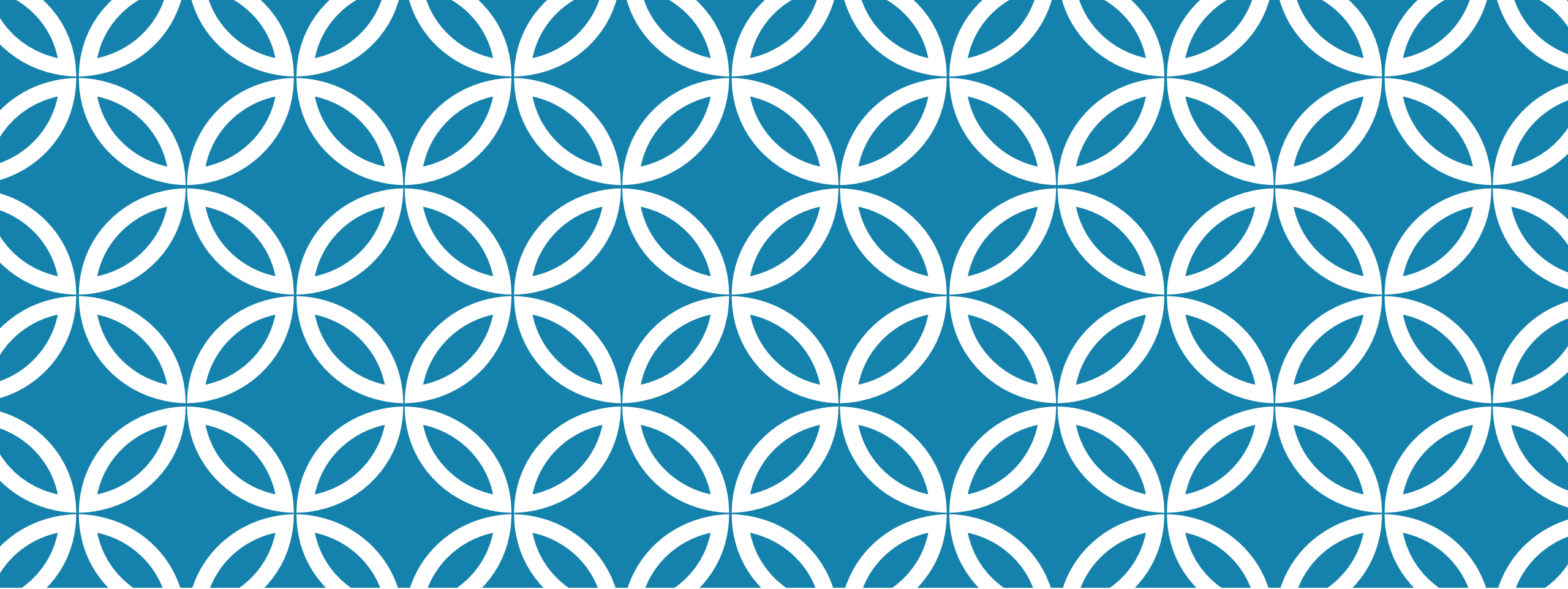




IOP & GONIOSCOPY

Presented by:Dr.Zeina al-junaidi
Supervisor:Dr.MHD KouKou



INTRAOCULAR PRESSURE |

IOP

It is not a part of the diagnosis of the glaucoma it is only a risk factor

But we cannot treat glaucomatous optic neuropathy directly we treat the one risk factor we can impact .. IOP

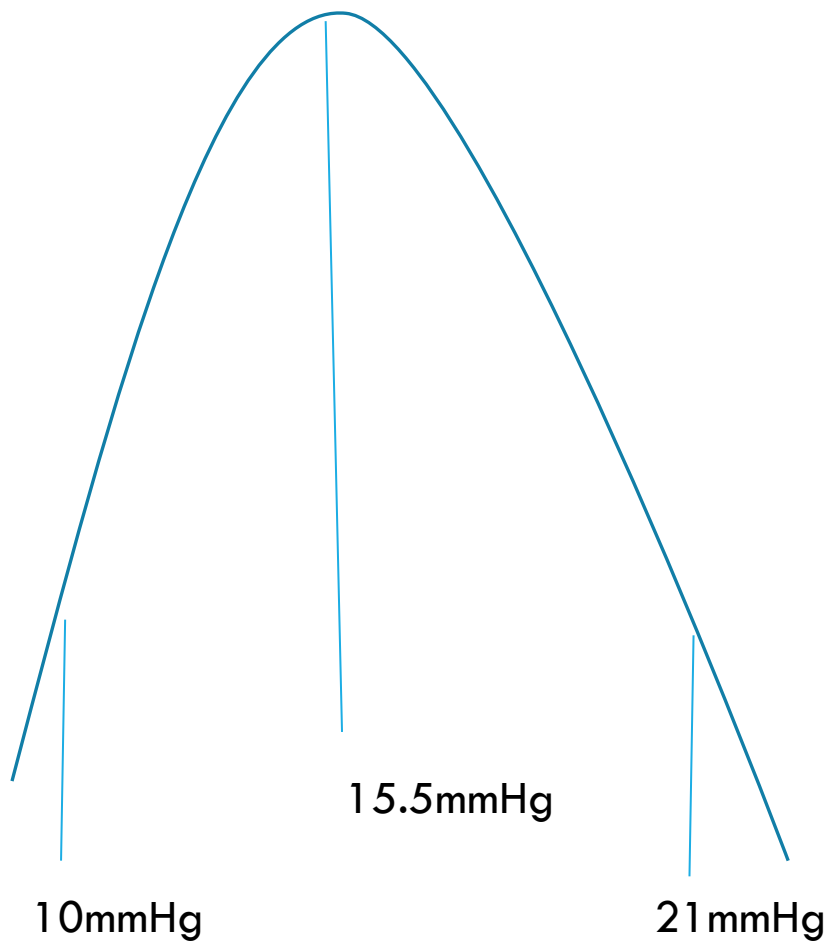
IOP

Mean IOP is 15.5 mmHg

With +/- SD the “normal” range is 10—21 mmHg

There is considerable fluctuation (2—6 mmHg) with more fluctuation in patients with glaucoma

IOP



Few ppl who are under 10mmHg
Most of ppl are above 21mmHg ...10% of adults

IOP ARTIFACTS

Breath holding

Crying

Valsalva

Examiner pushing on globe

Corneal issues(Cylinder, Edma , Scarring)

THINGS THAT CAN RAISE IOP

***Elevated Episcleral venous pressure:**

-tight tie

-Bending over or lying supine

***Rapid fluid intake**

***corticosteroids**

THINGS THAT CAN LOWER IOP

Aerobic exercise

General anesthesia

Pregnancy

Alcohol

Marijuana

IOP MEASUREMENT

Directly : manometric technique.

Palpation: during which the examiner estimates IOP by the response of the eye to digital pressure

Tonometers

weight applied to the cornea

Applanation :force necessary to flatten a small, standard area of the cornea

Goldman
Perkins

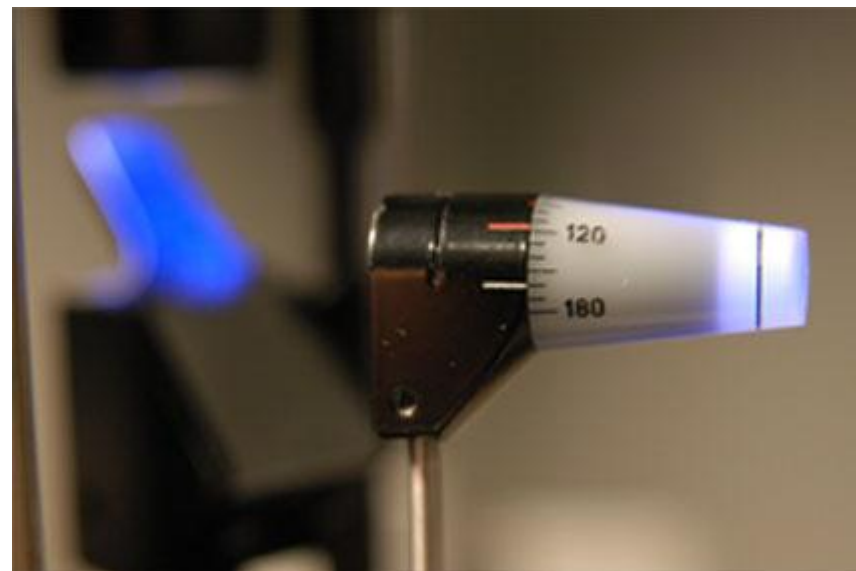
indentation : amount of deformation or indentation of the globe in response to a standard

Strain Gauge(Tonopen)

Rebound(iCare)

APPLANATION INSTRUMENTS

Goldmann tonometer



GOLDMANN APPLANATION TONOMETRY

Goldmann applanation tonometry is the gold standard

Applanation tonometry displaces only about 0.5 nml of aqueous

humor, which raises IOP by about 3%

the Goldmann Applanation tonometer contains a bi-Prism that flattens the cornea over an area 3.06mm in diameter

at this diameter the tear's capillary attraction is balanced by the cornea's resistance to flattening

This all true for an average thickness of 520

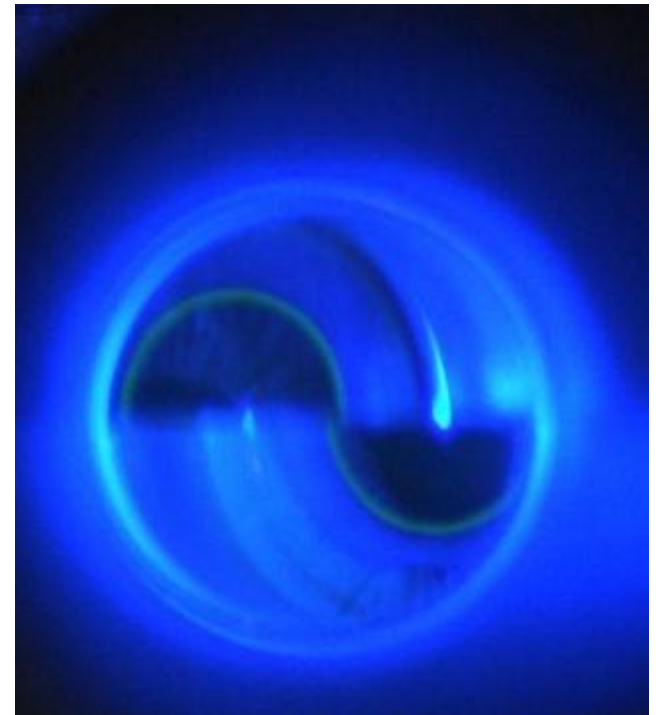
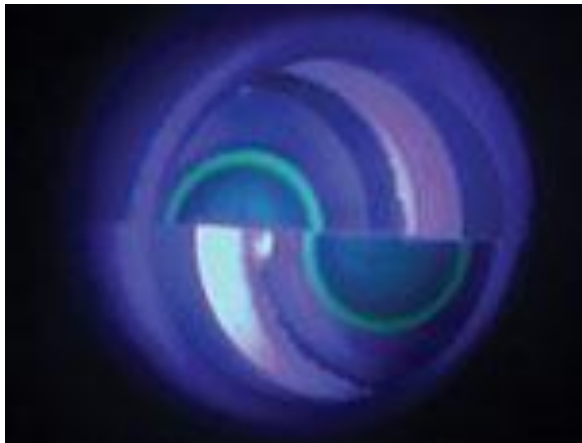
Thick corneas overestimate pressure

