STRUCTURE OF EYE
AQUEOUS HUMOR

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ALL FIGURES HAVE BEEN TAKEN FROM 'COMPREHENSIVE TEXTBOOK OF PHYSIOLOGY' BY DR. G K PAL WITH PERMISSION)

FUNCTIONAL ANATOMY OF EYE

- fluid filled spherical organ.
- diameter: 24 mm.
- 3 layers:

  1) outermost: cornea and sclera

  2) middle: uveal tract:iris, ciliary body, choroid

  3) innermost: retina containing photoreceptors

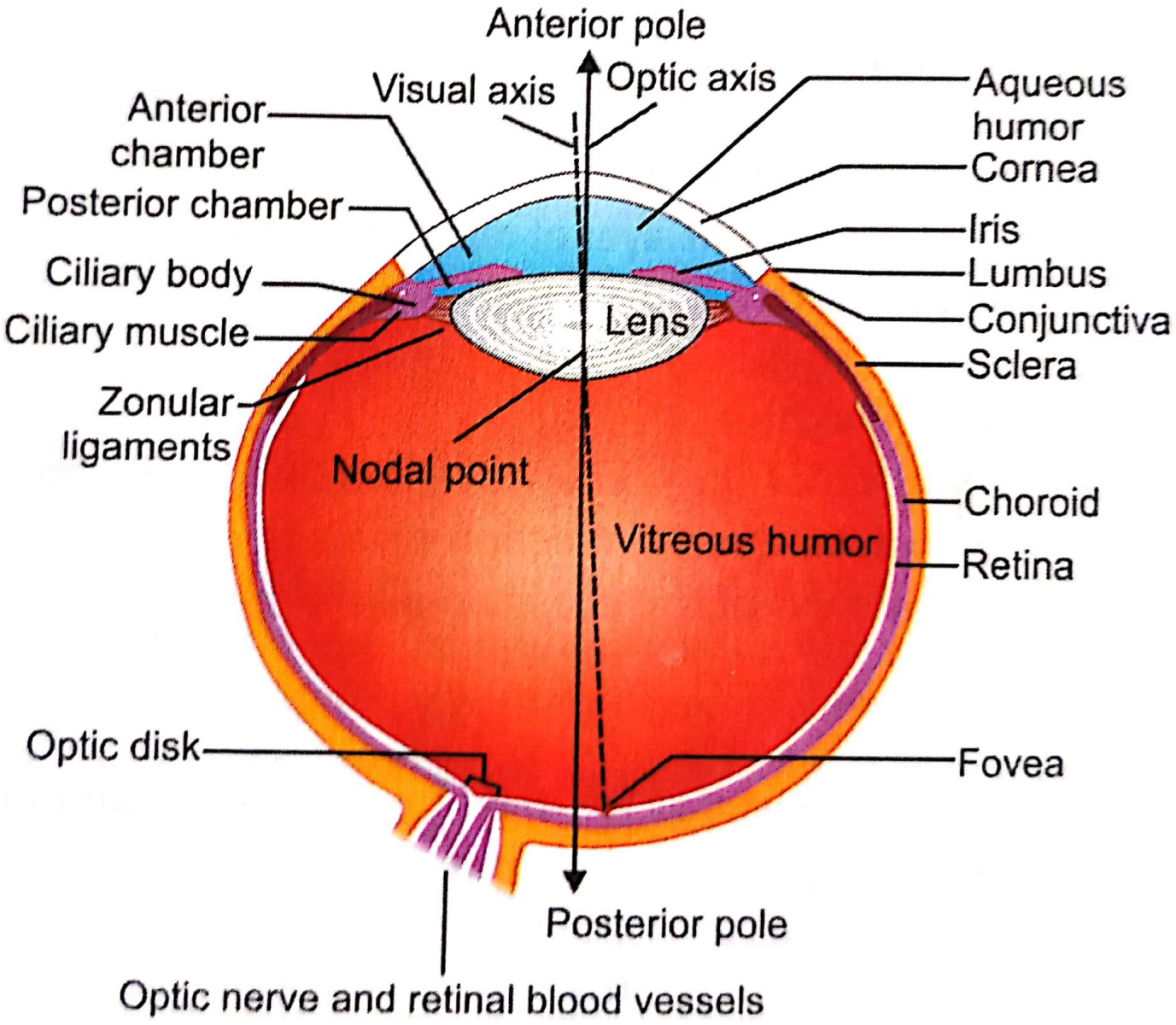

Fig. 142.1: Horizontal section of the right human eye, showing the major parts and their relative positions.

