

Aqueous Humour

Sourav

HOD

Anatomical considerations

- Maintenance of IOP
- Pathophysiology of glaucoma revolves around the aqueous humour (AH) dynamics.
- Involve all with virtually all portions of the eye.
- Principal ocular stretchers concern with
 - 1. Ciliary body** : Ciliary body is the site of aqueous production
 - 2. Posterior chamber**
 - 3. Ant. Chamber**
 - 4. Aqueous out flow system.**

Posterior chamber

- Post.chamber is a triangular space containing about 0.06 ml of AH. Freshly formed AH from the ciliary processes is poured in to this space.
- Post.Chamber is bounded anteriorly by the posterior surface of the
- Iris
- Part of the ciliary body
- Post.by the cristaline lens and it zonules
- Laterally by the ciliary body

Posterior chamber

- It can be divided into following three component
 1. Prezonular space
 2. Zonular space
 3. Retrozonular space

Posterior chamber

- Pre-zonular space: It lies between the post. Surface of the iris and anterior surface of the zonular fibers.
- Zonular space: It is also known as ciliolental space. It is bounded centrally by equator of the lens, periphery by the ciliary processes, anteriorly by the post. Surface of anterior zonular fibers and post. by the ant. Surface of posterior zonular fibers.
- Retrozonular space: it lies between the post. surface of zonules and peripheral part of ant. vit face

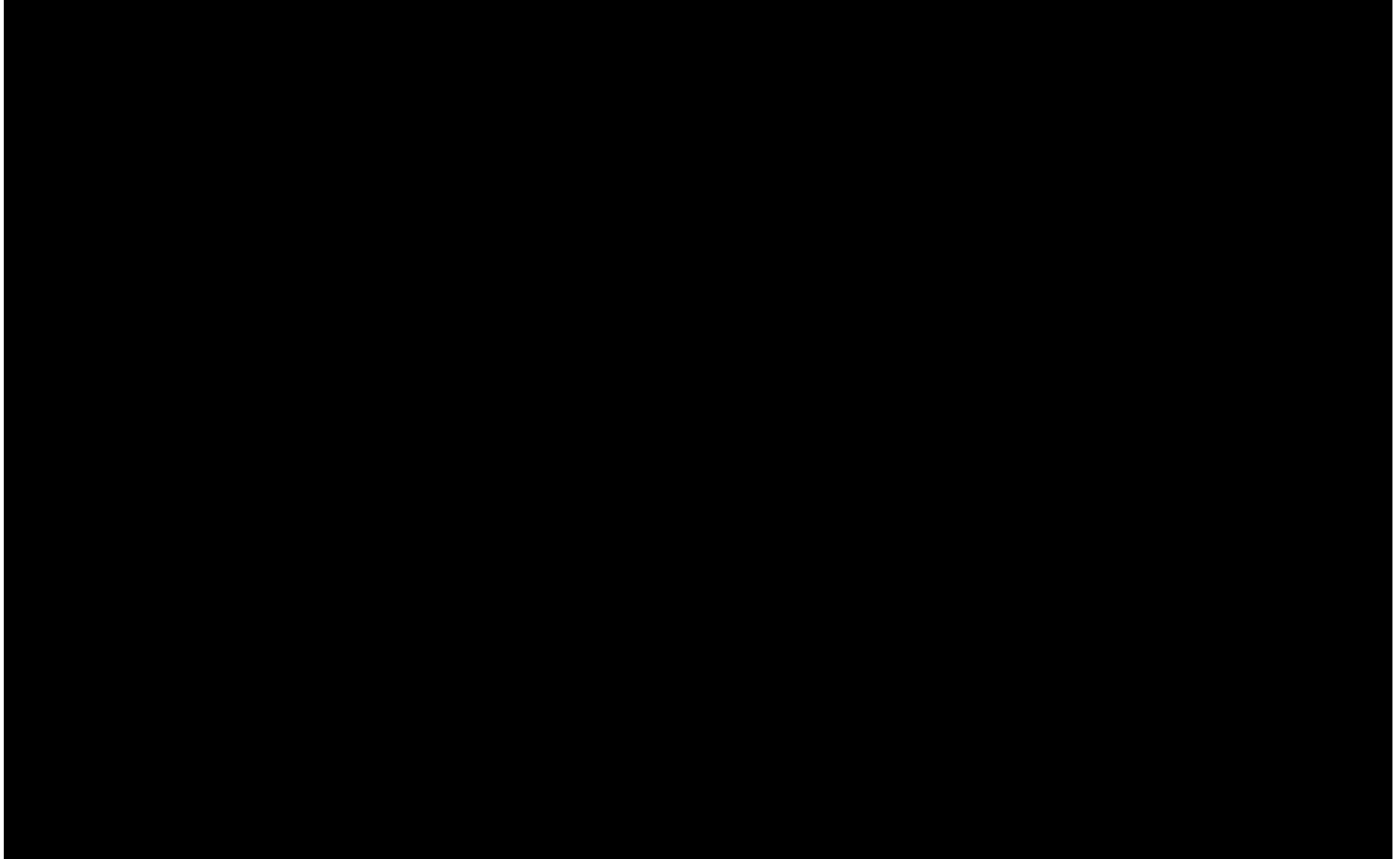
Anterior chamber

- It is bounded **anteriorly by the** back of the cornea and
- **post.by the** ant.surface of the iris and part of the ciliary body
- 3 mm deep in the center in normal adults
- Shallow in young children and older people
- Contain 0.25ml of AH.