Thin corneas underestimate pressures

GOLDMANN APPLANATION TONOMETRY

GOLDMANN APPLANATION TONOMETRY

It is important that the width of the fluorescent band is about 10% of the width of the arch that means not too thin to underestimate and not too thick to overestimate



GOLDMANN APPLANATION TONOMETRY

If the patient has high astigmatism :

Can overcome by

Making two measurements 90 degrees apart and averaging

Or by line up the tonometer tip with $-$ cylinder axis

GOLDMANN APPLANATION TONOMETRY

It requires smooth cornea

Affected by corneal thickness

___thick cornea overestimates IOP

*except edematous corneas which underedtime

___thin cornea underestimates

*refractive surgery

CCT AND IOP

CCT (microns)	Adjustment for Measured IOP mmHg
445	+7
455	+6
465	+6
475	+5
485	+4
495	+4
505	+3
515	+2
525	+1
535	+1
545	0
555	-1
565	-1
575	-2
585	-3
595	-4
605	-4
615	-5
625	-6
635	-6
645	-7

PERKINS TONOMETER

Is a portable version that can be used vertically or horizontally



STRAIN GAUGE (TONOPEN)

Electronic strain gauge flattens the cornea

Takes 4—10 readings and gives a single number

Fast and Works well on scarred or irregular corneas



REBOUND (ICARE)

Probe rapidly directed at cornea and bounces back and it measure the rebound of of the cornea

Greatest advantage is the ability to check pressures in young children without anesthesia



MISCELLANEOUS

Schiotz

Dynamic contour

Pneumatometer

Air puff

Transpalpebral

DYNAMIC CONTOUR

Pasacal

*Concave sensor

--less affected by corneal thickness

*measures ocular pulse amplitude

*expensive

*less influenced by corneal thickness but more by corneal curvature



PRAEVENTION VON INFEKTIONEN
durch sterile 1-Weg-Schutzkappen

SELBST-KALIBRIEREND

DIREKTE SICHT DURCH MESSKOPF

KEIN FLUORESZIN NOTWENDIG

MONTAGE
an alle gängigen SPATLAMPEN-MODELLE

EINFACHE BEDIENUNG
über nur einen Knopf

SMT SWISS MICROTECHNOLOGY AG
mmHg: IOP 14.6
Q=3 OPA 2.8
PASCAL DYNAMIC CONTOUR TONOMETER



GEFEDERTER MESS-ARM gewährleistet konstante Appositionskraft und schont die Hornhaut

Mikroprozessor erfasst **100 WERTE PRO SEKUNDE**

EINDEUTIGE DIGITALE ANZEIGE

Akkustische Rückmeldung durch **MESSMELODIE**

SMT SWISS MICROTECHNOLOGY AG
mmHg: IOP 17.4
Q=1 OPA 1.4
PASCAL DYNAMIC CONTOUR TONOMETER

PNEUMATONOMETER



Flattens the cornea with a probe floating on a column of gas

Like tonopen. It works on scarred corneas

NON-CONTACT TONOMETER

Puff of air to flatten the cornea

Used by providers who couldn't use topical anesthesia

Fairly accurate in the normal range Less accurate at high pressures

Some patients find this uncomfortable



TRANSPALPEBRAL

Diaton

Measures IOP through the upper eyelid

Helpful in eyes with corneal prostheses (like Kpro)



SCHIOTZ TONOMETRY

Inexpensive

Potable

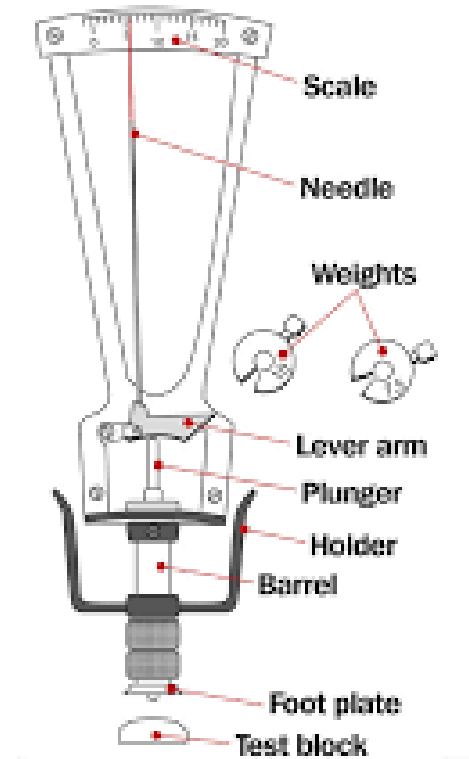
The patient is supine

Weight used to indent the cornea

Depth of indentation measured on a scale

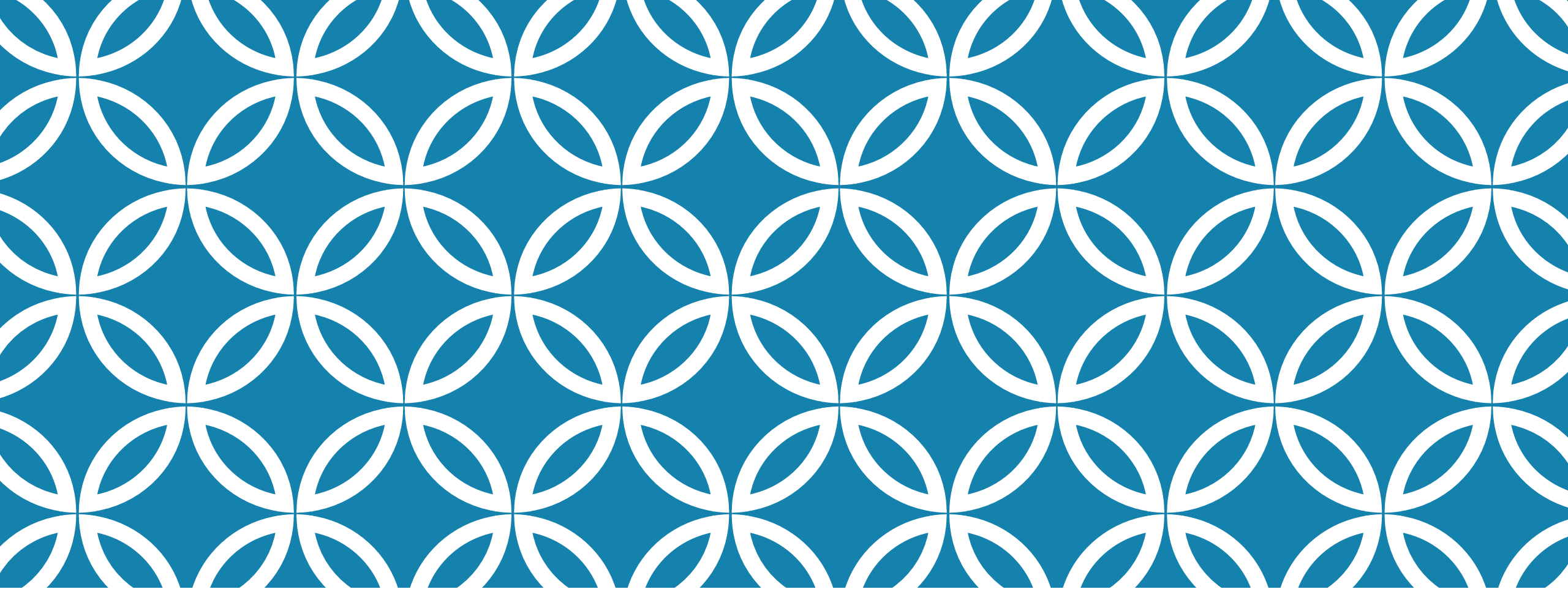
usually 5.5g weight but heavier weight can be added at higher IOPs

