

# GLAUCOMA – Part 1

# Topics covered

- Anatomy of the Angle
- Assessment of angle
- Gonioscopy
- Physiology – Aqueous Humour production & Drainage
- Factors affecting IOP
- Tonometry
- CCT
- Visual Fields

# Anterior Chamber

- Anterior chamber is an angular space bounded anteriorly by the posterior (inner) surface of the cornea and posteriorly by the anterior surface of the iris and a part of ciliary body.

## **Boundaries of anterior chamber:**

- **Anteriorly**

Inner surface of the cornea

At periphery, trabecular meshwork

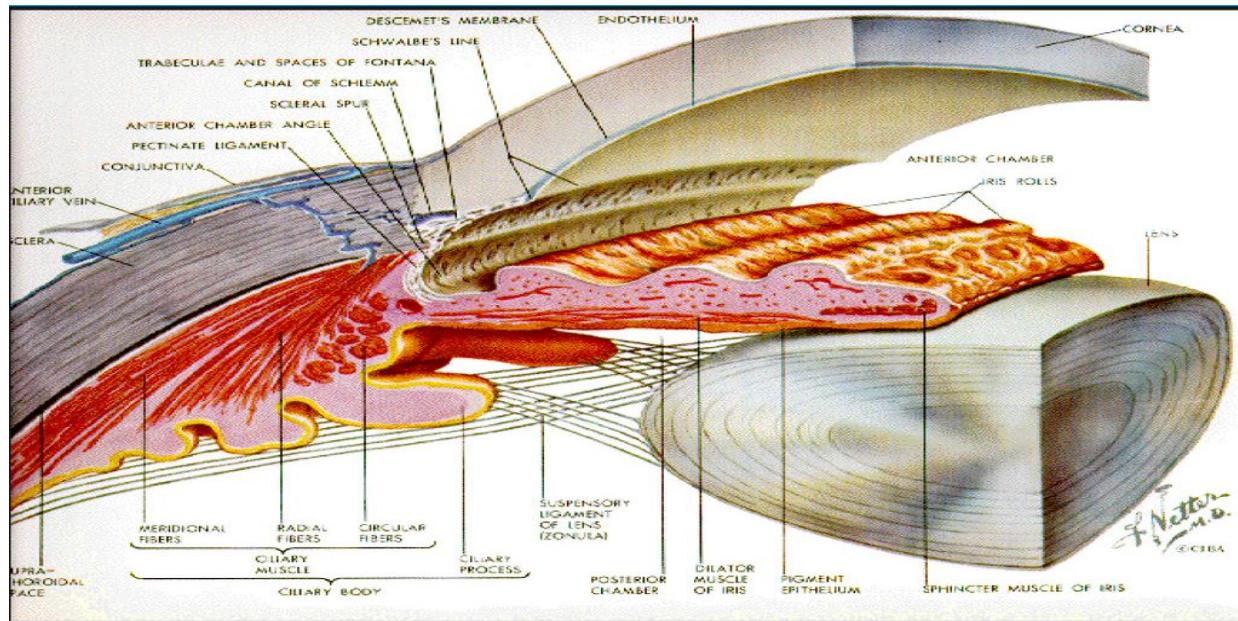
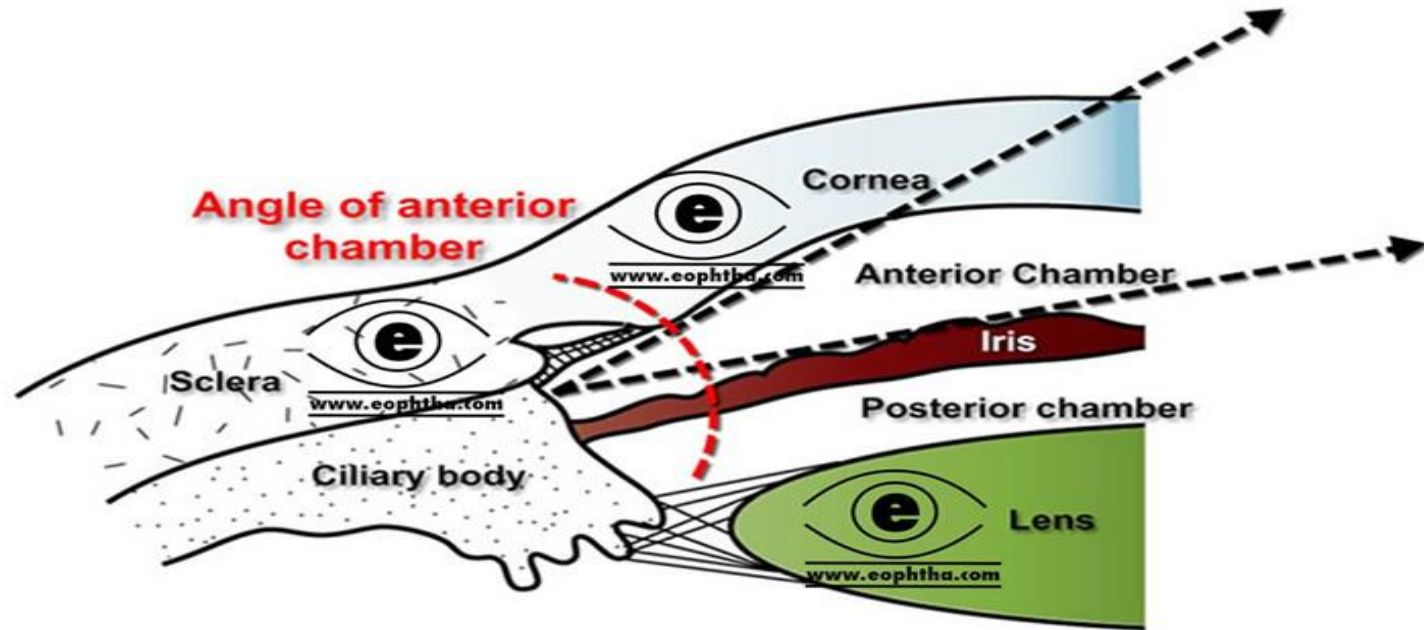
- **Posteriorly**

Lens,

Anterior surface of the iris and

Anterior face of the ciliary body

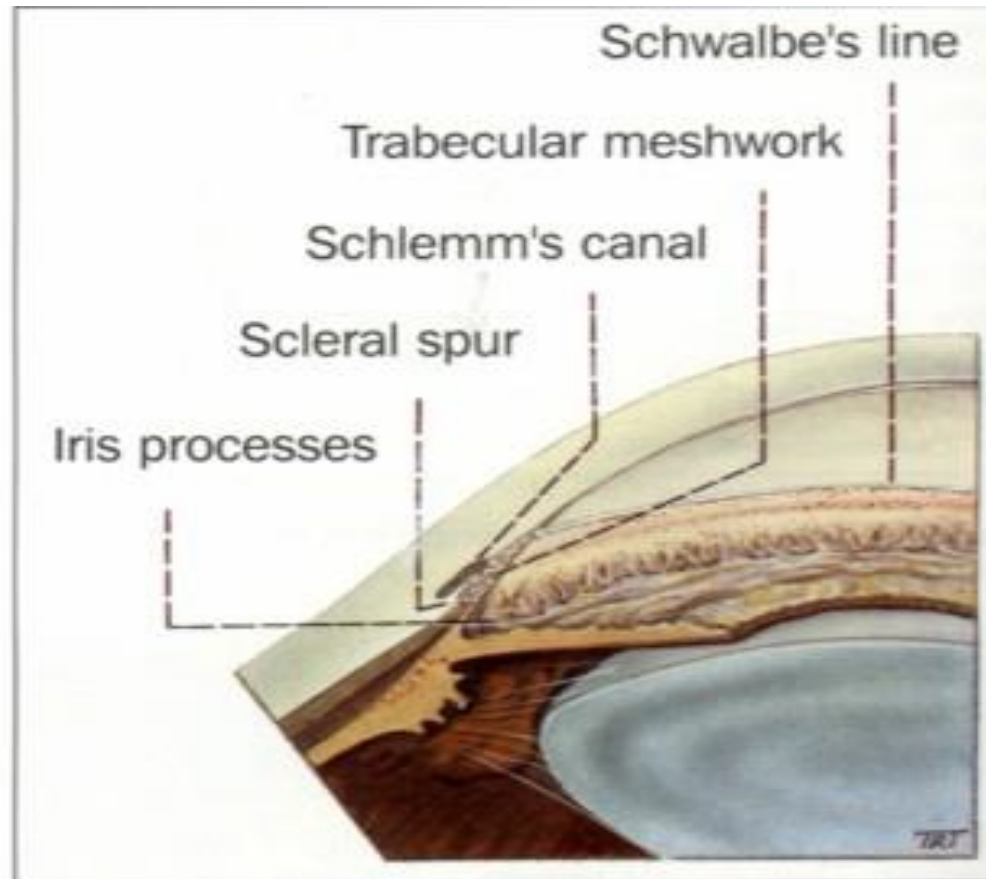
# Anatomy of Anterior chamber angle



# Angle of anterior chamber

It is the angle recess formed between posterior surface of cornea and anterior surface of iris bounded from anterior to posteriorly by

- Schwalbe's line
- Trabecular meshwork
- Scleral spur
- Anterior surface of ciliary body along with the root of iris



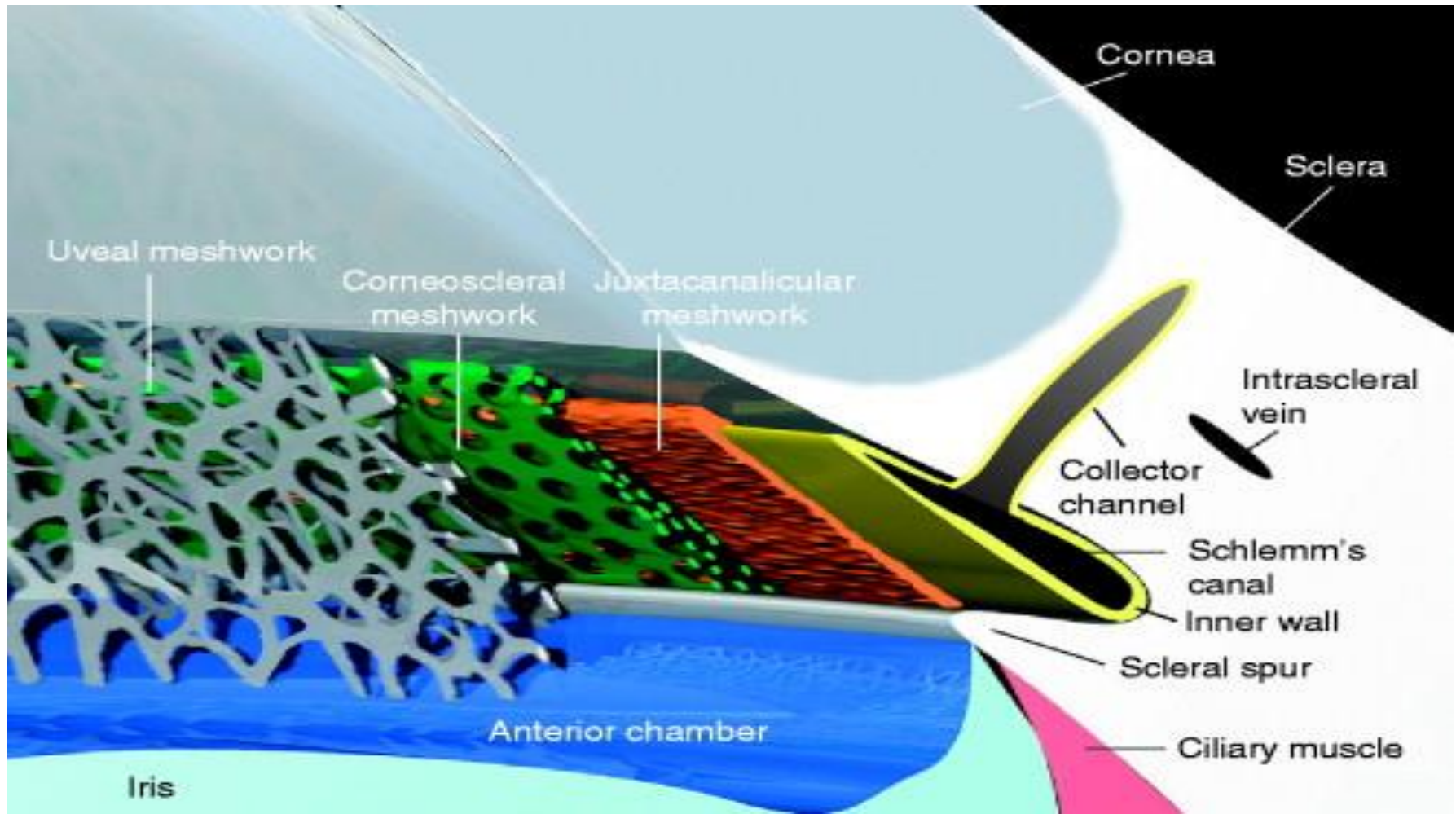
- **Schwalbe's Line**
- Schwalbe's line occurs in a 50 to 150  $\mu\text{m}$  transition zone (zone S) between the trabecular meshwork and the corneal endothelium. It is the anterior border of the trabecular meshwork and the posterior border of Descemet's membrane.
- It marks the prominent end of Descemet's membrane of the cornea.

- **Trabecular Meshwork**

- The trabecular meshwork is located between the scleral spur and Schwalbe's line.
- The trabecular meshwork consists of three layers
- Uveoscleral meshwork: It is the most internal part of trabeculum. It is characterised by thick band of connective tissue and large pores. These thick bands originates from iris root and extends upto Schwalbe's line.

- Corneoscleral meshwork: Corneoscleral meshwork forms the middle of the trabeculum and it is the most extensive part of this sieve like tissue. Corneoscleral meshwork extends from the scleral spur to the anterior wall of the scleral sulcus and contains elliptical openings or pores. These pores gradually reduce in size as trabecular sheets approach the Schlemm canal.

- Juxtacanalicular meshwork: juxtacanalicular meshwork differs histologically from other trabecular mesh works. It is single layered amorphous tissue which is believed to provide maximum resistance to aqueous humor tissue outflow. It borders the canal of Schlemm.

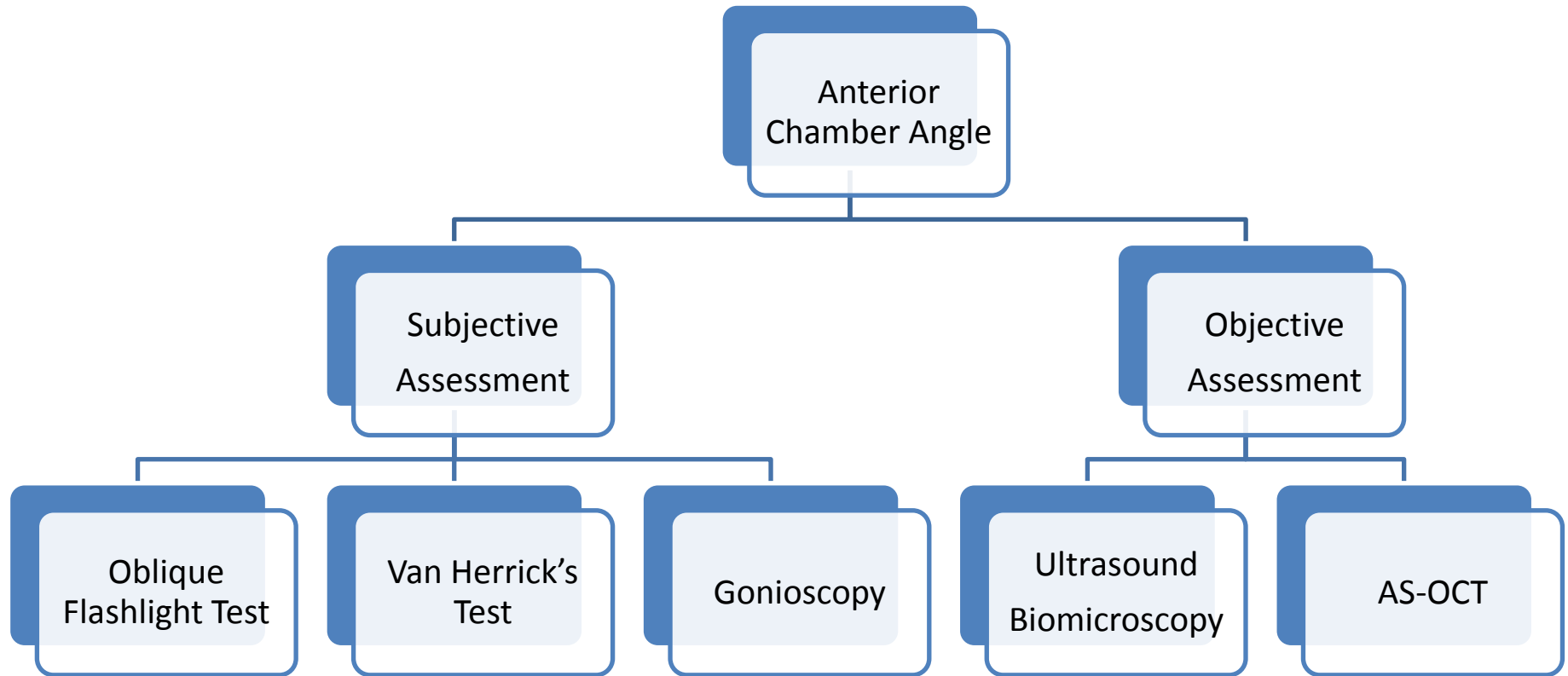


## ***Canal of Schlemm***

- A sieve or net like structure, the trabecular meshwork, bridges the scleral sulcus converting it into a tube, which is known as schlemm's canal.
- It is a circular canal with a diameter of 190 to 350 microns, in the sclera which lies posterior to the sclerocorneal junction.