Angle of the anterior chamber

1. Ciliary band
2. Scleral spur
3. Trabecular meshwork
4. Schwalbe's line

Aqueous outflow system



Aqueous outflow system

- A. Trabecular meshwork
 - 1. Uveal meshwork
 - 2. Corneoscleral meshwork
 - 3. Juxtacanalicular meshwork
- B. Schlemm's canal
- C. Collector channels
 - 1. Direct system
 - 2. Indirect system
- D. Episcleral veins

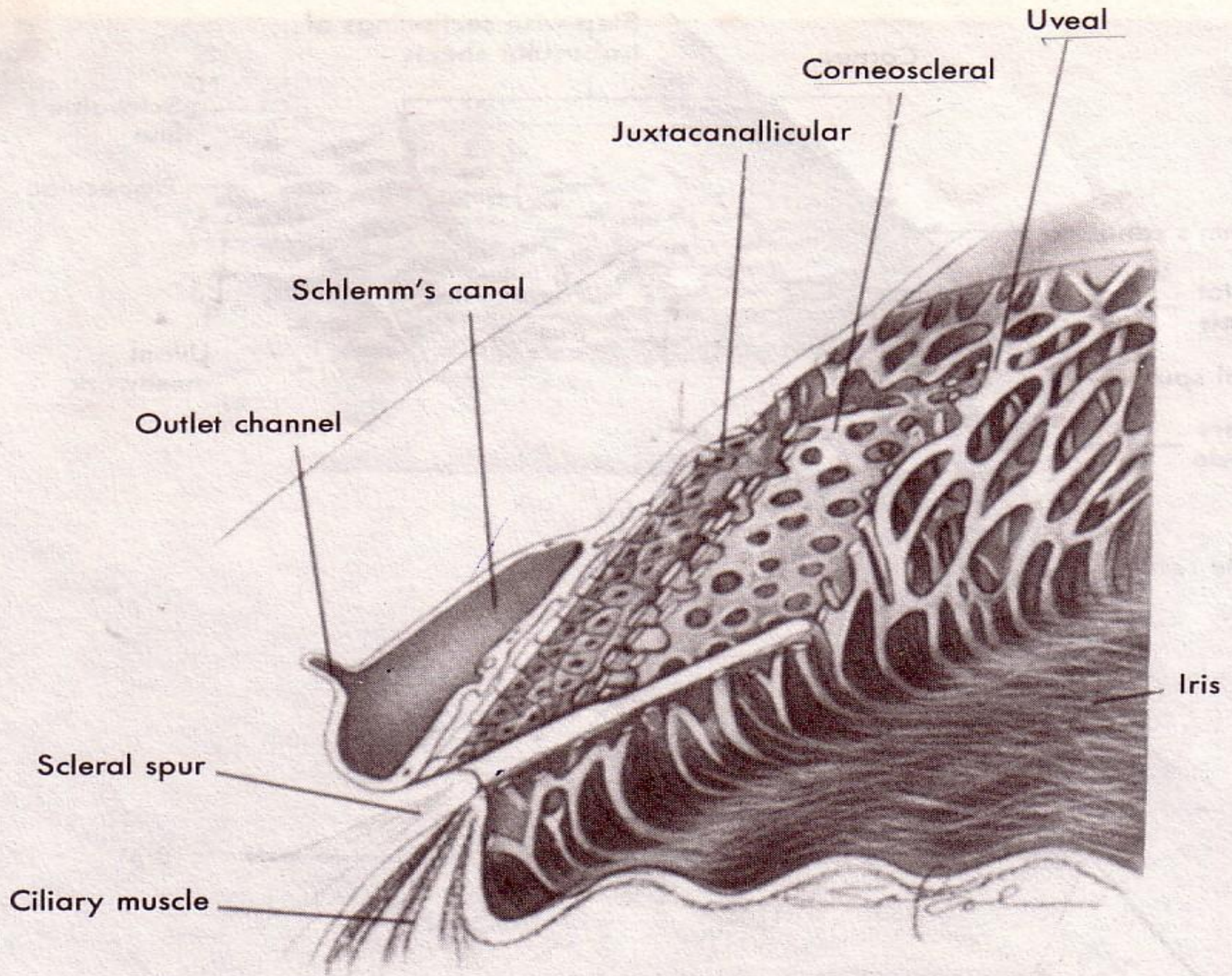
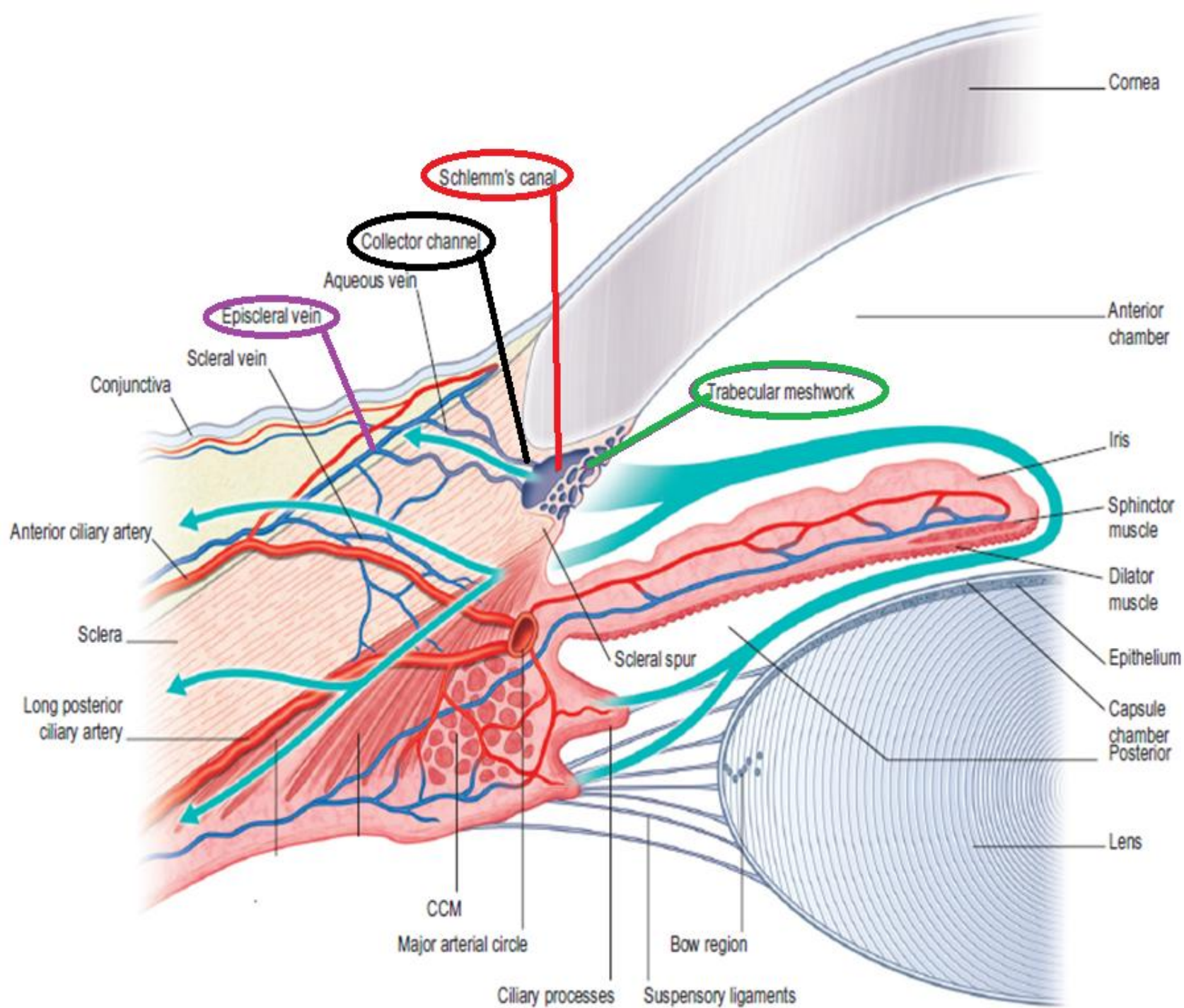
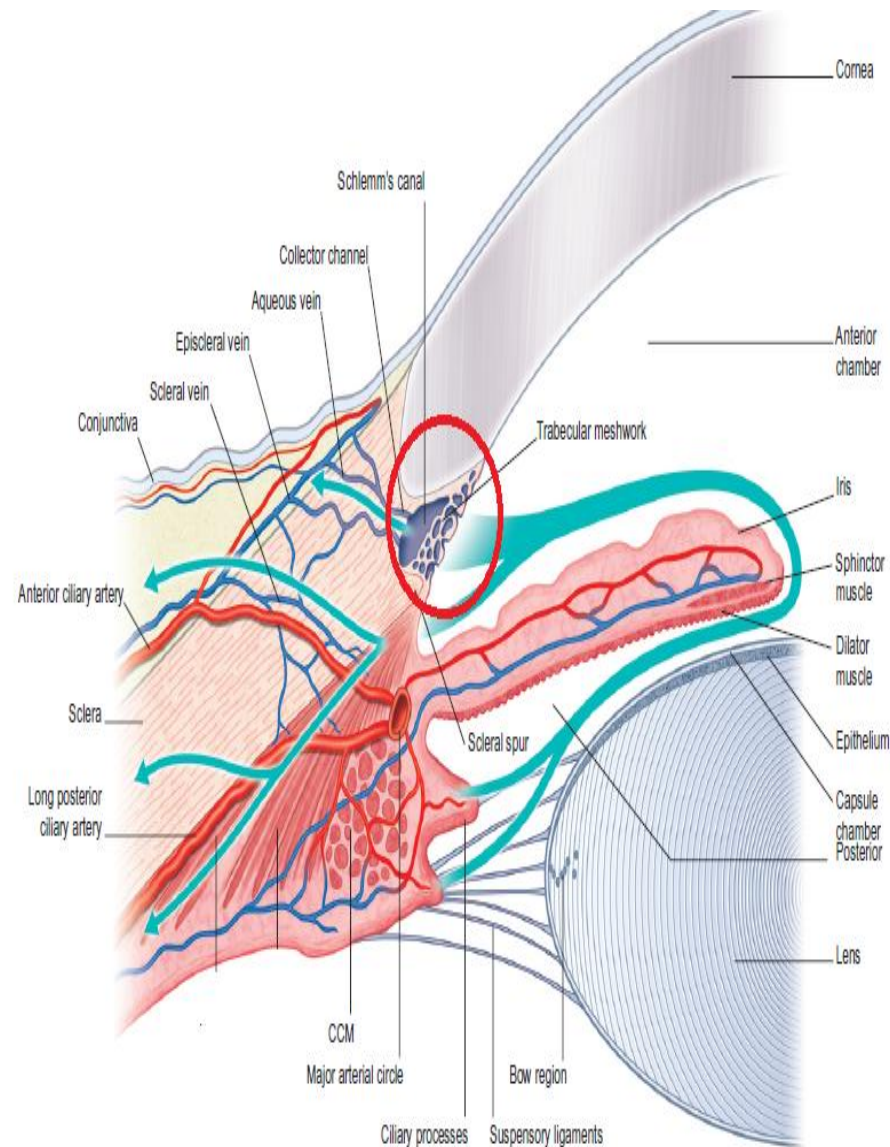