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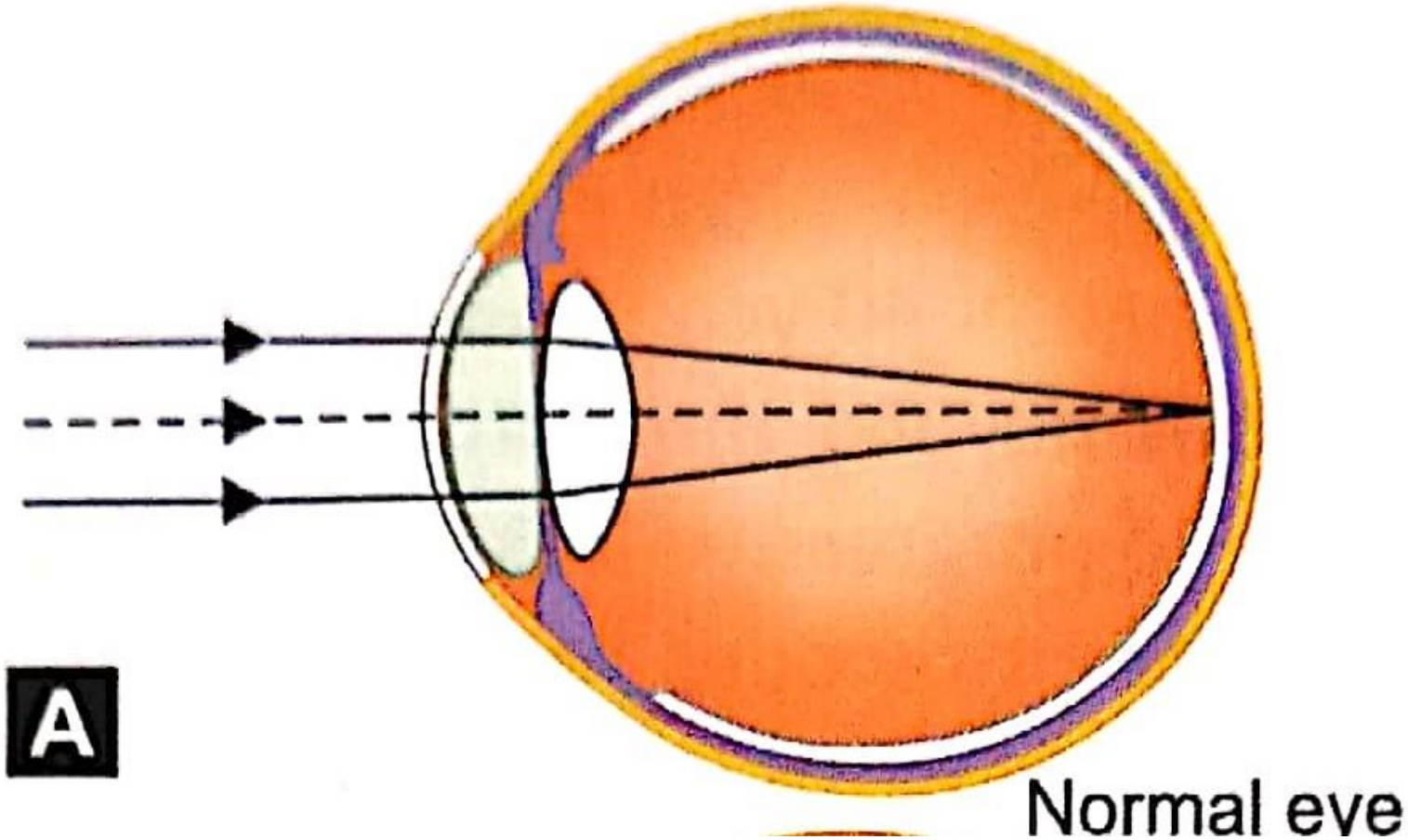
A
Normal eye

CORNEA

- sensory nerve: trigeminal n.
- transperent, avascular having 5 layers.
- so very less chances of graft rejection:corneal transplant easy.
- inflammation of cornea is called keratitis that may result in corneal opacities.

SCLERA

- white tough avascular fibrous coat- provides protection.
- composed of collagen fibers.
- extraocular muscles are inserted over it.
- covered with bulbar conjunctiva.

UVEAL TRACT: CHOROID, CILIARY BODY, IRIS.

- **CHOROID**:

contains many blood vessels.

contains connective tissue containing pigment cells- *chromatophores.(absent in albinos).*

chorioretinitis.