- ***Scleral sulcus and scleral spur:***  
Limbus is the transition zone between the cornea & sclera.
- On the inner surface of the limbus, there is an indentation or groove, which is known as the scleral sulcus.
- This scleral sulcus has a sharp posterior margin- the scleral spur & a sloping anterior wall which extends to the peripheral cornea.
- The ciliary body is attached to the scleral spur and there exists a potential space, the supraciliary space, between ciliary body and the sclera.
- Iris inserts into the anterior side of the ciliary body and the part of the ciliary body between root of iris & scleral spur is known as **ciliary band**.

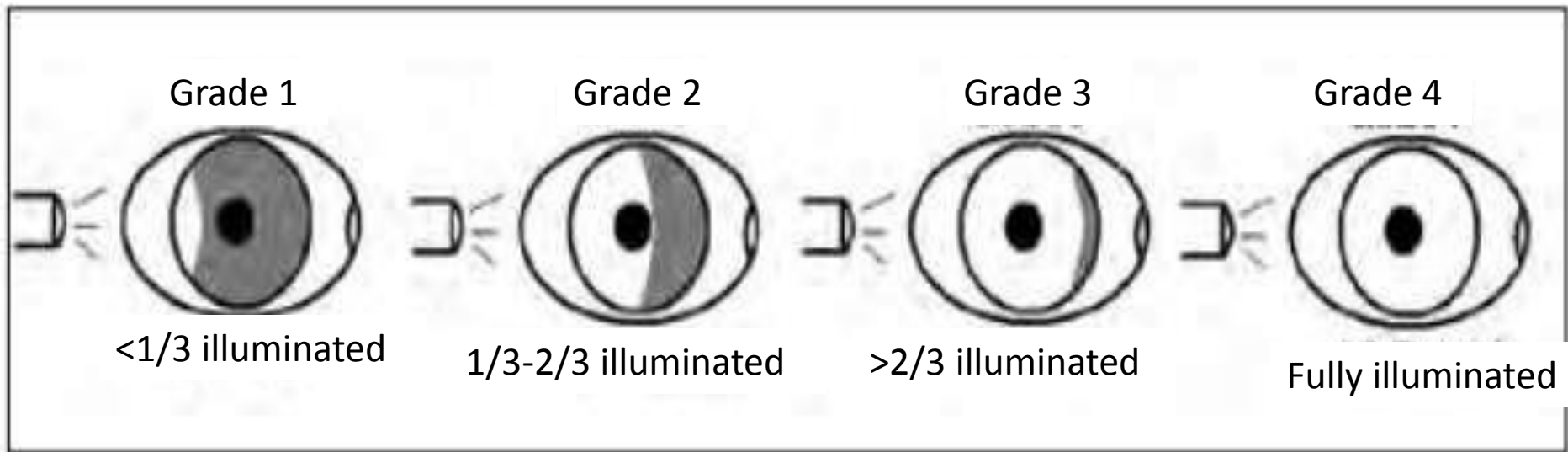
# Methods of Assessment of Anterior Chamber Angle



# Oblique Flashlight Test

- Shine a pen torch into the pt's eye from the temporal side such that the pen torch lies in the same plane as of eye.
- Deep anterior chamber, the iris lies flat and the whole iris will be illuminated.
- Very shallow anterior chamber the iris lies forward, blocking some of the light and very little of the iris is illuminated.

# Based on the amount of Iris illuminated the ACD can be graded

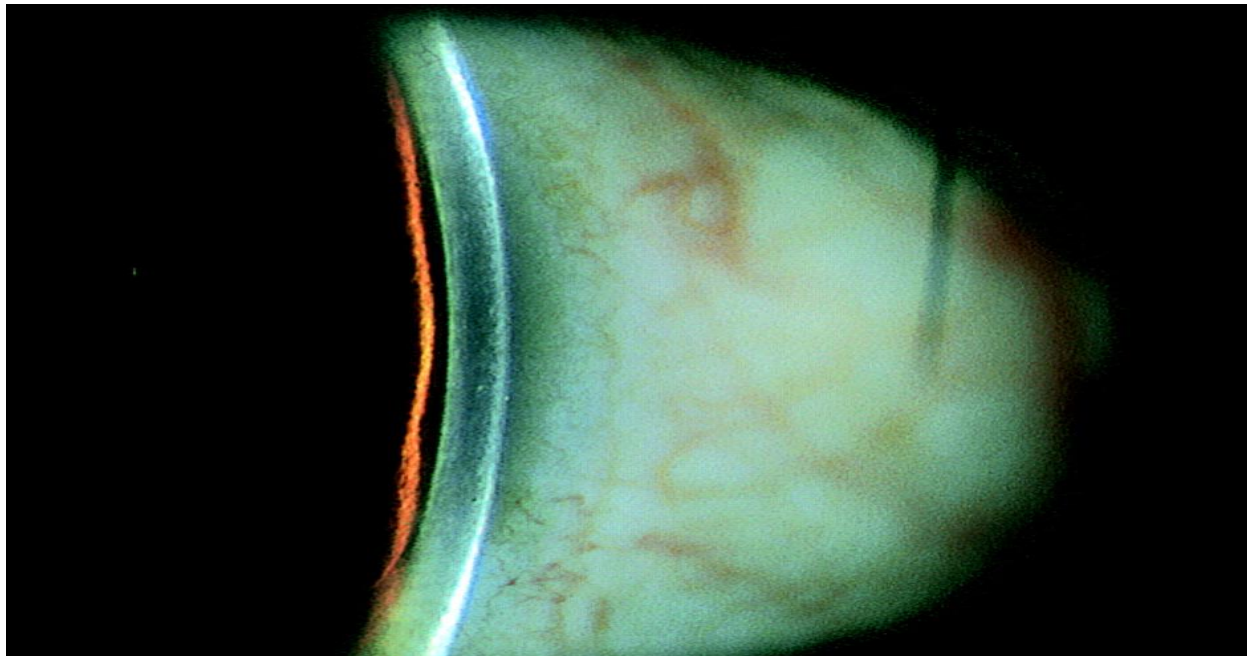


Grading of anterior chamber angle/depth using the pen torch method/ oblique flash light method

# Van Herrick's technique:-

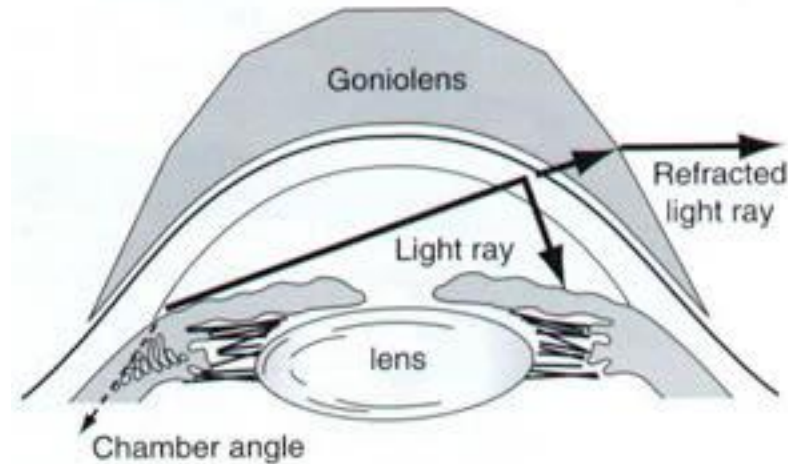
- Common quantitative method of assessing the size of the ACA using the slitlamp biomicroscope.
- It involves comparing the size of an optic section width on the cornea to the gap between the section and the reflection on the iris when a beam is trained just within the limbus at an angle of  $60^\circ$ .

Van Herick's Grade	Ratio to limbal corneal section
Grade 1	< 1:4
Grade 2	1:4
Grade 3	1:2
Grade 4	1:1 (or >1:1)

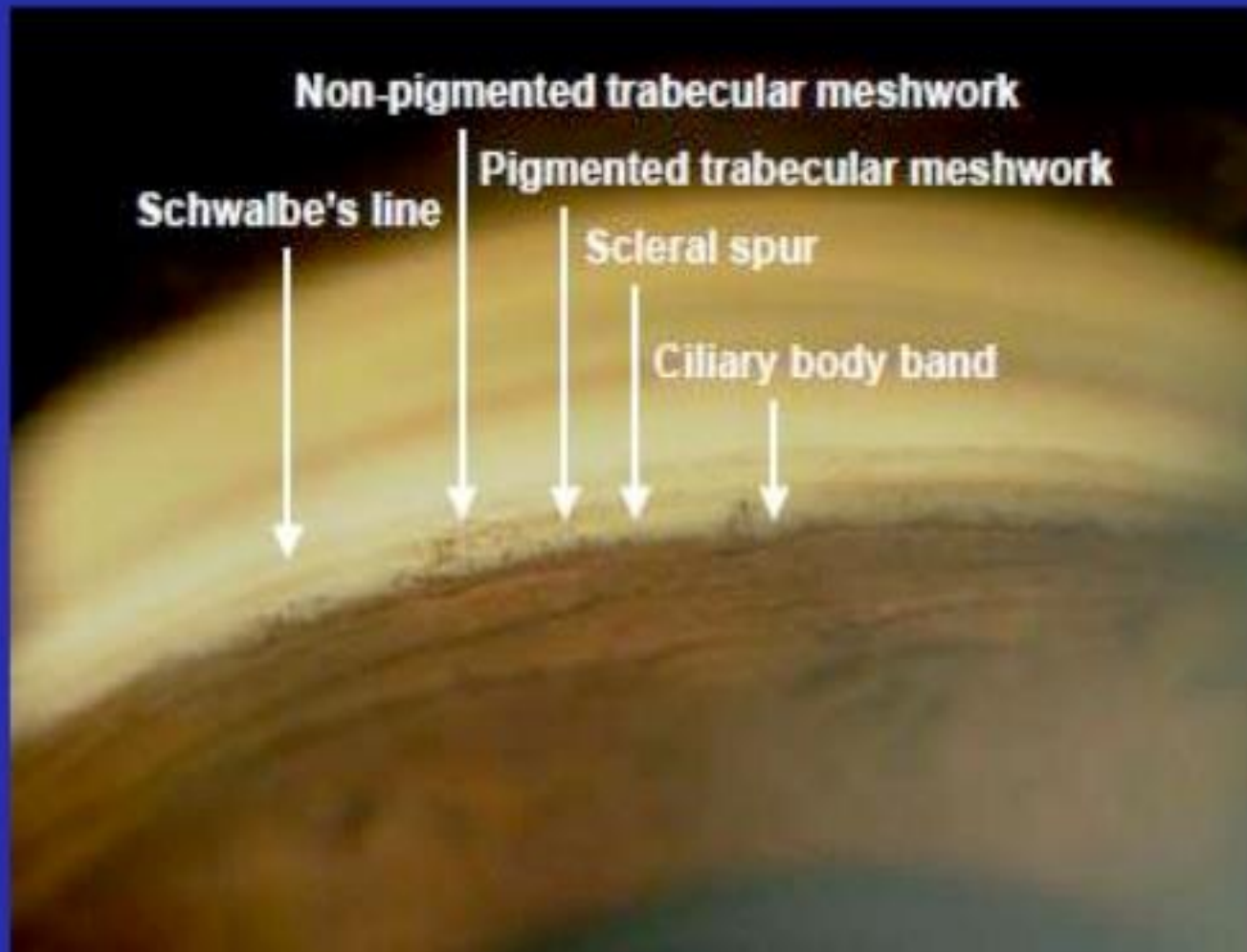


# GONIOSCOPY

- Gonioscopy involves visualization of the anterior chamber angle
- **Principle** - Rays coming from angle of anterior chamber, strike the corneal interface at an angle that exceeds the critical angle ( $46^\circ$ ).
- Rays are **totally internally reflected**.
- Gonioscope lens **changes the interface from cornea- air to lens-air, changing the critical angle**, thus permitting the viewing of angle structures.

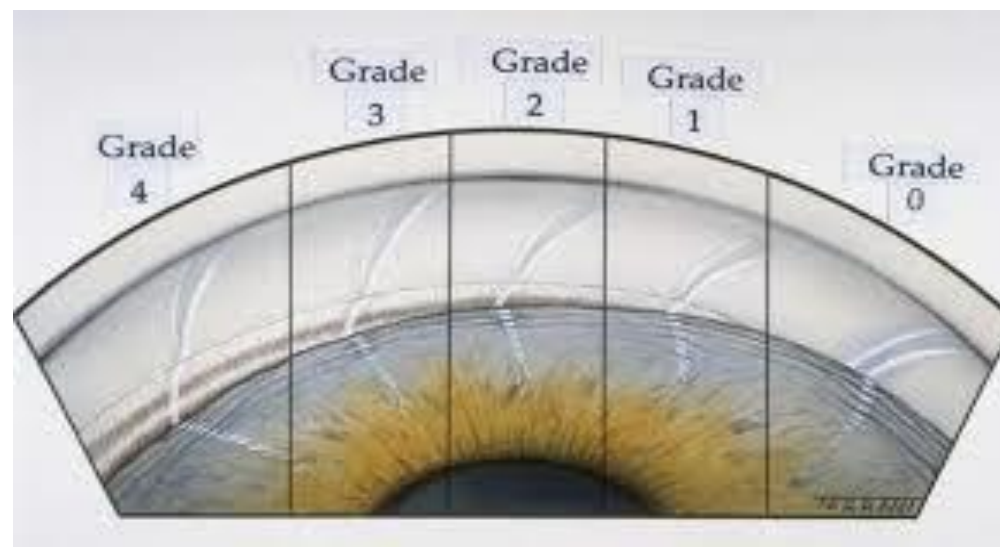


# Normal Angle Structures



**Table 1. Grade system according to Shaffer gonioscopic classification**

Shaffer grade 4	35°-45°	Wide open angle in which all structures were visible up to the iris root and its attachment to the anterior ciliary body.
Shaffer grade 3	20°-35°	Wide open angle up to the scleral spur. In grades 3 and 4, no risk of angle closure existed.
Shaffer grade 2	20°	Angle was narrow with visible trabecular meshwork. In this angle width, a possible risk of closure existed.
Shaffer grade 1	10°	Occurs when the angle was extremely narrow up to the anterior trabecular meshwork and the Schwalbe line, with a high risk of probable closure
Shaffer grade 0	0°	The angle was closed with iridocorneal contact and no visibility of the ACA structures.

