

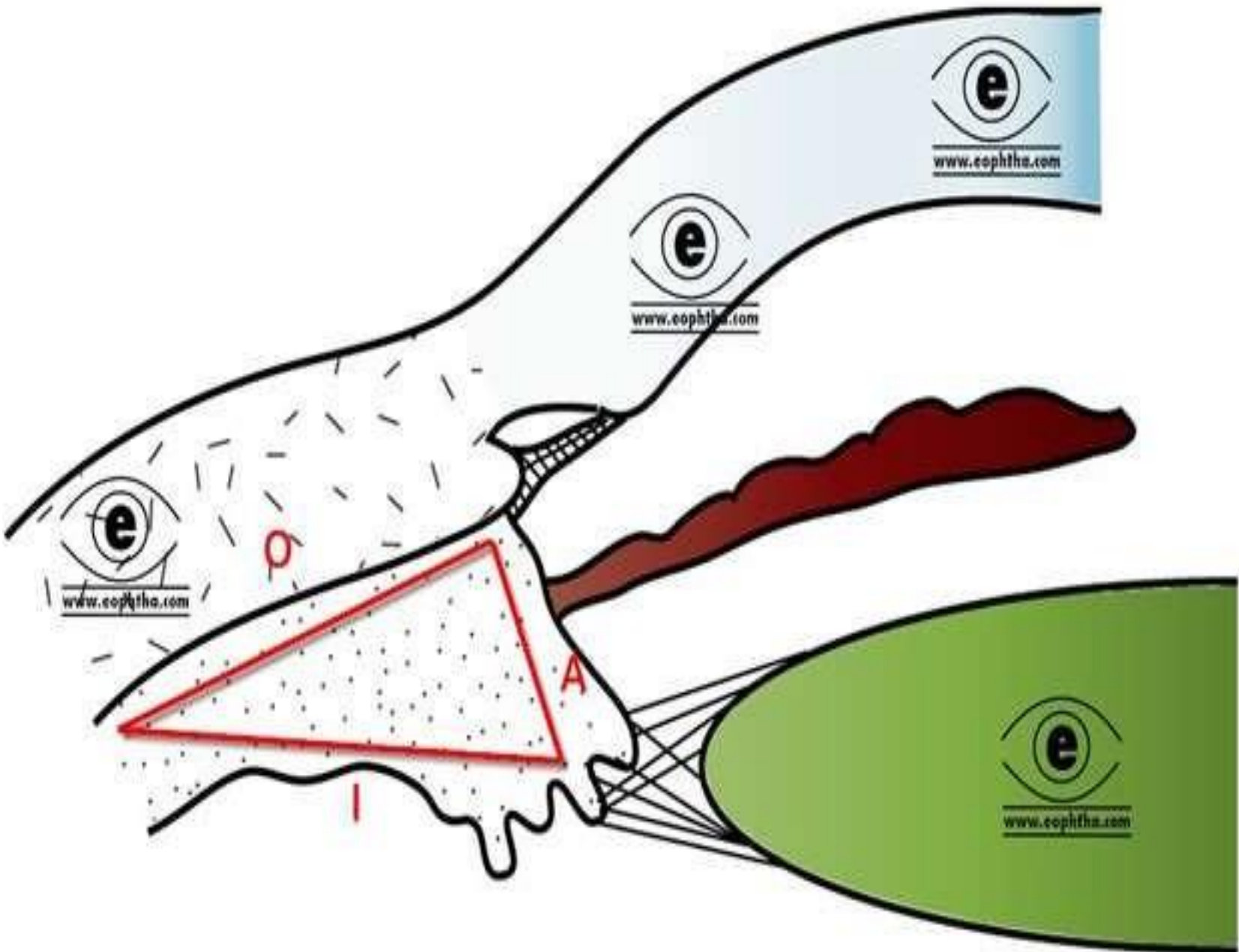
ANATOMY OF LENS DR. RESHMA RAMAKRISHNAN

Ciliary body

- Ciliary body is the middle part of the uveal tract . It is a ring shaped structure which projects posteriorly from the scleral spur.
- It is brown in colour due to melanin pigment.
- Anteriorly it is confluent with the periphery of the iris (iris root) and anterior part of the ciliary body bounds a part of the anterior chamber angle.
- Posteriorly ciliary body has a crenated periphery, known as ora serrata, where it is continuous with the choroid and retina.
- Ciliary body has a width of approximately 5.9 mm on the nasal side and 6.7 mm on the temporal side.

