

Finer Nuances of IPCL work up , Patient selection & Surgery steps

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- **Co-Founder Medical Director**
- **No financial disclosures**

Learnings from near 3000 cases Of Phakic IOLs

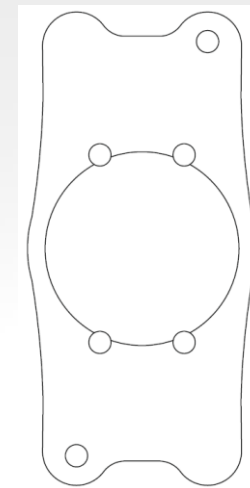


Various OPTIONS in Phakic lenses

Our large experience is with **EYEPCL** and ICL



10th Evolving Practice Of Ophthalmology Middle East Conference
EPOMECC
 EXPANDING VISION



MY experience



- Leading holes for orientation
- Haptic pads
- Holes in optic haptic vault
- Holes in the optic-superior/centraflow

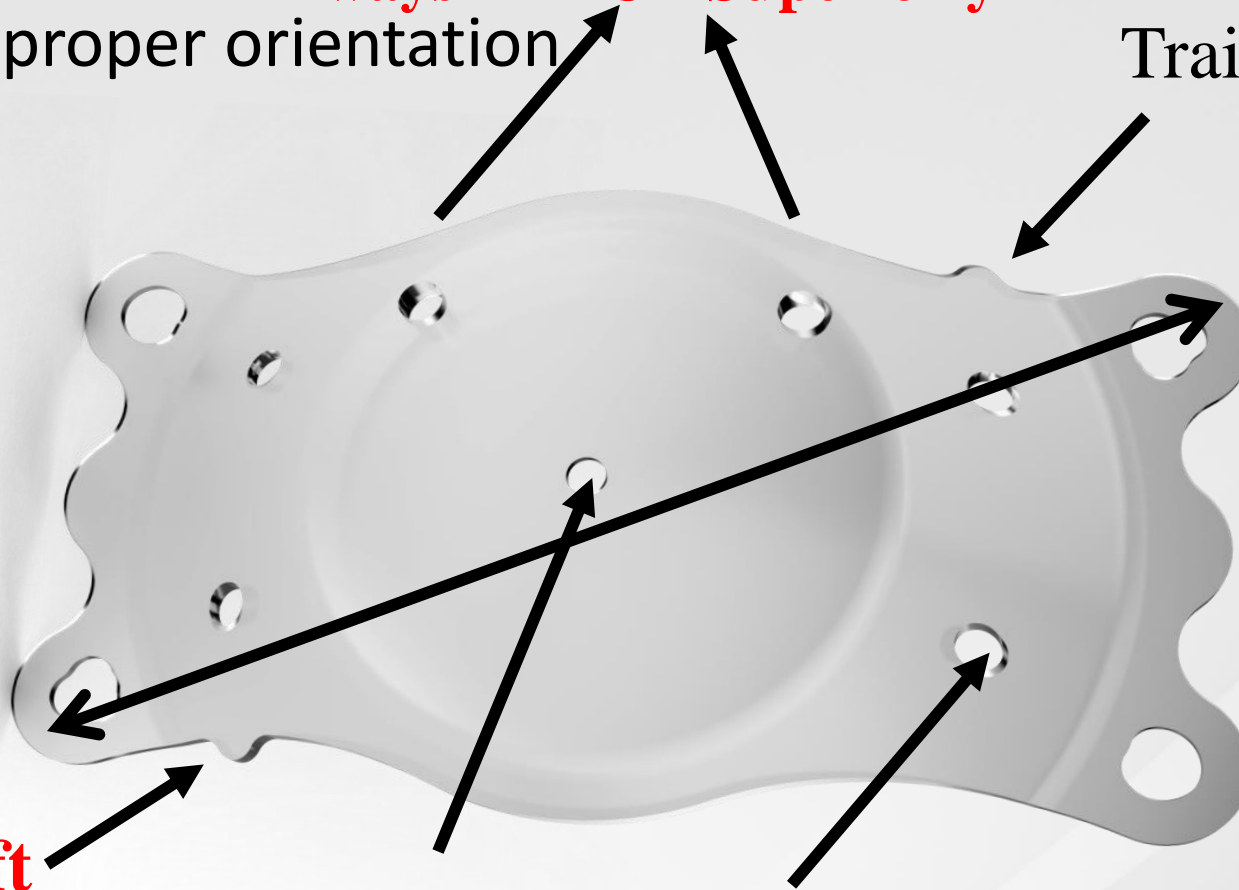


IPCL implant ALWAYS HORIZONTAL V2 without tapered central hole

Always PLACE Superiorly

- TO ensure proper orientation

Trailing right



**Always
Leading left
landmark**

Central
Tapered
hole

Extra 4 hole in haptics

Our experience with IPCL since 2013 = 3045 cases

- 1193 cases (V1) of IPCL done
- 1852 cases of (V2) done till now **3045 cases till now**
- Follow up period near **over 9 years**
- **17 cases** of secondary **Piggy back** for Post pseudophakic residual error
- **8 case of Presbyopic** (4 secondary Piggyback & 4 Primary presbyopia)
- Model v1 done with yag laser PI (V1) done at least 7 days prior
- Power corrected from **+6 diopters to -34 diopters**

10th Annual Meeting
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 Middle East Conference

DESIGN ADVANTAGE CENTRAL HOLE

Less scattering and loss of light due to Central Hole

EPOMECC

EXPANDING VISION

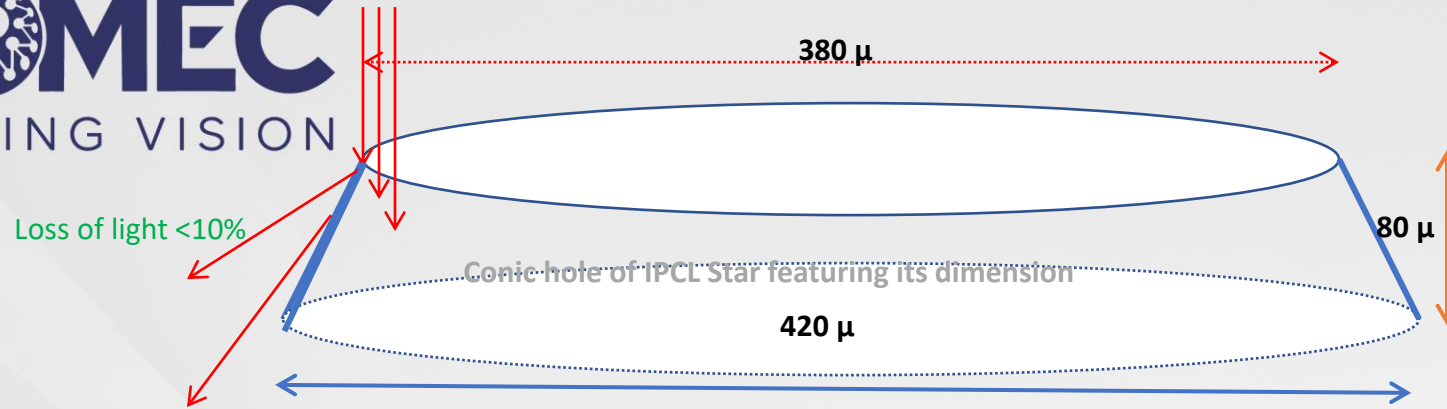


Fig 3: Conic hole of IPCL Star featuring scattering of light in photopic condition (parallel wavefront)

