



Gaza Ophthalmic Centre

0.1 Anatomy of the Eye Ophthalmology

4TH YEAR MEDICAL STUDENTS

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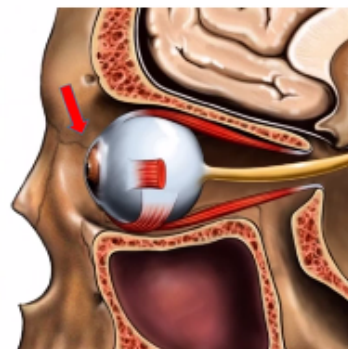
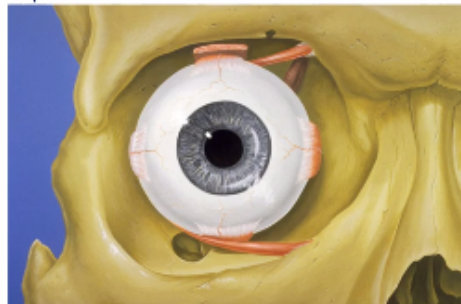


Good morning. This lecture is an introduction to the course of for the fourth year medical .students

Eye ball

□Introduction:

- The eye placed in the anterior part of the orbit
- Only the anterior part of the eye ball is exposed



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The eyeball is placed in the anterior part of the orbit and that's why only its anterior part is .exposed to the anterior to the external world

Eye ball

❑ The eye moves by 6 extra ocular muscles:

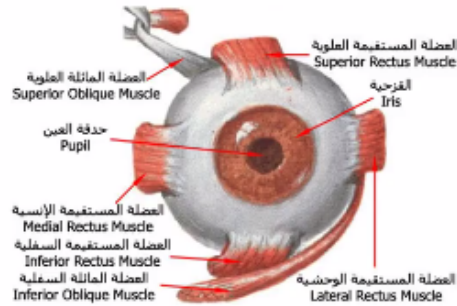
❑ 4 recti

- ❑ Superior,
- ❑ Inferior,
- ❑ Lateral
- ❑ Medial

❑ 2 obliques

- ❑ Superior
- ❑ Inferior

❑ The muscles are innervated by 3rd, 4th and 6th cranial nerves



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The eyeball is moved by six muscles four rect, sup, inf, lateral, medial and two obliques. The muscles are supplied by three cranial nerves the third, the fourth, and the sixth

Eye ball

❑ The Optic nerve

❑ Connects

- ❑ the eye to
- ❑ the brain,

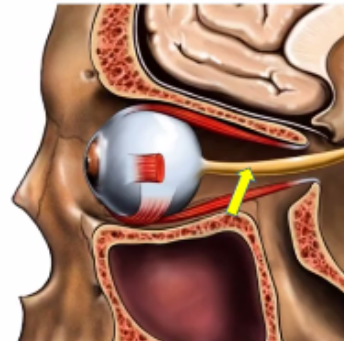
❑ Carries visual impulses

❑ passing through the

- ❑ Optic foramen and
- ❑ Optic canal

❑ The Ophthalmic nerve

❑ Carries sensory impulses



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The eye have two sets of sensory cranial nerves. The second cranial nerves optic nerve connects the eye to the brain and carries visual impulses passing through the optic foramen and the optic canal. While the trigeminal the fifth the ophthalmic division carries sensory impulses

Eye ball

❑ The exposed part of the eye ball consists of

❑ Cornea

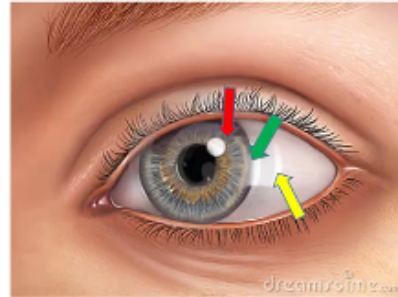
- ❑ central
- ❑ transparent part
- ❑ (visual)

❑ Sclera

- ❑ opaque white part
- ❑ protective

❑ Junction of

- ❑ sclera with
- ❑ cornea is called
- ❑ Limbus



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the exposed part of the eye consists of the cornea and the sclera. The cornea is central transparent parts that have a visual function while the sclera is the white opaque posterior part and it's mainly protective. The junction between the sclera and the cornea is called the .Limbus or the ring

Eye ball

❑ Anterior part of eye ball

❑ Covered by the

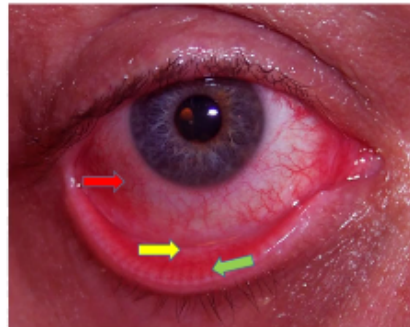
❑ Conjunctiva

- ❑ thin
- ❑ mucous membrane

1. Covering the sclera
1. Bulbar conjunctiva

2. Reflected part
1. Fornix

3. Covering the eye lid
❑ Palpebral conjunctiva



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The anterior part of the eyeball is covered by conjunctiva, which is the thin mucous membrane. The conjunctiva covering the sclera is called the bulbar conjunctiva and it's freely mobile. The reflected part between the sclera and the back of the eyelids is called the Fornix while the conjunctiva covering the back of the eyelids are called the palpebral conjunctiva .and it's firmly attached to the tarsus plates of the eyelid