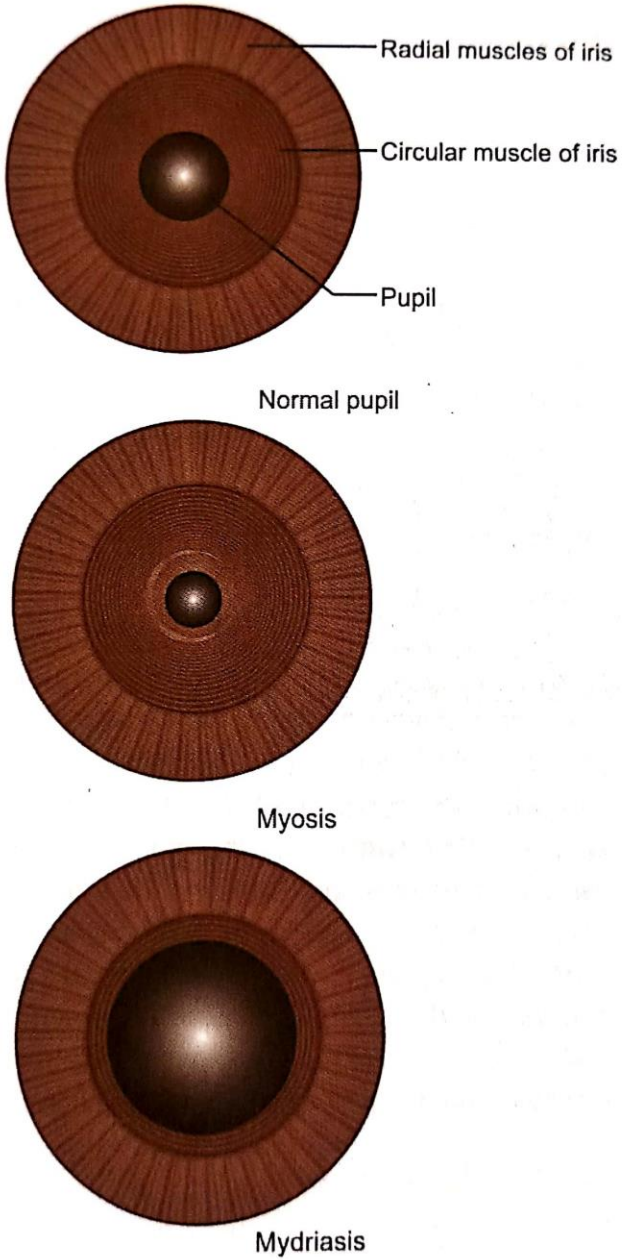

Fig. 142.3: Change in pupillary diameter in response to varying intensities of light. During miosis, the circular muscles of iris contract causing pupillary constriction. During mydriasis, causing pupillary dilation.

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CILIARY BODY

- ciliary muscles and ciliary processes.
- ciliary muscle supplied by iii nv
- ciliary body is attached to suspensory ligaments which hold the lens.
- contraction of ciliary m relaxes the sus. lig. and lens becomes more convex.
- ciliary processes: bld. vessels.

  produce aqueous humor

IRIS

- thin, pigmented, circular, contractile diaphragm over the ant. surface of lens.
- central aperture: pupil
- 2 muscles:

1. spinchter pupillae (parasympathetic): constriction of pupil
2. dilator pupillar (sympathetic): dilation of pupil

* regulates the amt. of light entering the eye.

* pigment gives color to eye.

CRYSTALLINE LENS

- biconvex, transperent, avascular, elastic- behind the iris.
- nucleus, cortex, capsule
- collagen fibres: α crystalline
- refractive power: 17 d
- function: to converge light rays and focus them on the retina.
- presbyopia.
- Cataract, aphakia

Presbyopia

- **A**ge-related process.
- Gradual thickening and loss of flexibility of the natural **lens**.
- Within the proteins in the **lens**, making the **lens** harder and less elastic over time.
- Difficult for the eyes to focus on close objects.

THE RETINA:

- TWO LAYERS:

1) OUTER PIGMENTED EPITHELIAL LAYER
2) INNER NEURONAL LAYER

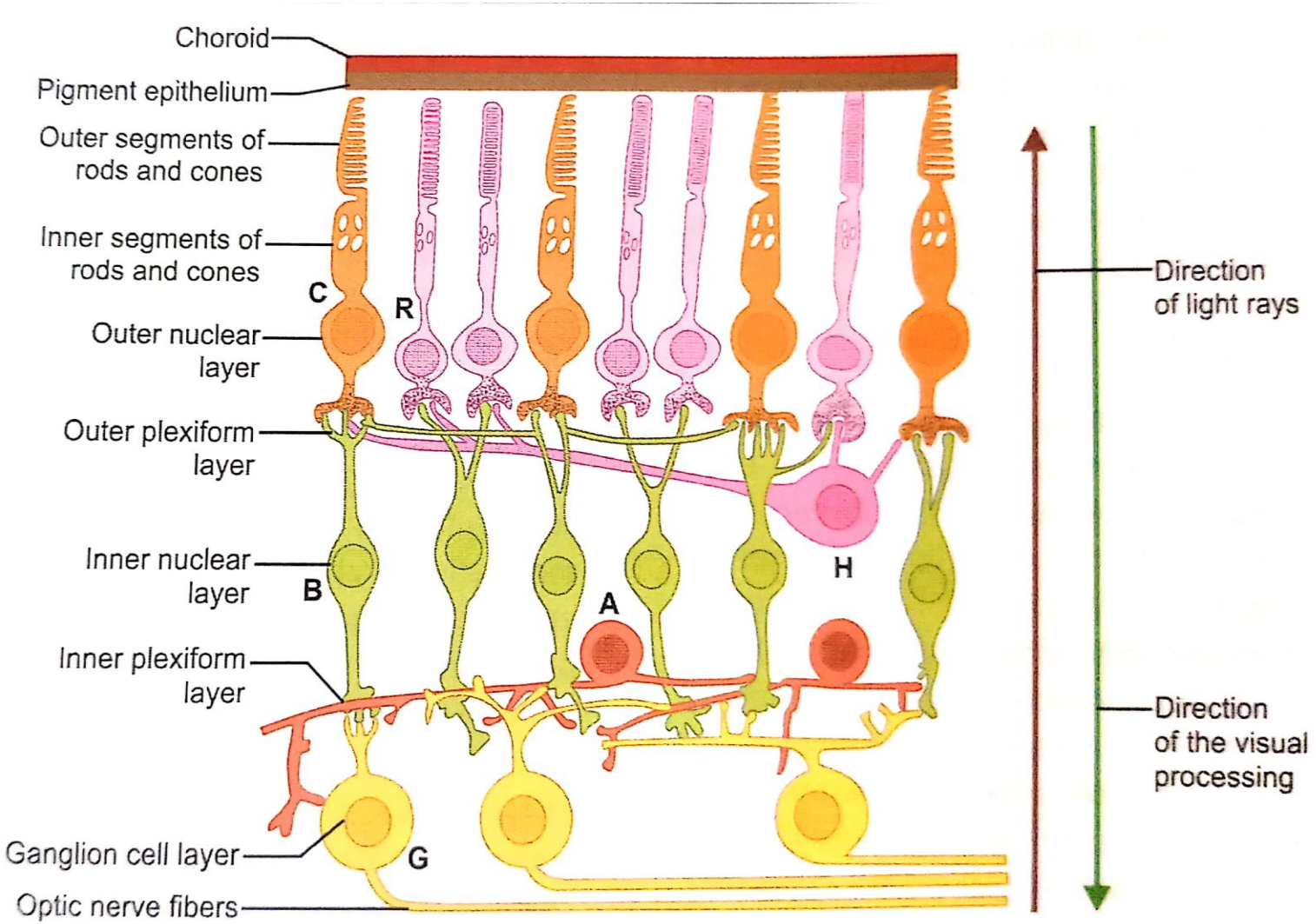


Fig. 142.5: The layers of retina. (A: Amacrine cell; B: Bipolar cell; H: Horizontal cell; G: Ganglion cell; R: Rods; C: Cones).

OUTER PIGMENTED LAYER:

- RICH IN MELANOCYTES
- PREVENTS SCATTERING OF LIGHT
- PHAGOCYTOSIS
- STORAGE OF VIT. A

- IN ALBINISM MELANIN IS CONGENITALLY ABSENT LEADING TO PHOTOPHOBIA AND DEFECTIVE VISION.

INNER NEURAL LAYER

- 1) PIGMENT EPITHELIUM
- 2) RODS AND CONES
- 3) EXTERNAL LIMITING MEMBRANE
- 4) OUTER NUCLEAR LAYER
- 5) OUTER PLEXIFORM LAYER
- 6) INNER NUCLEAR LAYER
- 7) INNER PLEXIFORM LAYER
- 8) LAYER OF GANGLION CELL
- 9) NERVE FIBERS
- 10) INTERNAL LIMITING MEMBRANE

MACULA LUTEA & FOVEA CENTRALIS

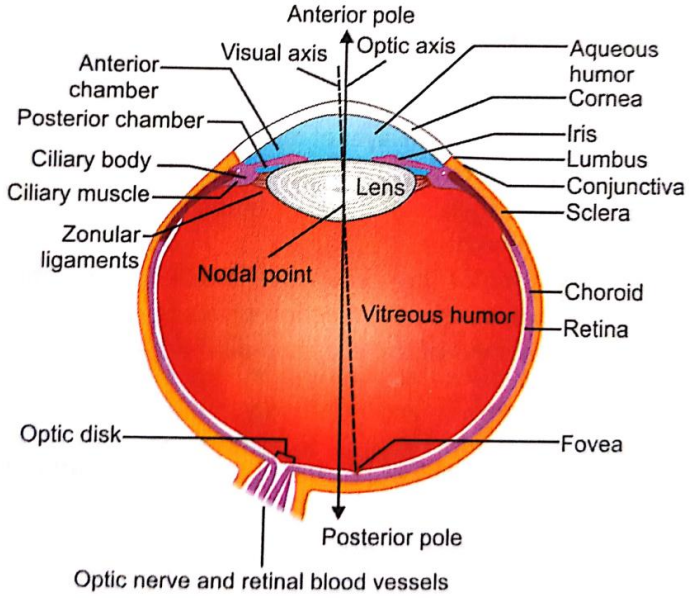


Fig. 142.1: Horizontal section of the right human eye, showing the major parts and their relative positions.

- present at posterior pole of eye.
- macula lutea is small yellowish spot of 1-2 mm in diameter.
- its central part has small depression of 0.4 mm in dia. called fovea centralis.