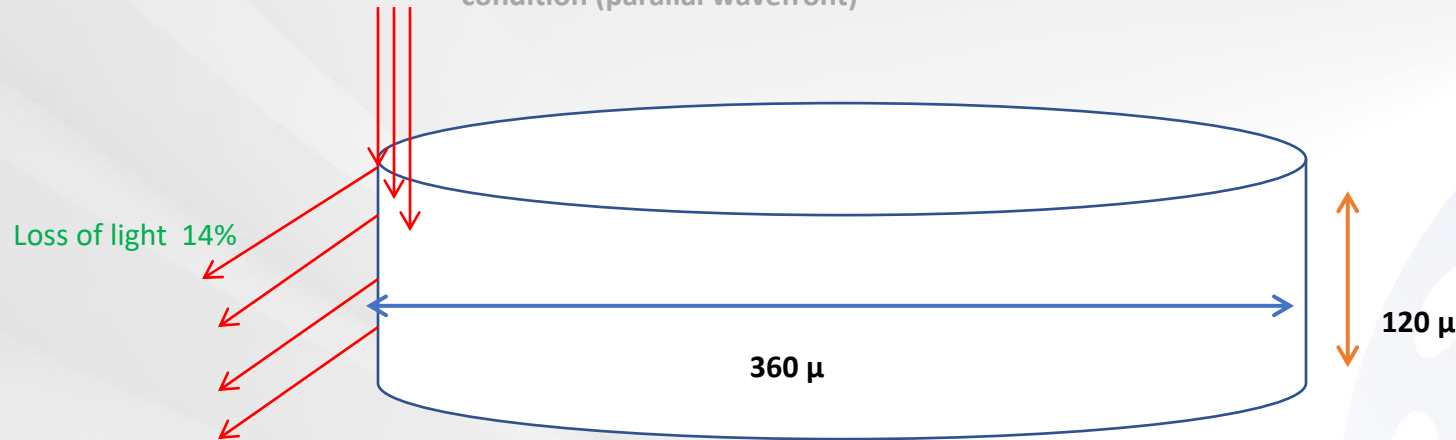


Fig 4: Normal hole of Visian ICL featuring scattering of light in photopic condition (parallel wavefront)



General about IPCL

- 11.5 mm to **14.00** mm size in steps of 0.25 mm (IPCL)
- Optic size can be Personalized **upto 8 mm plus**
- Smart customized toric
- +8 to -34 available in increments of 0.5mm (IPCL)
- Cylindrical power available upto 14 diopters
- Sloping central hole lesser Positive dysphotopsia
- **TORIC IPCL NEEDS NO ROTATION - Smart TORIC LENS**

Size available

ICL

Model No	Overall Diameter (mm)
ICM121V4	12.10 mm
ICM126V4	12.60 mm
ICM132V4	13.20 mm
ICM137V4	13.70 mm

IPCL

Model No	Overall Diameter (mm)
EPCL11	11.00 mm
EPCL112	11.25 mm
EPCL115	11.50 mm
EPCL117	11.75 mm
EPCL12	12.00 mm
EPCL122	12.25 mm
EPCL125	12.50 mm
EPCL127	12.75 mm
EPCL13	13.00 mm
EPCL132	13.25 mm
EPCL135	13.50 mm
EPCL137	13.75 mm
EPCL14	14.00 mm



The road to getting it right

- Approach to the patient-- Selection /exclusion criteria
may variable for intermediate
/Advanced
Case selection-finer nuances
 - Work up and investigations
- Special considerations in some cases
- Surgical steps –Loading and insertion (special situations)
- Immediate post operative findings
- Follow up period -Observations
- Complications and management
- Interesting cases - Videos

Patient selection and exclusion



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MIDDLE EAST CONFERENCE**



Exclusion criteria for Phakic IOLs



- Myopia other than axial myopia (sclerotic cataract)
- Evidence of nuclear sclerosis or developing cataract
- Corneal dystrophy/ Endothelial cell count
<2000cells/cu mm
- Anterior chamber depth less than 2.8 mm (beginner 3.0 mm)
- History of uveitis , even if healed , posterior synechiae

SPECULAR COUNT



Remember!

Exclusion criteria for Phakic IOLs -2

- Avoid High Lens rise – ie- more than 500 microns
- Glaucoma (especially shallow angle)
- Mid dilating /smaller pupil (beginner)
- Very large resting pupil size(beginner) more than 7.2 mm
- Angle pathology $<35^*$ / Iris cysts. Pigmentary , PAS,(UBM)
- History of retinal detachment/ Shallow RD
- Keratoconus with very steep cornea (shallow angle)
(beginner)

ICL vs IPCL power range

Power available

ICL

Myopic ICL (ICM):

- Sphere: -0.5 to -20

Hyperopic ICL (ICH):

- Sphere: +1.0 to +10.0 D

Toric ICL (TICM):

- Sphere: -0.5 to -18.0 D
- Cylinder: +1.0 to +6.0 D

IPCL

Myopic IPCL:

- Sphere: -0.5 to -30.0 D

Hyperopic IPCL:

- Sphere: +1.0 to +15.0 D

Toric IPCL:

- Sphere: -0.5 to -30.0 D
- Cylinder: +1.0 to +8.0 D

Pre-op assessment for IPCL -1

Sizing up



- Refraction – Objective & subjective Dilated acceptance and PMT at 12mm vertex distance
- White to white measurement also vertical white to white if Astig more than 2 diopters
- Pupil size measure pre op mesopic size especially if larger
- Maximum possible dilatation pre op (careful if dilate less)
- Especially For Large Cornea over 12 mm (Begin..) – confirm max dilatation