Eye ball

□ The sclera

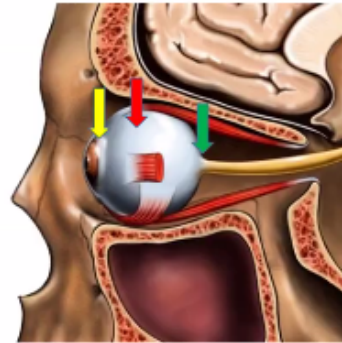
Extends

□ From

- The limbus
- anteriorly

□ to the

- optic nerve
- posteriorly



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.The sclera therefore extends from the Limbus anteriorly to the optic nerve posteriorly

Eye ball

□ Dimensions:

□ Geometric axis

- Antero-posterior
- 24 mm

□ Equator:

- Encircles the eye,
- 12 mm behind the limbus

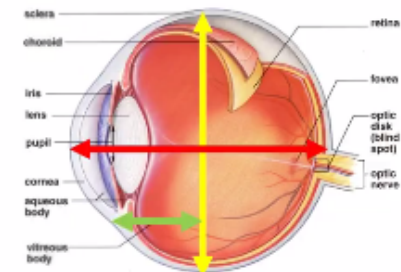


Fig. 32.30 Structure of the human eye.

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The eye geometric access from anterior to posterior is about 24 millimeter an average .subject and the equator which encircles the eye is about 12 millimeters behind the limbus

Eye ball

□ Eye Ball Layers:

1. Outer coat:
 1. Cornea
 2. Sclera
2. Middle coat:
 1. Iris
 2. Ciliary Body
 3. Choroid
3. Innermost layer:
 1. Retina

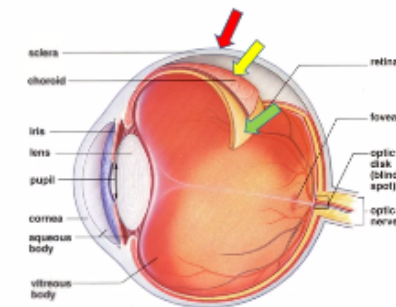


Fig. 32.30 Structure of the human eye.

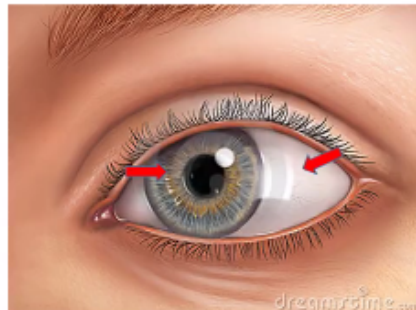


The eye have three coats the outer coats cornea and sclera, the middle coats Iris & ciliary body and choroid while the innermost is the retina

Eye ball

□ Eye Ball Layers:

- Outer coat:
 1. Cornea
 - 1/6
 - Transparent
 2. Sclera
 - 5/6
 - Opaque
- The functions are
 - Visual
 - Protective



the outer coat contains from the cornea which is the anterior one sixth and it is transparent with visual function the sclera is the remaining five sixth as white opaque at of protective .function

Eye ball

□ Eye Ball Layers:

□ Middle coat:

1. Iris
2. Ciliary body
3. Choroid

□ Vascular

□ Nutritive function.

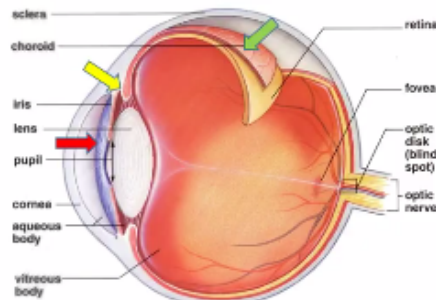


Fig. 32-39 Structure of the human eye.