Parts of ciliary body

- Ciliary body, in cross section, is a triangular structure .
- Outer side of the triangle (O) is attached with the sclera with suprachoroidal space in between.
- Anterior side of the triangle (A) forms part of the anterior & posterior chamber. In its middle, the iris is attached.
- The inner side of the triangle (I) is divided into two parts. The anterior part (2 mm) with finger like processes is known as pars plicata (corona ciliaris) and posterior smooth (4 mm) is known as pars plana (orbicularis ciliaris).



Pars plicata:

- The pars plicata is the portion of ciliary body which contains the ciliary processes.
- Ciliary processes are the finger like projections, which extend into the posterior chamber.
- The regions between ciliary processes are called valleys of Kuhnt.
- They are approximately 70 to 80 in numbers.
- A ciliary process measures approximately 2 mm in length, 0.5 mm in width, and 1 mm in height.

Pars plana

- Pars plana is the flat or smooth part of the ciliary body.
- It terminates at the ora serrata, which is the transitional zone between ciliary body and choroid.
- Histologically, the pars plana consists of a double layer of epithelial cells: the inner, nonpigmented epithelium, which is continuous with neurosensory retina
- and the outer, pigmented epithelium, which is continuous with the retinal pigment epithelium (RPE) .

Applied anatomy

- The pars plana is a relatively avascular zone, which is important surgically in the pars plana approach to the vitreous space.
- The pars plana provides surgical access to the vitreous and retina

Ora serrata: the transition zone

- The ora serrata can be termed as the anterior border of the neurosensory retina
- **Applied anatomy**

Topographically, ora serrata corresponds to the insertion of the medial and lateral rectus muscles.

Lens and ciliary body:

- The zonules course from ciliary body to the lens.
- Some of these zonular fibers insert into the internal limiting membrane of the pars plana region and travel forward through the valleys (valleys of Kuhnt) between the ciliary processes

Layers of ciliary body:

- From inside to outside (from sclera to vitreous), ciliary body consists of following four layers.
- 1. Ciliary epithelium:
 - 1A. Non pigmented epithelium of ciliary body NPE of ciliary body extends from iris root to ora serrata.
 - It begins as a continuation of posterior pigmented epithelium of iris near iris root.
 - At ora serrata, the NPE continues as sensory retina.
 - It gives origin to parts of the suspensory lens ligament.

- 1 B. Pigmented epithelium of ciliary body:
- The cells of the pigmented epithelium are 8 to 10 micrometer wide and contain large pigment granules.
- These pigment granules are three to four times larger than those of the choroid and retina.
- These cells are rich in organelles and are very active metabolically.
-
- The cells of pigment epithelium secrete basement membrane which continues posteriorly with the retinal pigment epithelium (RPE).

Applied anatomy

- Ciliary epithelium : metabolic activity
- The cells of both the ciliary epithelium have a greater number of mitochondria and thus they have a higher degree of metabolic activity, with a significant role in the active secretion of aqueous humor.

2. Ciliary stroma:

- Ciliary stroma contains blood vessels, nerves and ciliary muscle.
- Ciliary stroma continues anteriorly with iris stroma and continues posteriorly with choroidal stroma after thinning out at pars plana

- Blood vessels in ciliary stroma: Major arterial circle of iris
- Major arterial circle of iris, formed by the anastomosis of long posterior ciliary arteries and anterior ciliary arteries, is located in ciliary stroma near iris root just in front of circular portion of ciliary muscle.
- Ciliary stroma also consists of numerous capillaries which are fenestrated and large in size.
- The capillaries are more in numbers in ciliary processes, making them the most vascular organ of the eye

Muscle in ciliary stroma: ciliary muscle

- Ciliary muscle is a nonstriated or smooth muscle primarily situated in the anterior two thirds of the ciliary body stroma. The muscle has three parts –
 - > Outer longitudinal (Brücke's muscle)
 - > Middle oblique portion (also called reticular or radial)
 - > inner circular portion (Müller's muscle)

- Contraction of the ciliary muscle, especially of the longitudinal and circular fibers, pulls the ciliary body forward during accommodation.
- This forward movement of ciliary body relieves the tension in the suspensory lens ligament (zonules), making the elastic lens more convex and thereby helps the eye in accommodation by increasing the refractive power of the lens

- Ciliary muscle is innervated by the autonomic nervous system, parasympathetic postganglionic fibres derived from the oculomotor nerve.
- The nerve fibres reaches the muscle via short ciliary nerve.
- The parasympathetic stimulation activates the muscle for contraction, whereas sympathetic innervation likely has an inhibitory effect.