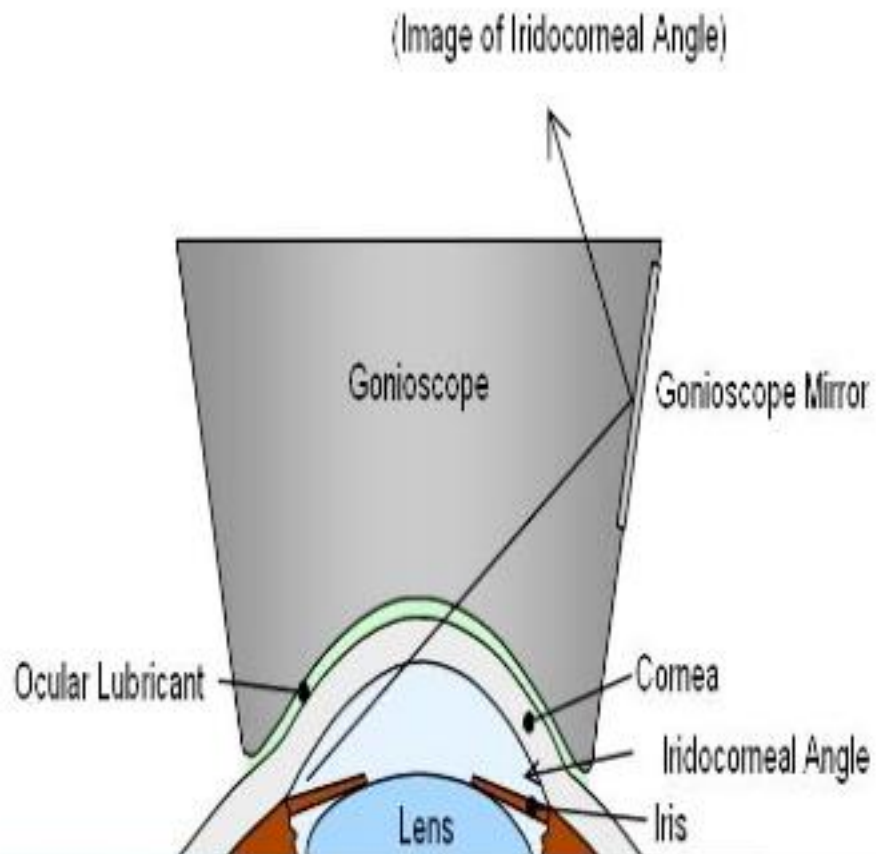


# Spaeth system of Grading

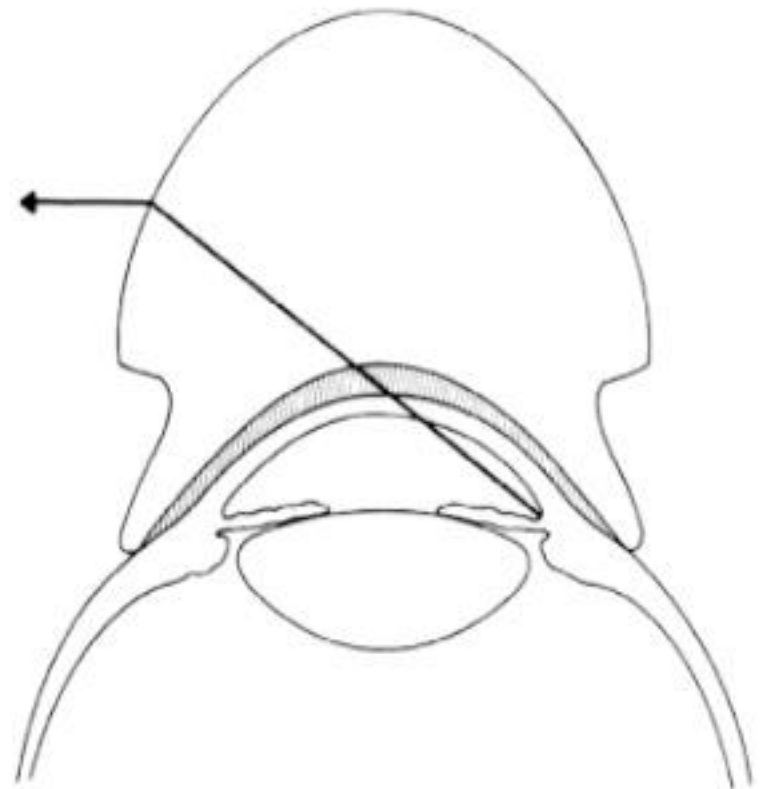
- Iris configuration –
  - q - Queer (concave peripheral iris)
  - r - Regularly straight iris
  - s - Steeply convex iris
  - • Angular width - 10°, 20°, 30°, 40°
  - • Level of iris insertion –
    - A (**A**nterior to schwalbe's line)
    - B (just **b**ehind schwalbe's line)
    - C (at the Sc leral spur)
    - D (**d**eep angle CBB seen)
    - E (**e**xtrremely deep angle)
- • Iris processes
  - U along angle recess
  - V upto Trabecular Meshwork
  - W upto Schwalbe's line
- • Pigmentation of posterior Trabecular Meshwork
  - (12 o'clock)
    - 0 — no visible pigmentation
    - 1+ — just perceptible pigmentation
    - 2+ — definite but mild
    - 3+ — moderately dense
    - 4+ — dense black pigmentation

# PRINCIPLE

## INDIRECT



## DIRECT



# DIRECT GONIOLENSES

Koepppe	Prototype diagnostic goniolens
Richardson Shaffer	For infants
Layden	For premature infants
Hoskins Barkan	Prototype surgical and diagnostic lens
Thorpe	For operating room
Swan Jacob	Surgical lens for children

# INDIRECT GONIOLENSES

Goldmann single mirror	Mirror inclined at 62°
Goldmann three mirror	Mirror for gonioscopy inclined at 59°
Zeiss four mirror	Mirrors inclined at 64° . Requires a handle (Unger)
Posner four mirror	Modified Zeiss with attached handle
Sussmann four mirror	Handheld Zeiss
Thorpe four mirror	4 mirrors inclined at 62°. requires fluid bridge
Ritch trabeculoplasty lens	2 mirrors at 59° and 2 at 62° with convex lens over the two

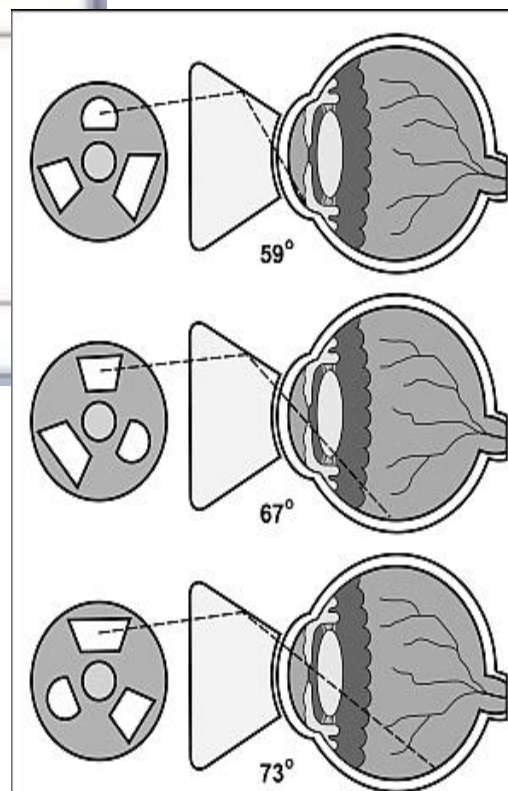
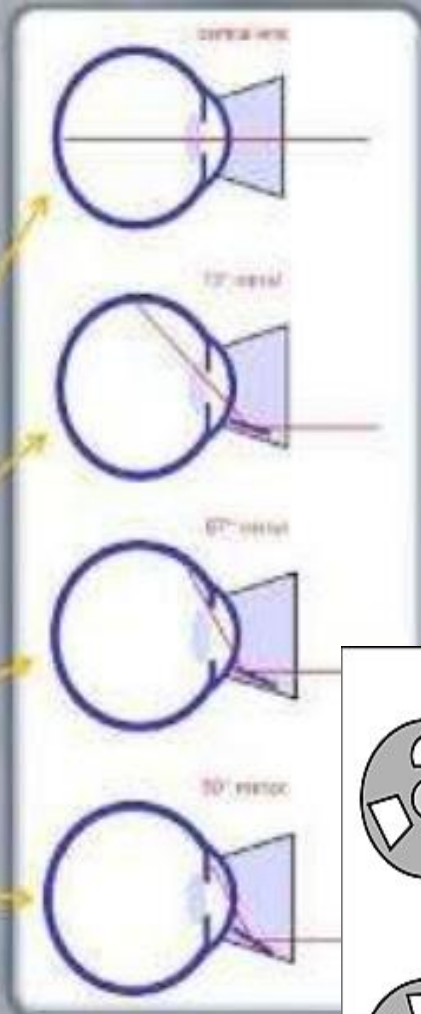
## Goldmann 3-Mirror gonioscopic lens :



- Procedure same as contact fundus lens

### Observation :

- Central lens (0) : Posterior pole
- 73° mirror (1) : Equator
- 67° mirror (2) : Ora serrata
- 59° mirror (3) : Iridocorneal angle



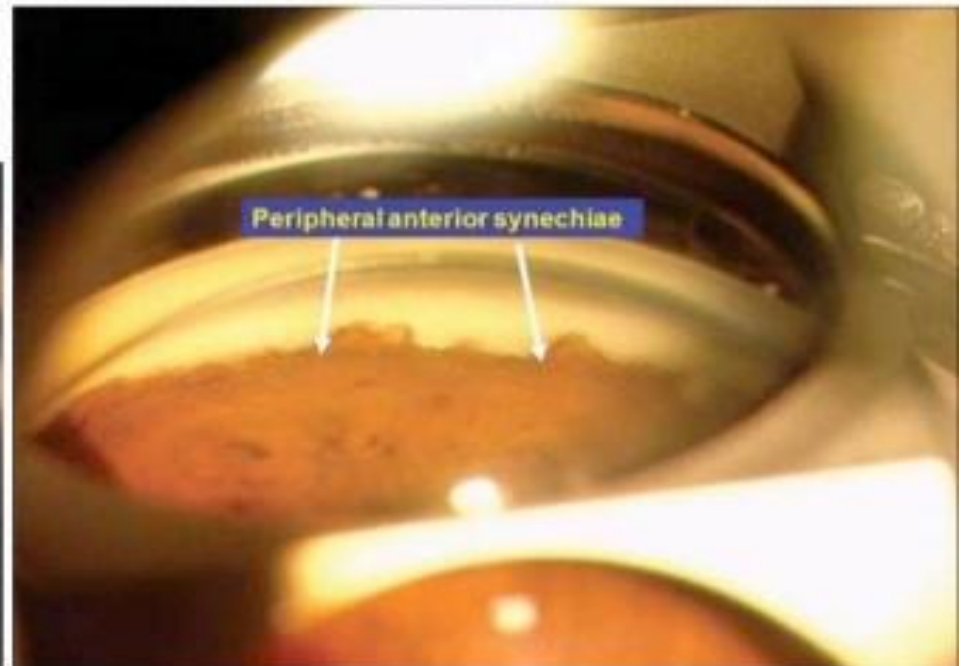
## IRIS PROCESS

- ▶ Fine
- ▶ Extend into scleral Spur
- ▶ Follow concavity of Recess
- ▶ Underlying Structures are seen
- ▶ Iris moves with indentation
- ▶ Broken with angle Recession

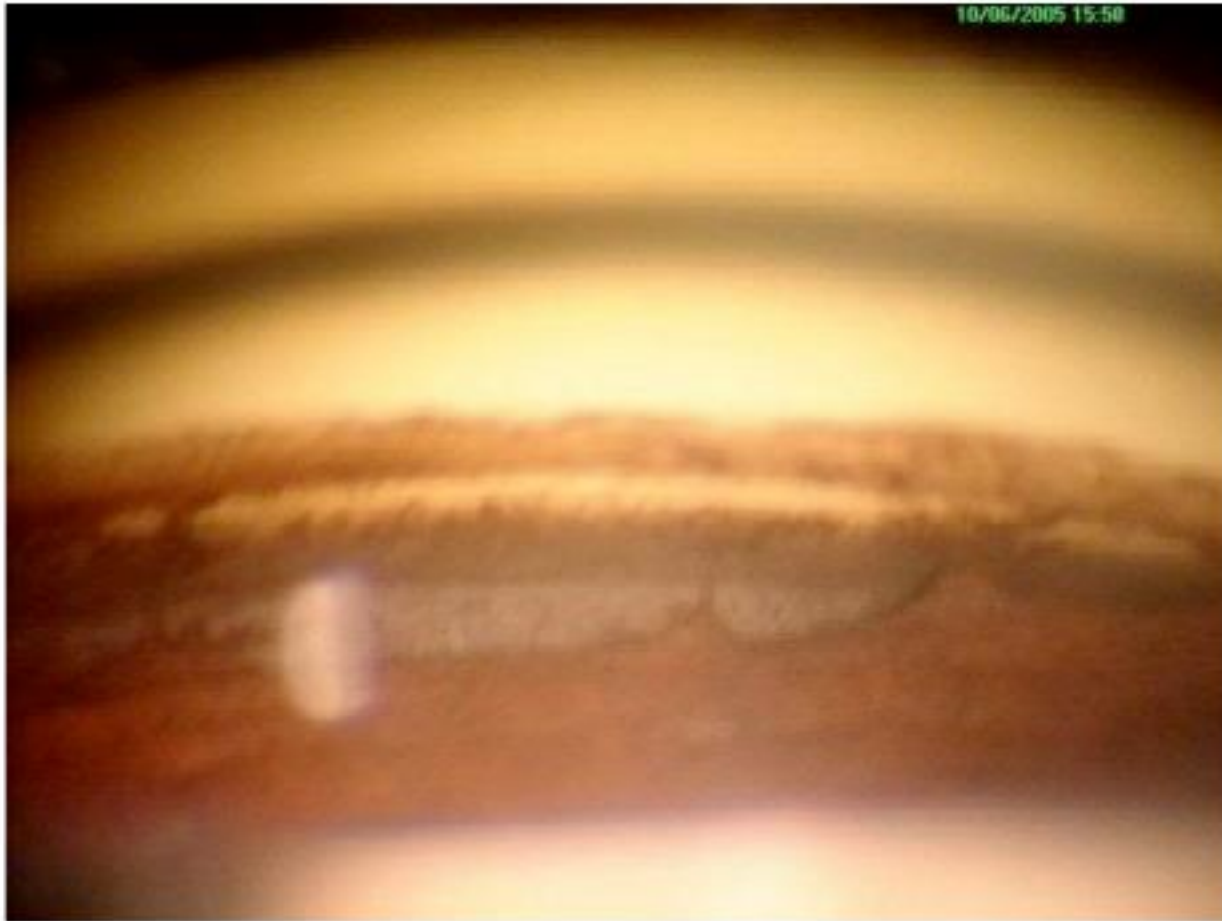


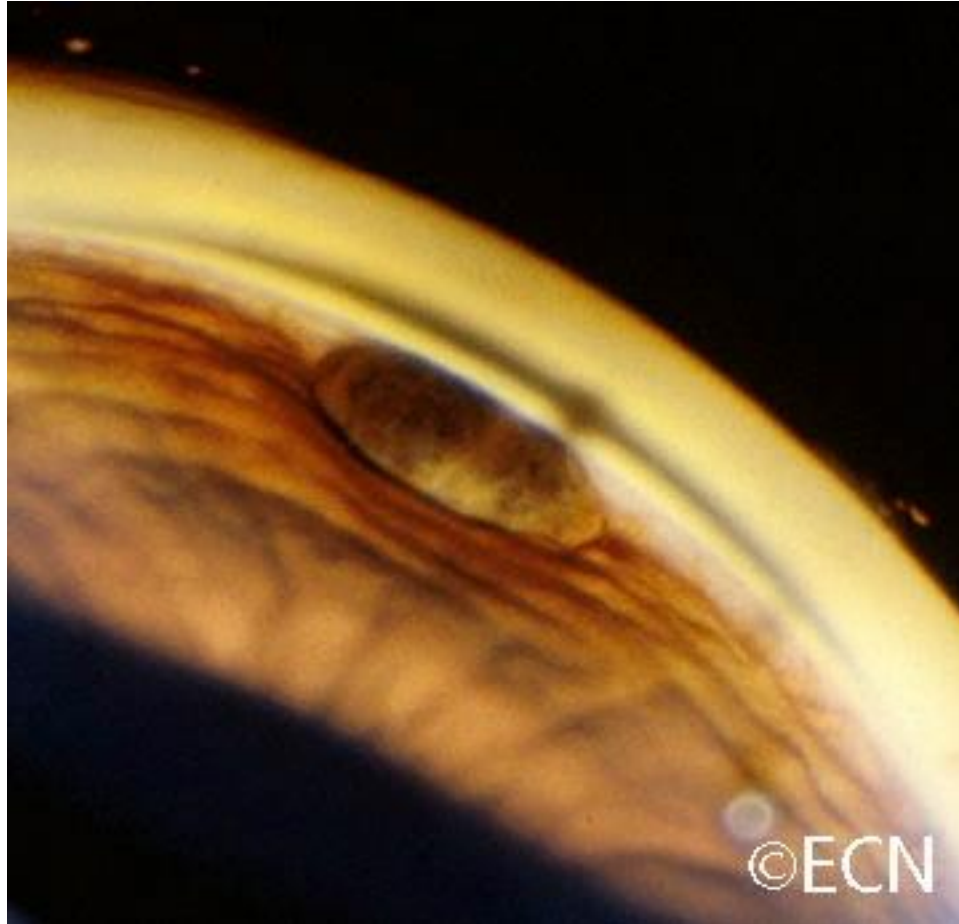
## PAS

- ▶ Broad
- ▶ Extend Beyond Scleral Spur
- ▶ Bridge concavity of Recess
- ▶ Obscures the View
- ▶ Resists Movement
- ▶ Intact in Recession