The middle coat the iris in front the ciliary body in the middle and the choroid in the posterior part is the vascular and it have mainly nutritive function in addition the iris through its hole the pupil controls the amount of light going inside the eye while the ciliary body and .the ciliary muscle controls the amount of accommodation to near vision

Eye ball

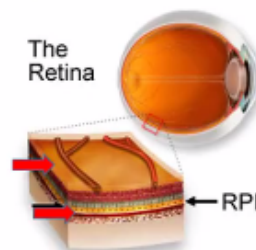
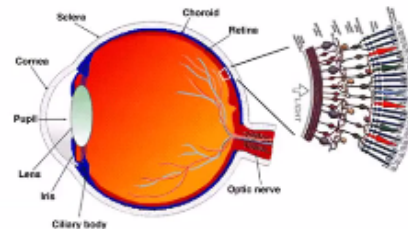
□ Eye Ball Layers:

□ Innermost layer:

□ Retina

□ Formed of 2 layers:

1. Sensory Retina
 - responsible for
 - reception of
 - visual impulses
2. Retinal pigment epithelium layer



The innermost layer consists of the retina which is two layers the sensory one responsible for the reception of the visual impulses and it gives the neuro sensory input to the visual cortex. The other layer the outer most one is the called the retinal pigment epithelial and it is has a .nutrient nutrition and protective function

Eye ball

- The eye chambers are three:

1. The Anterior Chamber
2. The Posterior Chamber
3. The Vitreous Cavity

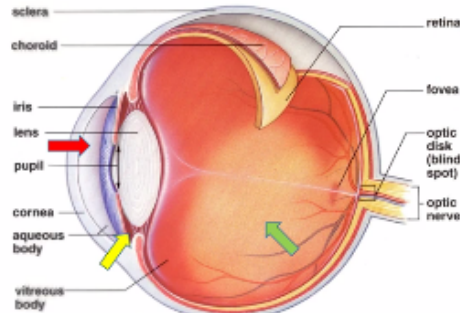


Fig. 32.36 Structure of the human eye.

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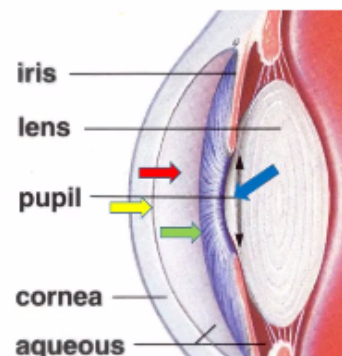
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The eye have three chambers the anterior the posterior and the vitreous cavity

Eye ball

- The Anterior Chamber

- Separates the
 - Cornea
 - Posterior surface
- From the
 - Iris
- Communicated with the
 - Posterior camber
 - through
 - the Pupil,
- Filled with
 - Aqueous Humor



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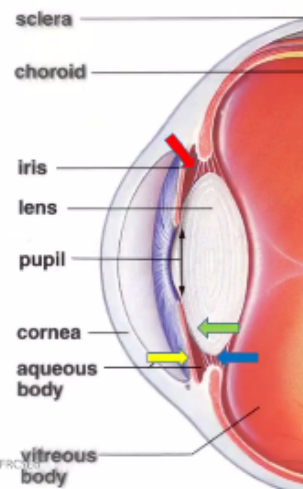
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the anterior chamber is present between the corneal posterior surface and the anterior surface of the iris. It communicates with the posterior chamber through the pupil. The AC is .filled with aqueous humor which is the watery solution

Eye ball

- The Posterior Chamber

- Small and
- Narrow space
- Between
 - the Iris
 - anteriorly
- and the
 - Lens and
 - its Zonules
 - posteriorly



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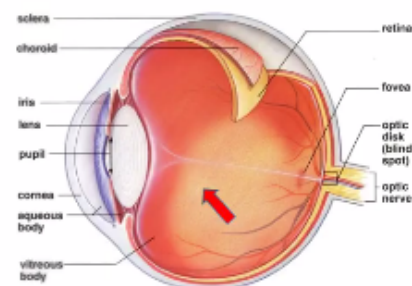
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The posterior chamber is a small and narrow triangular space, just behind the posterior aspect of the iris anteriorly and the anterior surface of the lens and its zonules posteriorly

Eye ball

- Vitreous Cavity:

- Largest chamber
- Behind
 - the Lens
- Bounded by the
 - Retina,
- Filled with a
 - Jelly-like substance
 - Vitreous humor



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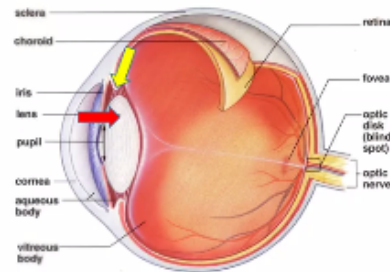


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The vitreous cavity is the largest chamber of the eye. Behind the posterior aspect of the lens bounded by the retina from all other aspects. It is filled with a jelly like substance called vitreous humor

Eye ball

- The lens:
 - Transparent
 - Biconvex structure
 - Located
 - Behind the Iris
 - fixed in its position by
 - Zonules called
 - Suspensory ligaments