IOP calculated by looking up scale reading on table

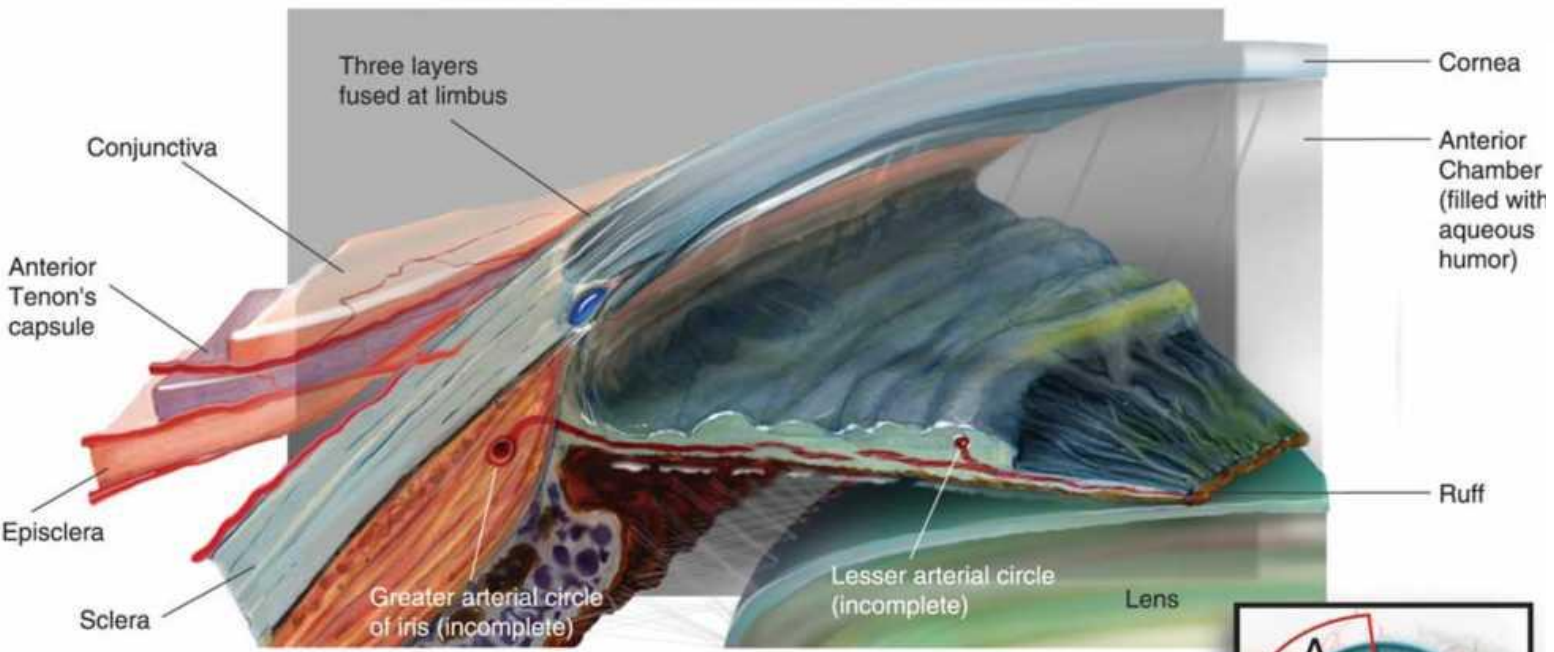


SCHIOTZ TONOMOMETRY

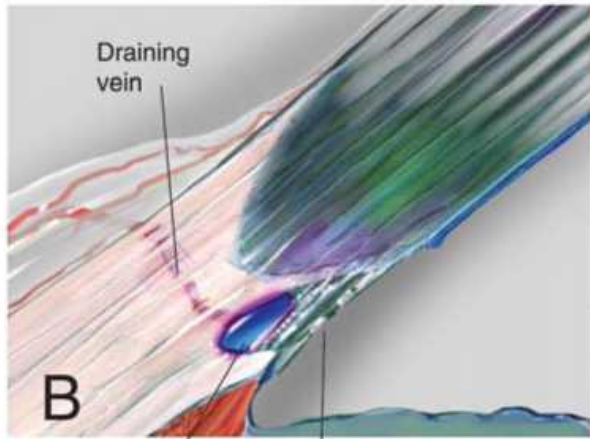




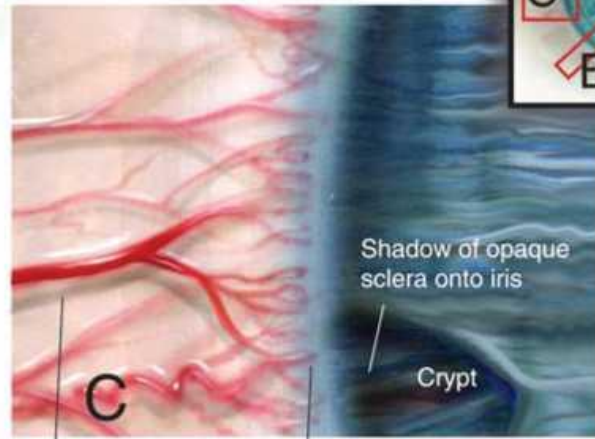
GONIOSCOPY |



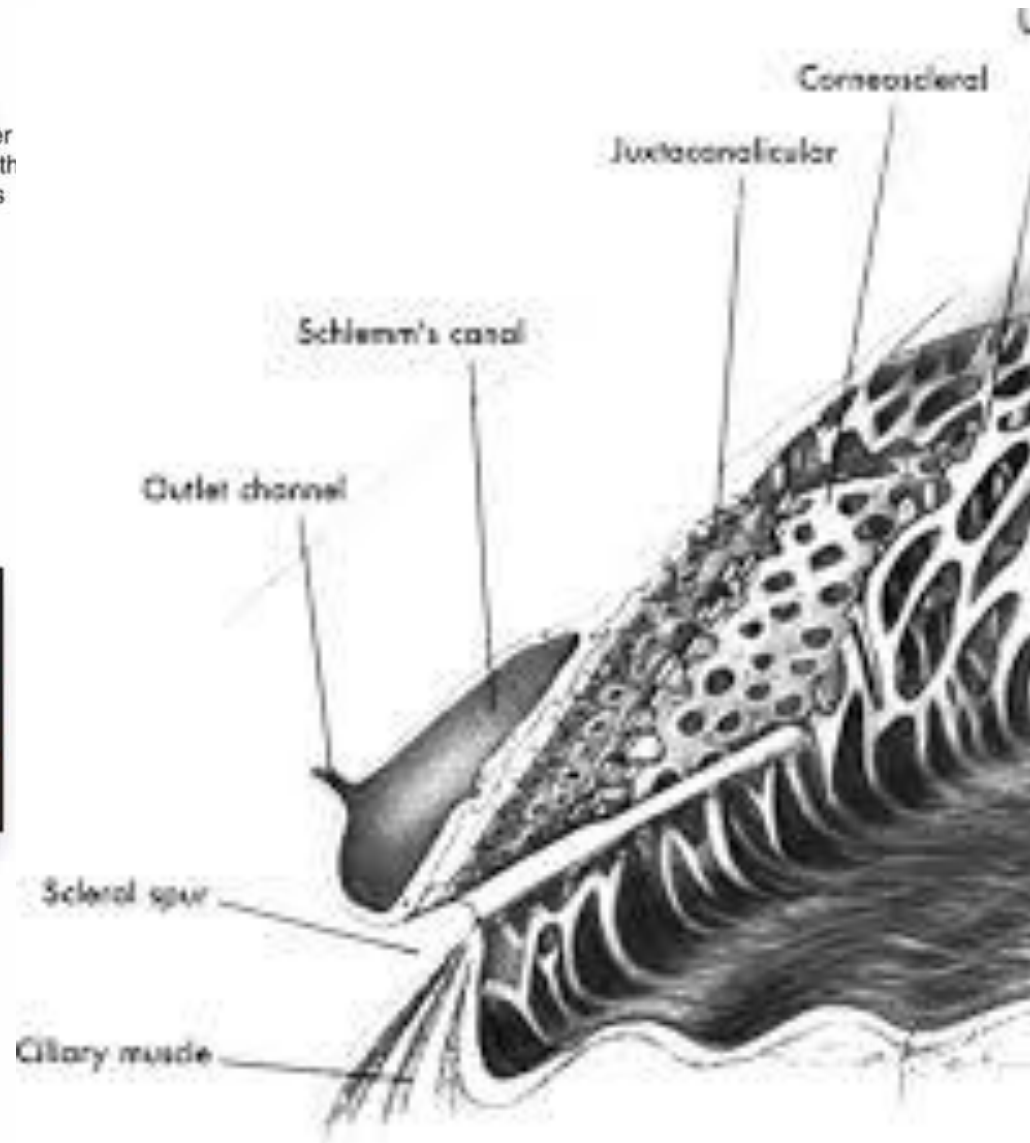
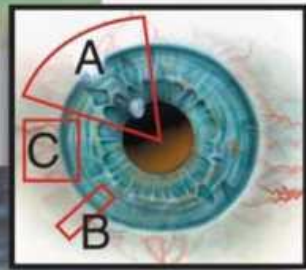
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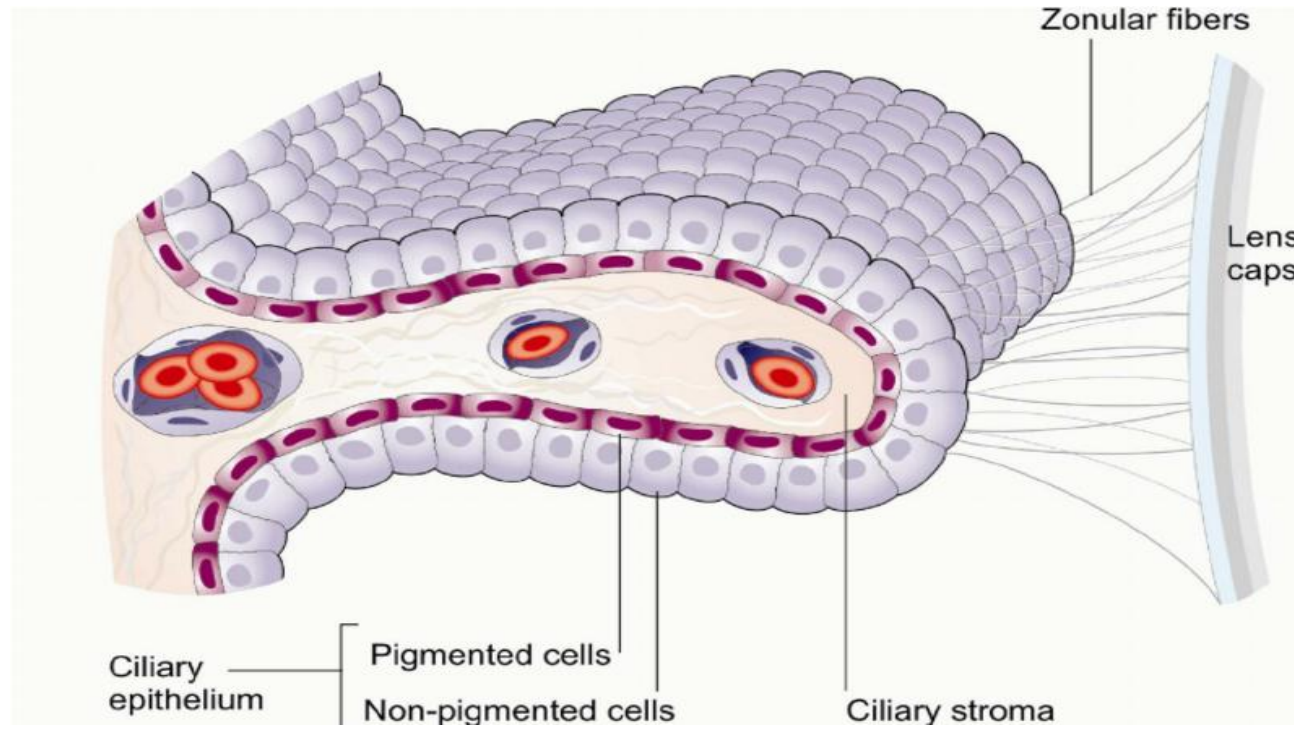
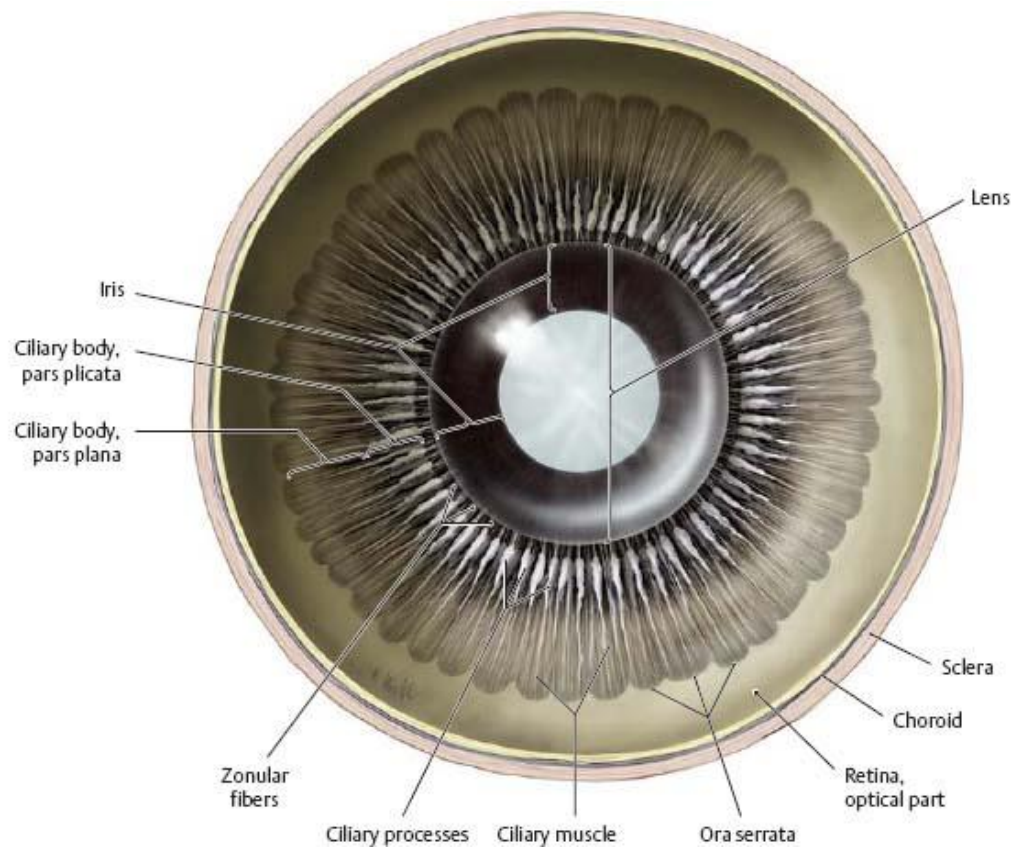