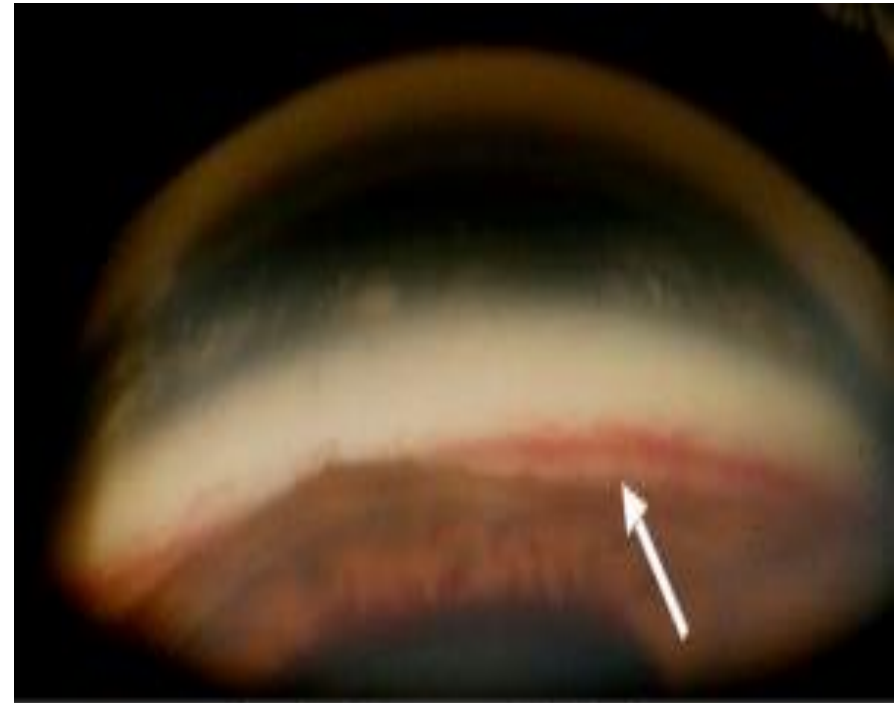


Angle recession: wide ciliary body band



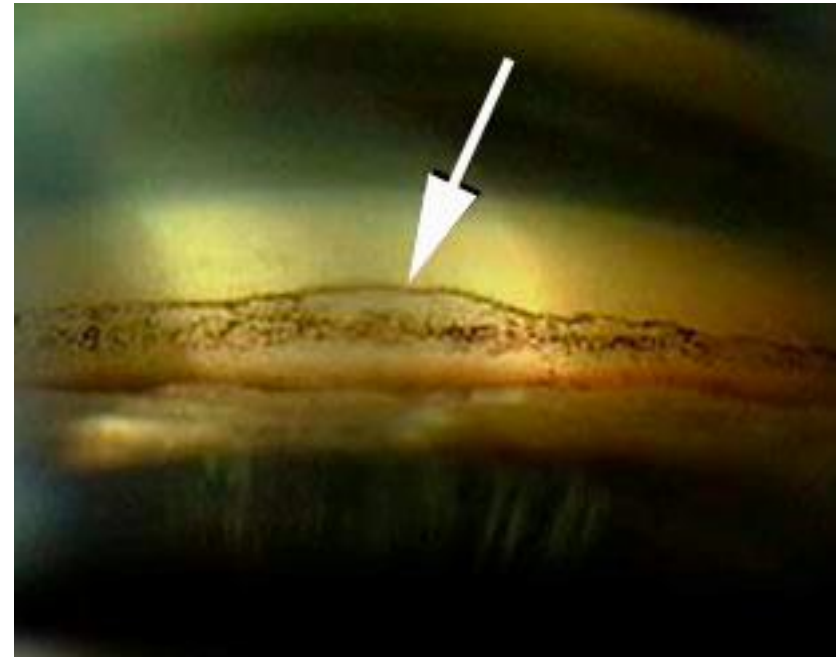
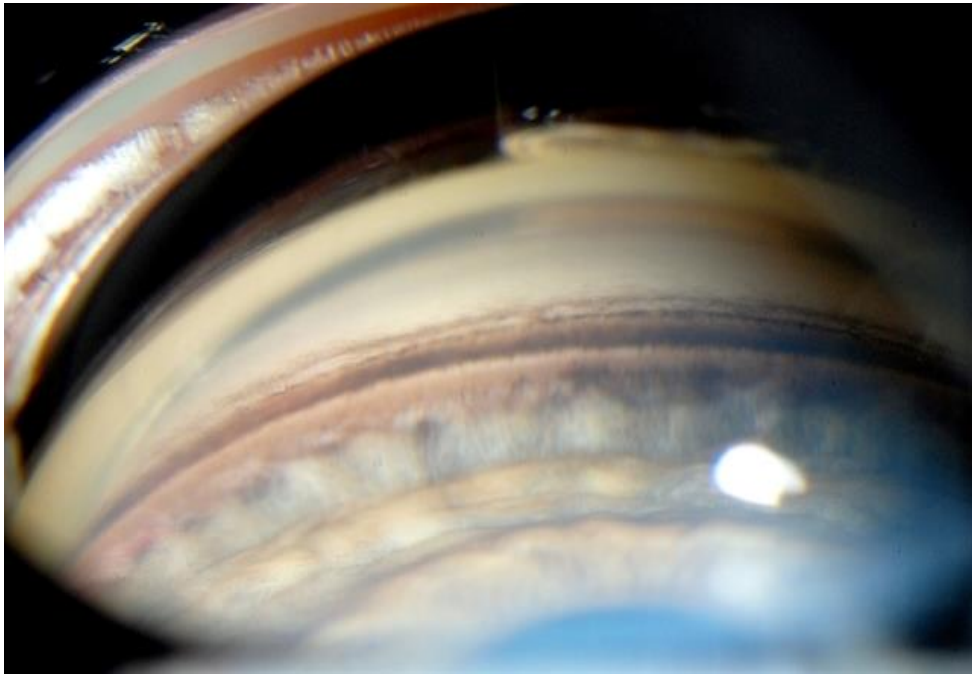


**IRIS TUMOUR SEEN AT THE ANGLE**



Angle Neovascularization

The trabecular meshwork has varying pigmentation.  
Pigmentation increases with age  
Increased pigmentation of the Schwalbe's line is called  
**Sampaolesi line** and is seen in Pseudoexfoliation and  
Pigment Dispersion Syndrome.



# Ultrasound Biomicroscopy (UBM)

- Two – dimensional high resolution gray scale images of ocular structures
- Quantitative and qualitative evaluation
- Principle- similar to B-Scan (10MHz)
- Freq - 50 MHz
- More requeency so less penetration and hence more resolution.

## Advantages of UBM

- Independent of corneal opacity
- Dynamic changes can be recorded
- Images can be automatically quantified

# Anterior Segment Optical Coherence Tomography (AS-OCT)

- Uses low coherence interferometry to obtain cross sectional images of the ocular structures.
- To image the anterior segment, longer wavelength light (1,310nm) is used.
- Anterior segment OCT can be used to take measurements of the angle.

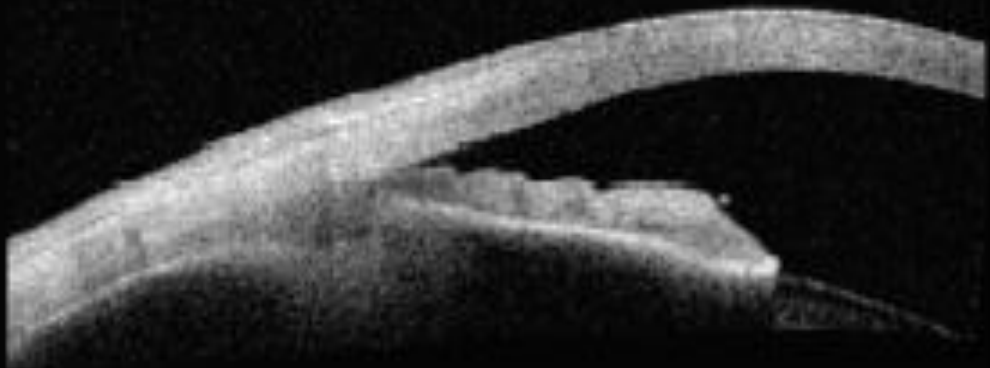
# UBM vs AS-OCT

## UBM



- Acoustic waves
- Waterbath - eye cup or Clear Scan Bag-Balloon
- (Semi) – Supine
- Visualization past iris P.E.

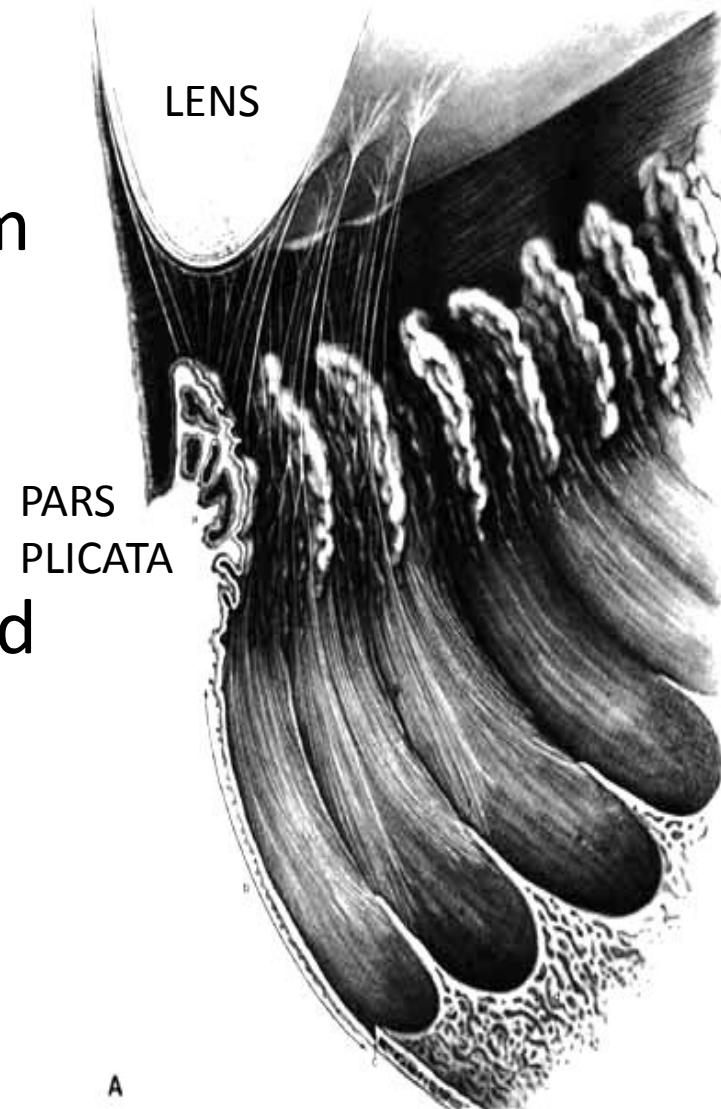
## AS-OCT



- Optical: Near infrared light
- Non-contact
- Up right
- Higher resolution, less move. artifact
- Minimal visualization past iris P.E.
- Rapid, ease of use (0.125sec scan)

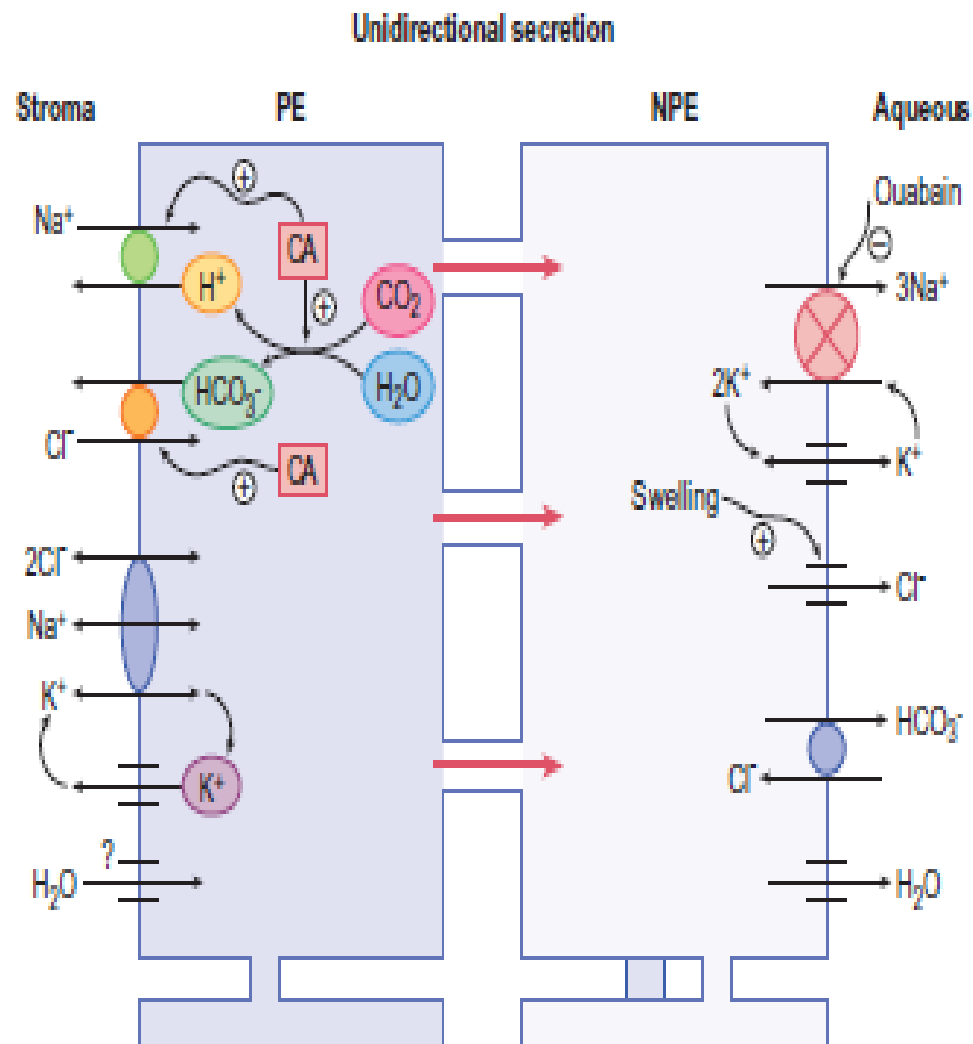
# Aqueous humour formation

- Aqueous humor is produced from **Pars Plicata** along the crests of the ciliary processes.
- Aqueous humor is derived from **Plasma** within the capillary network of the ciliary processes.
- **Three physiologic processes** contribute to the formation and chemical composition of the aqueous humor:
  - Diffusion
  - Ultrafiltration
  - Active secretion