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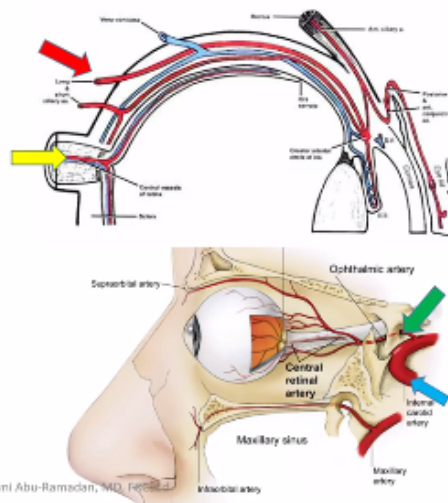
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The lens is a transparent bi convex structure located behind the iris, it is fixed in its position but the zonules called the suspensory ligament which connects the lens to the ciliary body and the ciliary muscle and that controls the amount of accommodation to near vision

Eye ball

- **The blood vessels:**
 1. Ciliary system
 2. Retinal system
 - Both from the
 - Ophthalmic artery
 - Derived from
 - Internal Carotid Artery



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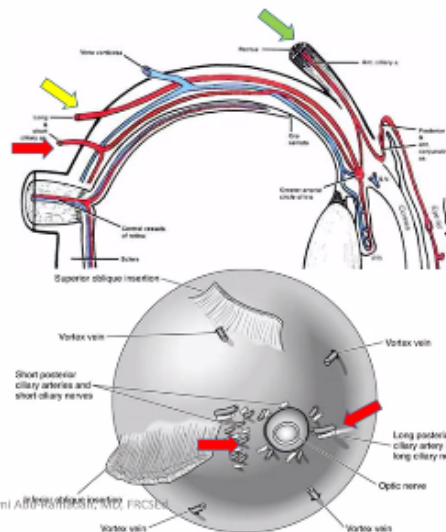
The eye has two sources of blood vessels: first the ciliary system and the retinal system, both of which originate from the ophthalmic artery, which is a branch of the internal carotid artery.

Eye ball

□ Ciliary system:

□ Arteries:

1. Posterior ciliary arteries
 1. Short
 2. Long
2. Anterior ciliary arteries



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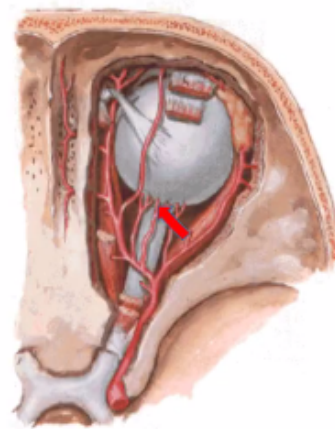
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The ciliary system have posterior ciliary arteries, which may be short or long as well as .anterior ciliary arteries

Eye ball

□ Short posterior ciliary arteries:

- 20 branches
- Enter surrounding optic nerve head
- Supply
 - Optic nerve,
 - Episclera
 - Sclera posteriorly
- Terminate in the
 - Choroid



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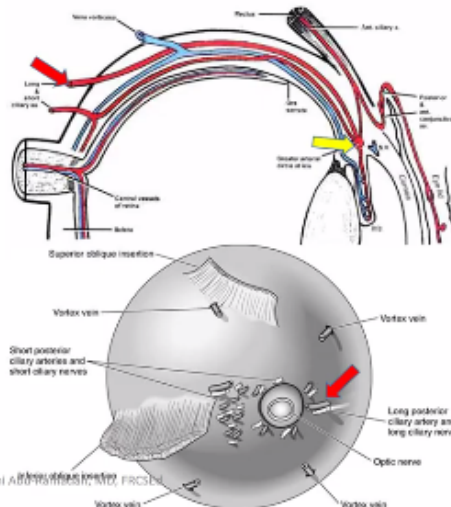
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The short posterior ciliary arteries are 20 branches which enters The eyeballs surrounding the optic nerve head. They supply the optic nerve, the epi sclera and the posterior part of the sclera. They terminate in the choroid the vascular structure of the innermost part of the eye

Eye ball

- ❑ Long posterior ciliary arteries:
 - ❑ passing forwards in
 - ❑ Suprachoroidal space,
 - ❑ Dividing in
 - ❑ Ciliary body
 - ❑ Forming
 - ❑ Major arterial circle of the iris
 - ❑ Circulus iridis minor
 - ❑ Supplying
 - ❑ Anterior part of the choroid



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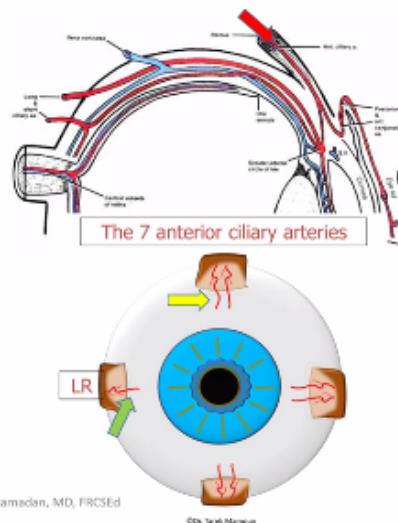
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long posterior ciliary arteries pass forward in the Supra choroid space between the sclera outside and the choroid internally and it divide in the ciliary body. They form the major arterial circle of the iris as well the minor arterial circle of the iris they supply the anterior part of the .choroid and the iris