Supraciliary lamina:

- supraciliary lamina is the outermost layer of ciliary body which lies adjacent to the sclera.
- Because of the lamellar arrangement of connective tissue in this area, supraciliary lamina acts as a potential space.
- Thus it also helps aqueous humor to exit by the unconventional pathway .

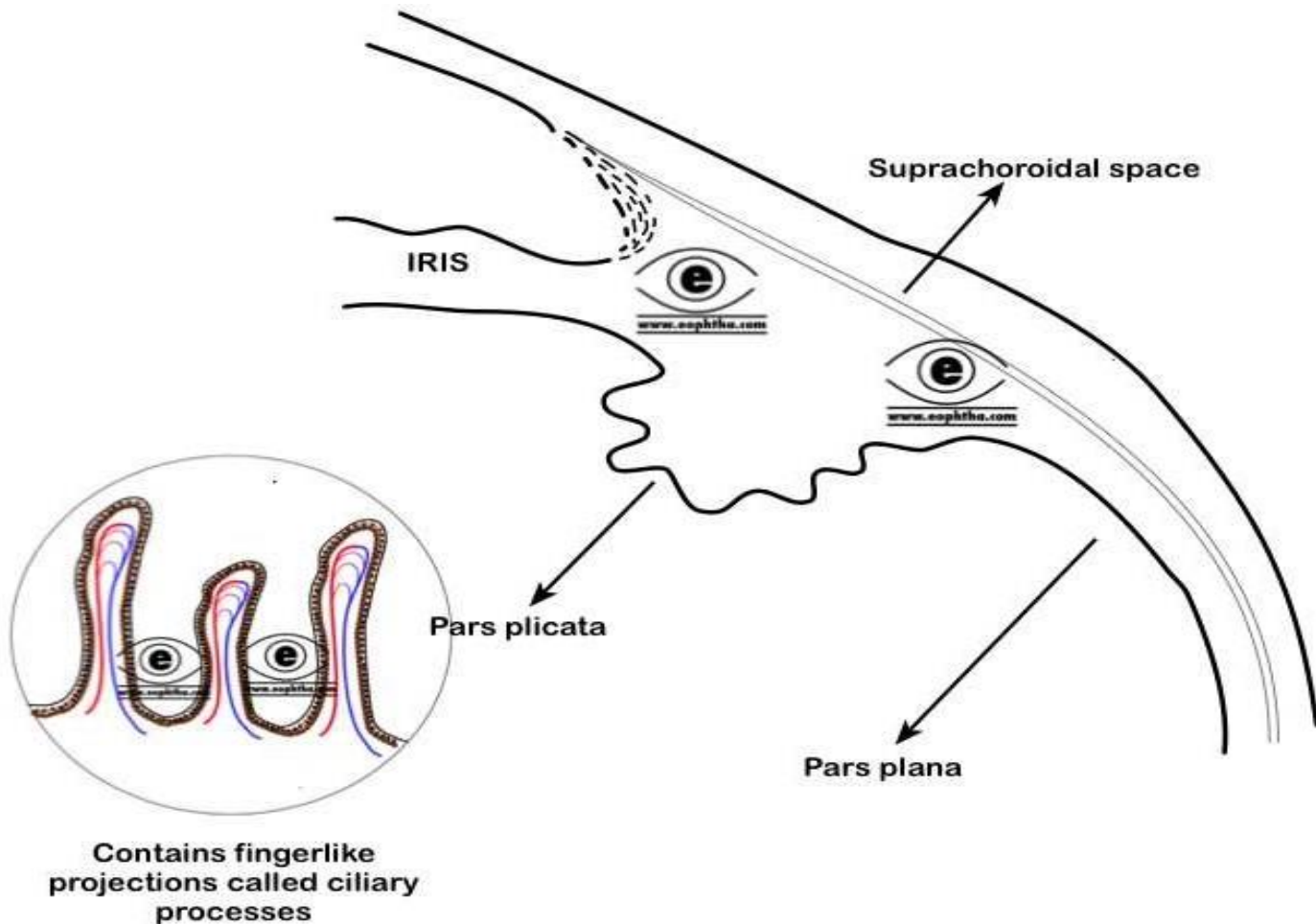
Applied anatomy

- Ciliary body detachment occurs through supraciliary lamina

Ciliary process :