OPTIC DISC

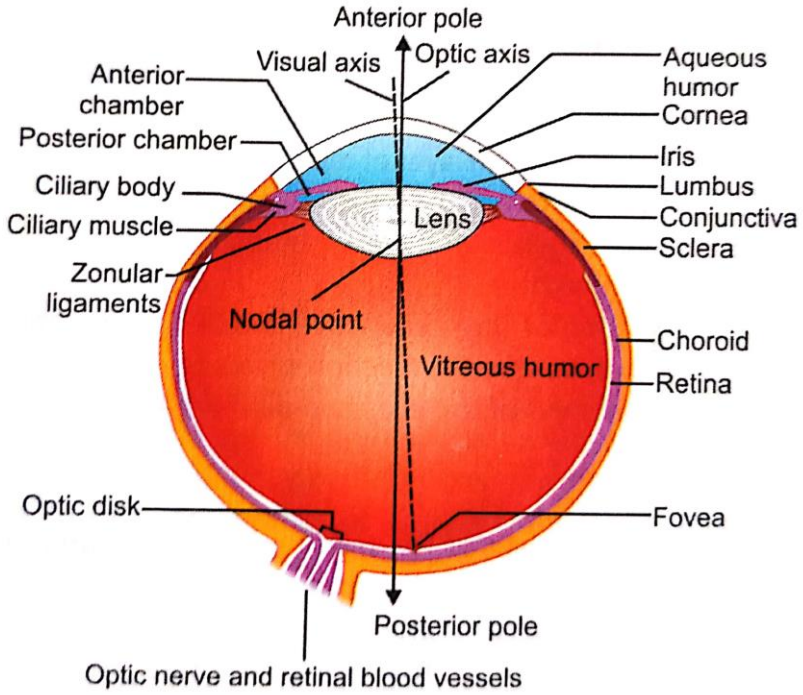


Fig. 142.1: Horizontal section of the right human eye, showing the major parts and their relative positions.

- located in post. pole of eye.
- lies 3 mm medial to fovea cenralis.
- along with optic disc, central vein and central artery of retina are also present

FUNDUS

- POSTERIOR PORTION OF INTERIOR PART OF EYEBALLA AS SEEN THROUGH OPTHALMOSCOPE.
- BRANCHES OF CENTRAL ARTERY AND VEIN CAN BE CLEARLY SEEN
- IT IS THE ONLY REGION OF BODY WHERE ARTERIOLES ARE READILY VISIBLE.
- USEFUL FOR DIAGNOSIS OF OCULAR DISEASES AS WELL AD CONDITIONS LIKE DM, HT ETC.

CHAMBERS OF EYE

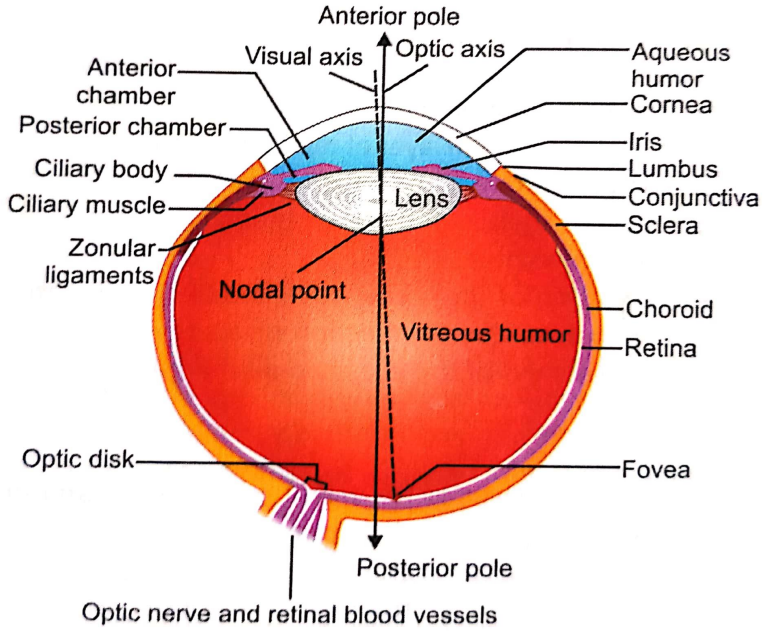


Fig. 142.1: Horizontal section of the right human eye, showing the major parts and their relative positions.

- anterior chamber: bet. cornea & iris
- posterior chamber: bet. iris & lens
- contain aqueous humor
- posterior to lens: vitreous humor-hyaloid canal, vitrein

AQUEOUS HUMOUR

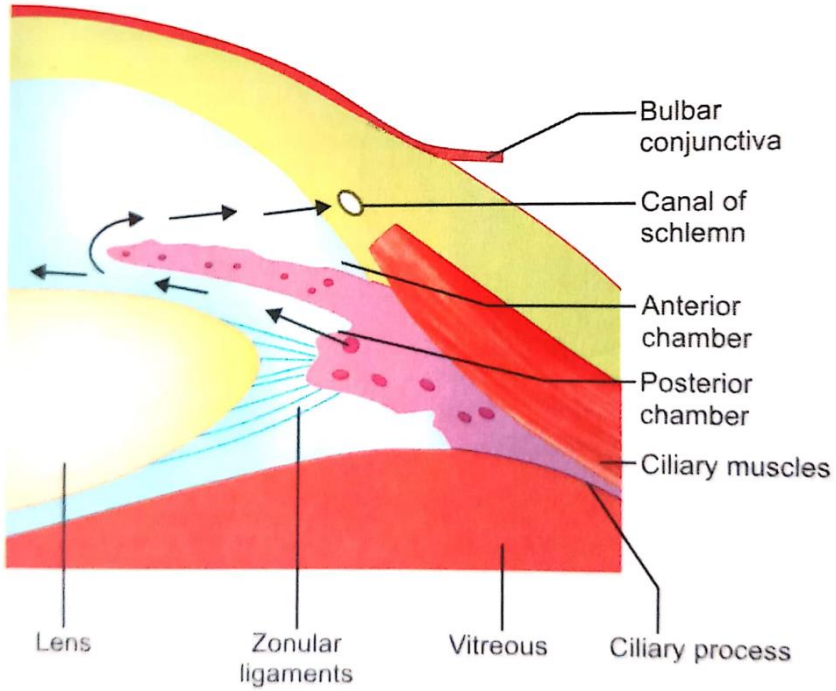


Fig. 142.4: Direction of flow of aqueous humor.