Eye ball

- ❑ Anterior ciliary arteries:
 - ❑ From
 - ❑ Muscular arteries
 - ❑ Supplying Rectus Muscles
 - ❑ 7 in number
 - ❑ 2 arteries for
 - ❑ each Rectus EOM
 - ❑ Except Lateral Rectus
 - ❑ → 1 artery
 - ❑ Supplying
 - ❑ Episclera
 - ❑ Sclera
 - ❑ Ciliary body
 - ❑ Conjunctiva



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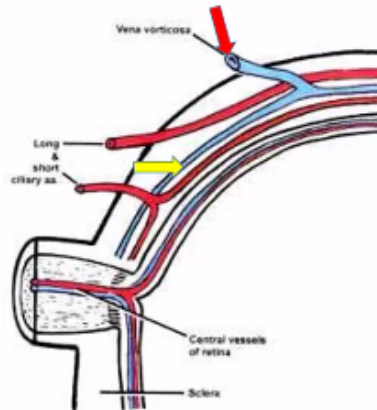
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The anterior axillary arteries they originate as branches from the muscular arteries that supply the rectus muscles. Each rectus muscle have two arteries on either side except for the lateral rectus which have one and that's why that the ant ciliary arteries are seven in number. They supply the episode era the sclera the ciliary body and the conjunctiva

Eye ball

• Venous system:

1. Vortex &
2. Posterior Ciliary



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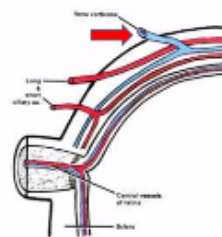
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.The venous system consists of the vortex veins and the posterior ciliary veins .

Eye ball

• Vortex veins

- 4 in number
- Drain
 1. Choroid
 2. Ciliary body
 3. Iris
- 2 superior and
- 2 inferior



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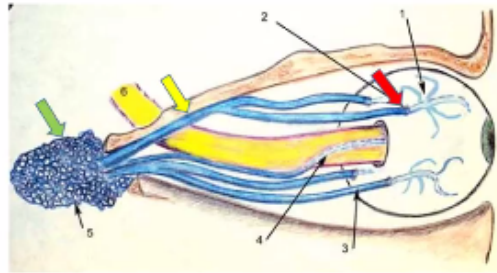
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The vortex are 4 in number two superior and inferior and they drain, the choroid the ciliary ,body, the iris

Eye ball

- Vortex veins
 - Draining to
 - Ophthalmic vein
 - and ultimately
 - Cavernous sinus



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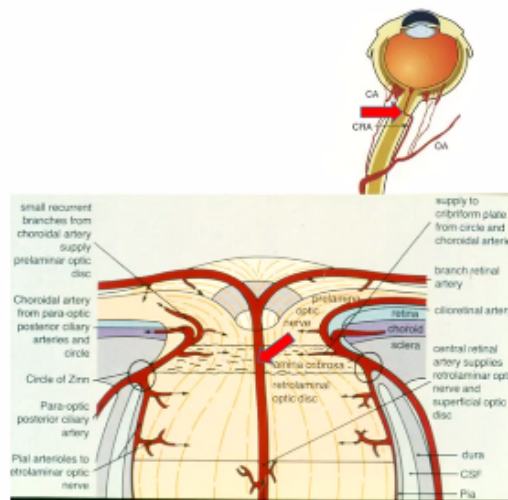
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they end and drain into the aphthalmic vein which ultimately ends into the covernous sinus

Eye ball

- **Retinal system:**
 - Central retinal artery:
 - Supplies the
 - Retinal inner layers
 - (The outer layers from choroid)



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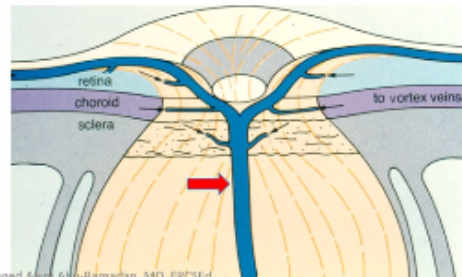
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The retinal system the central retinal artery supplies the retinal inner layers the outer layer . have its oxygen and nutrients supplied by diffusion from the choroid outside It