- Ciliary processes are finger like projections seen in pars plicata of ciliary body.
- Ciliary processes are approximately 70 to 80 in numbers in each eye and extend into the posterior chamber, and the regions between these ciliary processes are called valleys of Kuhnt.
- Zonules of lens (suspensory ligaments of lens) are inserted in these valleys.
- The ciliary processes are white whereas the valleys of Kuhnt are dark in colour.

- Ciliary processes increase the surface area of pars plicata, which is approximately 6 square centimetre, approximately five times the surface area of corneal endothelium



Blood supply of ciliary process:

- Long posterior ciliary artery, a branch of ophthalmic artery, pierce the globe near the optic nerve and run up to ciliary body to form major arterial circle.
- Several branches from major arterial circle supply ciliary processes.
- These are mainly pre capillary arterioles and they divide in to network of capillary plexuses in each of the ciliary processes.
- These vessels drain in to choroidal and intrascleral veins

Applied anatomy

- The pre capillary arterioles supplying the ciliary processes have sphincters which may be responsible for the auto regulation of blood supply to the tissue.

Choroid

- Choroid is a thin but highly vascular membrane lining the inner surface of sclera.
- It extends from anteriorly ora serrata to the optic nerve posteriorly.
- Choroid becomes continuous with pia and arachnoid at the optic nerve.
- Choroid is normally 100-220 μm thick ; thickness is highest at macula 500- 1000 μm .

Applied anatomy

- Choroidal thickness increases in intraocular inflammation.

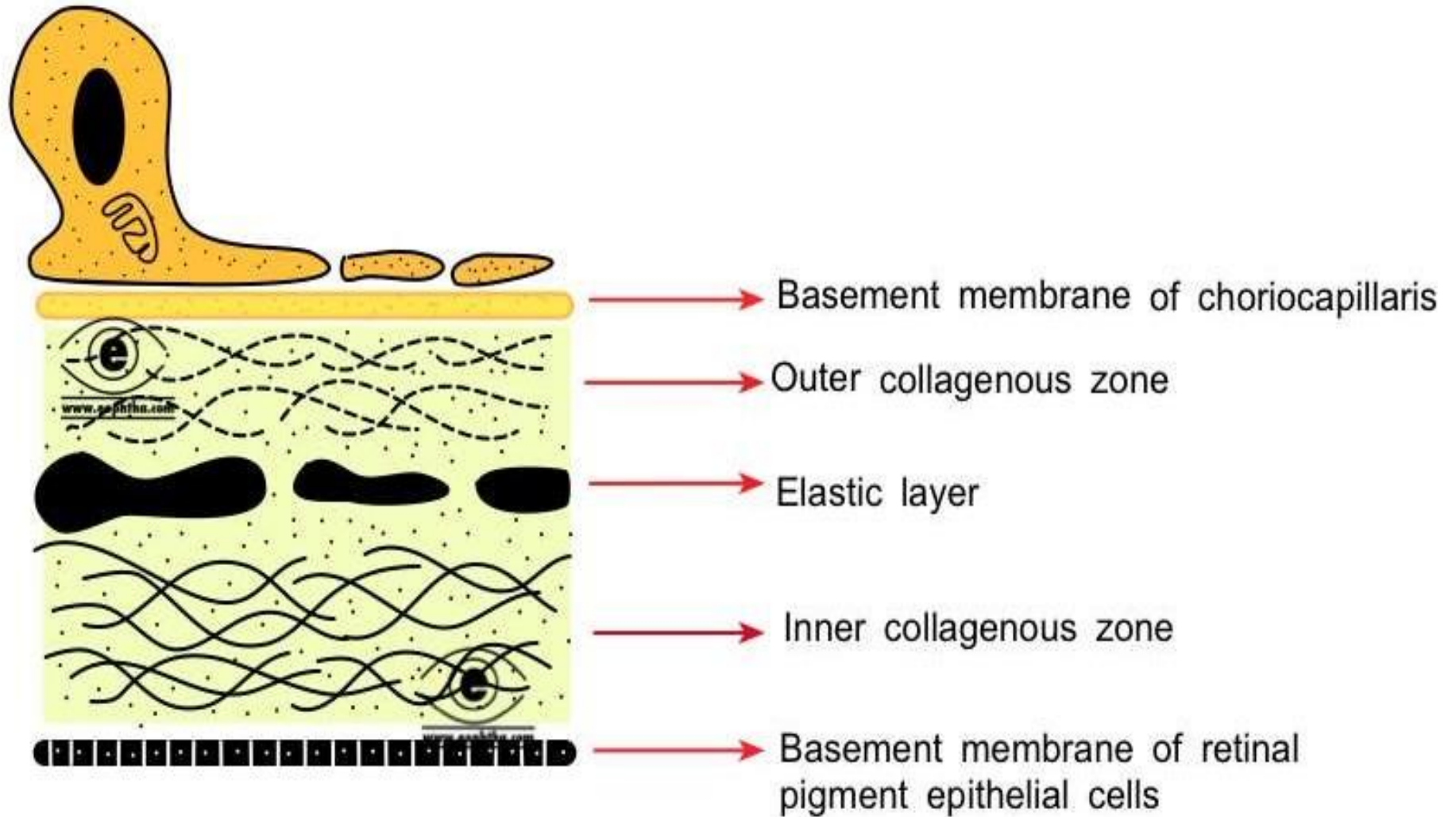
- Choroid can be divided into the following layers histologically
- 1. Suprachoroid lamina (lamina fusca):
- 2. Choroidal stroma:
- 3. Layer of Choriocapillaris (Choriocapillaries are thickest and most abundant in submacular area)