FIG. 8-3 Cutaway diagram of layers of trabecular meshwork in aqueous outflow system. (Modified from Shields MB: Textbook of glaucoma, Baltimore, Williams & Wilkins, 1987.)



Trabecular meshwork

- It is sieve-like structure through which aqueous humour leaves the eye.
- Trabecular meshwork is a complex connective tissue, components of which directly or indirectly affects aqueous outflow.



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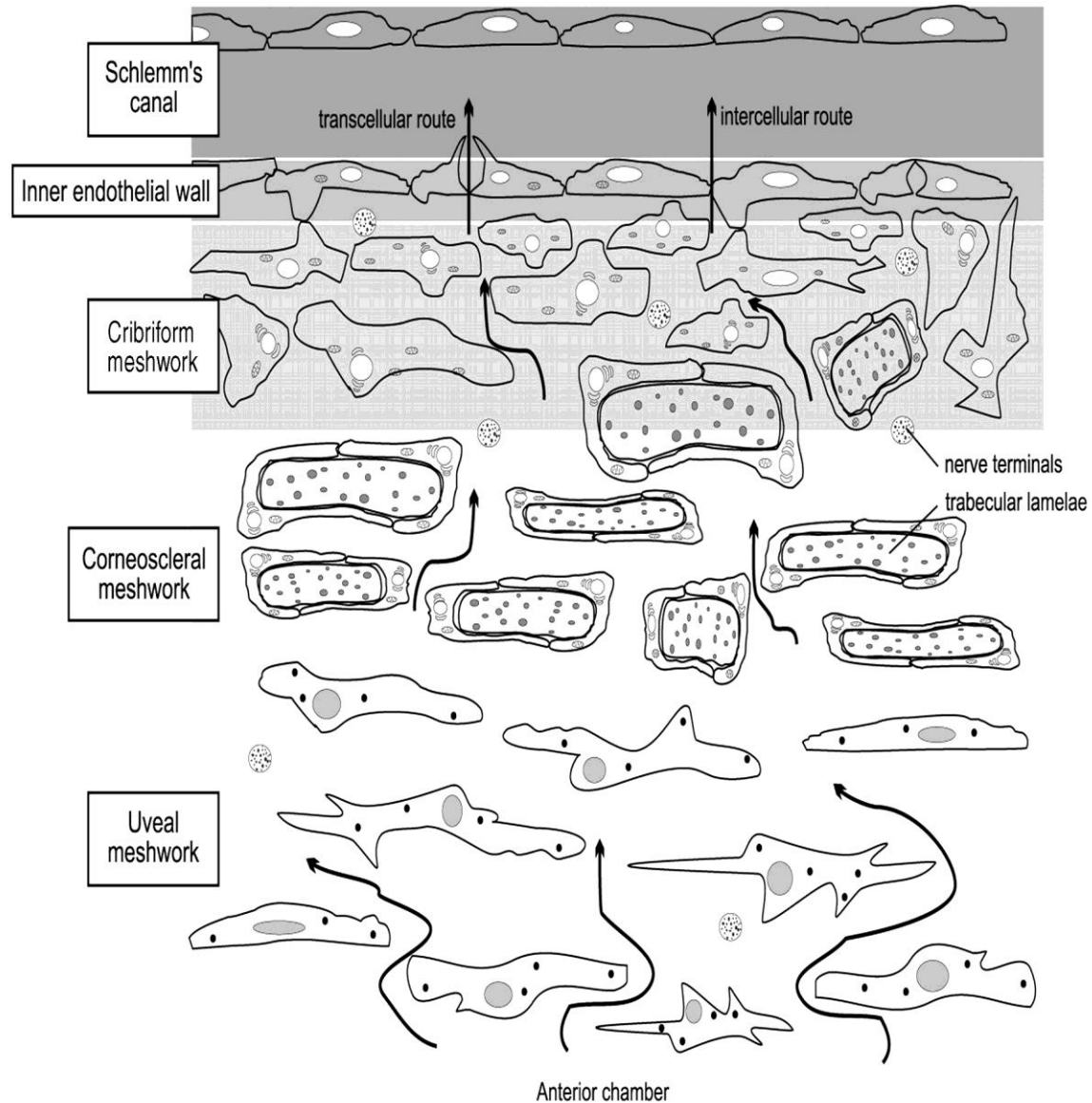
- Hyaluronic acid is an endogenous GAG of the Trabecular meshwork (TM). Degeneration of Hyaluronic acid by hyaluronidase which enables increase aqueous outflow
- Other GAGs including Chondroitin, heparin, dermatan and keratan sulphates are constitute of TM and they too many influence of aqueous outflow.

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- Component of Trabecular meshwork are _____
Fibronectin, elastin, laminin, collagen and smooth muscle myosin containing cells.
- Glycoproteins and GAG composition of the Trabecular meshwork is not constant throughout life. Changes in the composition advancing with age have been implicated in the pathogenesis of POAG.

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- Trabecular meshwork consists of three portions
 1. Uveal meshwork
 2. Corneoscleral meshwork
 3. Juxtacanalicular meshwork