Eye ball

- **Retinal system:**

- Central retinal vein:
 - → Ophthalmic vein
 - → Cavernous sinus

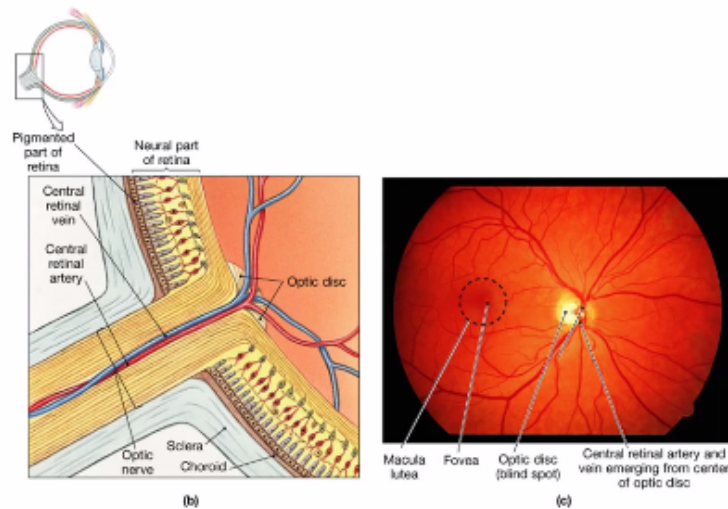


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the central retinal vein drains into the aphthalamic vein, which also drains into the cavernous .sinus

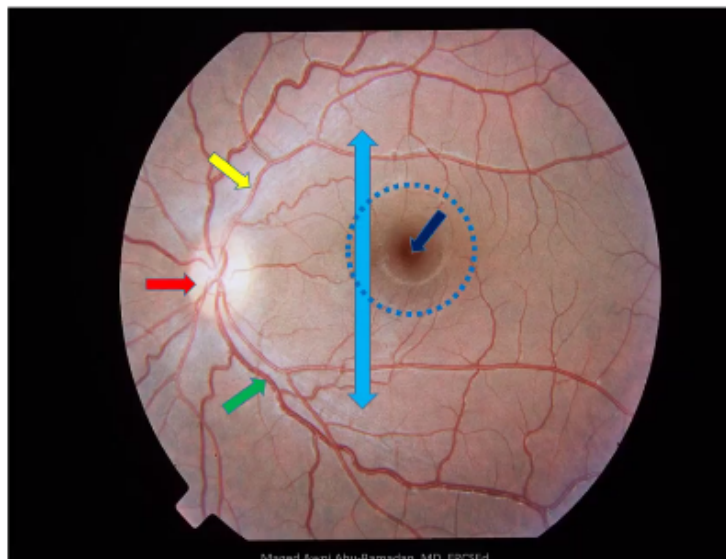


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This is to show the relation between the central retinal vein, the optic disk and the inner .retina



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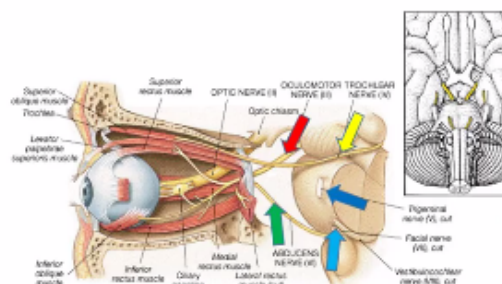
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If you look through the ophthalmoscope or fundoscope, we can see here the main feature is the optic disc features by the red arrow. And then we can see a group of or arcade of arteries and branches of the central retinal artery and central retinal vein going up the upper arcade and the lower arcade denoted by the green one. The areas spanning between the upper and lower temporal arcades is called the macula anatomically. However, for clinical purposes, the macula is more defined as the area bounded by the interrupted blue circle. With its middle there is a depression called the fovea centralis that the center of the maximum vision that we might have

Nerves of the Eye

- Oculo Motors:
 - 3rd,
 - 4th,
 - 6th cranial nerves
- Facial nerve: (VII)
- Sensory: (V)
- Sympathetic
- Parasympathetic



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The eye has several sources of cranial nerve innervation. First we have the third the oculomotor, the fourth the trochlear and the sixth abducent cranial nerves which supply the extra ocular muscles. The facial nerve supplies the orbicularis oculi, which is the muscle that closes the eyelid. However the ophthalmic, and to a little extent the maxillary divisions

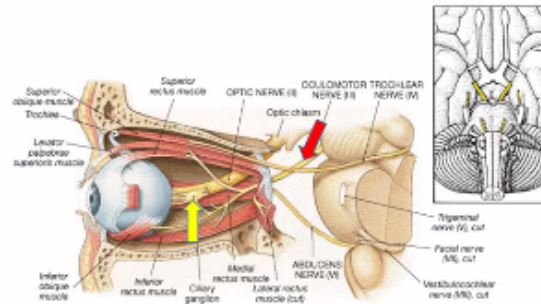
of the ophthalmic of the trigeminal nerve they first give sensory supply to the skin and to the eye. Also the autonomic both sympathetic and parasympathetic supply eye

Nerves of the Eye

- Oculomotor (III nerve)

Supplies

- All Extra Ocular Muscles
 - Except SO & LR
- All Intra Ocular Muscles
 - (Parasympathetic)