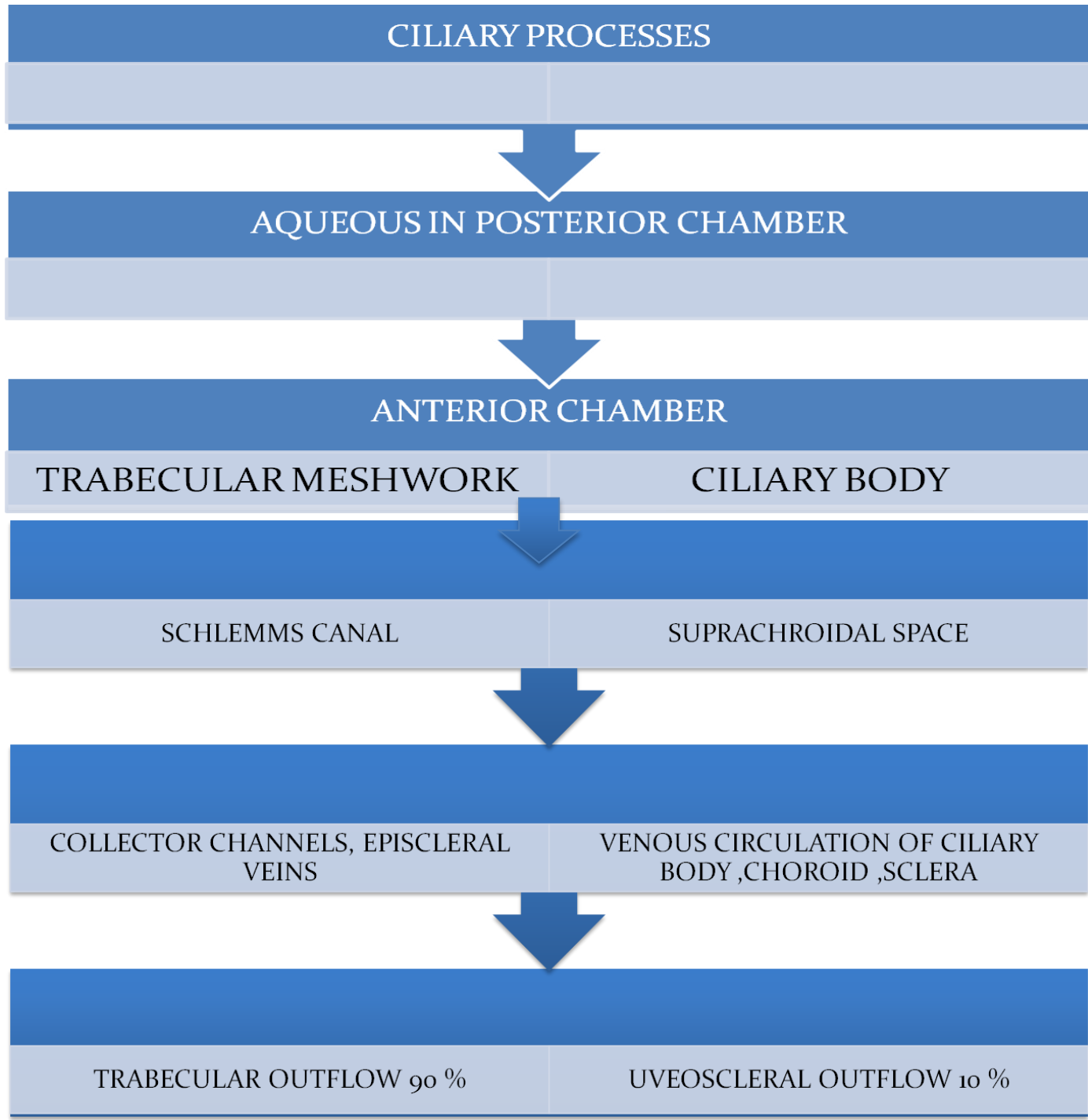


# Biochemistry of Aqueous humour formation

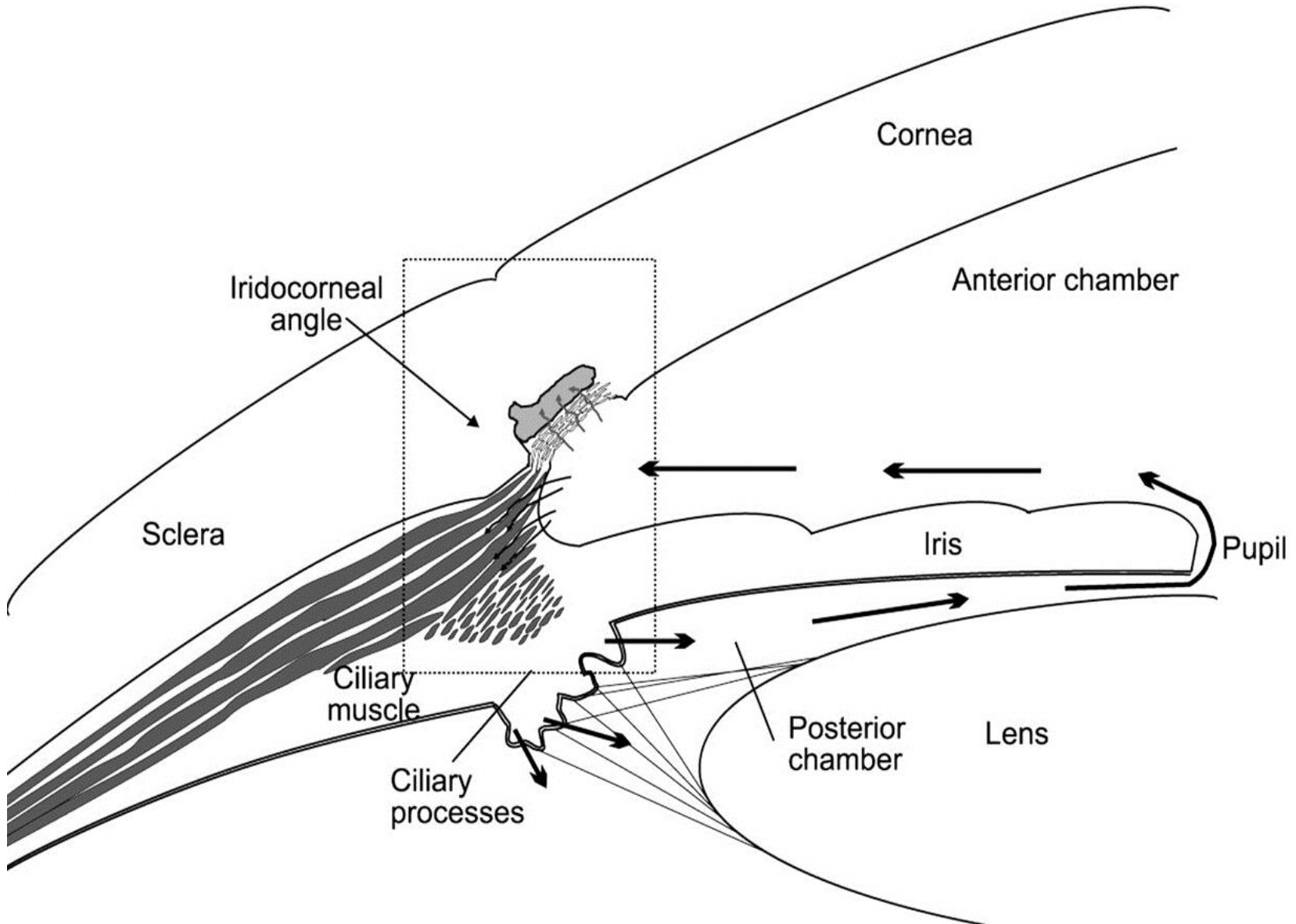
- The structural basis for aqueous humour secretion is the **Bilayered ciliary epithelium**. (pigmented epithelium & non-pigmented epithelium )
- The active process of aqueous secretion is mediated by **two enzymes** present in the NPE: **Na<sup>+</sup>-K<sup>+</sup>-ATPase** and **carbonic anhydrase**

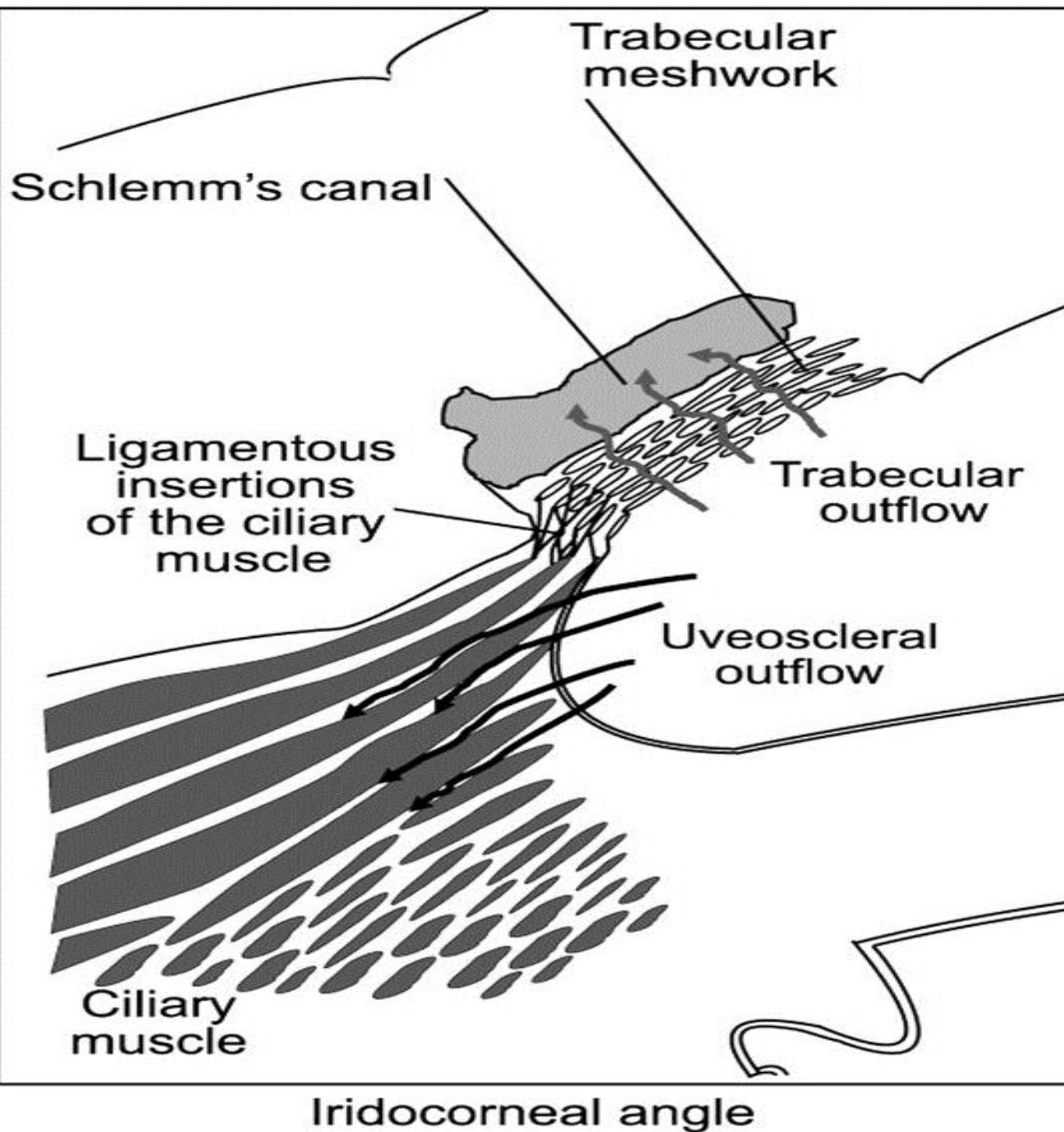


A  
Q  
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# AQUEOUS OUTFLOW





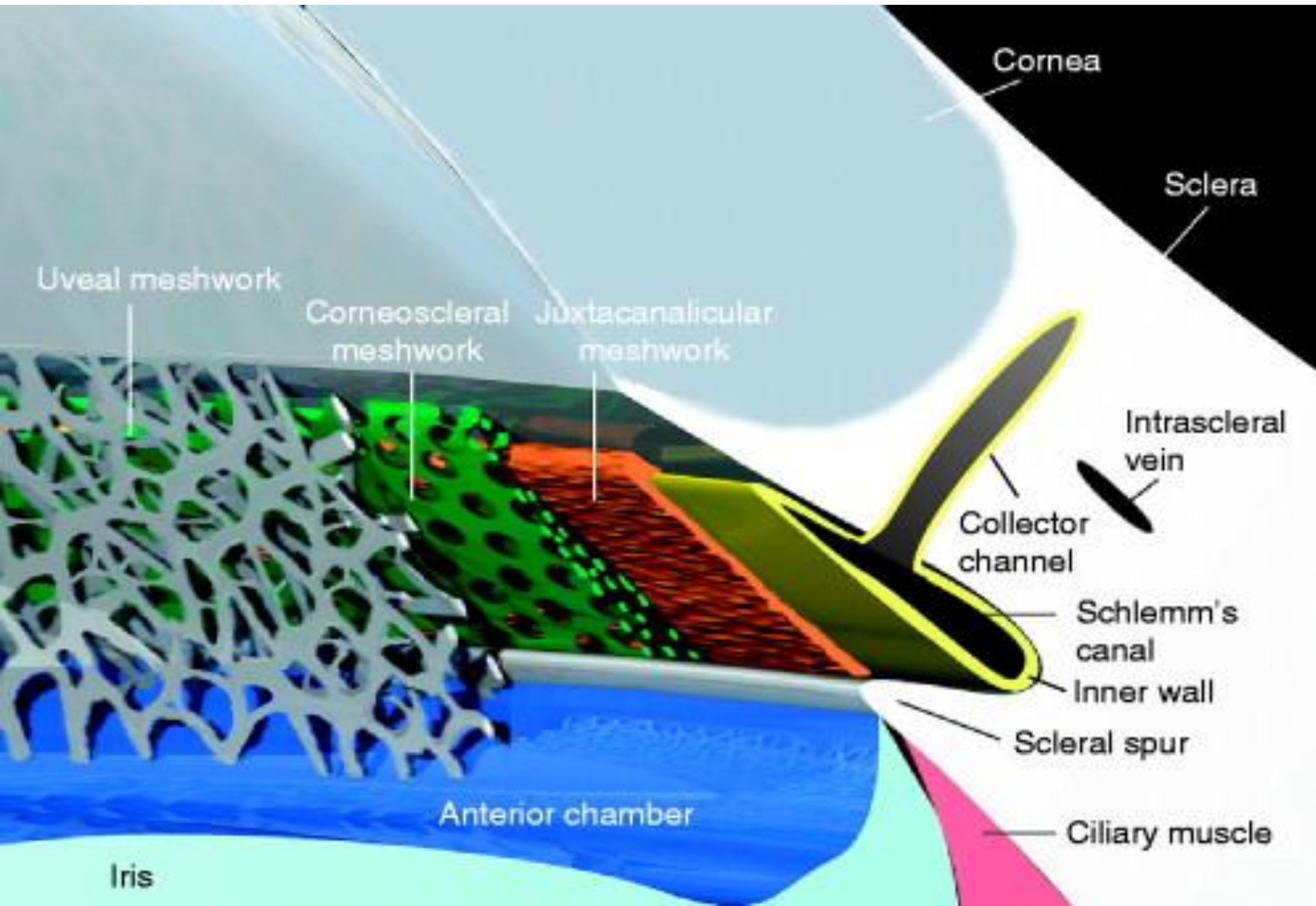
## Aqueous outflow

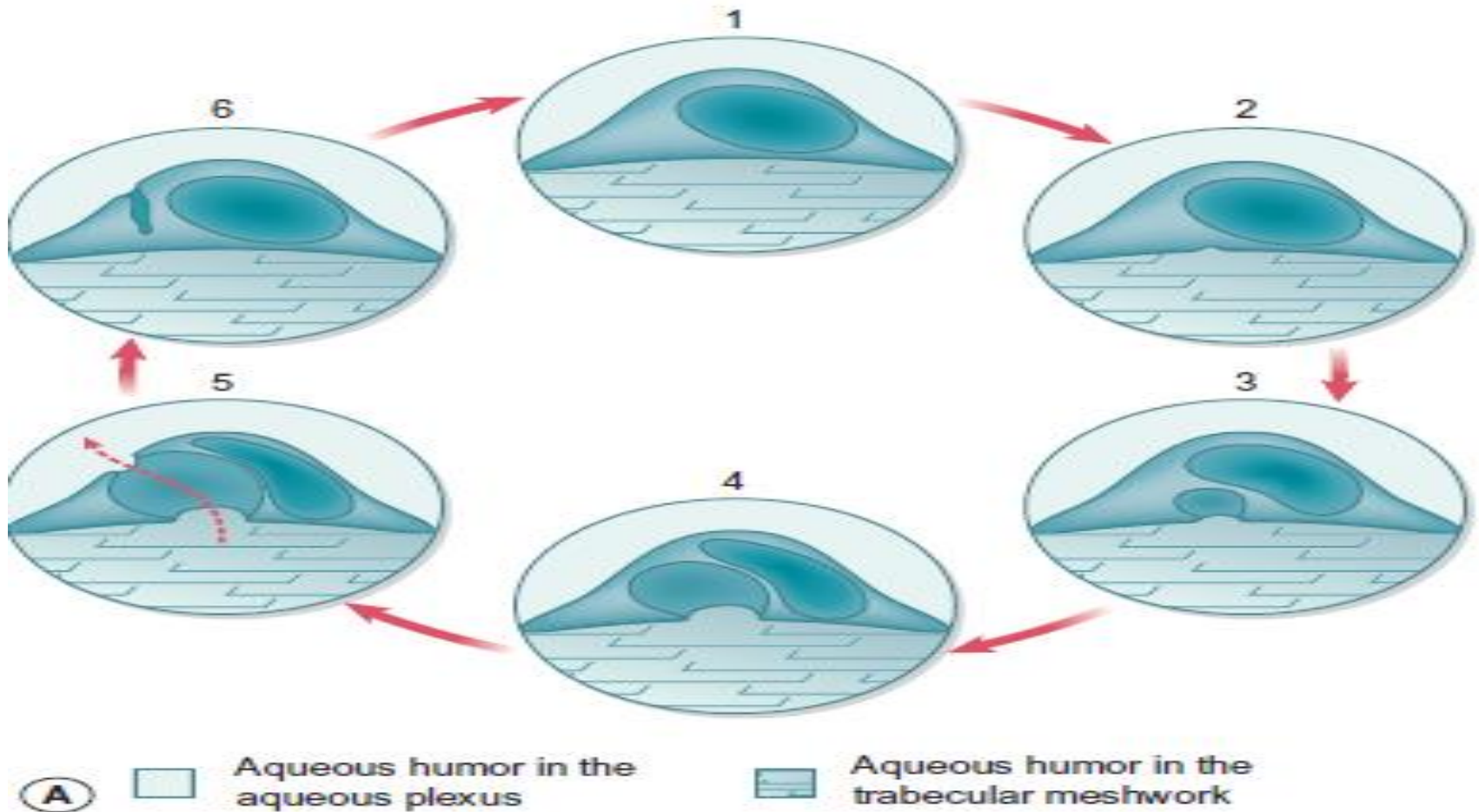
**Conventional or  
Trabecular outflow  
70% to 95%**

**And the**

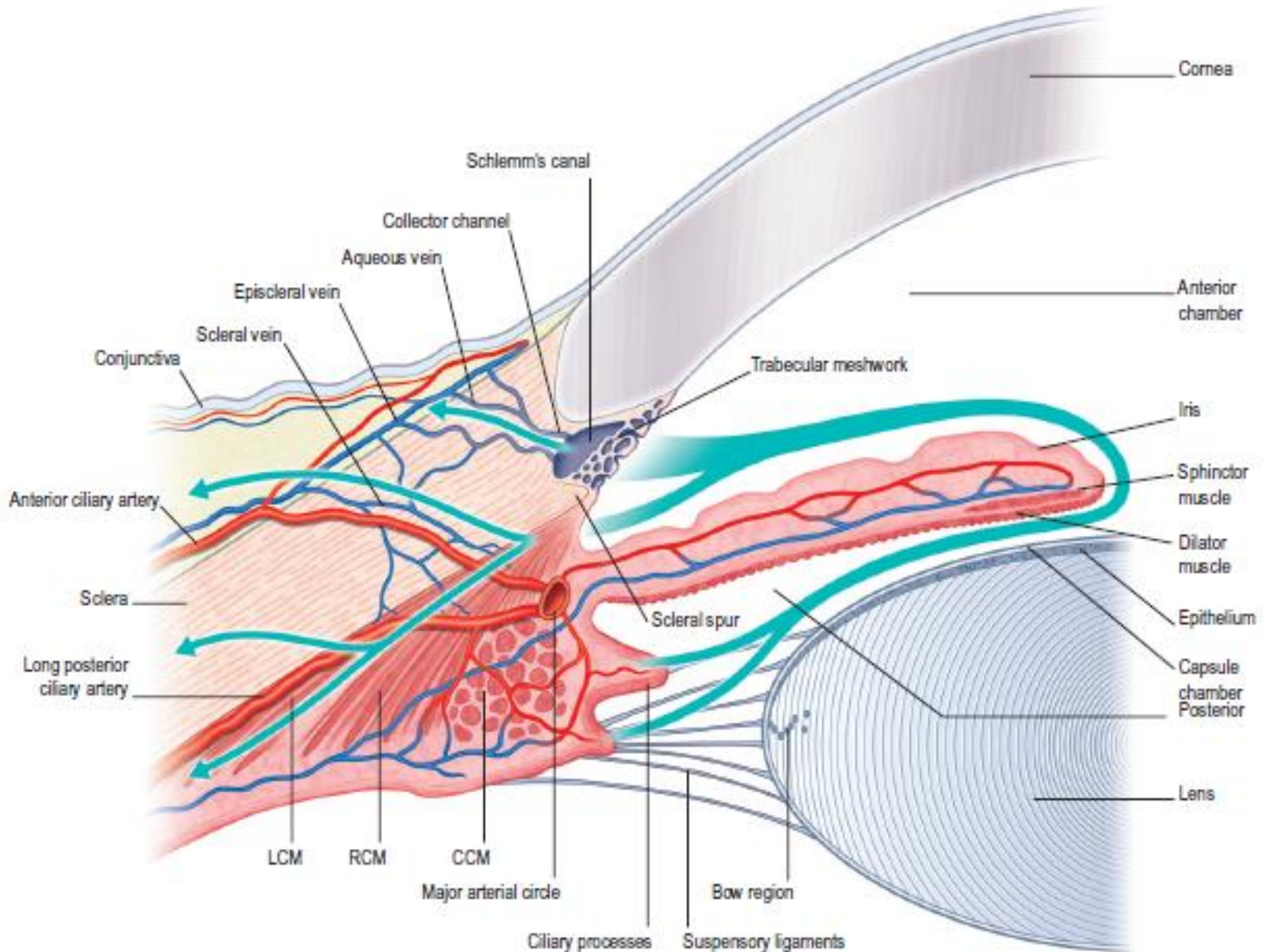
**Unconventional or  
Uveoscleral  
outflow  
5% to 30%**

# Conventional or Trabecular Outflow





**Theory of transcellular aqueous transport** -series of **pores and giant vacuoles opens** (probably in response to transendothelial hydrostatic pressure) on the connective tissue side of the juxtacanalicular meshwork. **Fusion of basal and apical cell plasmalemma** creates a temporary **transcellular channel** that allows bulk flow of aqueous into Schlemm's canal.