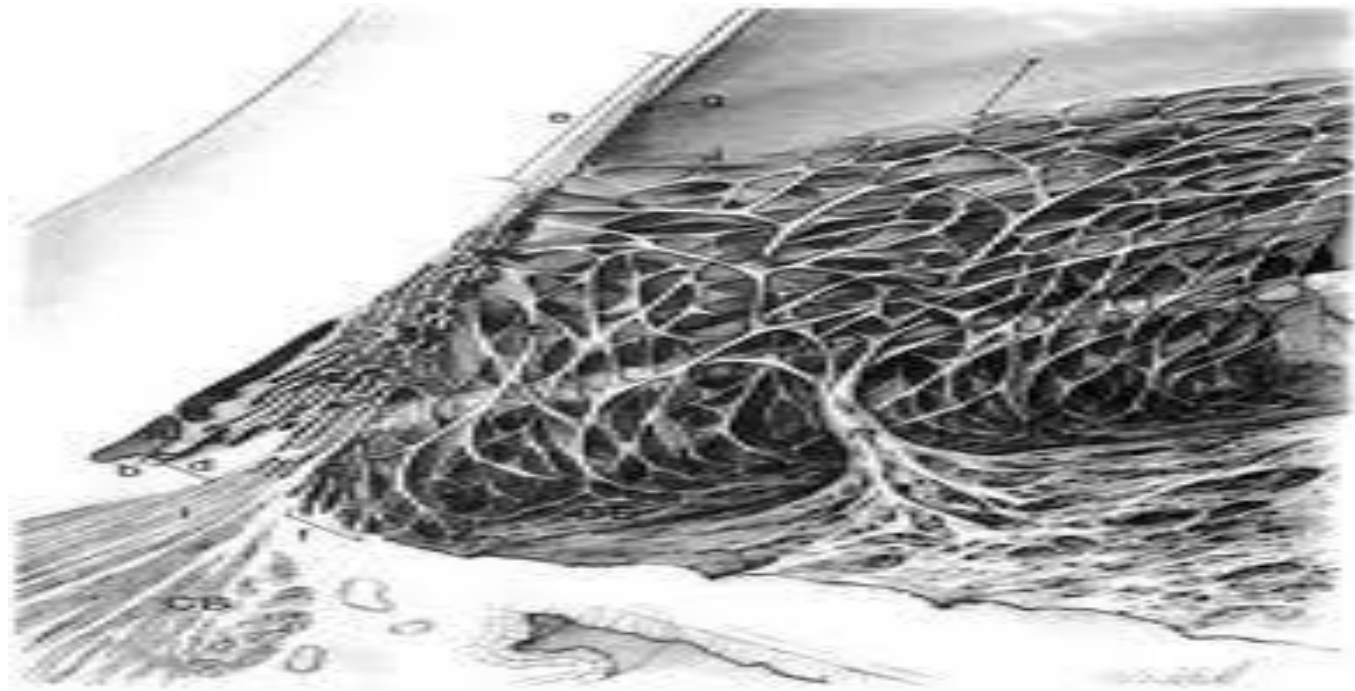


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- Uveal meshwork: it is the inner most part of the Trabecular meshwork and extend from iris root and ciliary body of the Schwalbe's line.
- Trabeculae of uveal meshwork are cord like and 2-3 layers thick
- Arrangement of uveal trabecular bands creates irregular opening which may vary in size from 25 μ to 75 μ

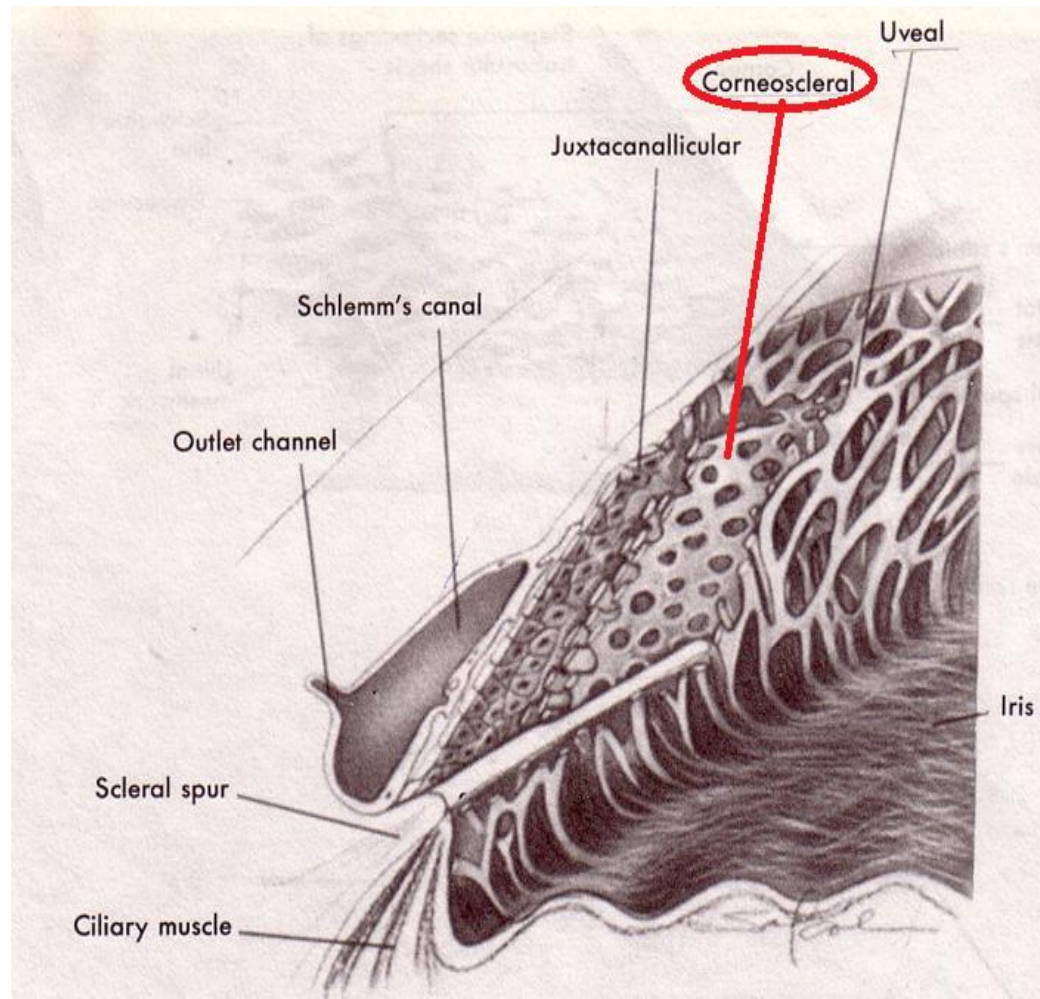
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- Electronic microscopically each trabeculae is seen to have 3 concentric layer central collagenous core, middle layer of a basement membrane, and enclosing Trabecular meshwork



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- Corneoscleral meshwork:
- This portion extends from the scleral spur to the anterior wall of the scleral sulcus.
- It consists of 8-14 sheets of trabeculae that are interconnected via cytoplasmic processes