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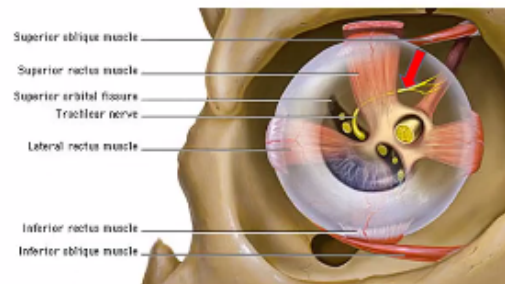
The oculomotor nerve supplies all the extra ocular muscles except the superior oblique and .lateral rectus and also it gives parasympathetic supply to all intra ocular muscles

Nerves of the Eye

- Trochlear (IV nerve)

Supplies

- Superior oblique



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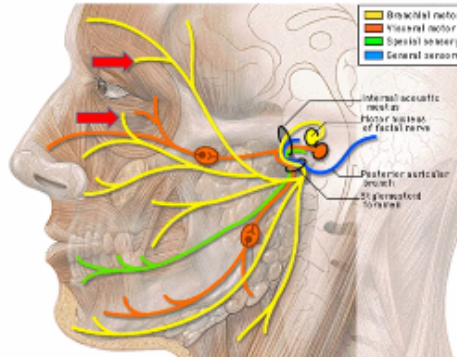
The trochlear nerve supplies one muscle the superior oblique. The abducent supplies the .lateral rectus muscle from its medial aspect

Nerves of the Eye

- Facial nerve: (VII)

Supply

- Orbicularis Oculi muscle &
- Lacrimal glands (PS)



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The facial nerve supplies the orbicularis oculi and also it gives parasympathetic supply to the lacrimal gland

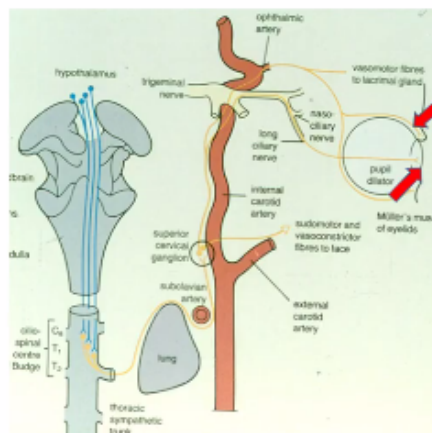
Nerves of the Eye

- Sympathetic:

- (surround Arterial BS, ICA)

Supply

1. Muller's muscle in the lid and
2. Dilator pupillae muscle



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The sympathetic consists of three neurons and it's surround the arterioles of the brainstem and the internal carotid artery supplies mullers muscle which helps in raising the upper eyelid as well as supplying the dilator pupillary muscle

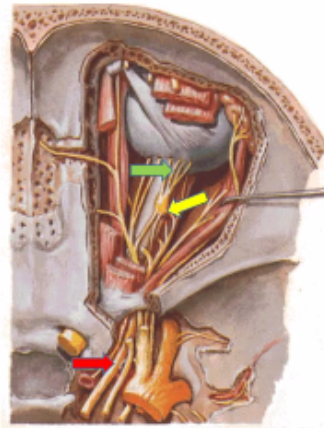
Nerves of the Eye

- Parasympathetic:

1. Via III nerve
2. → Ciliary Ganglion
3. → Pos Ciliary nerves

Supply

1. Ciliary Muscle
2. Constrictor Pupillae



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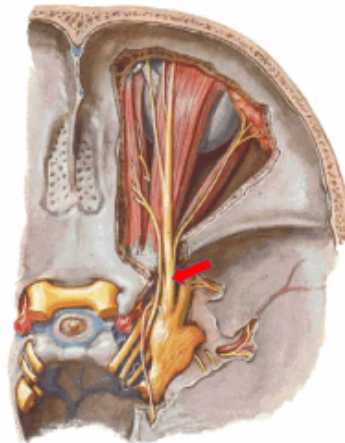
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The parasympathetic supply goes together or via the third nerve reaches the ciliary ganglion. And then postganglionic fibers goes into the posterior ciliary nerves to supply the ciliary muscle and the constrictor pupillae

Nerves of the Eye

- Sensory:

- Ophthalmic division of
- Trigeminal nerve (V nerve)



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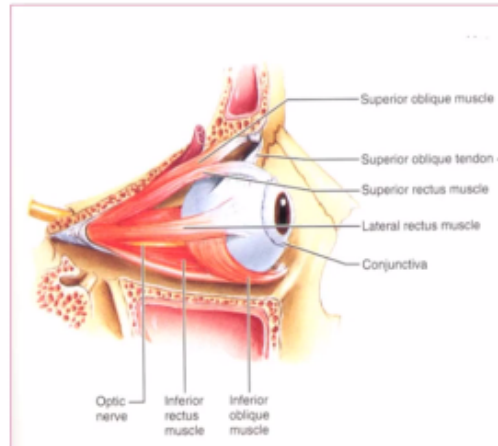
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The ophthalmic division of the trigeminal nerve is the main sensory supply to the eye and the upper eyelid. The lower eyelid also get some supply from the maxillary division of the trigeminal nerve