# Factors affecting IOP

## A. Factors causing long term changes in IOP

1. **Heredity** : First degree **relatives with POAG** have higher IOP
2. **Age** : There may be a **positive independent correlation** between IOP and age & may be related to reduced facility of aqueous outflow & decreased aqueous production.  
Increases with age.
3. **Sex** : Equal between sexes in 20-40 age group. More in **females in older age** group.
4. **Race** : **Blacks** have been reported to have slightly higher pressures than whites.(tend to have thinner corneas , greater CDR and higher IOP)
5. **Refractive Error** : A positive correlation between IOP and both **axial length** of the globe and increasing degrees of **myopia**.

## B. Factors causing short term changes in IOP

- **Diurnal and postural variation**- the mean amplitude of **daily fluctuation** is usually **less than 5mmHg** in normal individuals. The most common pattern is for pressure to be **highest in the early morning** and lowest in the late evening. The IOP increases when changing from the **sitting to the supine** position.
- **Systemic venous pressure : Straining**, as associated with the Valsalva maneuver, electroshock therapy, or playing a wind instrument, has been reported to elevate the IOP. May be due to elevated **episcleral venous pressure** and increased orbicularis tone.

***For about 1 mmHg rise in episcleral venous pressure, IOP rises by 0.8 mmHg.***

- **Mechanical pressure on the globe :**

**Blinking** 10 mm Hg IOP rise,

**Hard lid squeezing** 50 mm Hg IOP Rise Contraction of extraocular muscles also influences the IOP. There is an increase in IOP on **up-gaze** in normal individuals, which is augmented by Graves' infiltrative ophthalmopathy.

- Positive correlation between systemic **hypertension** and IOP.

- Systemic **hyperthermia** has been shown to cause an increased IOP.

- Exposure to **cold air** reduces IOP, apparently because episcleral venous pressure is decreased.

## Effect of anaesthesia on IOP

- General anesthesia reduces the IOP.
- Exceptions are trichloroethylene and ketamine which elevate the ocular pressure.
- In infants and children GA can mask a pathologic pressure elevation.
- Depolarizing muscle relaxants, such as succinylcholine and suxamethonium cause a transient increase in IOP, possibly due to a combination of extraocular muscle contraction and intraocular vasodilation
- Elevated  $p\text{CO}_2$  causes an increase in IOP, whereas reduced  $p\text{CO}_2$  or increased concentration of  $\text{O}_2$  is associated with an IOP reduction.

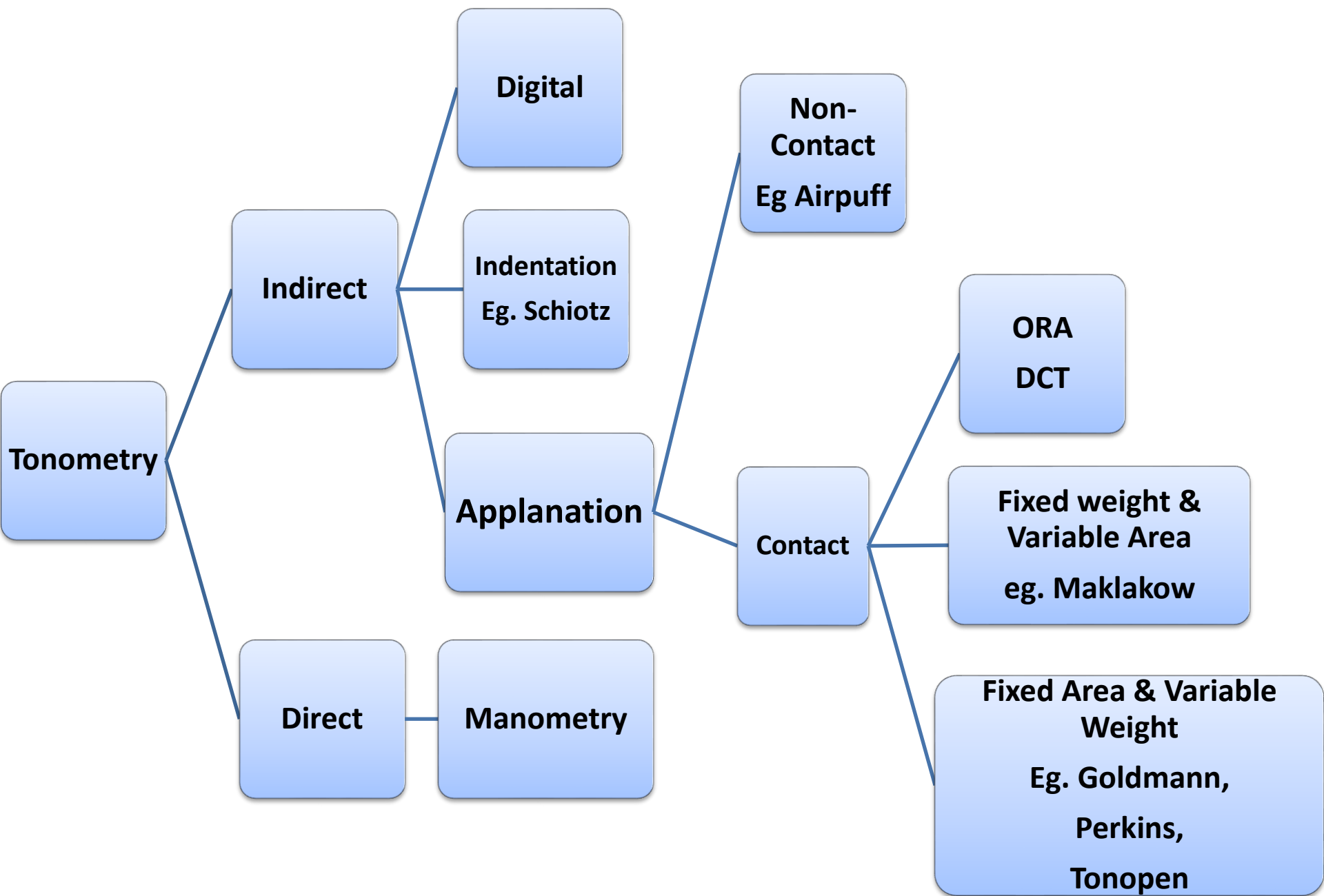
- **Alcohol**- lowers the IOP
- **Caffeine** - transient rise in IOP
- **Tobacco** smoking - transient rise in the IOP, and smokers have higher mean IOPs than nonsmokers
- **Corticosteroids** may also cause IOP elevation.

# TONOMETRY

- Three methods of evaluating the IOP
  1. Palpation
  2. Manometry
  3. Tonometry
- Four physical principles of tonometers
  1. Indentation
  2. Applanation
  3. Contour matching
  4. Rebound

# Features of an Ideal Tonometer

- Accurate
- Provide repeatable and reproducible results
- Minimally invasive
- Convenient to use
- Simple to calibrate
- Stable from day to day
- Easier to standardize
- Free from maintenance problems



Features	Indentation	Applanation
Example	Schiotz tonometer	Goldmann tonometer
Displacement of fluid	Large volume – 30 $\mu$ l	Small volume – 0.5 $\mu$ l
Influence by scleral rigidity	Greatly influenced	Not much influenced
Mechanism	Fully mechanical	Mechanical + optical
Other instrument	Not required	Slit lamp required
Position of patient	supine	Sitting (both in perkin's)
Size	small, light, portable	Attached to slit lamp so bulky
Fluorescein and cobalt blue filter	Not required	Required
Sterilisation	Effective	Is difficult

# Goldmann's Applanation Tonometer

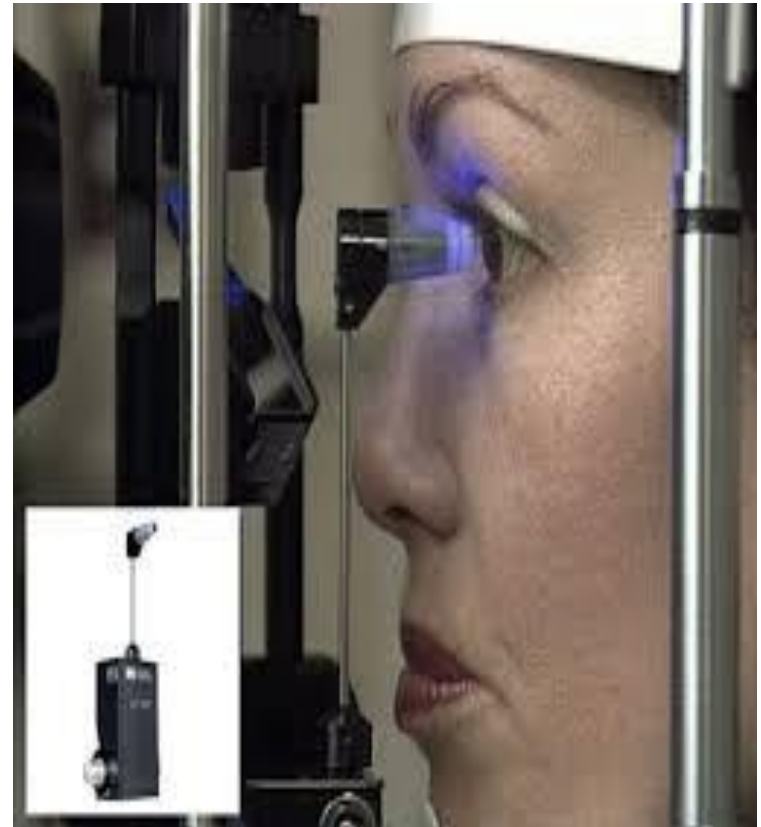
- Gold standard  
Most common  
Mounted on a slit lamp
- Determines the force necessary to flatten/applanate an area of cornea of **3.06 mm** in diameter

## Imbert Ficks Law:

- “Pressure inside an *ideal* sphere (P) is equal to force (F) necessary to flatten its surface, divided by the area of the flattening (A)”

## Advantage

- The volume displaced is so small, ocular rigidity, or the ‘stretchability’ of the globe has little effect on the readings



# Indentation Tonometry

- **Schiøtz tonometer :**

## **Advantages**

Inexpensive,

Portable,

Autoclavable instrument

## **Disadvantages**

Affected by scleral rigidity and corneal contour

## **Contraindications**

- Active eye infections
- Recurrent corneal erosions
- Corneal abrasions that are not healed



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# Non contact tonometer (NCT)

## Air puff tonometer

Applanates cornea with jet of air

Accuracy decreases

With increase in IOP

In eyes with abnormal cornea  
or poor fixation.

Use: **Screening programs**

## **Advantages:**

operated by non-medical

personnel as well

topical anesthesia not required

Non contact technique

**New NCT, Pulsair is a portable  
hand held tonometer**



# DIGITAL TONOMETRY/PALPATION METHOD

- ♦ Intraocular pressure (IOP) is estimated by response of eye to pressure applied by finger pulp.
- ♦ **PROCEDURE:** Patient looks down



Index finger of both hands used

One finger is kept stationary which feels the fluctuation produced by the indentation of globe by the other finger.

If IOP is raised → fluctuation produced is feeble or absent and the eyeball feels firm to hard.

When the IOP is very low → eye feels soft like a partially filled balloon.

# Newer tonometers

1. Trans –palpebral Tonometer
2. Pascals Dynamic contour tonometer- for scarred, irregular corneas, post refractive surgery(thin corneas)
3. Ocular Response Analyzer (Newer type of NCT, measures corneal hysteresis)
4. Bioresonator: Applanation resonance tonometer (ART)

# CENTRAL CORNEAL THICKNESS

- The impact of central corneal thickness (CCT) on applanation tonometry was first discussed by Goldmann.
- Ehlers and coworkers interpolated that deviation from the influence of CCT of 520  $\mu\text{m}$  yields an underestimation of IOP by applanation tonometry of approximately 0.7 mm Hg per 10  $\mu\text{m}$ .

## Bechmann in 2000 found following association of CCT with different forms of glaucoma:

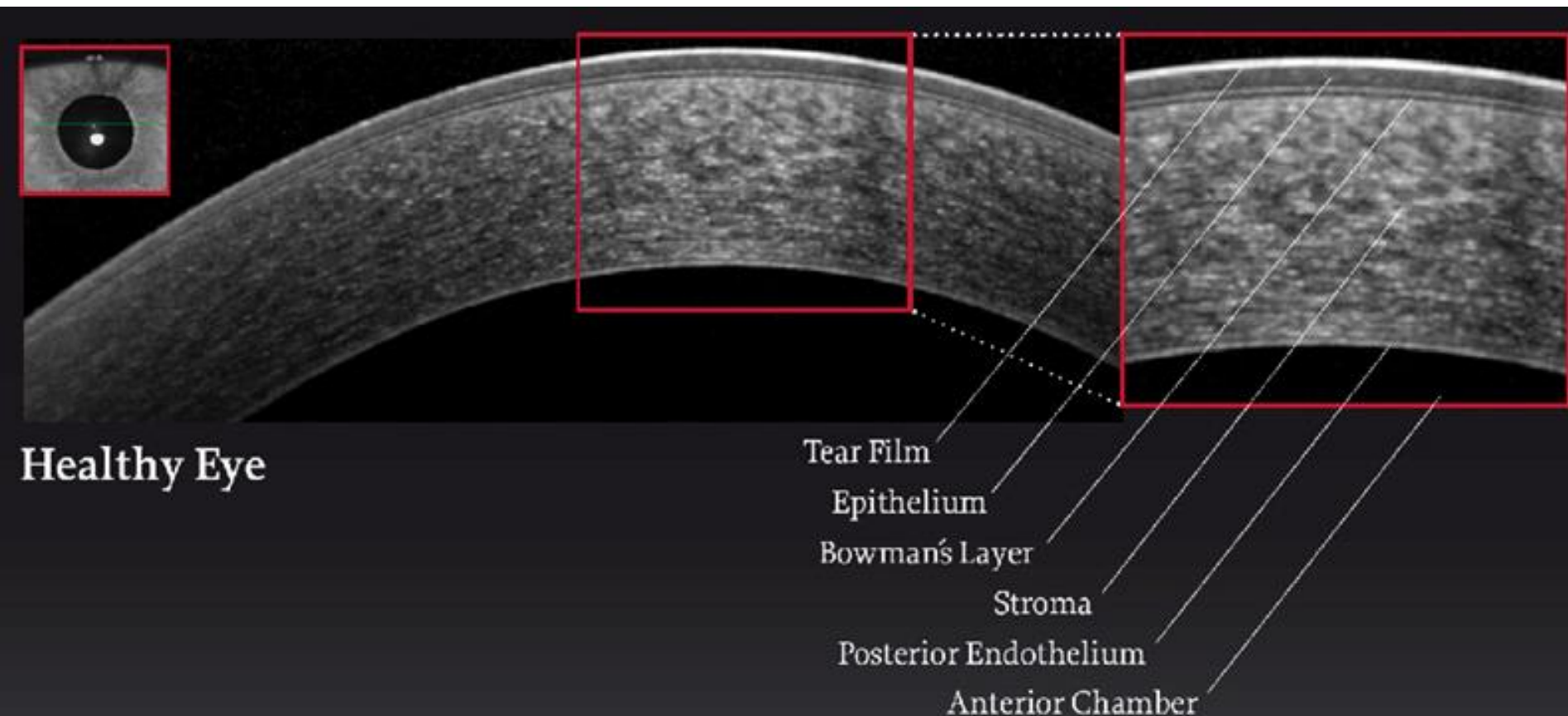
- Increased CCT measurements are found in patients with ocular hypertension, which can lead to falsely elevated IOP readings.
- Decreased CCT is found in patients with low tension glaucoma, resulting in falsely reduced IOP measurements.
- CCT was found to be lower in patients with Pseudoexfoliation syndrome and in Primary open angle glaucoma.
- There is no difference in corneal thickness in patients with pigmentary glaucoma and primary open angle glaucoma.
- ***Ocular Hypertension Treatment Study (OHTS) group published that central corneal thickness (CCT) was an important independent risk factor for progression from ocular hypertension to early glaucoma.***

# Techniques of Pachymetric measurements

Ultrasonic techniques	Optical techniques	Alternative techniques
Conventional ultrasonic pachymetry	Manual optical pachymetry	Pentacam
Ultrasound biomicroscopy	Specular microscopy	Pachycam
	Scanning slit technology	Ocular response analyser
	Optical coherence tomography	
	Optical low coherence interferometry	
	Confocal microscopy	
	Laser doppler ineterferometry	

## ANTERIOR SEGMENT OCT

The capability of OCT to measure CCT has been demonstrated recently. This technique allows a two dimensional mapping of corneal thickness by using non-contact, non-invasive, cross sectional visualization of the human cornea.