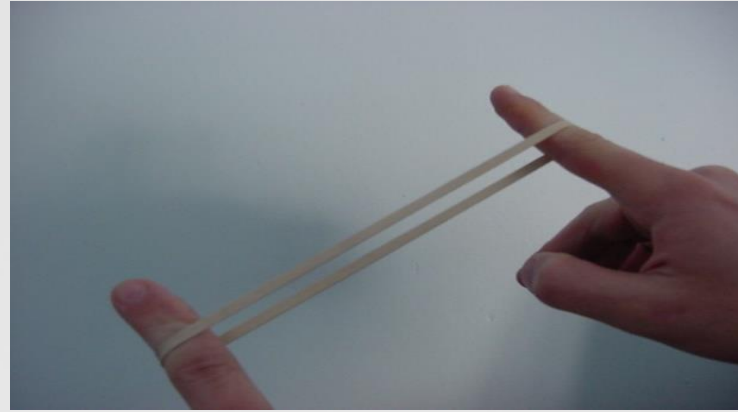
Pre-op assessment for IPCL -2

Sizing up-2



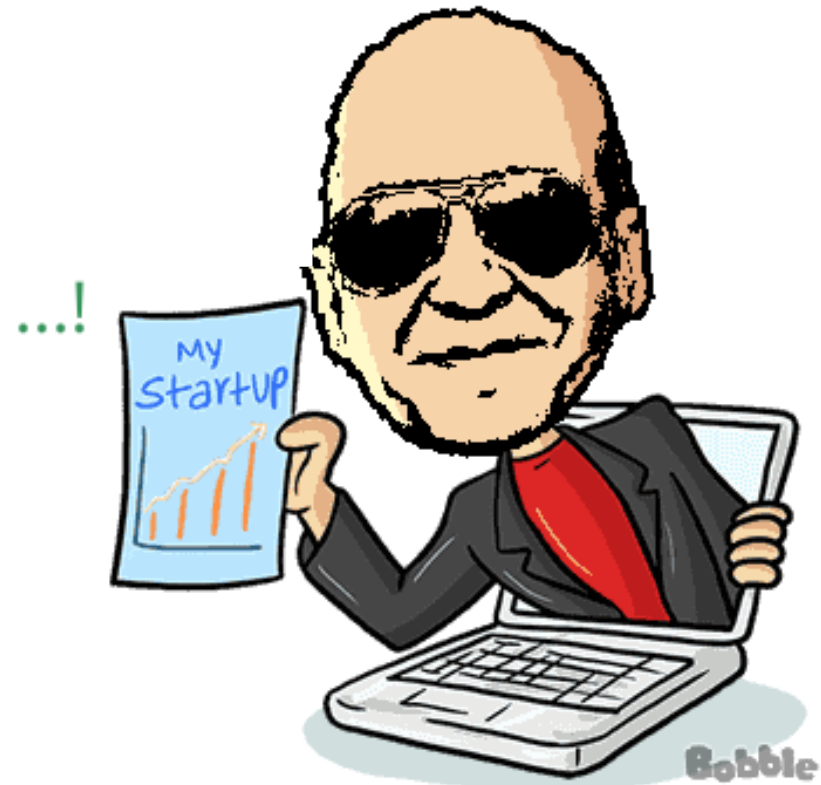
- Anterior chamber depth (ACD) – from corneal endothelium
- KERATOCONUS-BE CARE FULL Angle measure and ACD calibrate
- Posterior segment examinations- High risk group
- **Lens Rise**, K-reading(important) & Topography–
- BIOMETRY and axial length
- Intra-ocular pressure , Disc evaluation
- **Gonioscopy and angle measure - Even if ACD GOOD**
- **Specular microscopy (if possible)**

Practical Learnings and break points....



- **Refraction and acceptance** accuracy, always Dilate and Cycloplegic (occasional accommodators)
- **Retinal screening** high risk population VERY VERY IMPORTANT
- Focus on White To white , have one staff trained once your nomogram is set , New parameter Of **HAD/ ATA=0.3-04 mm**
- **Extremes** -- Give as much data as possible if odd size or power, Angle, Lens Rise, K values
- If in doubt **THROW THE DATA TO THE MANUFACTURER**
- **Large sized resting pupils** need larger optic size
- **Partial dilating** pupil needs a lot of learning curve ---beginners careful
- **Avoid Pilocarpine** / carbachol – IOP spike(retained Visco) , shallow vault initially
- **Vault changes** over time especially in first few days.. Reduces by 100 to 150u if visco retain
- **Minimal opacities** behind Implant – wait could be viscoelastic
- Watch out for **IOP peak in first few hours** -Retained visco. Or over iflation of AC
- Watch for Steroid responders ...

Let us see the Preop work up

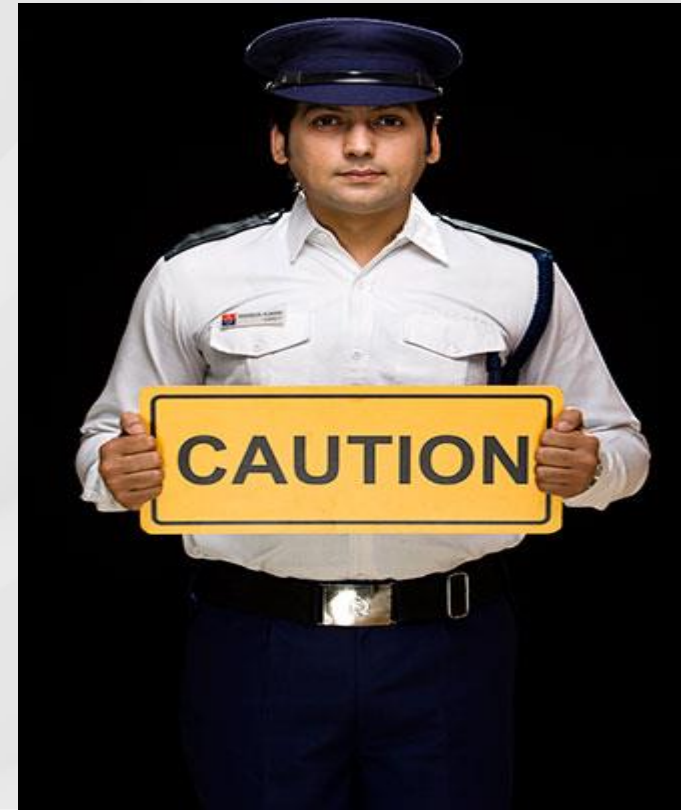


Getting it Right -Accuracy of documentation

- Most important

All patients Cycloplegic refraction ideal and followed by PMT

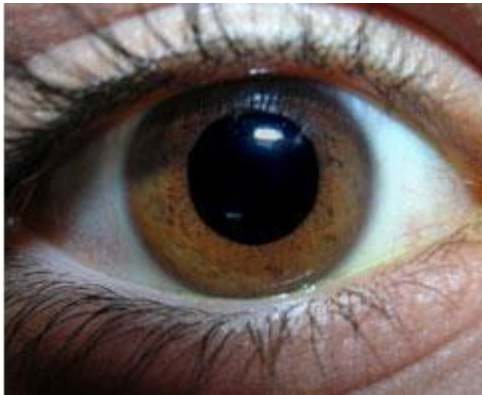
- Mention squint (intermittent)
- Amblyopia if any mention and document
- Contact lens trial (full correction) if possible
- Lenticular changes if any always screen