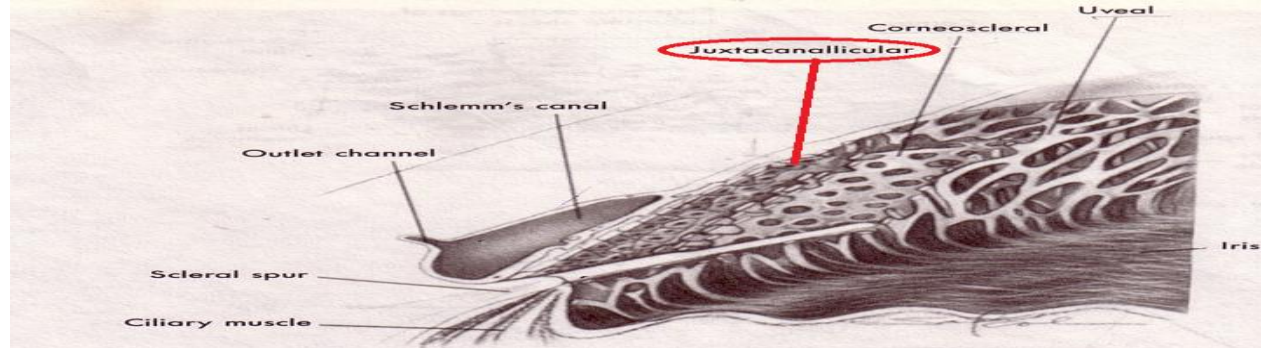


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It consist of flat sheets of trabeculae which are perforated by elliptical openings which are smaller than in the uveal meshwork (5-50 μ). This holes become progressively smaller as the trabecular sheets approach Schlemm's canal.



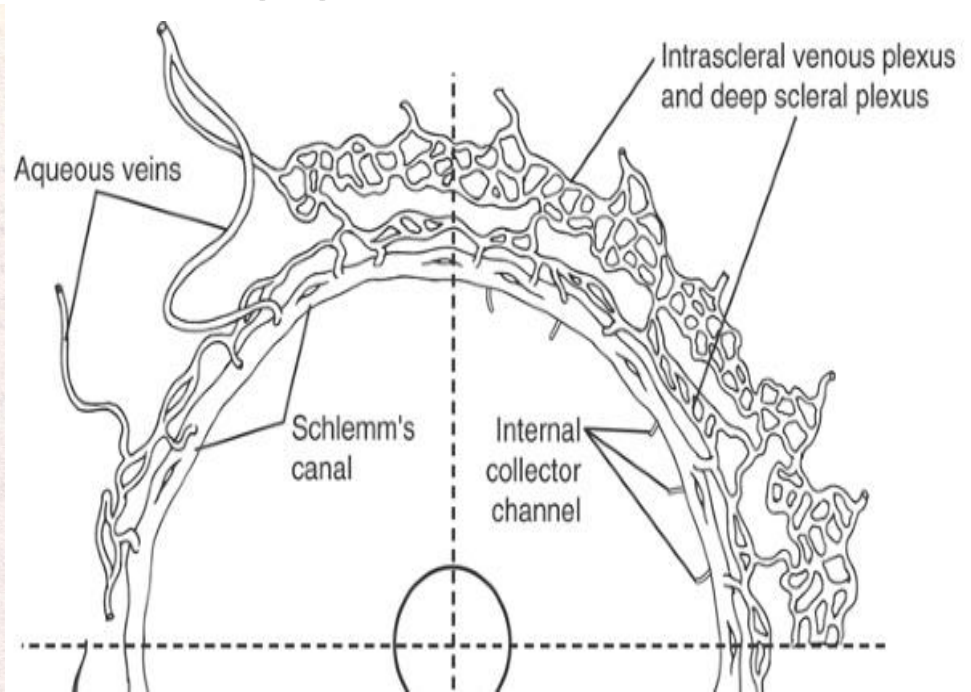
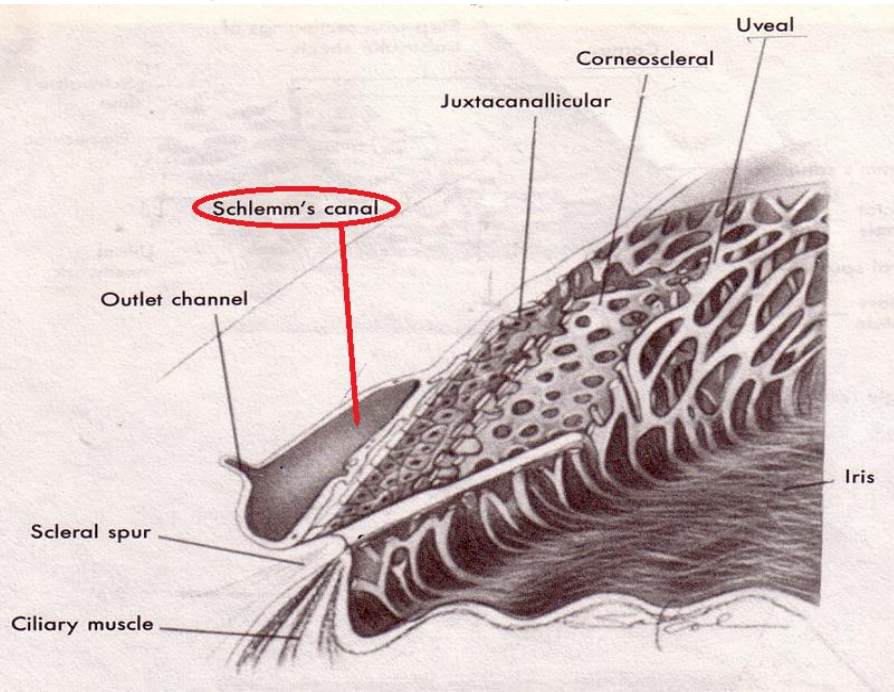
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- Juxtacanalicular Tissue The outermost portion of the meshwork (adjacent to Schlemm's canal) it is mainly offers the normal resistance to the aqueous outflow.
- It consist of a layer of connective tissue (containing 2-5 layer of loosely arranged cells) lined on either side by endothelium
- This narrow part of trabeculum (thickness 2-20 μm) connects the corneoscleral meshwork with schlemm's canal.