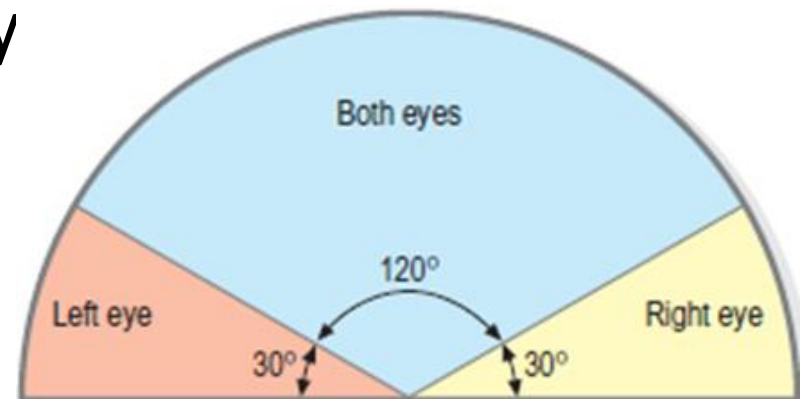
# Visual field

## Definition

- The visual field is that portion of the external environment of the observer wherein the steadily fixating eye can detect visual stimuli

## Extent of visual field

The field of vision is defined as the area that is perceived simultaneously by a fixating eye. The limits of the normal field of vision are  $60^\circ$  into the superior field,  $75^\circ$  into the inferior field,  $110^\circ$  temporally, and  $60^\circ$  nasally



# Basics

- Every point in retina corresponds to a certain direction in visual field.
- Fovea corresponds to the point on which gaze is fixed, the point of fixation
- Nasal retina sees objects in the temporal visual field and viceversa.
- Points in the superior retina corresponds to the objects in the inferior visual field and vice versa.

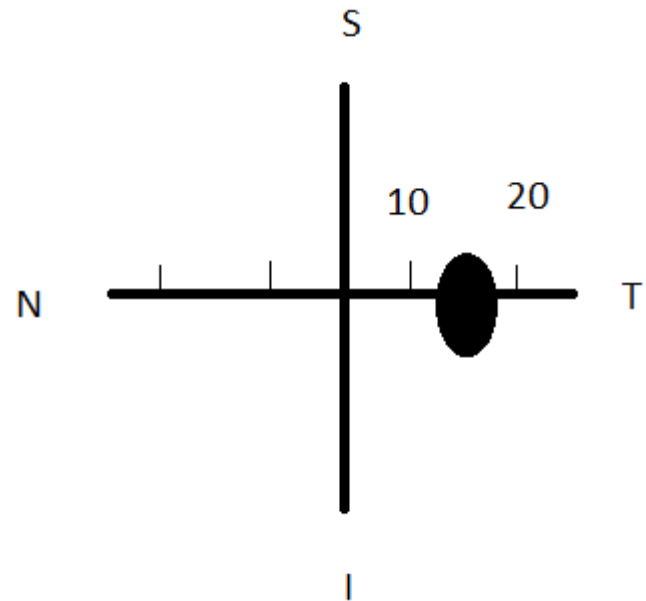
## PHYSIOLOGICAL BLIND SPOT

Corresponding to optic nerve head

15 degrees temporal to point of fixation

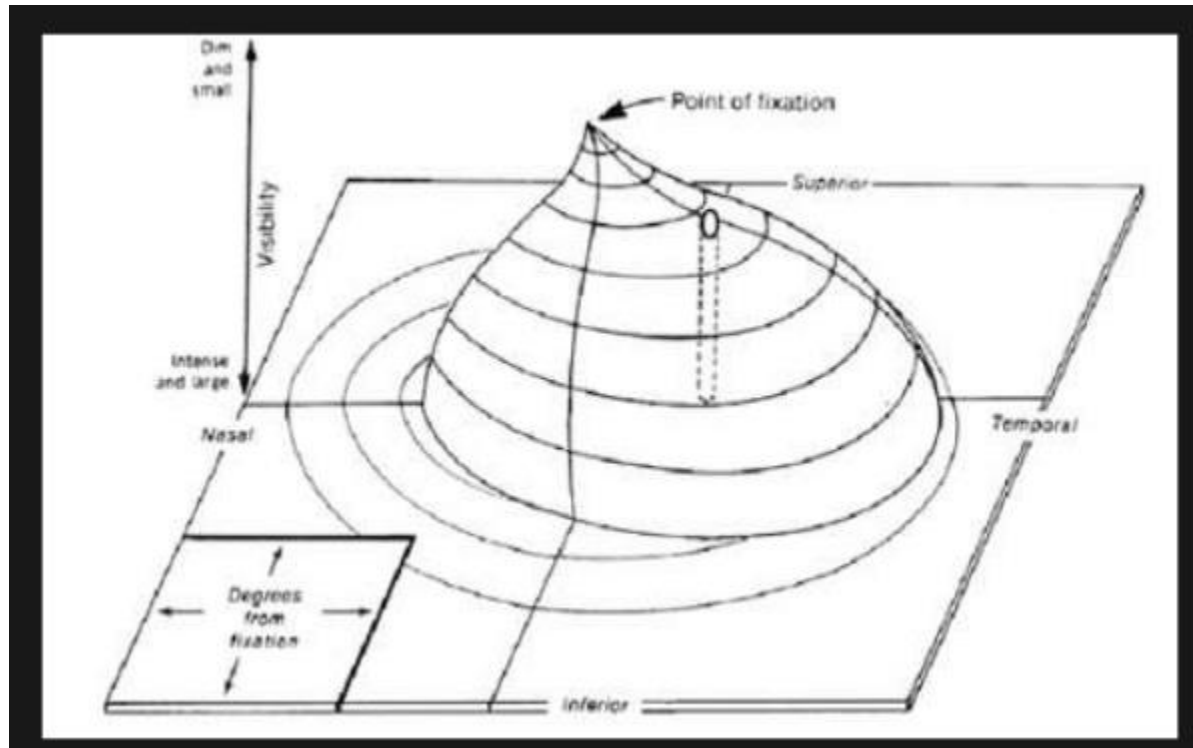
Span – 5 degrees horizontal  
7 degrees vertical

Two thirds below the horizontal meridian



# Traquair's hill of vision

- Traquair, in his classic thesis, described an island of vision in the sea of darkness. The island represents the perceived field of vision, and the sea of darkness is the surrounding areas that are not seen. In the light-adapted state, the island of vision has a steep central peak that corresponds to the fovea, the area of greatest retinal sensitivity.



# Definition of perimetry

- Measurement of visual functions of the eye at topographically defined loci in the visual field
- Measures differential light sensitivity, or the ability of a subject to distinguish a stimulus light from background illumination

# Types of perimetry

- Standard visual field testing involves measuring the contrast sensitivity or the ability of an observer to just distinguish the target from background.
- STANDARD ACHROMATIC PERIMETRY(SAP)-Conventional visual field testing is performed with a white target against a dimly illuminated white background(white on white).
- Two types of SAP commonly used:
  - kinetic
  - static

- **Static**

- 1. VFD detect earlier with
- 20% defect
- 2. Area fixed but stimulus
- varies in intensity
- 3. Three dimensional
- 4. Computerized
- 5. Threshold type
- 6. Less error
- 7. Both glaucoma and
- neurological

## Kinetic

1. Detect when 40% damage
2. Intensity is fixed but stimulus moves from non-seeing to seeing area
3. Two dimensional
4. Not computerized
5. Non threshold type
6. More error
7. Good for neurological

# Manual kinetic perimetry

- GOLDMANN PERIMETER-Consists of a bowl with a radius of 30cm.bothstimulus size and intensity can be adjusted.
- Stimilus size in goldmann perimetry

Stimulus size	Area on 30cm bowl (mm2)	Angle substended (degrees)
0	1/16	0.05
1	¼	0.11
2	1	0.22
3	4	0.43
4	16	0.86
5	64	1.72

# AUTOMATED STATIC PERIMETRY

- Here, stimuli of same size and different intensity are randomly presented in predetermined locations of the visual field and subject responses are registered.
- The default stimulus is size 3. For a patient who has advanced glaucomatous loss documented with size 3 stimulus, it is reasonable to switch to size 5.
- Testing algorithm in Humphrey Field Analyzer (HFA)

	30-2	24-2	10-2
Number of test points	76	54	68
Grid(degrees)	6	6	2

# Humphrey's visual field test

- WHITE ON WHITE
- BACKGROUND ILLUMINATION - 31.5 asb
- STIMULUS SIZE – GOLDMANN - III
- DURATION OF SPOT EXPOSURE 0.2s

# Humphrey's visual field test

- Two types— on the basis of strategies
- Threshold test—using threshold stimulus for diagnosis of glaucoma and neurological lesions
- 2. Screening test— using suprathreshold stimulus for detection of glaucoma

- 1.Threshold test—is of three types

a)Central tests:

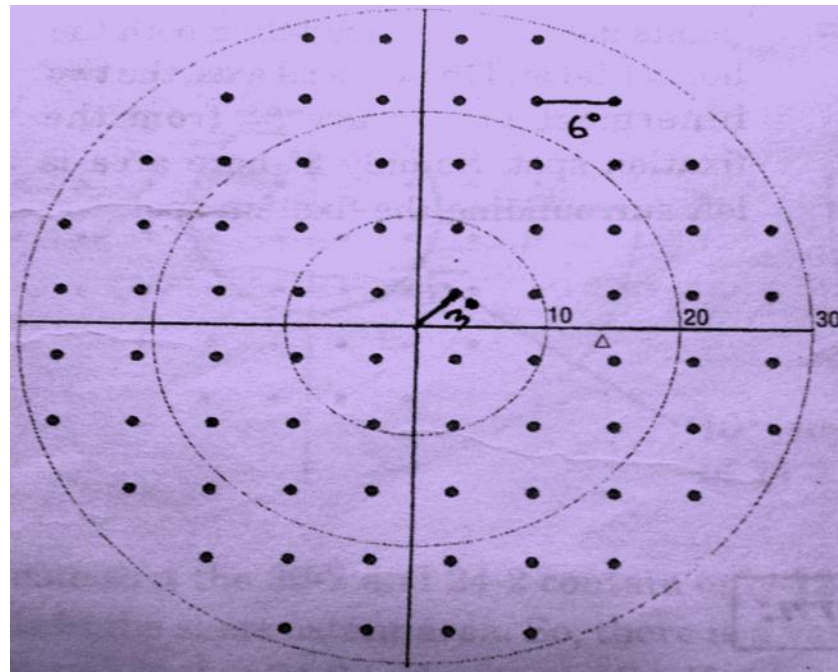
- Central30-2
- Central 24-2
- Central 10-2
- Macular program

B)peripheral tests- peripheral 60-4,nasal step-  
additional 12 locations upto 50 deg nasal

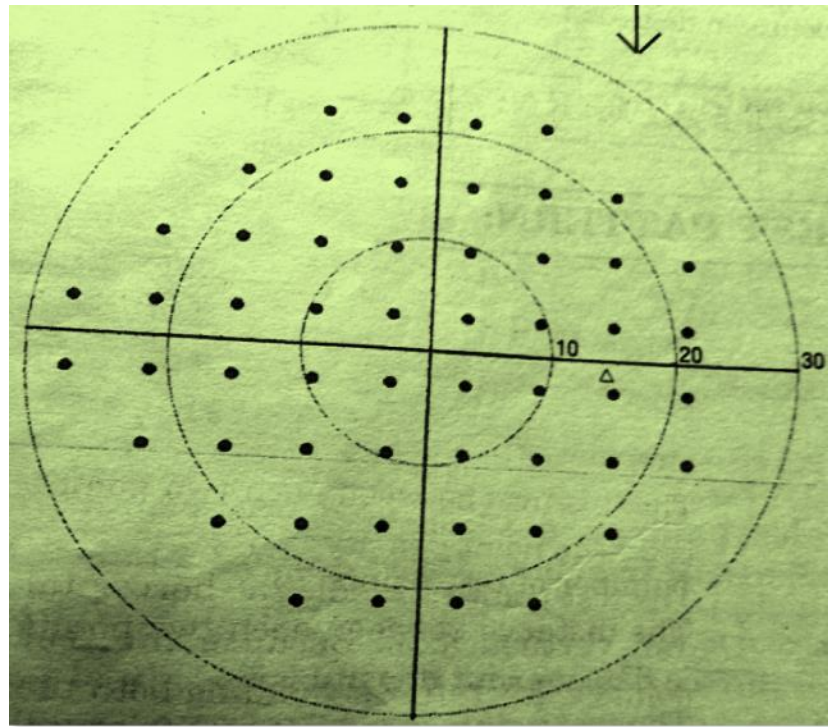
C)special test-neurological -20,neurological -30

# Central 30- 2 threshold test pattern

- No of test points –76
- Point density is  $6^\circ$  (distance between the two points)
- Bare area(non-testing area) is  $3^\circ$  from the fixation point
- Extension of testing area from the fixation point is 30degrees

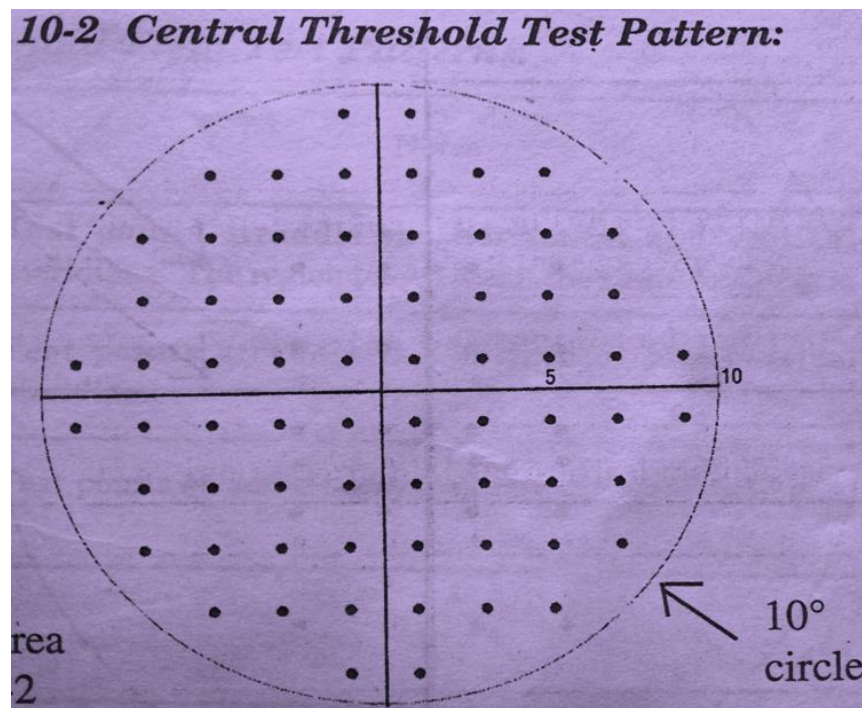


- **Central 24-2 threshold test pattern**
- No. of test points---54
- Point density is  $6^\circ$  (distance between two points is  $6^\circ$ )
- Bare area (non-seeing area) is  $3^\circ$  from the fixation point
- Extension of testing area from fixation point is  $24^\circ$