B

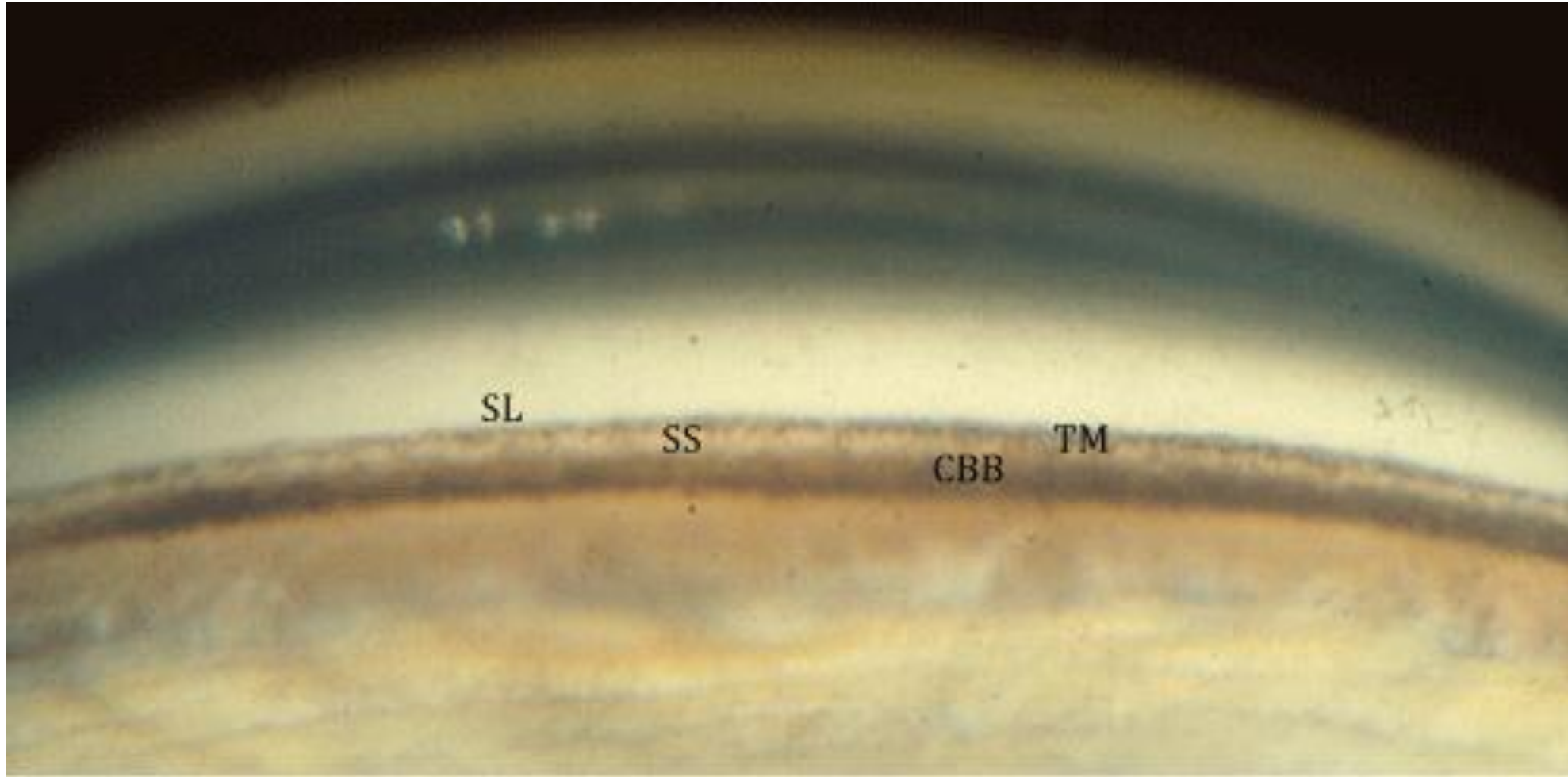


C

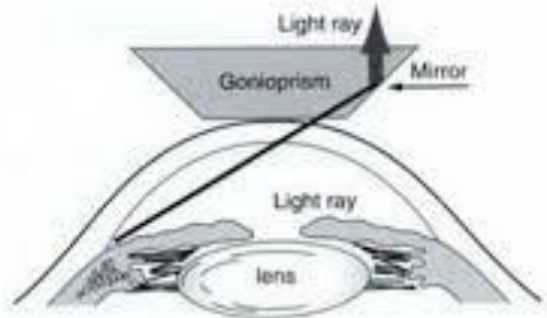
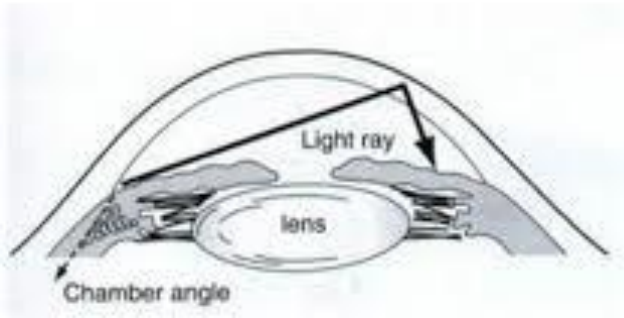
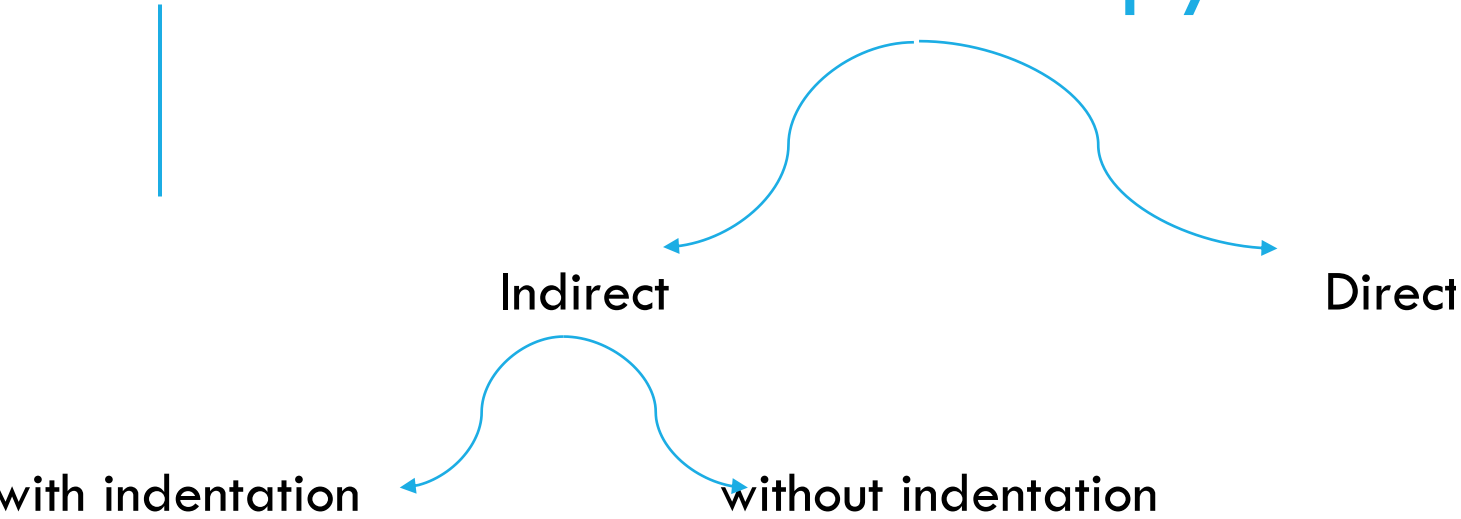




GONIOSCOPY



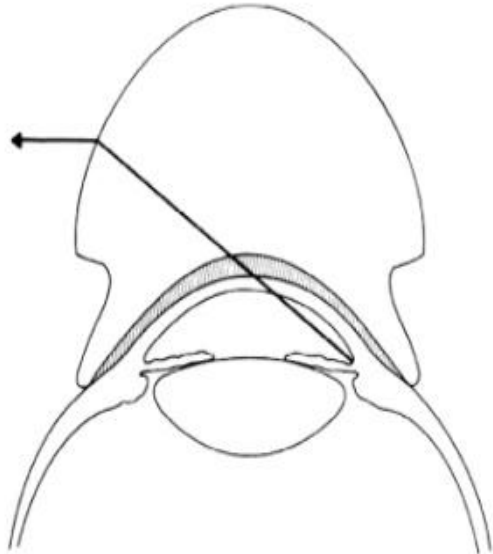
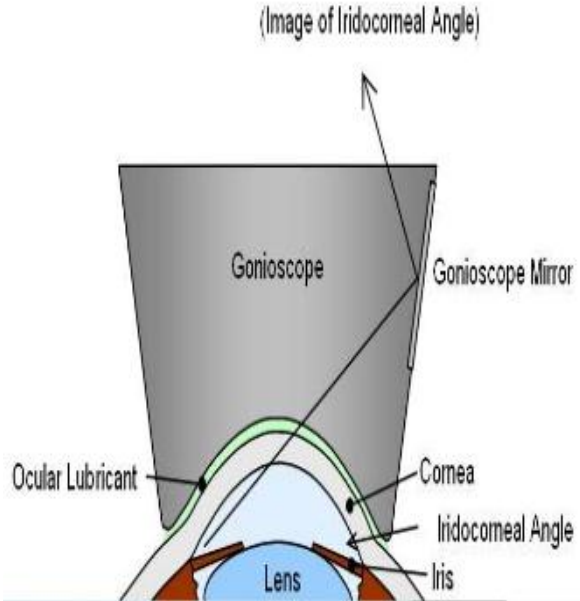
Gonioscopy



PRINCIPLE

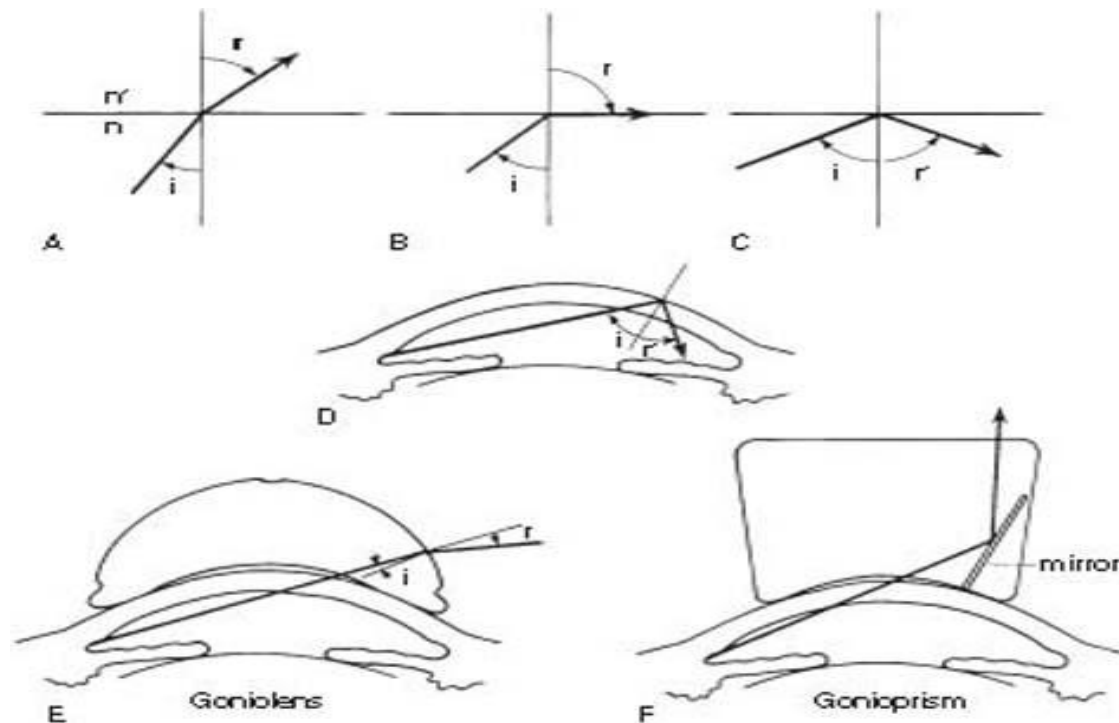
INDIRECT

DIRECT



DIRECT GONIOSCOPY

Angle is viewed directly as direct goniolenses have steeper curvature than the cornea, so the light rays are refracted at the corneal-air interface such that critical angle is not reached



DIRECT GONIOSCOPY

Koeppe

Swan Jacobs

Layden





DIRECT GONIOSCOPY

Advantages:

1. Direct visualization shows normal view.
2. Panoramic view of the entire circumference.
3. Easy to look down over the convex iris.
4. Comparison possible between the two eyes.
5. It can be used for Goniotomy & Goniosynechialysis.
6. Can be done under anesthesia

Disadvantages:

1. Cumbersome.
2. Supine position.
3. Costly Equipment.
4. Time consuming.
5. Angles look more open as patient lies supine.