ROLE of Pupil SIZING Watch out- for Pupil size & Dilatation- Pre-Op / Per op

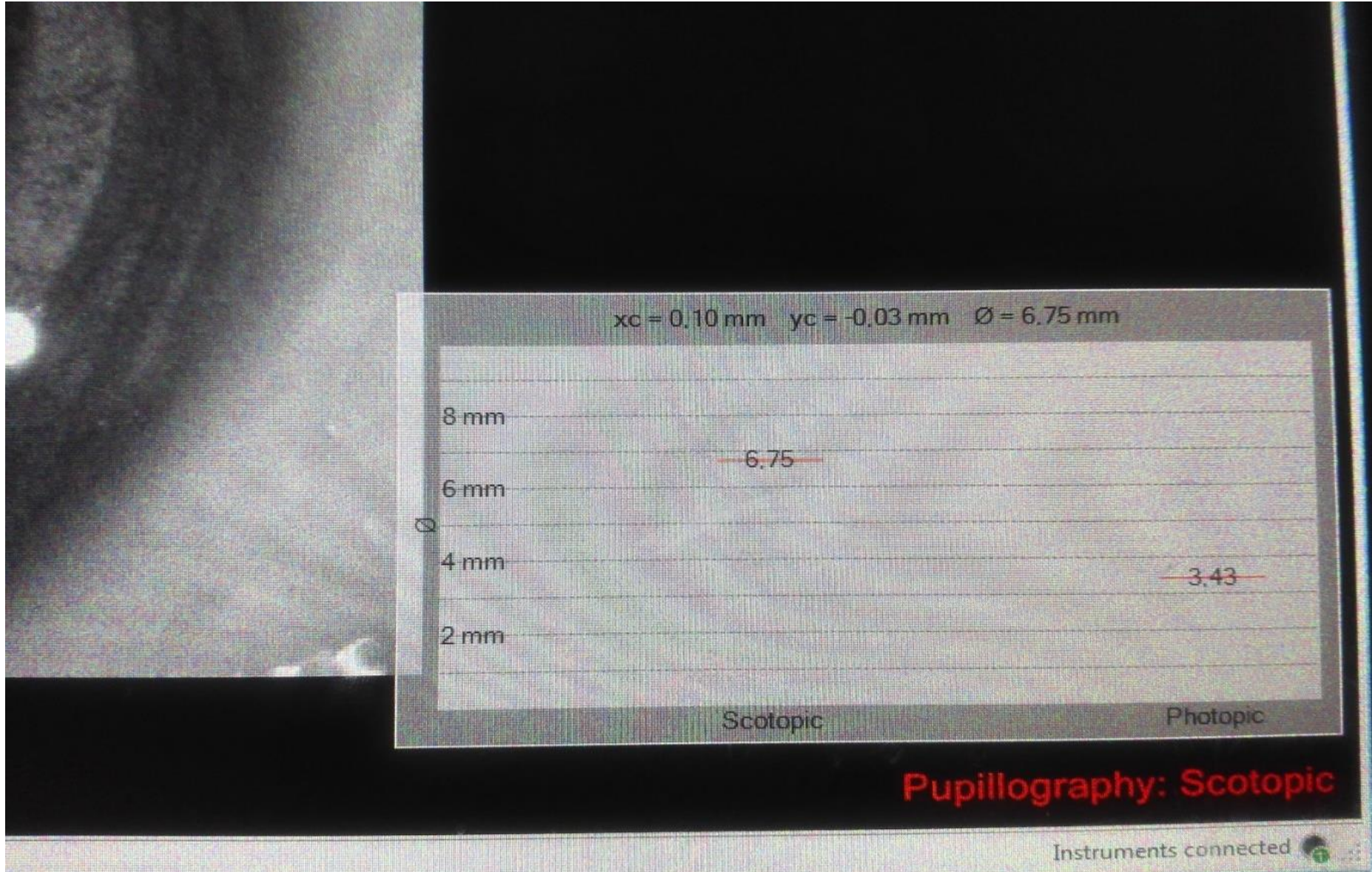


- **UNDILATED** If Very **large** mesopic pupil ...NOTE especially if larger than 7.4 mm
- **DILATED** Aim for Minimum 9 mm dilation- watch for **smaller pupils post dilate**. (beginner)
- Pre-treat: Tropicamide, Phenylephrine and NSAID and note



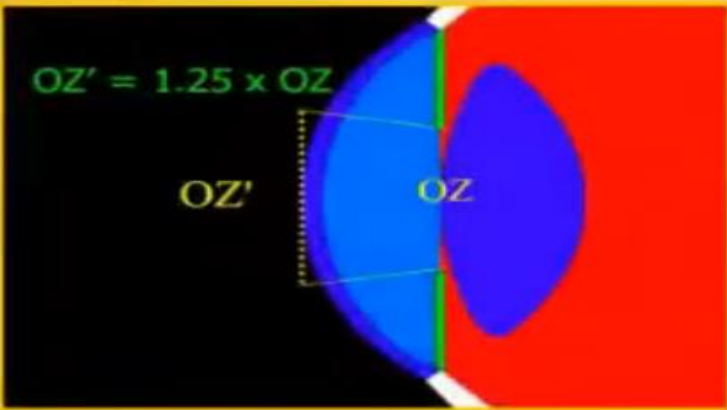
- Colvard Pupillometer
- Autorefractor
- ORBSCAN IIz, Sirius etc

IPCL sizing -Using automated Pupilometer



Optical Zone diameter

Corneal magnification effect
pupil size X1.25= corneal opt zone



Optical Diameter (mm)	Approximate Equivalent OZ at Corneal Plane (mm)
6.1	7.6
5.9 - 6.1	7.4 - 7.6
5.3 - 5.8	6.6 - 7.3
5.0 - 5.2	6.3 - 6.5
4.9	6.1
5.8	7.3