- thin watery fluid
- ph 7.1 to 7.3
- specific gravity 1.002-1.004
- formed by capillaries of ciliary processes at rate of 2cumm / min.
- formed by ultrafilteration, diffusion and active transport

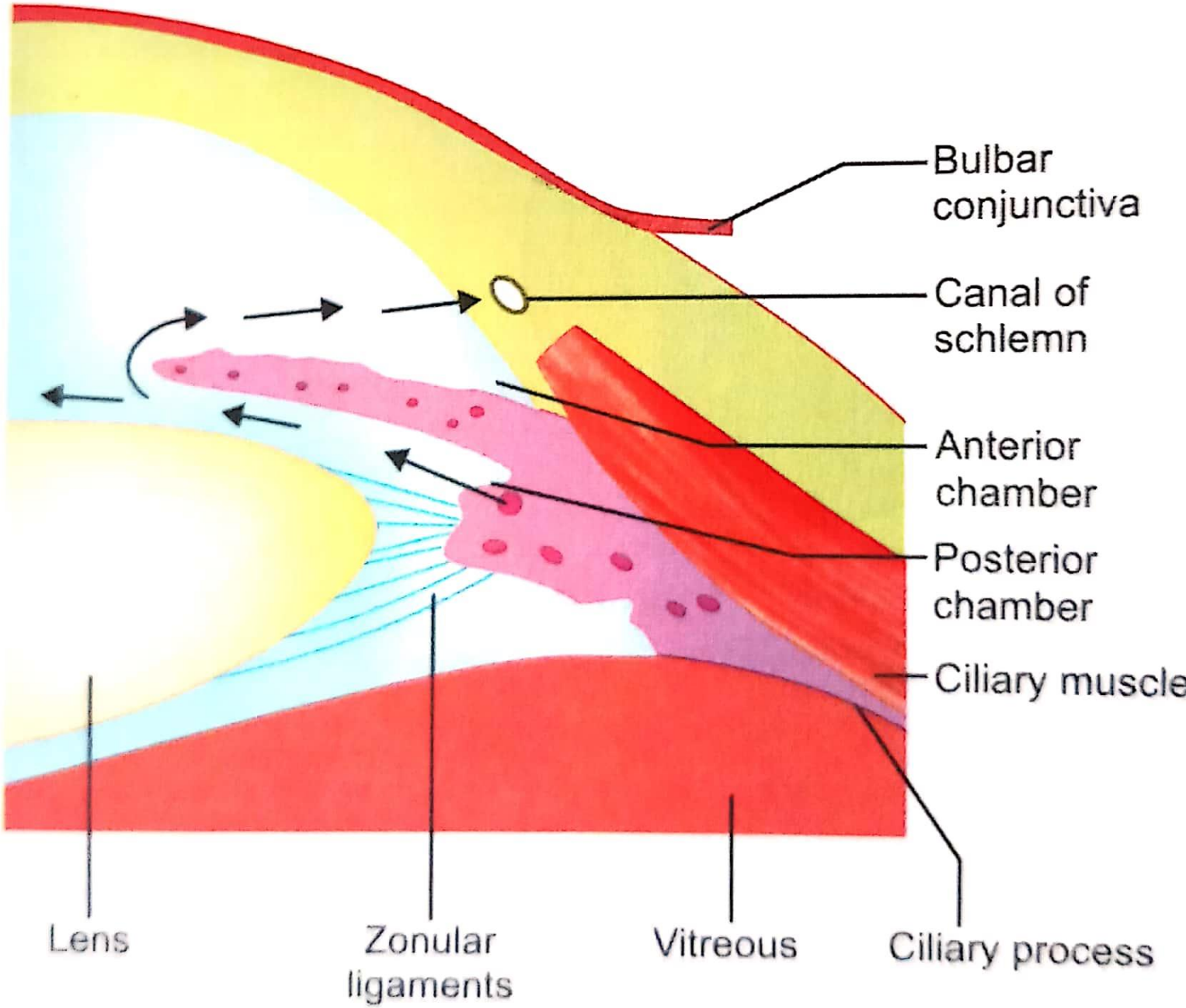


Fig. 142.4: Direction of flow of aqueous humor.

COMPOSITION

- IT IS ULTRAFILTERATE OF PLASMA, HENCE VERY LOW PROTEIN CONTENT,
- CONTAINS VIT. C, NaCl, GLUCOSE.