INDIRECT GONIOSCOPY

Goldmann Three or Single mirror

Zeiss Four mirror

Posner Four mirror

Volk Four mirror

INDIRECT

Advantages:

- Convenient to use.
- Controlled illumination.
- Manipulation and indentation possible.
- Fundus can be seen through the central lens

Disadvantages:

- Cannot compare both the eyes simultaneously.
- Needs co-operation of patient.



INDIRECT GONIOSCOPY



GOLDMANN SINGLE MIRROR



GOLDMANN 3 MIRROR

GOLDMANN STYLE LENS

Easy to use

Beautiful view

Good for photo and laser

Inconvenient

Can't indent well

Clinic flow

INDIRECT GONIOSCOPY

VCARE



4 Mirror Gonio Lens Black



Zeiss-style lenses

Convenient

Easy to see whole angle
great for indentation

Harder to master

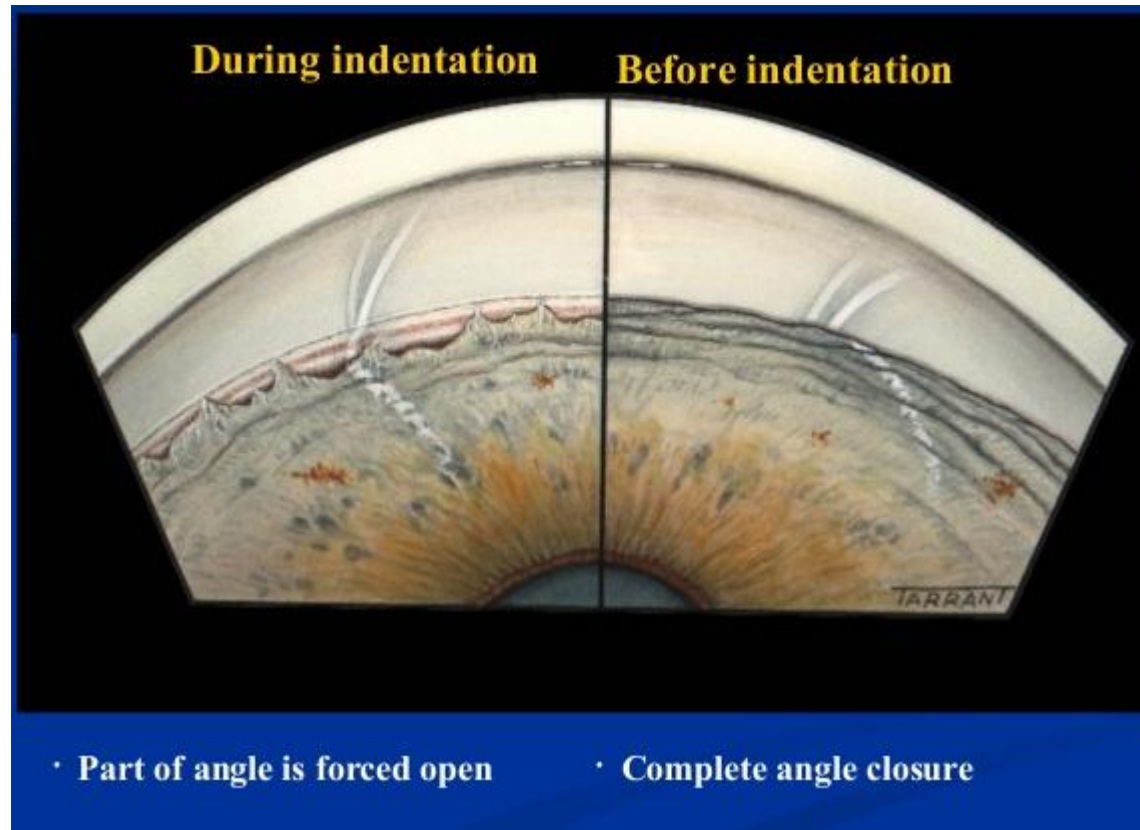
Requires a light touch

INDENTATION GONIOSCOPY

- Indentation gonioscopy is a strategy that helps determine whether angle closure is the result of the iris being in apposition (i.e., just touching the angle) or the result of the iris actually being stuck on the angle, via synechiae.

Indentation gonioscopy is also a great tool for diagnosing plateau iris. It involves using the lens to apply pressure to the central cornea, driving the iris posteriorly—sort of a dynamic version of the gonioscopy exam

INDENTATION GONIOSCOPY



Contact Lens	Type	Advantage	Disadvantage
Koeppel	Direct	Convenient for examination under anesthesia (EUA), no angle distortion, able to view fundus, easiest for angle photography, excellent anatomic view, panoramic view.	Patient must be in supine position, laborious examination patient dislikes, examiner must change position, gonioscope or operating microscope required.
Barkan	Direct	Surgical goniolens with blunted side allows access for goniotomy, variable sizes.	Same as Koeppel.
Goldman 3-Mirror	Indirect	Excellent gonioscopy for neophyte to learn anatomy, viscous bridge creates suction effect stabilizing eye for examination and laser therapy.	Goniogel required for best view which obscures patient's vision and may compromise further same-day diagnostic tests, corneal abrasion in compromised cornea, part of angle hidden in narrow-angled eyes, time consuming when necessary to evaluate both eyes, artificial narrowing of the angle.
Zeiss 4-Mirror	Indirect	Rapid evaluation without goniogel, no corneal compromise with goniogel, further same-day diagnostic tests not compromised, indentation or compression gonioscopy allows expert evaluation of narrow-angled eyes with hidden anatomy, patient friendly, slit lamp friendly with minimal movement to see 360°, option for compression to perform indentation gonioscopy.	Must first master Goldmann gonioscopy, more hand-eye co-ordination necessary than for Goldmann gonioscopy, Unger handle required, easy to apply excessive force causing corneal folds with poor view of angle.

DIRECT V/S INDIRECT

DIRECT

- ▶ Panoramic view of iridocorneal angle with ability to adjust view by examiner.
- ▶ Both eyes can be examined simultaneously.
- ▶ No viscous [coupling] material required.
- ▶ Direct view for surgery e.g. Goniotomy
- ▶ DISADV: Inability to perform indentation, low magnification, assistance.

INDIRECT

- ▶ Segmental View
- ▶ One Eye at a time
- ▶ Viscous required
- ▶ Mirror Image seen
- ▶ Excellent optics with Slit Lamp
- ▶ Indentation Can be Done



GRADING THE ANGLE WIDTH

Table 1. Grade system according to Shaffer gonioscopic classification

Shaffer system

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.

Scheie system

Allocates a Roman numeral accordingly

Higher numeral signifies a narrower angle

GRADING OF ANGLE

Spaeth system

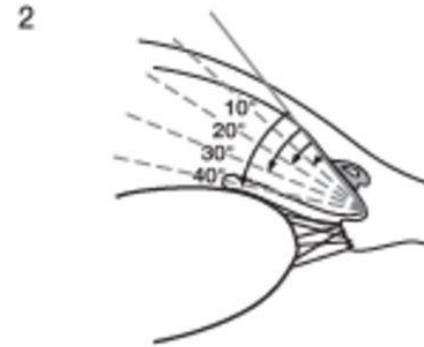
Complicated and underused

Document the insertion level of the iris root before and during compression dynamic gonioscopy



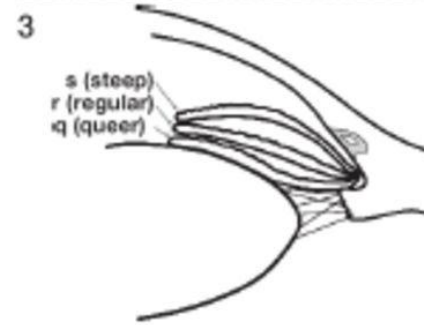
Insertion of iris root

- A Anterior to Schwalbe's line
- B Behind Schwalbe's line
- C On the Scleral Spur
- D Behind the Scleral Spur
- E On the Ciliary Band



Angular width of angle recess

- Slit
- 10° } narrow
- 20° }
- 30° } wide
- 40° }



Configuration of the peripheral iris

- s Steep, anteriorly convex
- r Regular
- q Queer, anteriorly concave



Plateau Configuration

GRADING OF ANGLE W

Van Herrick method

Screening tool

Overestimates the angle width (particularly those with a plateau iris conformation)



Fig. 2.11. Ángulo de grado 4.



Fig. 2.12. Ángulo de grado 3.



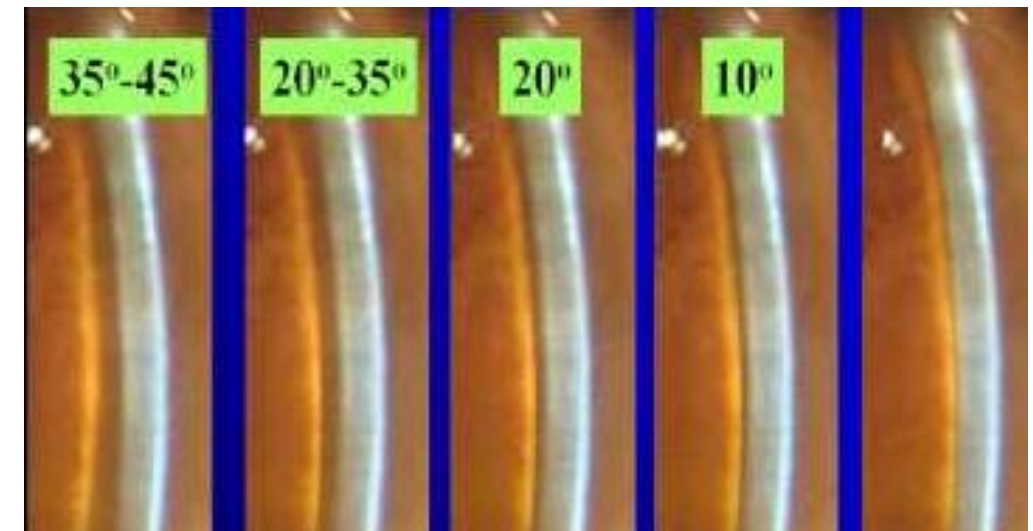
Fig. 2.13. Ángulo de grado 2.