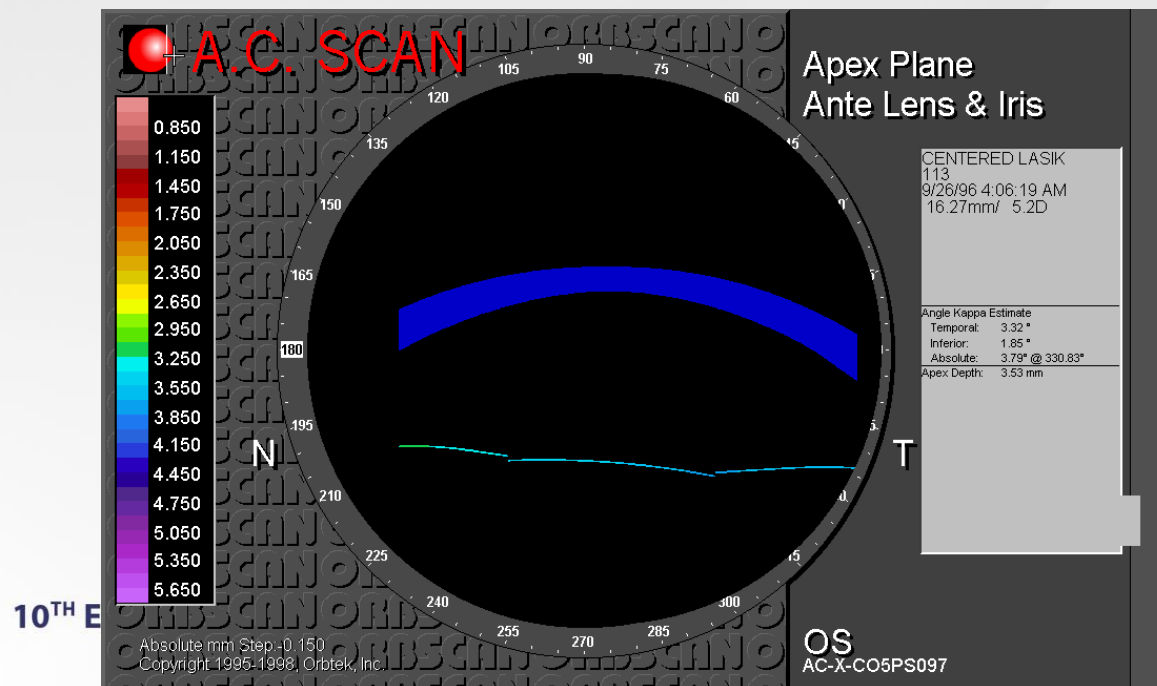
Note:

Toric myopic lenses have the **same OZ** as myopic spherical lenses

Toric hyperopic lenses have the **same OZ** as hyperopic spherical lenses.

Pre-Operative Planning- ACD cut off 2.8 mm for IPCL Calculation

- **ACD has to be more than 2.8 mm** can use IOL master , Pentacam, SIRIUS, Gallelei (measure Internal ACD) usually all very accurate
- Beginners aim for 3.0 mm and above)
 - Orbscan or **A-scan(immersion) biometry (subtract Corneal pachymetry)** ASOCT/pachymeter
 - Pentacam , Sirius , Gallieli

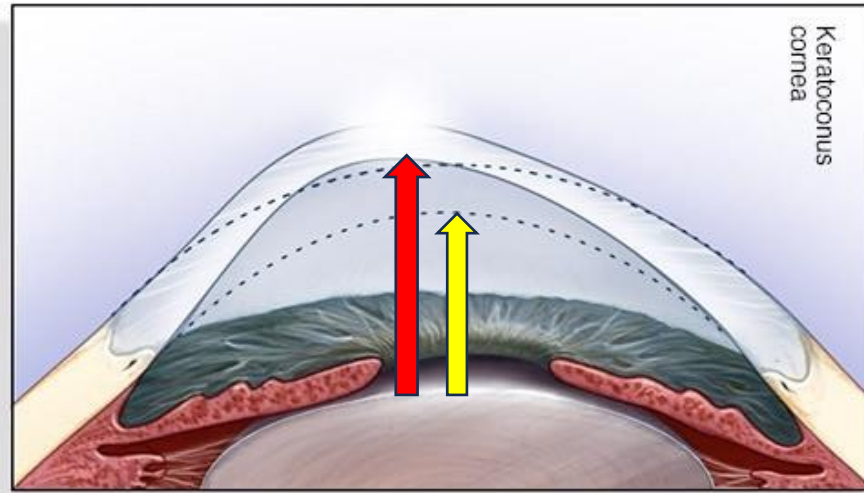
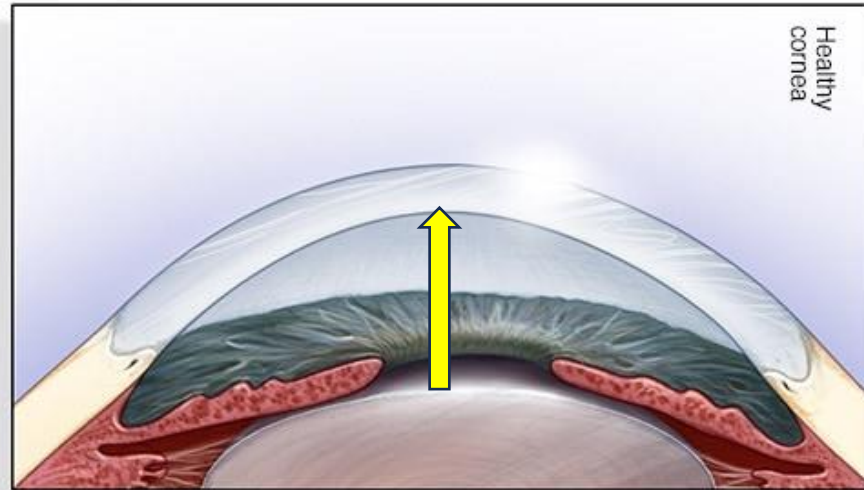


If ACD is 2.8 mm – Are u totally safe ?

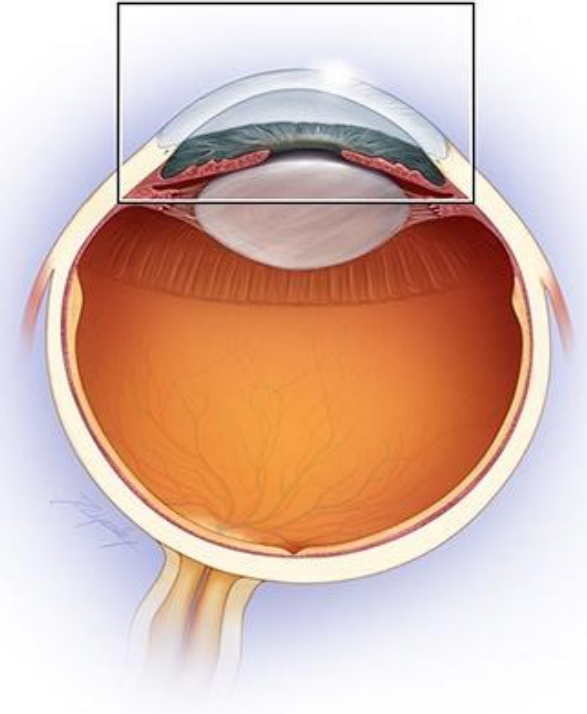
Remember!