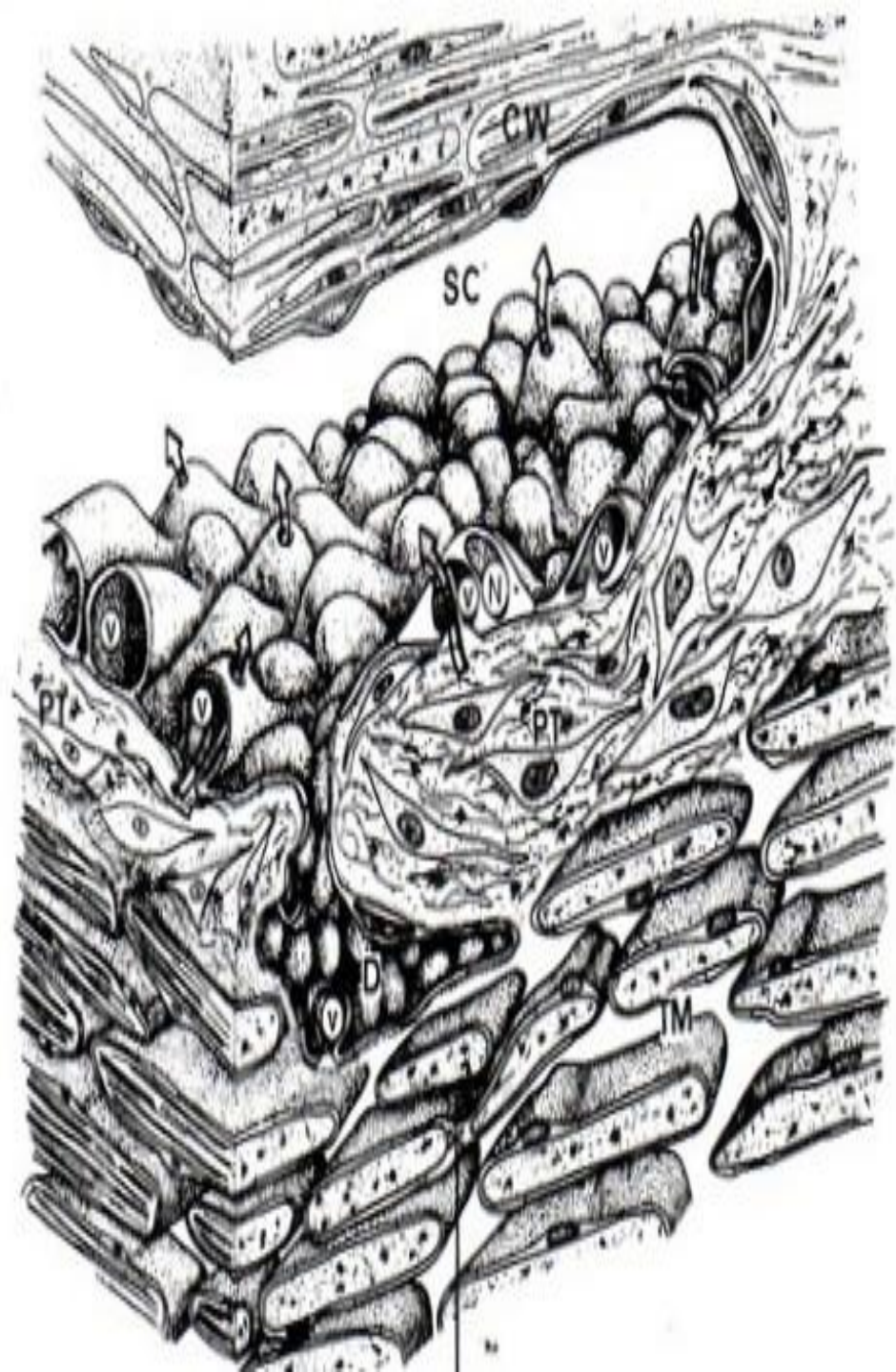
2.Schlemm's Canal

- It is an endothelial lined oval channel present circumferentially in the scleral sulcus. The endothelial cells of it's inner wall are irregular, spindle shape and containing giant vacuoles.



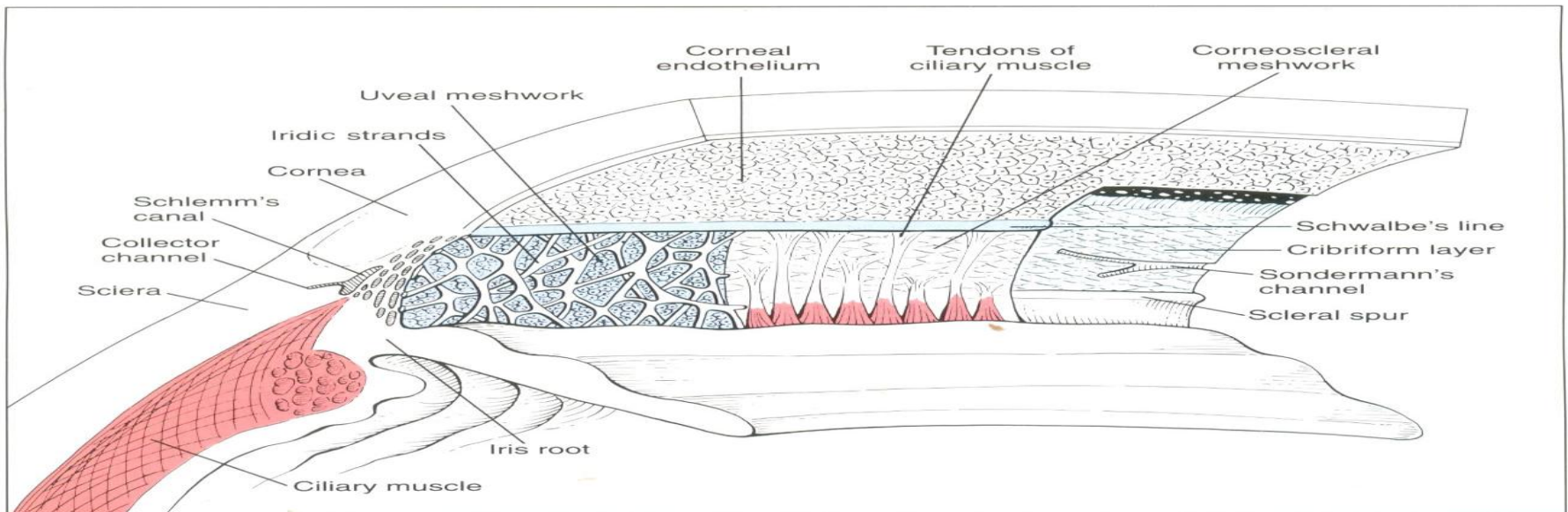
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- The endothelial cells lining the outer wall of the schlemm's canal are smooth and flat.
- outer wall of the canal contains numerous openings of the collector channels.
- Lip like thickening have been observed around the opening of the outlet channel and septa have been noted to extend from this opening to the inner wall of schlemm's canal, which presumably help to keep the canal open.