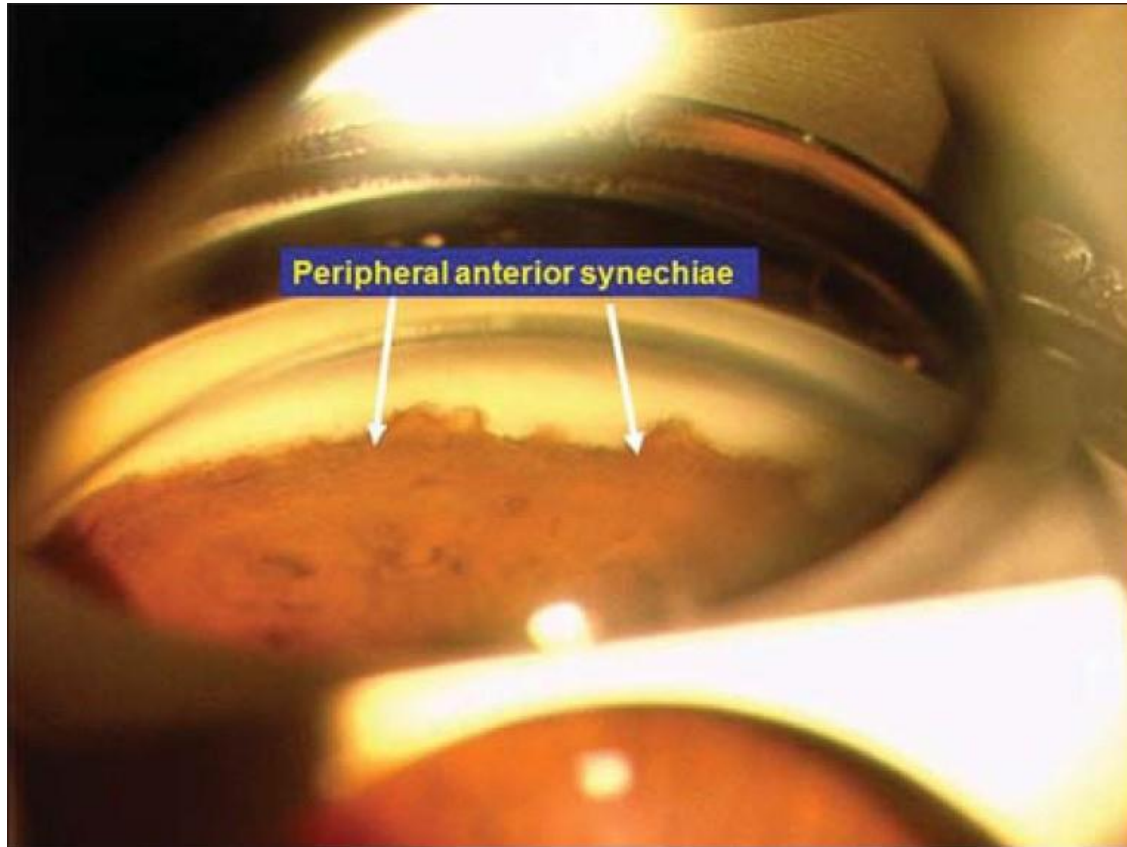
Fig. 2.14. Ángulo de grado 1.

Table 10.1 Van Herick method for anterior chamber angle assessment

Anterior chamber depth as a proportion of corneal thickness	Description	Grade	Comment
≥ 1	Peripheral AC space equal to full corneal thickness or larger	4	Wide open
$\frac{1}{4}$ – $\frac{1}{2}$	Space between one-fourth and one-half corneal thickness	3	Incapable of closure
$\frac{1}{4}$	Space equal to one-fourth corneal thickness	2	Should be gonioscoped
$< \frac{1}{4}$	Space less than one-fourth corneal thickness	1	Gonioscopy will usually demonstrate a dangerously narrowed angle

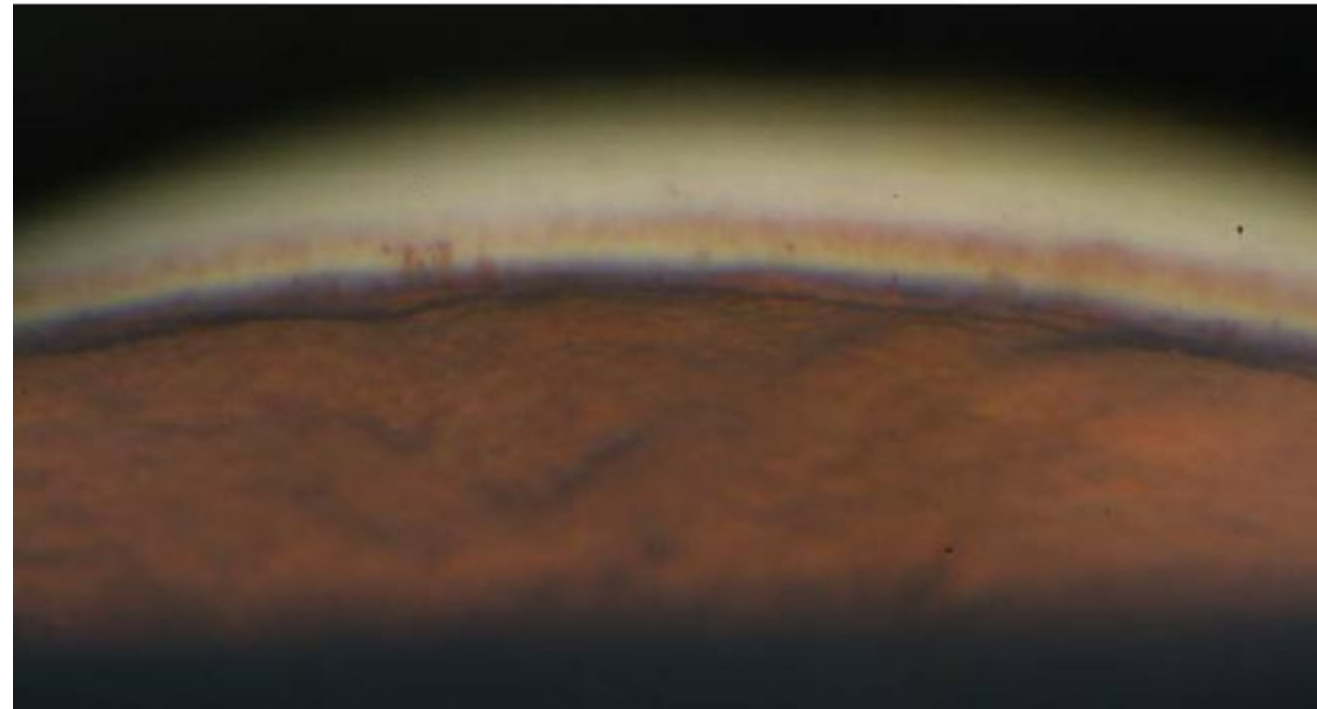
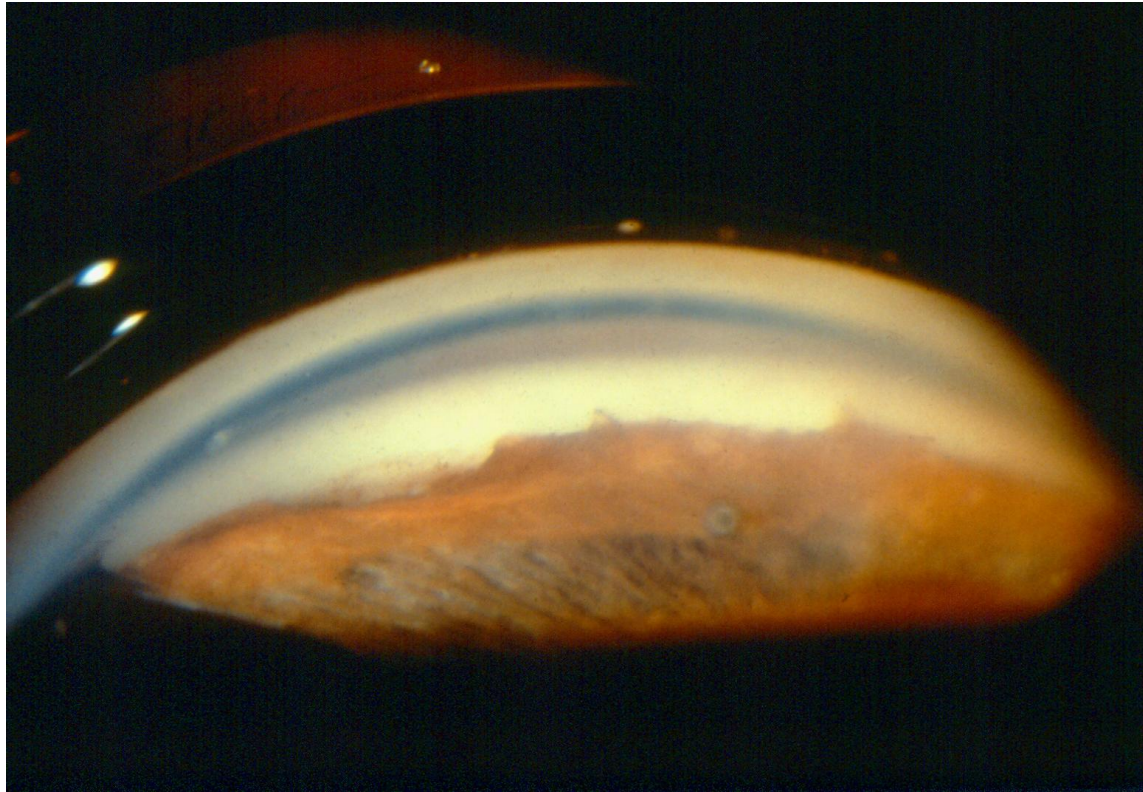


PATHOLOGICAL FINDINGS

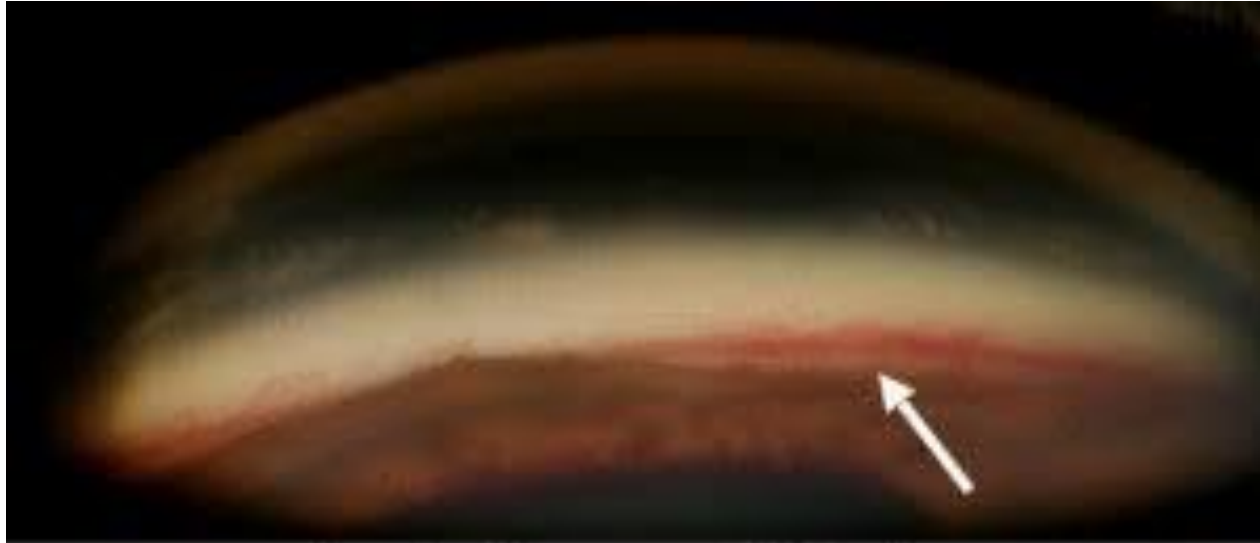


- 1) Primary angle closure glaucoma
- 2) Anterior uveitis
- 3) Iridocorneal endothelial syndrome