CIRCULATION

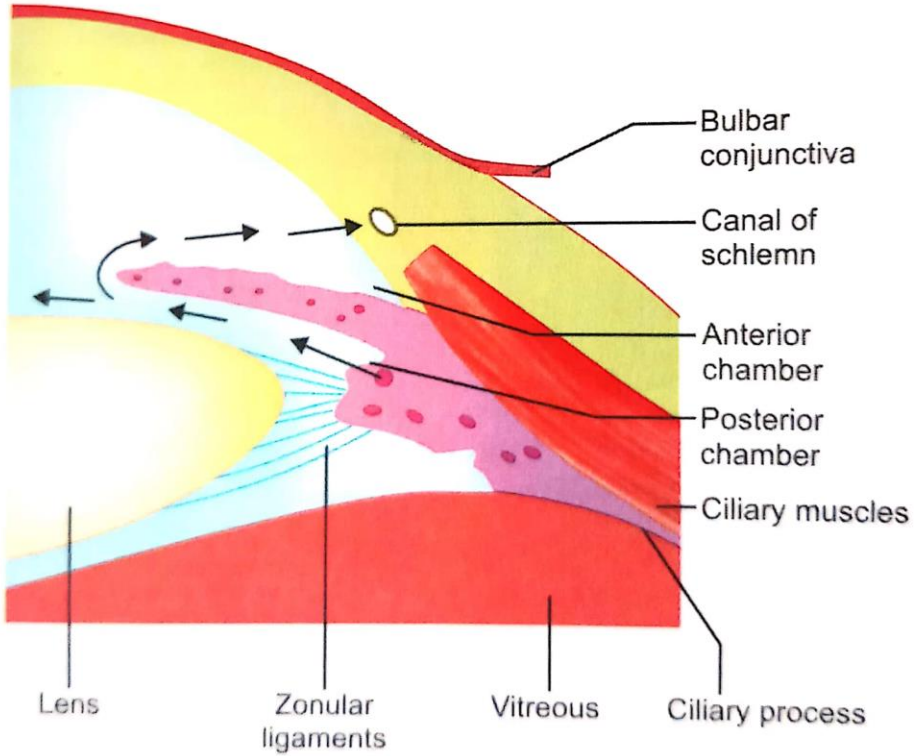


Fig. 142.4: Direction of flow of aqueous humor.

- formed by ciliary processes and drained by canal of sclemn.
- there is presence of blood aqueous membrane.

FUNCTIONS OF AQUEOUS HUMOR

- PROVIDES NUTRITION TO ALL AVASCULAR STRUCTURES OF EYE – CORNEA AND LENS.
- MAINTAINS IOP WITHIN PHYSIOLOGICAL RANGE WHICH IS REQUIRED FOR NORMAL VISION.

APPLIED: GLAUCOMA

- NORMAL INTRAOCULAR PRESSURE IS 13-18 mmHg.
- INCREASED IOP: GLAUCOMA

TYPES

- Primary

  Narrow angle: Acute

  Wide angle: chronic

- Secondary

- Congenital

PRIMARY: Acute, narrow angle

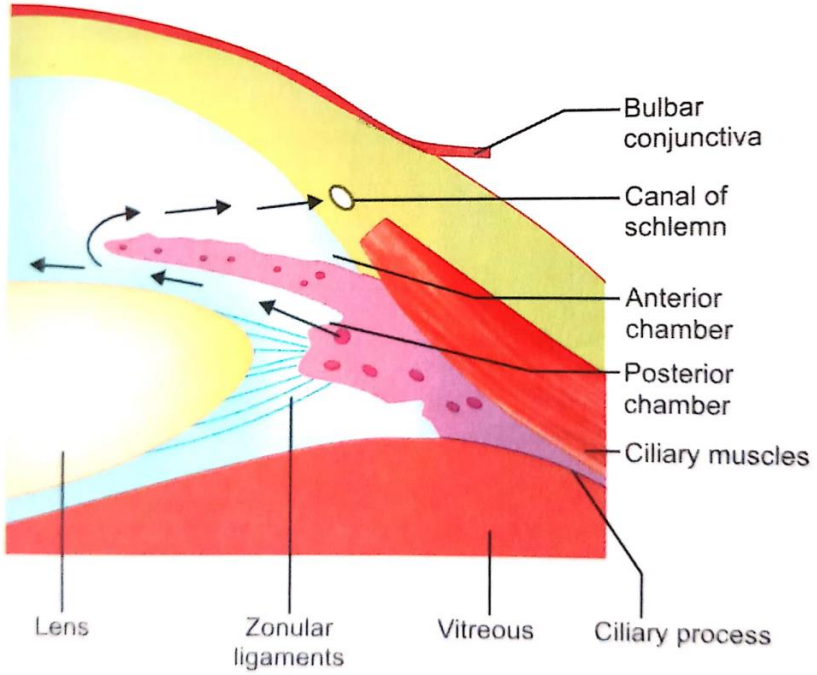


Fig. 142.4: Direction of flow of aqueous humor.

- It cause rise of IOP within 2-3 days and if untreated immediately leads to blindness.
- Iris blocks the iridocorneal angle leading to loss of drainage of aqueous humor.