- Yes and No..
- Break points
- Angle anomalies
- Resting Large pupil size
- Non dilating or small pupil
- Iris configuration flat
- Iris cysts
- Lens rise
- keratoconus ..careful
- Post synechiae

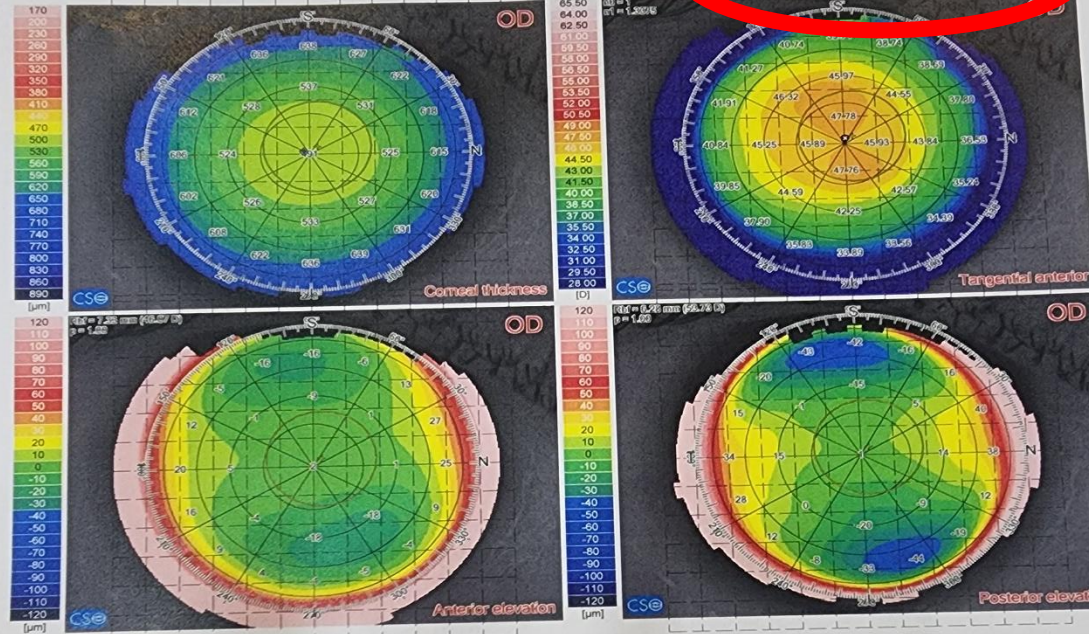
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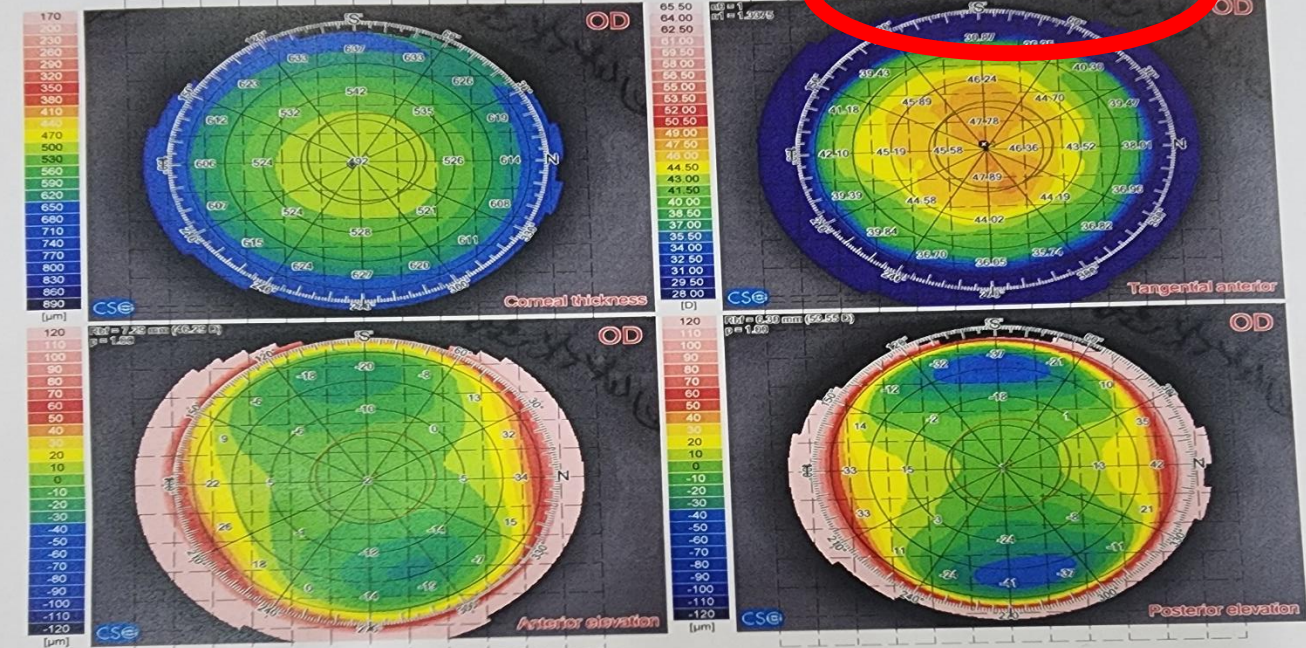
Healthy cornea vs keratoconus



RENU, RENU - OD
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 Identification code: P1920224855
 Acquisition date: 05-09-2023 14:28:01 [#1-2]



RENU, RENU - OD
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 Acquisition date: 28-09-2023 12:30:02 [#1-5]