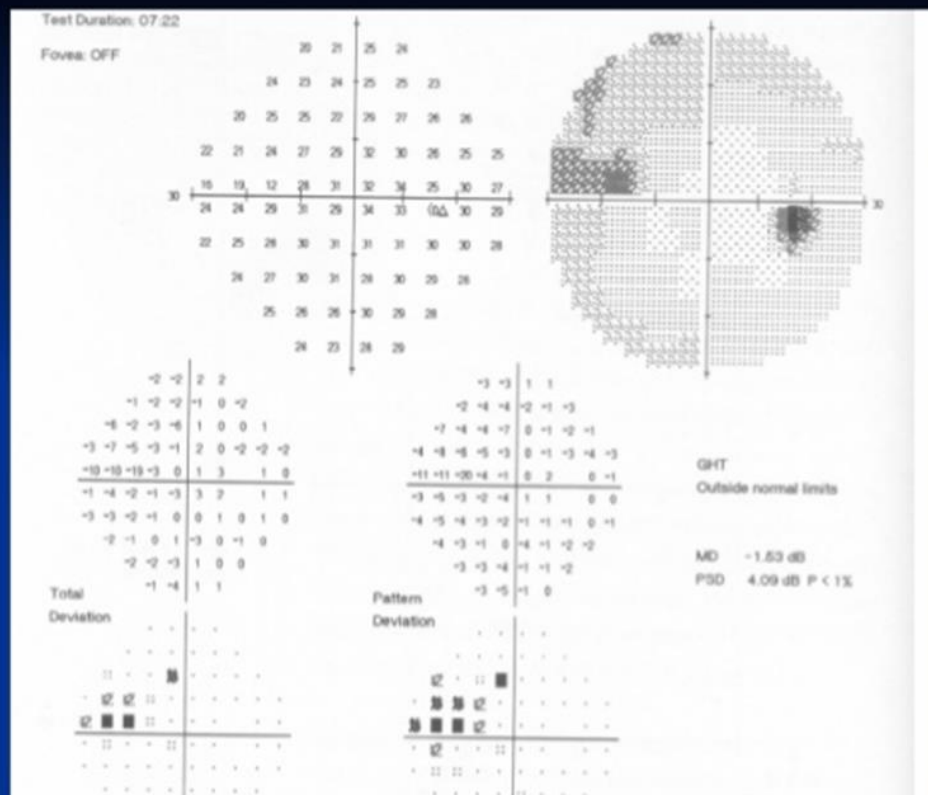
# Central 10-2 threshold pattern

- No. of points----68
- Point density is  $2^\circ$ (distance between two points is  $2^\circ$ )
- Bare area(non-seeing area) is  $1^\circ$  from the fixation point
- Extension of testing area from the fixation point is  $10^\circ$

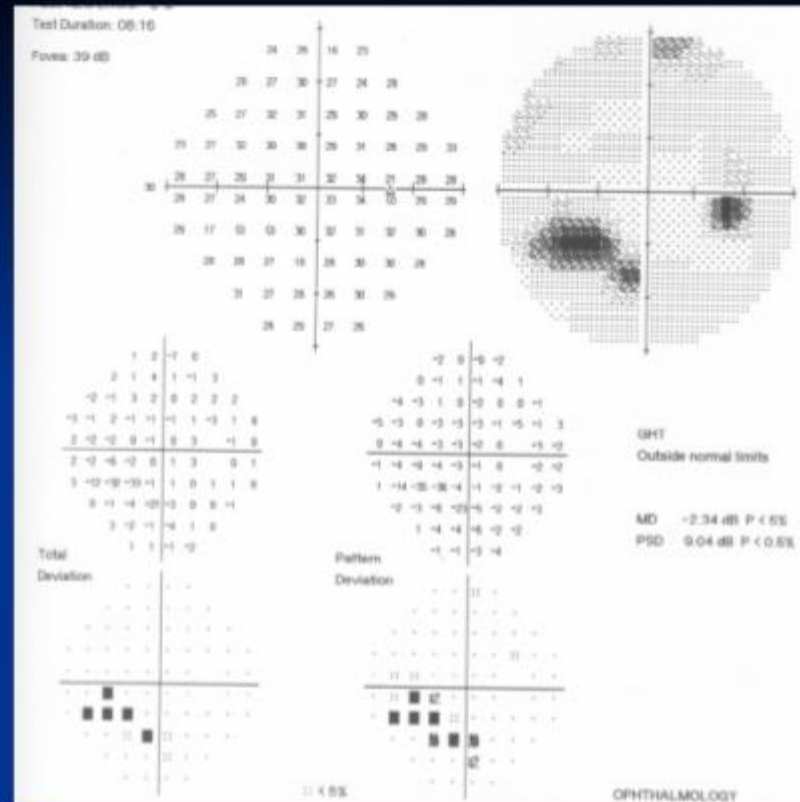


# Glaucomatous Visual field abnormalities

- Initially observed in Bjerrum area, 10- 25° from fixation
- Correlate with abnormalities seen on optic nerve head
- Field defects:
  1. Paracentral scotomas
  2. Nasal step (Earliest)
  3. Siedel scotoma
  4. Arcuate scotoma
  5. Double arcuate or ring scotoma
  6. End-stage or near total defect with only a residual temporal island of vision



Superior nasal step



Inferior paracentral scotoma

Central 30-2 Threshold Test

Fixation Monitor: Gaze/Blindspot

Fixation Target: Central

Fixation Losses: 1/25

False POS Errors: 1 %

False NEG Errors: 6 %

Test Duration: 08:49

Stimulus: III, White

Background: 31.5 ASB

Strategy: SITA-Standard

Pupil Diameter: 2.0 mm

Visual Acuity:

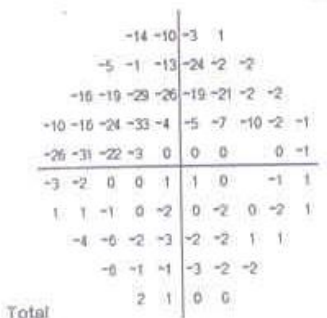
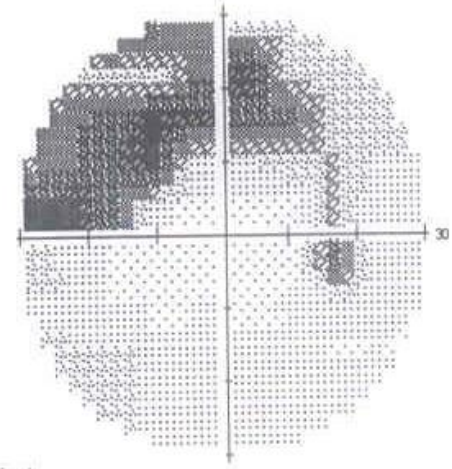
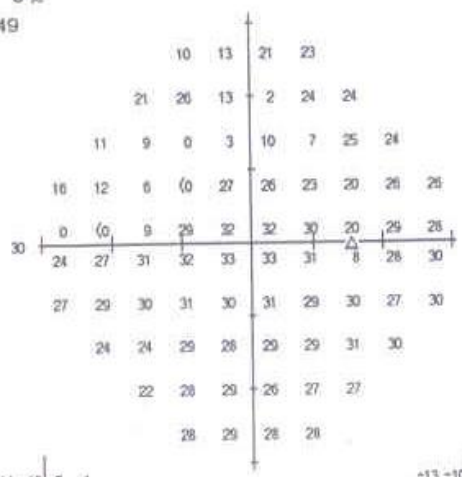
RX: -4.00 DS    DC X

Date: 11-27-1996

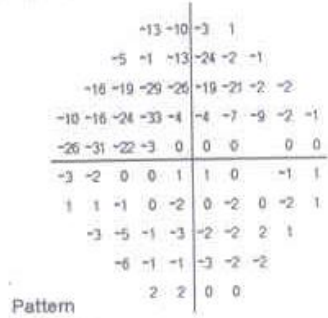
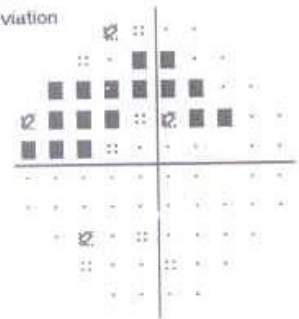
Time: 8:07 AM

Age: 65

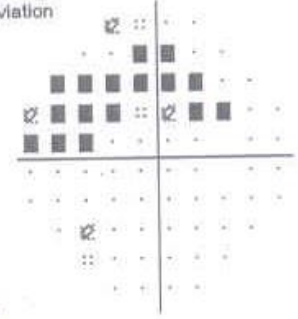
Fovea: OFF



Total Deviation



Pattern Deviation



GHT

Outside normal limits

MD    -5.68 dB    P < 0.5%

PSD    10.81 dB    P < 0.5%

< 5%

< 2%

< 1%

< 0.5%

Superior Arcuate Scotoma

Name: Patient 5-4

10

DOB: 09-09-1920

### Central 30-2 Threshold Test

Fixation Monitor: Gaze/Blindspot

Stimulus: III, White

Pupil Diameter: 3.0 mm

Date: 02-07-1997

Fixation Target: Central

Background: 31.5 ASB

### Visual Acuity

Time: 3:33 PM

Fixation Losses: 0/17

Strategy: SITA-Fast

RX: +3.50 DS      DC X

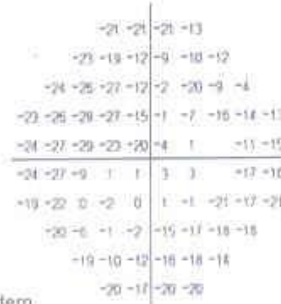
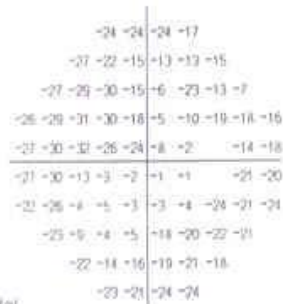
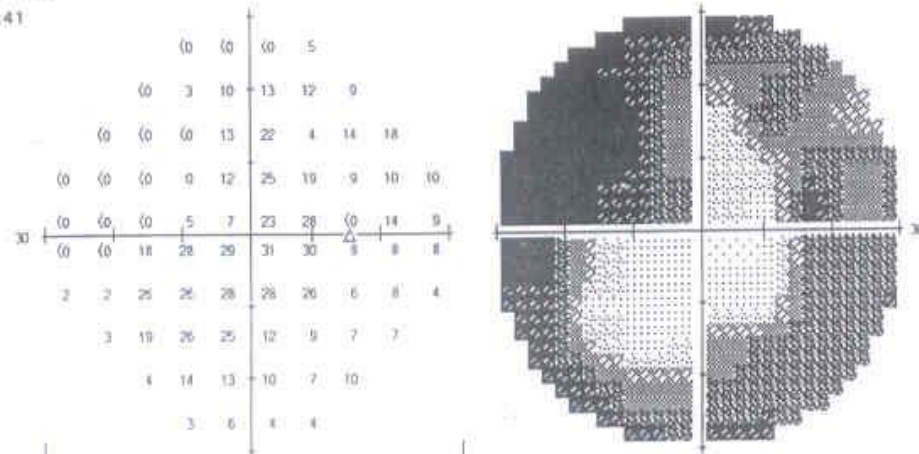
Age: 76

False POS Errors: 0 %

False NEG Errors: 18 %

Test Duration: 06:41

Fovea 33 dB



GHT

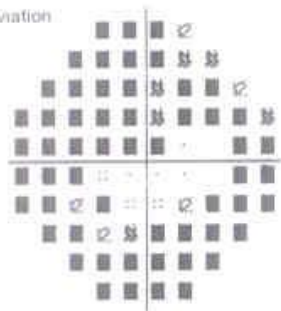
Outside normal limits

MD -16.48 dB,  $P < 0.5\%$ .

PSD 10.98 dB P < 0.5%

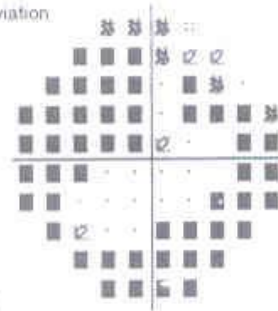
Total

## Deviation



### Pattern

Deviation

 $\leq 5\%$ 

$\sigma < 2\%$

 $\Delta \leq 1\%$ 

■ < 0.5%

OPHTHALMOLOGY

MALMÖE UNIVERSITY HOSPITAL

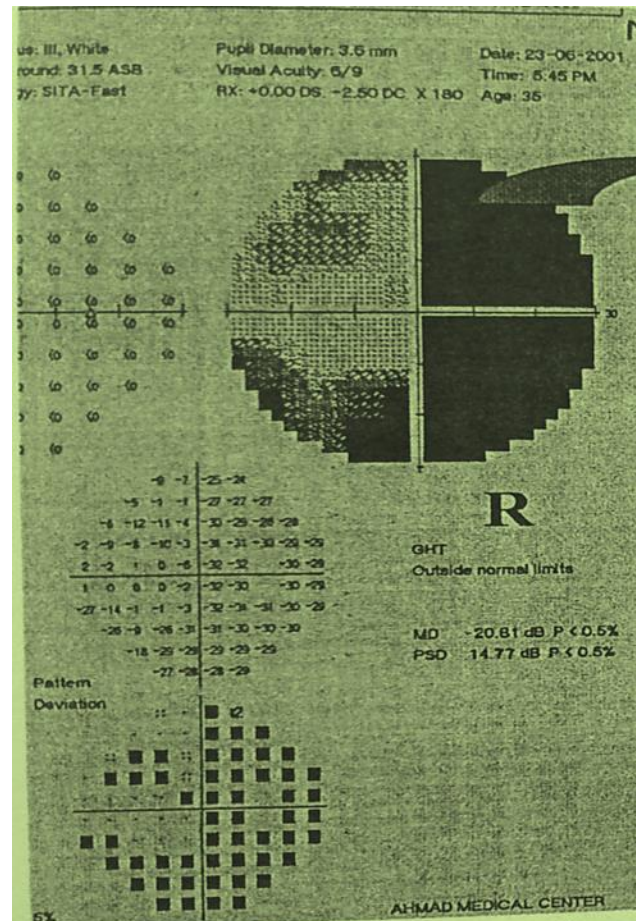
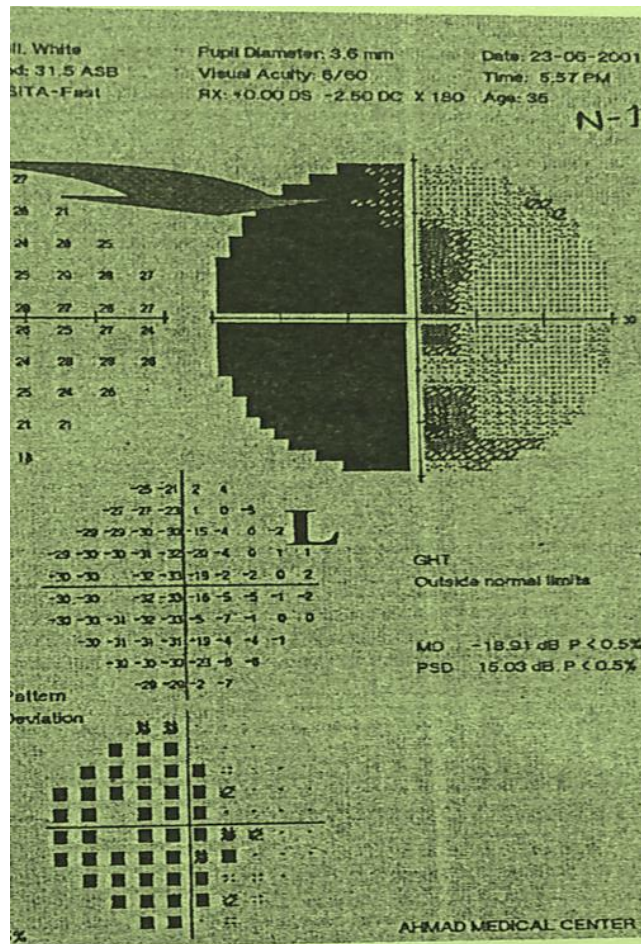
# Ring Scotoma

# Anderson's criteria

On static perimetry, glaucomatous field loss is considered significant if:

1. Analysis of glaucoma hemi-field test is abnormal in 2 consecutive occasions
2. 3 contiguous non-edge points on the pattern deviation plot within Bjerrum area have a probability of  $< 5\%$  of being in normal population, one of which have a probability of  $< 1\%$
3. Pattern standard deviation (PSD) should have a probability of  $< 5\%$  confirmed on two consecutive tests

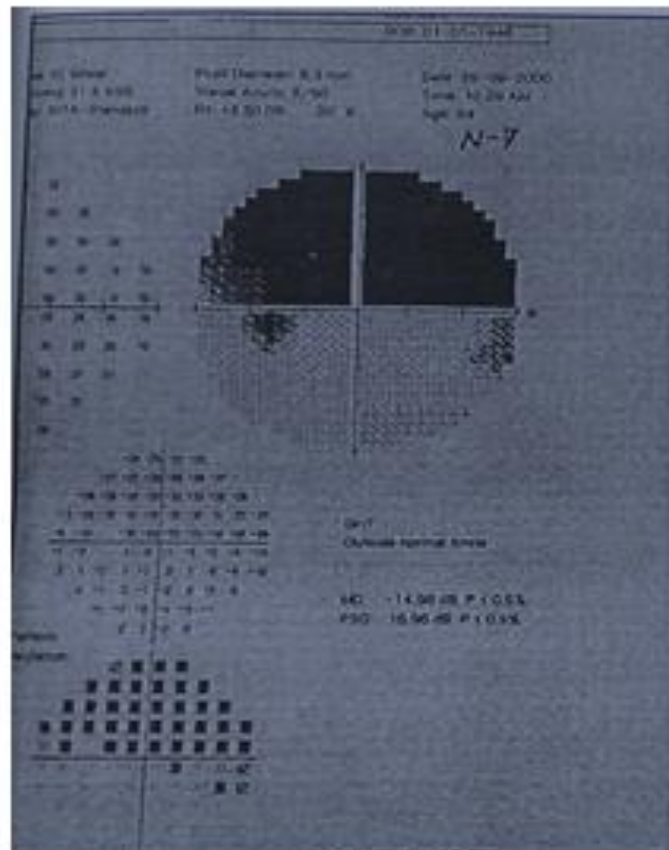
Bitemporal hemianopia : Lesion is situated at the chiasma which damage the crossing nasal fibres of both optic nerves



# Superior altitudinal field defect

## causes

- AION
- Optic neuritis
- Hemiretinal vein occlusion
- Hemiretinal artery occlusion
- Optic nerve coloboma
- glaucoma



THANKYOU