PAS VS PROCESSES

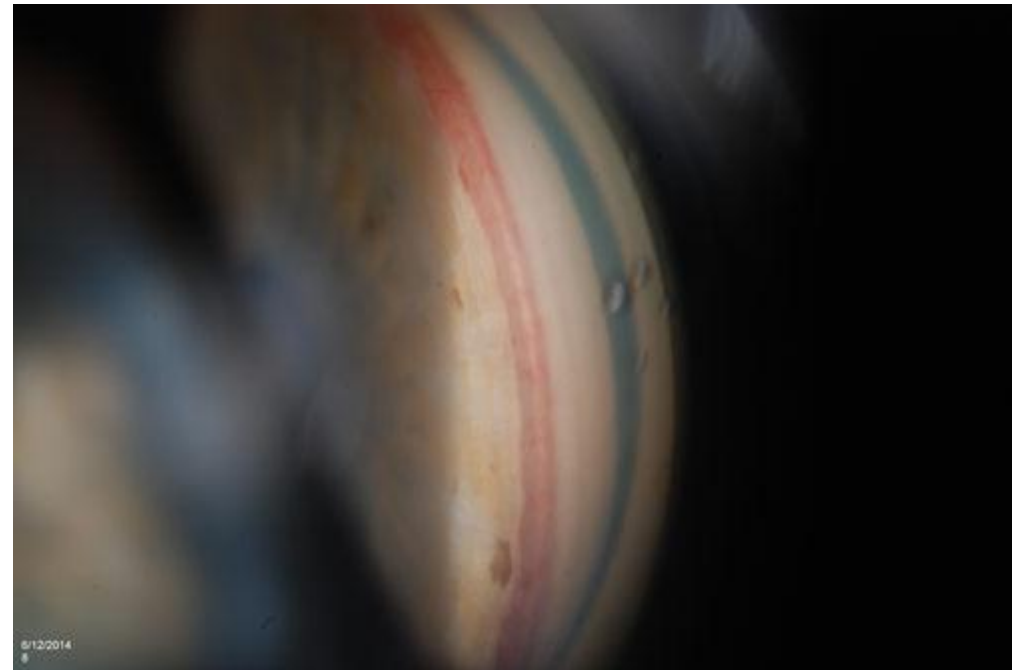


PATHOLOGICAL FINDINGS

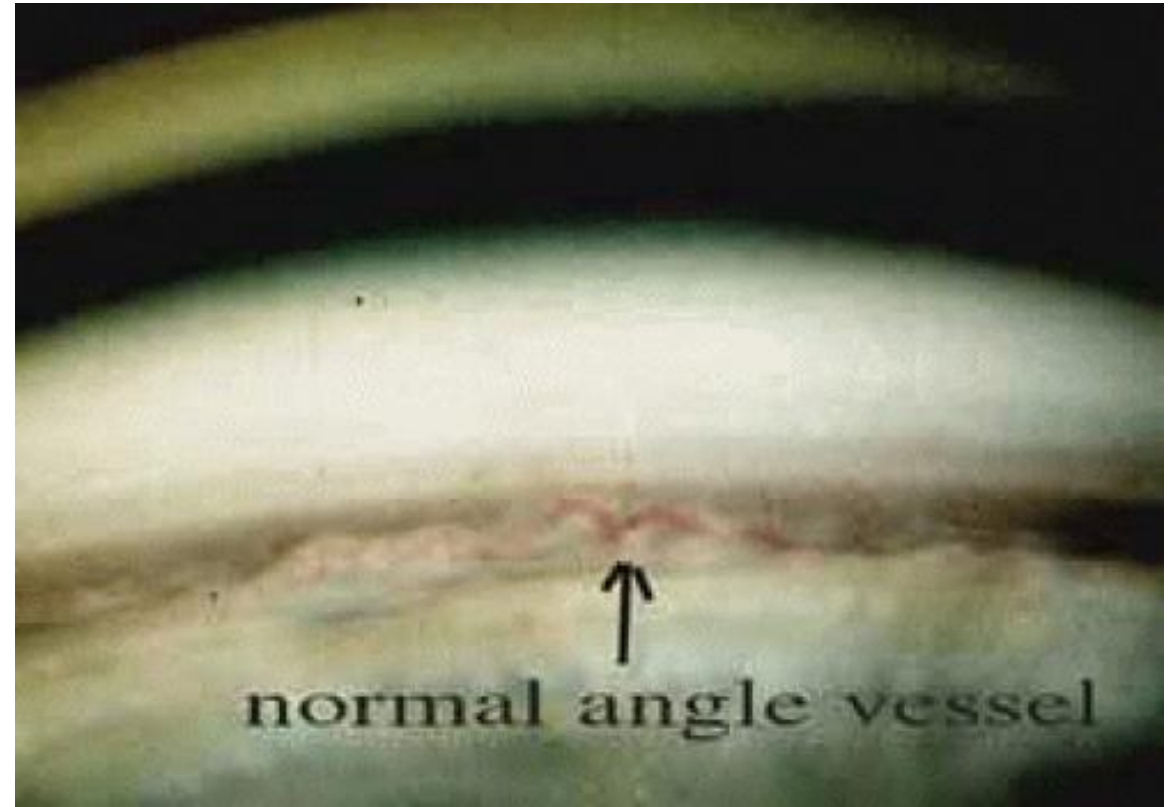
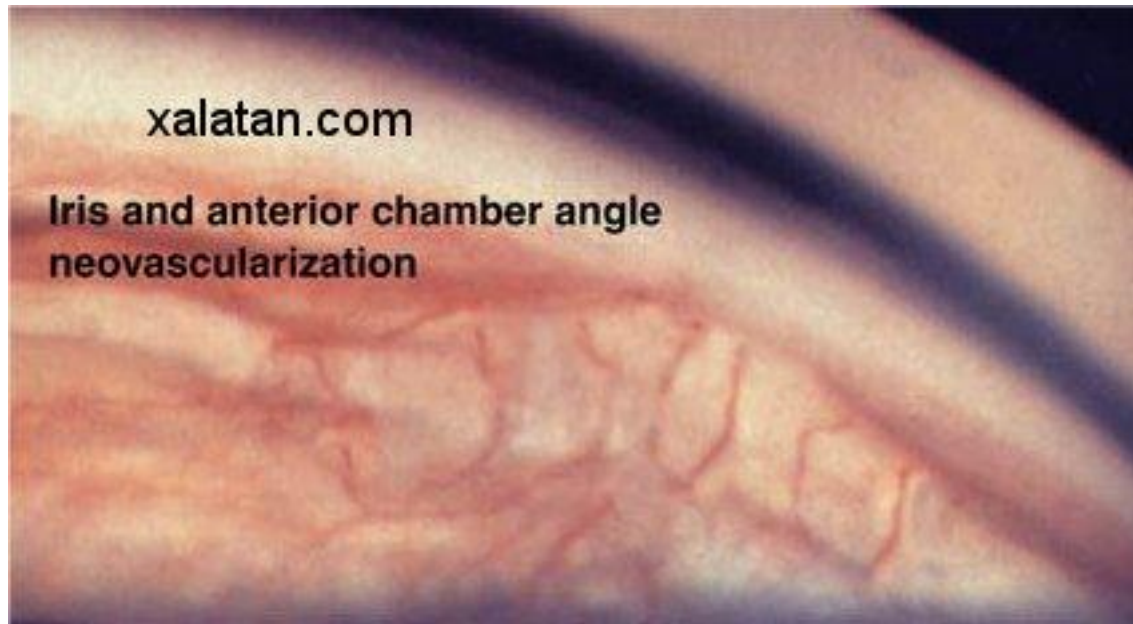


Angle Neovascularization

- 1) Neovascular glaucoma
- 2) Fuchs heterochromic cyclitis
- 3) chronic anterior uveitis