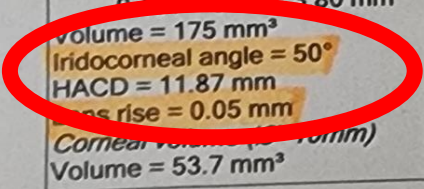
Post op IPCL - Toxic x 7 days

Acquisition quality	Coverage(SC.) = 99% Coverage(P.) = 91%	Not edited(SC.) = 100% Centration(P.) = 100%		
Summary Indices HVID [®] = 11.45 mm + Pupil (Topographic) r = 0.36 mm @ 49° Ø = 3.31 mm λ intercept: r = 0.92 mm @ 49° ◆ Thinnest location r = 0.20 mm @ 150° Thk = 491 µm ◆ Apex r = 0.20 mm @ 84° Curv = 48.98 D Anterior Chamber CCT + AD = 0.491 + 3.31 = 3.80 mm Volume = 175 mm ³ Iridocorneal angle = 50° HACD = 11.87 mm Lens rise = 0.05 mm Corneal volume (Ø=10mm) Volume = 53.7 mm ³	K readings Sim-k Anterior Ø=3mm K1 = 45.89 D @ 12° K2 = 47.77 D @ 102° Avg = 46.81 D Cyl = -1.88 D Ax 12° K1 = 45.98 D @ 10° K2 = 47.86 D @ 100° Avg = 46.90 D Anterior Ø=5mm K1 = -1.88 D Ax 10° K2 = 45.91 D @ 12° K1 = 45.91 D @ 12° K2 = 47.70 D @ 102° Avg = 46.79 D Anterior Ø=7mm K1 = 45.73 D @ 12° K2 = 47.24 D @ 102° Avg = 46.47 D Cyl = -1.51 D Ax 12°	Hemi-meridians n1 = 1.376 n2 = 1.3375 Posterior Ø=3mm K1 = -6.12 D @ 184° K2 = -6.59 D @ 116° K1 = -6.18 D @ 352° K2 = -6.57 D @ 268° Avg = 46.81 D Cyl = -1.65 D @ 185° K1 = -6.65 D @ 109° K2 = -6.21 D @ 354° K1 = -6.19 D @ 187° K2 = -6.67 D @ 109° K1 = -6.25 D @ 354° K2 = -6.56 D @ 277°	Shape indices n1 = 1.376 n2 = 1.3375 Anterior Ø=6.0mm r1 = 46.21 D Ax 12° rs = 47.96 D p = 0.78 RMS/A = 0.04 µm/mm ² Posterior Ø=6.0mm r1 = -6.20 D Ax 7° rs = -6.57 D p = 1.06 RMS/A = 0.08 µm/mm ² Anterior Ø=8.0mm r1 = 46.53 D Ax 12° rs = 48.00 D p = 0.66 RMS/A = 0.06 µm/mm ² Posterior Ø=8.0mm r1 = -6.25 D Ax 10° rs = -6.59 D p = 0.96 RMS/A = 0.08 µm/mm ²	Refractive analysis Cyl = -1.98 D Ax 11° MPP = 46.73 D LSA = 0.97 D Keratoconus screening Sif = -0.54 D KvI = 5 µm BCVf = 0.00 D @ 140° Slb = -0.22 D Kvb = 9 µm BCVb = 0.00 D @ 146° Thk = 491 µm Class: - 'Normal'

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	Anterior Ø=7mm	K1 = 45.73 D @ 12° K2 = 47.24 D @ 102° Avg = 46.47 D Cyl = -1.51 D Ax 12°	Posterior Ø=7mm K1 = -6.19 D @ 187° K2 = -6.67 D @ 109°	Posterior Ø=8.0mm rf = -6.25 D Ax 10° rs = -6.59 D p = 0.96 RMS/A = 0.08 µm/mm²		

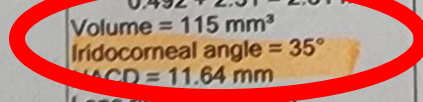
Pre op-50*



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	Anterior Ø=5mm	K1 = 45.83 D @ 175° K2 = 48.35 D @ 281°	Posterior Ø=5mm K1 = -6.14 D @ 175° K2 = -6.75 D @ 82°	Posterior Ø=6.0mm rf = -6.18 D Ax 5° rs = -6.56 D p = 1.08 RMS/A = 0.07 µm/mm²		
	Anterior Ø=7mm	K1 = 46.37 D @ 11° K2 = 48.25 D @ 101°	Posterior Ø=7mm K1 = -6.16 D @ 7° K2 = -6.28 D @ 205°	Anterior Ø=8.0mm rf = 46.44 D Ax 13° rs = 48.39 D p = 0.69 RMS/A = 0.04 µm/mm²		
	Anterior Ø=7mm	K1 = 45.70 D @ 192° K2 = 47.93 D @ 99°	Posterior Ø=7mm K1 = -6.19 D @ 175° K2 = -6.75 D @ 82°	Posterior Ø=8.0mm rf = -6.26 D Ax 6° rs = -6.60 D p = 0.92 RMS/A = 0.08 µm/mm²		
Anterior Ø=7mm	K1 = 46.10 D @ 8° K2 = 47.88 D @ 284°	Posterior Ø=7mm K1 = -6.20 D @ 7° K2 = -6.28 D @ 205°				

Post op-35*

↓ by 15*



Lens Rise

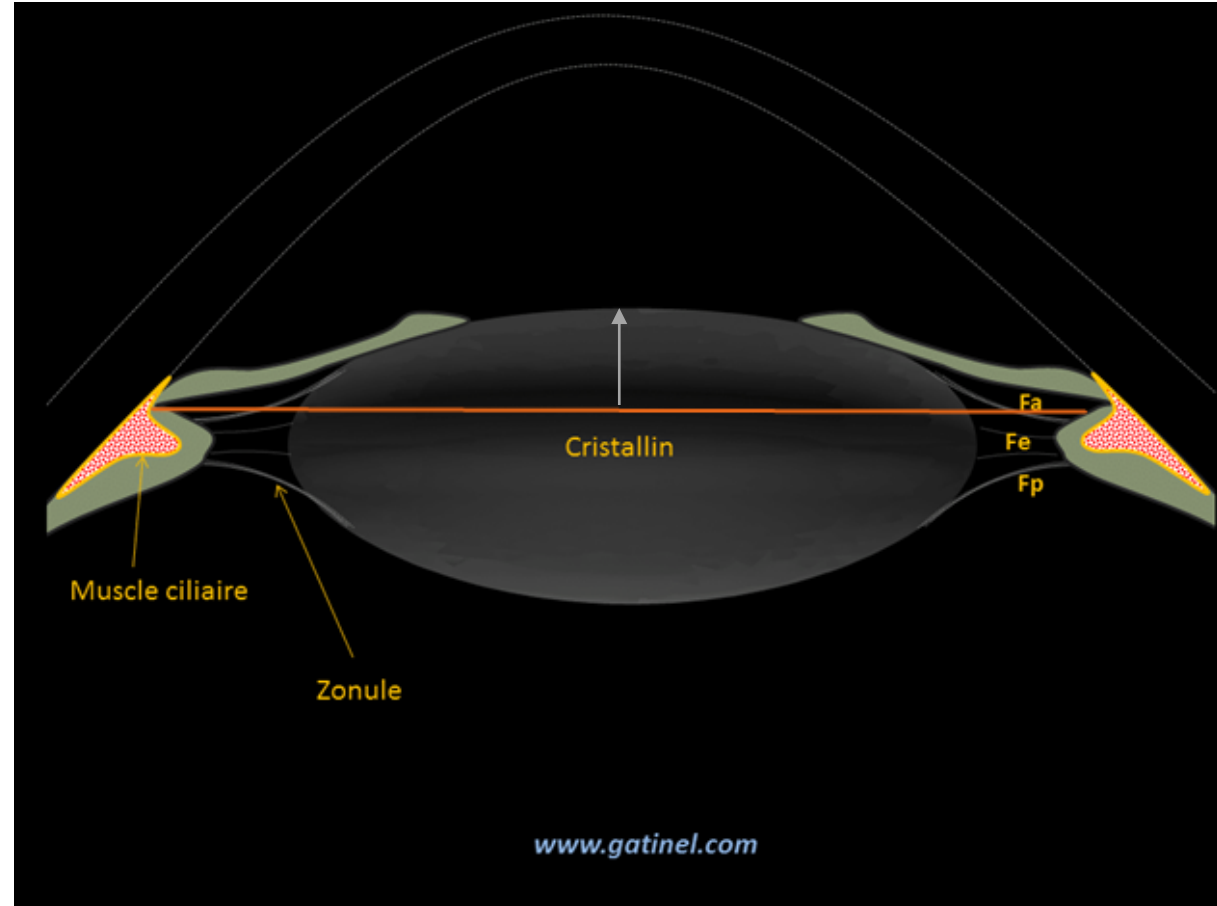
“Crystalline lens rise”.