Extraocular muscles

Six muscles

- Move the globe in various directions
- Four rectus muscles:
 1. Superior rectus III
 2. Inferior rectus III
 3. Medial rectus III
 4. Lateral rectus VI
- Two Oblique Muscles:
 1. Superior oblique IV
 2. Inferior oblique III



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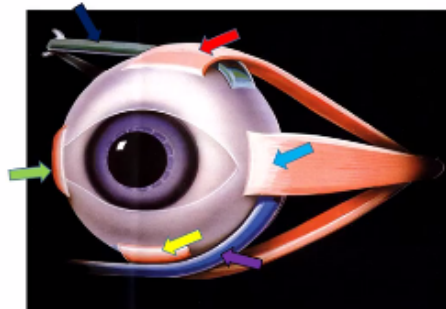
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there are six ocular muscles that move the globe in various directions four recti, the superior, inferior and medial recti is supplied by the oculomotor nerve the third, the lateral rectus supplied by the sixth, the oblique muscles is superior oblique supplied by the trochlear fourth and the inferior oblique once again by the third oculomotor

Extraocular muscles

- Four rectus muscles:
 1. Superior rectus
 2. Inferior rectus
 3. Medial rectus
 4. Lateral rectus
- Two Oblique Muscles:
 1. Superior oblique
 2. Inferior oblique



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Here we can see that the four rectus muscle is inserted into the anterior aspect of the eyeball on varying distances from limbus reaching between 5.5 up to 7.7. According to each muscle, we can also see that the two obliques are coming from the anterior aspect of the orbit and going backwards

Extraocular muscles

- Two Oblique Muscles:
 1. Superior oblique
 2. Inferior oblique



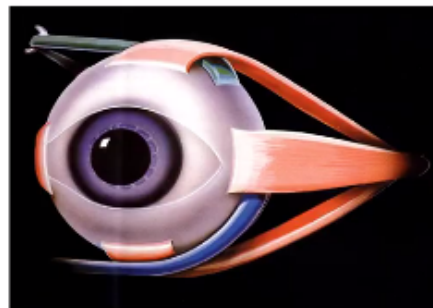
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From the back of the eye, we can see the insertion of the superior oblique above the inferior oblique down into the posterior aspect of the eyeball



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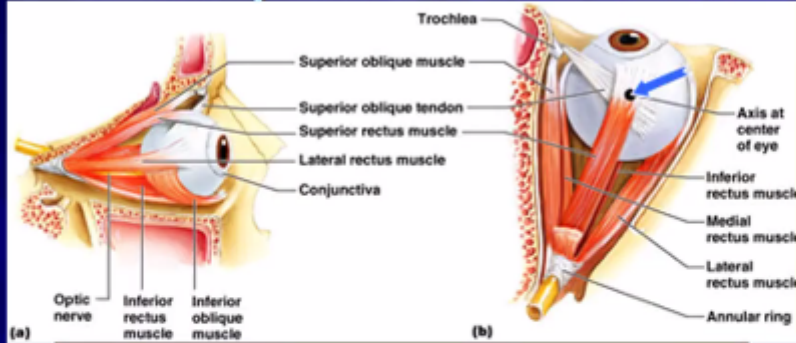
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This is to show the origin of the rectus muscle from the apex of the orbit and they go anterior to be inserted around the limbus while the two oblique muscles are inserted into the back of eye

Extrinsic Eye Muscles: Main Action



Name	Action	Controlling cranial nerve
Lateral rectus	Moves eye laterally	VI (abducens)
Medial rectus	Moves eye medially	III (oculomotor)
Superior rectus	Elevates eye	III (oculomotor)
Inferior rectus	Depresses eye	III (oculomotor)
Inferior oblique	Elevates eye and turns it laterally	III (oculomotor)
Superior oblique	Depresses eye and turns it laterally	IV (trochlear)

1

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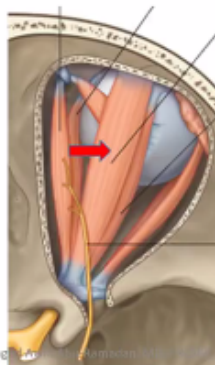
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each extra ocular muscle have a defined action as its primary action. They might also have secondary or even tertiary exit the lateral rectus takes the eye externally while the directors take it medially towards the nose, the superior rectus elevates the eye the inferior rectus depresses the eye, the two oblique muscles they elevate and depress the eye. But it could also turn it laterally and causes in intorsion or extorsion

Levator palpebrae superioris muscle

- Orbital muscle
- Elevates the upper lid
- III



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the levator palpebrae superioris muscle is an orbital muscle originating at the apex of the orbit passing near the roof of the orbit and then it turns downward to be inserted into the upper tarsus as well as other structures in the upper eyelid including the orbicularis oculi and the skin

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