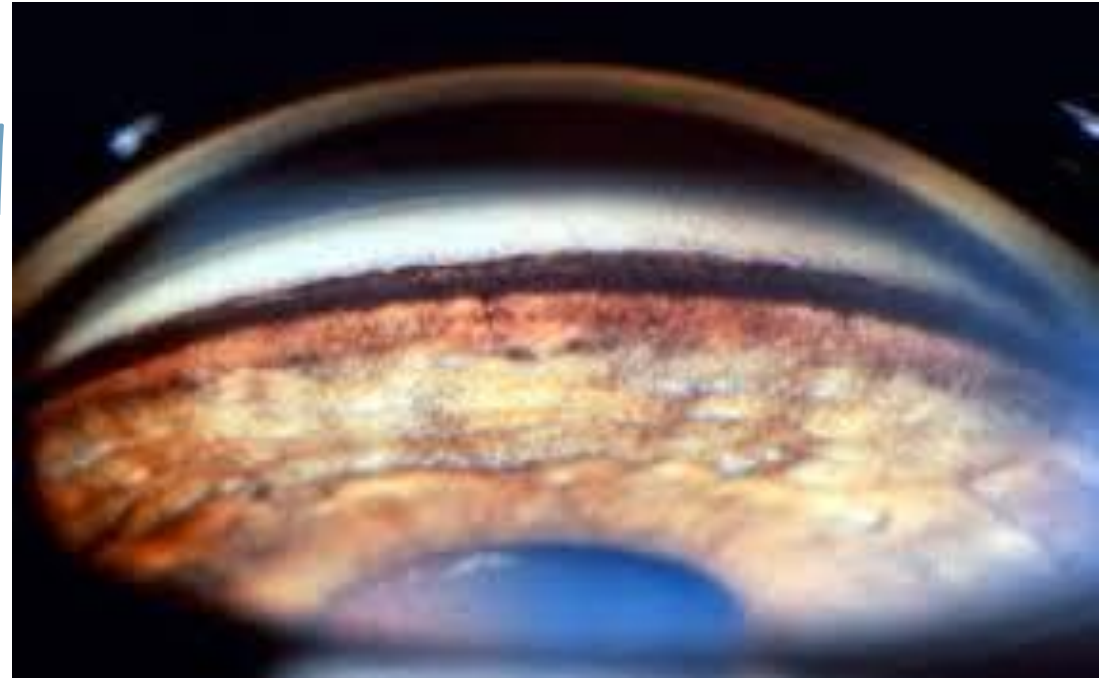
NEOVASCULARIZATION VS NORMAL VESSELS



PATHOLOGICAL FIN

Hyperpigmentation

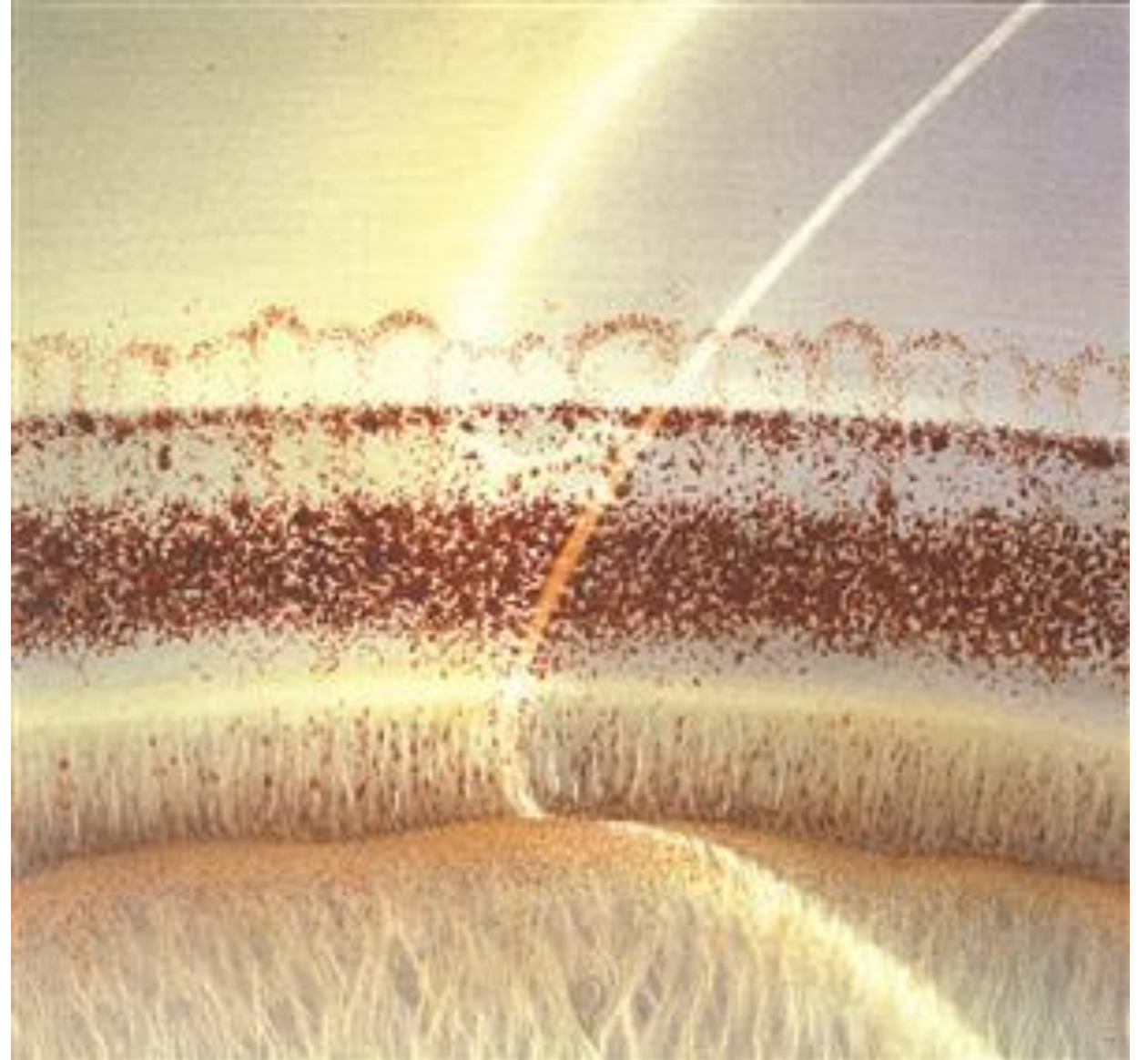
- Physiological
- Pigment dispersion syndrome
- Pseudophakic pigment dispersion
- Pseudoexfoliating syndrome
- Blunt ocular trauma
- Anterior uveitis
- Following AACG
- Following YAG laser iridotomy
- Iris or angle melanoma or naevus
- Naevus of Ota
- Iris pigment epithelial cyst



HYPERPIGMENTATION



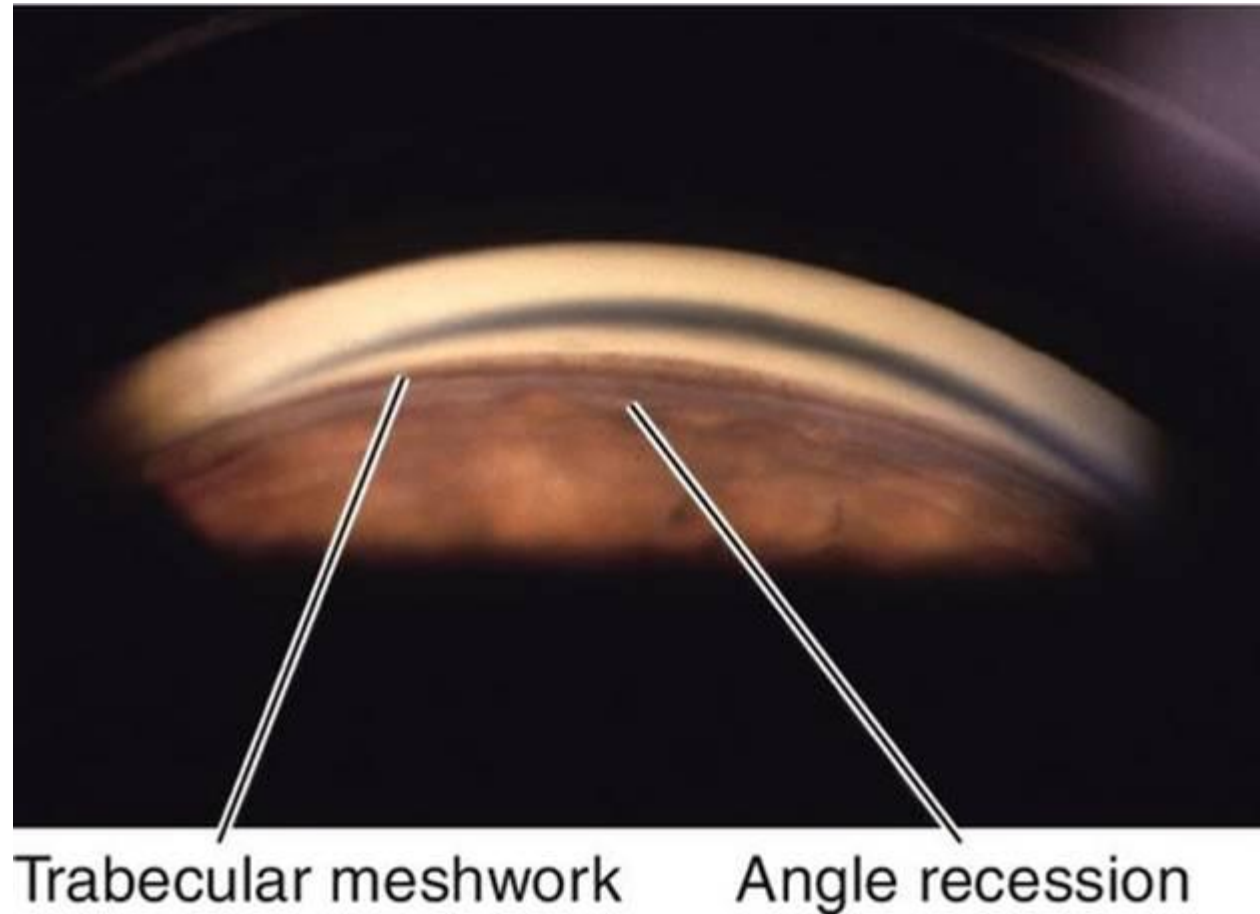
HYPERPIGMENTATION



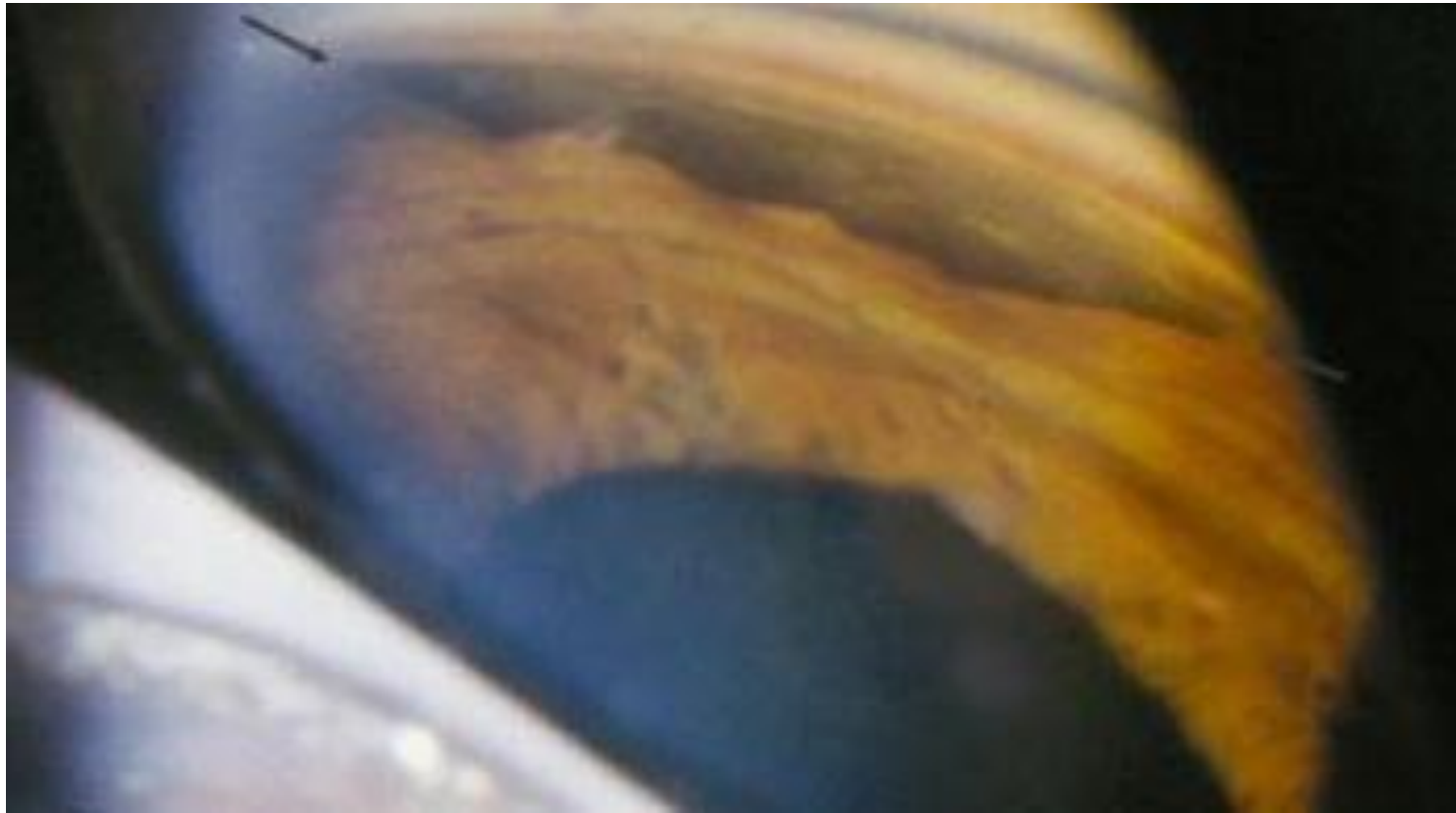
PATHOLOGICAL FINDINGS

Trauma

- Angle recession
- Trabecular dialysis
- Cyclodialysis
- Foreign body



ANGLE RECESS



PATHOLOGICAL FINDINGS

Blood in the Schlemm canal

- Physiological
- Struge-weber syndrome
- Carotid-cavernous fistula and Dural shunt
- Obstruction of the superior vena cava



thank
YOU