Applied anatomy

- *choroidal circulation:*
- Choroidal circulation constitutes 85% of the blood circulation of the eye.
- Choroidal blood flow is higher than that in tissues like retina and brain.
- Choroidal blood-flow ranges from 800 to 2000 mL/min/100 g of tissue.
- In embryonic life, choroid serves as an additional site for the erythropoiesis.

4. Bruch's membrane:

- Bruch's membrane is the innermost layer of choroid
- Bruch's membrane is composed of 5 layers and from internal to external,
- these are



Applied anatomy

- *Outer blood-retinal barrier*
The outer blood-retina barrier (BRB) is composed of three structural entities,
 - > *the fenestrated endothelium of the choriocapillaris,*
 - > *Bruch's membrane and*
 - > *the retinal pigment epithelium (RPE).*

Blood supply of uveal tract:

- The blood supply of the uveal tract is mainly from three arteries namely short posterior ciliary arteries, long posterior ciliary arteries and anterior ciliary arteries.
The posterior ciliary arteries are branches of the ophthalmic artery.

SHORT POSTERIOR CILIARY ARTERIES

- 15 to 20 short posterior ciliary arteries arise → form 10 to 20 branches → enter the sclera in a ring around the optic nerve → anastomose with other branches from the short posterior ciliary arteries to form the circle of Zinn (Zinn-Haller) which encircles the optic nerve at the level of the choroid → they run in suprachoroidal space between sclera and choroid, branch and
- supply the choroid.

LONG POSTERIOR CILIARY ARTERIES

- two long posterior ciliary arteries enter the sclera: one lateral and one medial to the ring of short ciliary arteries → run between the sclera and the choroid to the anterior globe → enter the ciliary body and branch superiorly and inferiorly → anastomose with each other and with the anterior ciliary arteries to form a circular blood vessel,
- the major arterial circle of the iris

ANTERIOR CILIARY ARTERIES :

- 7 anterior ciliary arteries are derived from muscular branches of ophthalmic artery
- two each from arteries of superior rectus, medial rectus, inferior rectus and only one from lateral rectus muscle → reaches episclera, form plexus and give branches → pierce sclera near the limbus to enter the eye → anastomoses with long posterior ciliary arteries to form **major arterial circle of iris**

- Thank you !!