SYMPTOMS

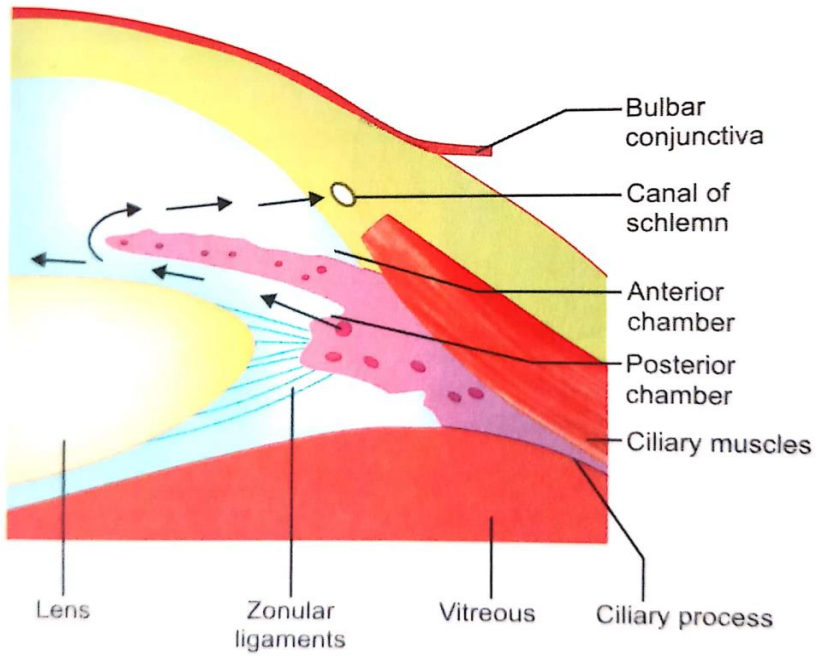
- Severe Pain
- Pressure over the eye
- Cloudiness
- Sensitive to light
- Halos seen around lights.
- Nausea and/or vomiting

Who is at risk?

- Family history of Glaucoma
- Myopia
- Diabetes
- People over 35 years of age

PRIMARY: Wide angle, chronic

- The trabecular fibers loose their proper alignment.
- Pores are obliterated and drainage of aqueous humor is hampered.
- Rise of IOP is moderate and blindness is very slow to appear.



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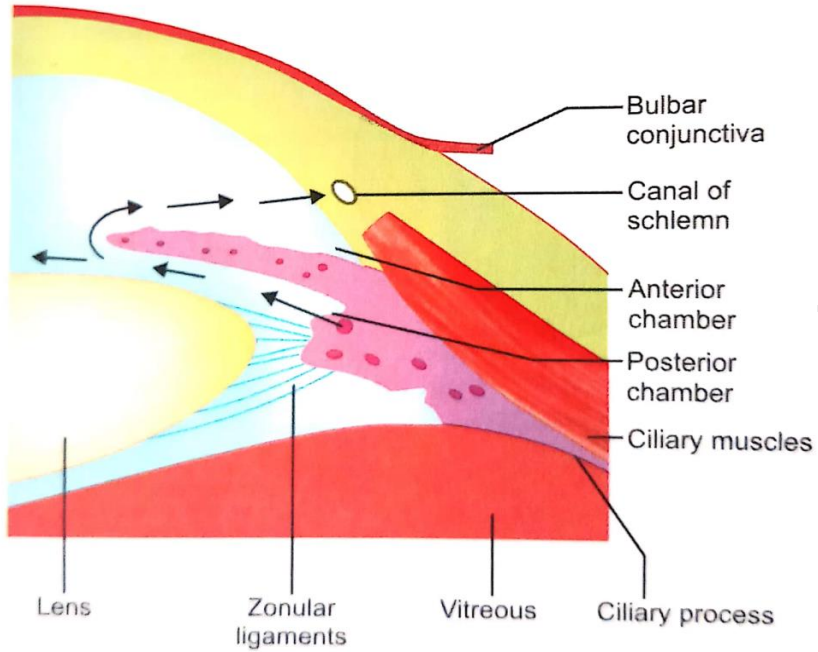


Fig. 142.4: Direction of flow of aqueous humor.

GRADUAL LOSS OF VISION.

PERIPHERAL VISION LOST FIRST.

CENTRAL VISION LOST LATER

- Early stages: NO symptoms.
- Mild pain in the eye, increasing gradually over time.
- “Halos” appearing around lights.
- Gradual loss of Peripheral vision.
- Loss of central vision later.
- Loss of night vision

Who is at risk?

- Family history of Glaucoma
- Myopia
- Diabetes
- People over 35 years of age

MANAGEMENT

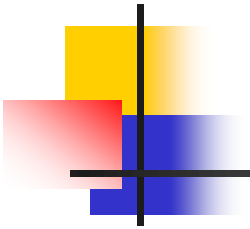
- Pilocarpine (parasympathomimetic agent) which constricts the pupil hence the angle becomes unblocked.
- Also B-blockers reduce the formation of aqueous humor.
- Laser surgery

CONGENITAL GLAUCOMA

- Parents normally are the first to recognize the symptoms of Congenital
- Cloudiness of the cornea due to Edema
- Distension of the eye
- Photophobia (sensitive to light)
- Damage to retina and optic nerve.

Secondary glaucoma

- Trauma to the eye,
- Abnormal deposits in the eye fluid
- Uveitis
- Lens Changes
- Drugs
- Haemorrhage



THANK YOU