3. Collector channels

- Also known as intrascleral aqueous vessels, are about 25-35 in number and leave the schlemm's canal at oblique angle to terminate ultimately into episcleral veins.



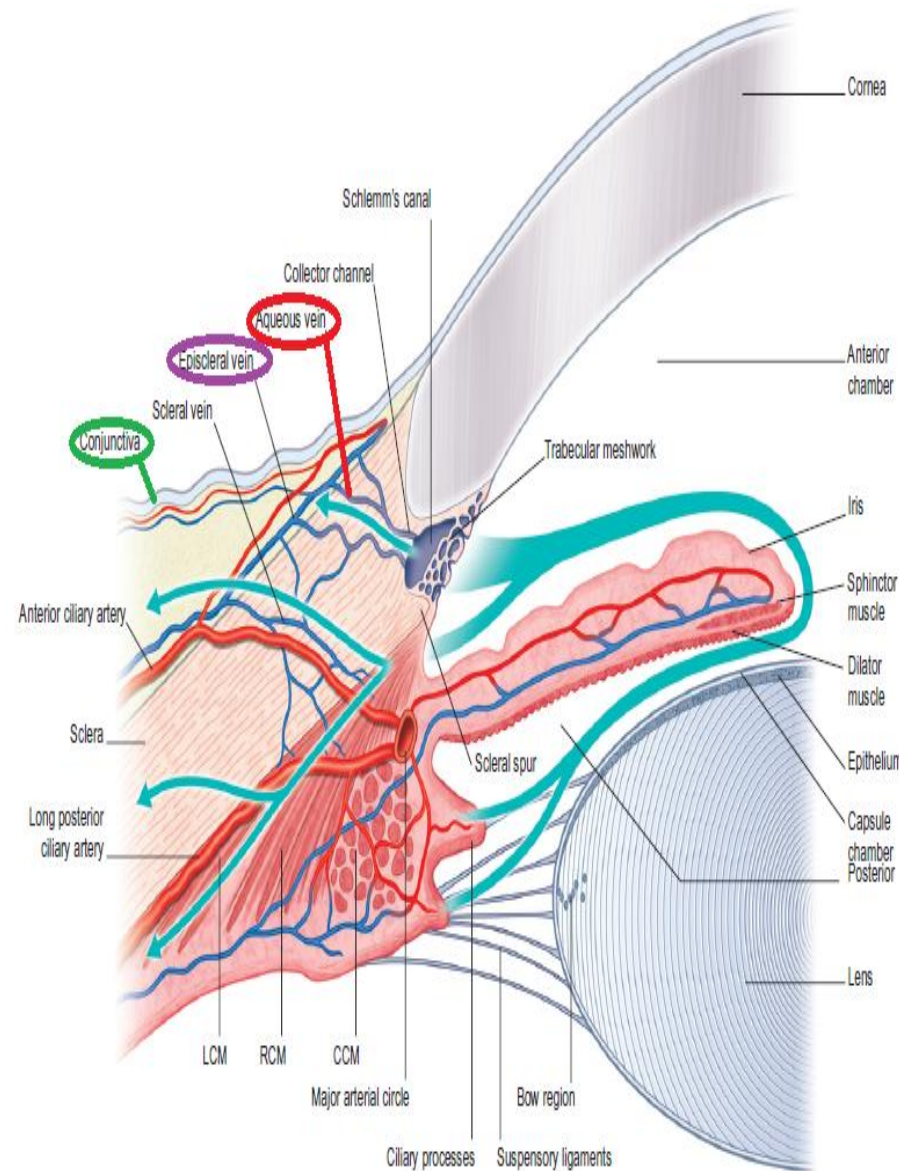
1.11 | Organization of the human trabecular meshwork.

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- Collector channels are lined by vascular endothelium similar to that of the outer wall of schlemm's canal.
- Relatively wide at their origin (20-90 μm)
- No valves are present in the collector channels.
- This intrascleral aqueous vessels can be divided into 2 system
 1. Direct system
 2. Indirect system

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1. Direct system: it is formed by about 8 larger vessels which run a short intrascleral course and terminate directly into the episcleral veins also called as *aqueous veins*.
- aqueous vessels terminate into episcleral and conjunctival veins in laminated junction, these are also referred to as the “laminated veins of Goldmann”.



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- Indirect system: it is constitute by numerous finer collector channels which drain into 3 inter connecting venous plexuses
 1. Deep interscleral plexus
 2. mid-intrascleral plexus
 3. Episcleral venous plexus

3. Episcleral veins

- Most of the aqueous vessels drain into the episcleral veins.
- Episcleral veins ultimately drain into the cavernous sinus via the anterior ciliary and superior ophthalmic veins.