This rise is a measure of the distance between the line from angle to angle, which is a fixed point in the anterior chamber

The AS-OCT device helps us.

If the rise is less than $600\ \mu\text{m}$ and the anterior chamber depth is greater than $3.2\ \text{mm}$, there appears to be very low risk of pigment dispersion or touch.

If the anterior chamber is less than 3.1 and lens rise is high then chances of pigment dispersion and cataract could be higher



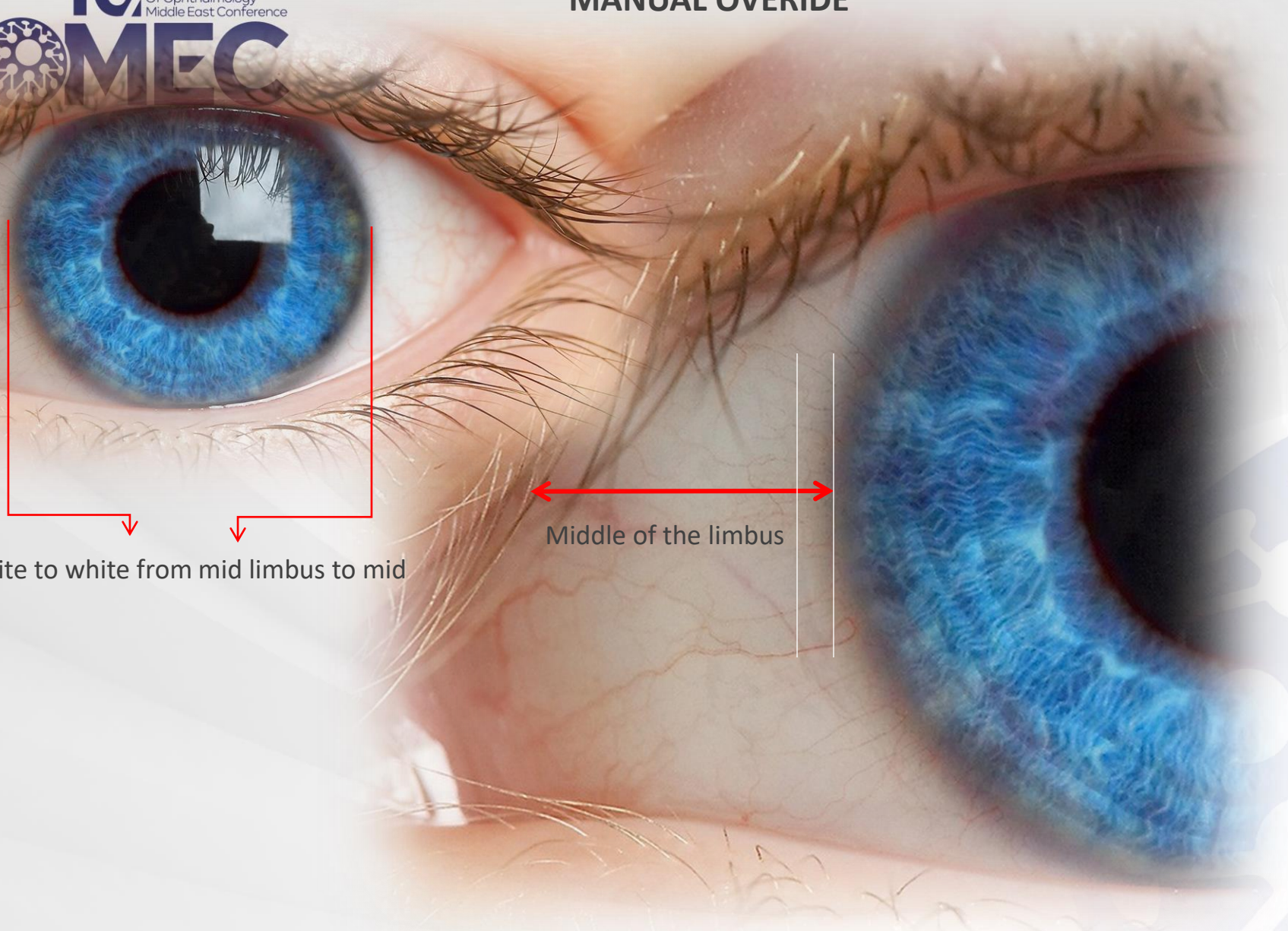
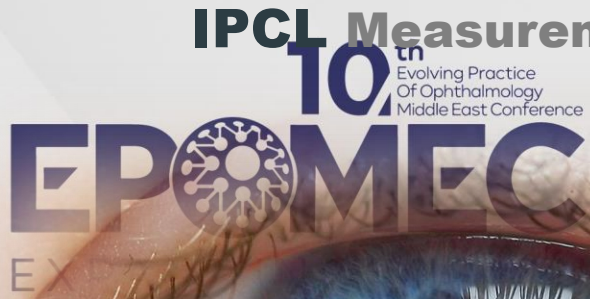
PLANNING PHAKIK IOL – Size is MOST important

- Lens too short – lens vault less, exposes to risk of Anterior capsular cataract, ROTATION and astigmatic issue,
- Lens too long – lens exceeds – angle crowding, pigment release , Zonular damage –closed angle glaucoma



IPCL Measurements

White to white measurement MANUAL OVERRIDE



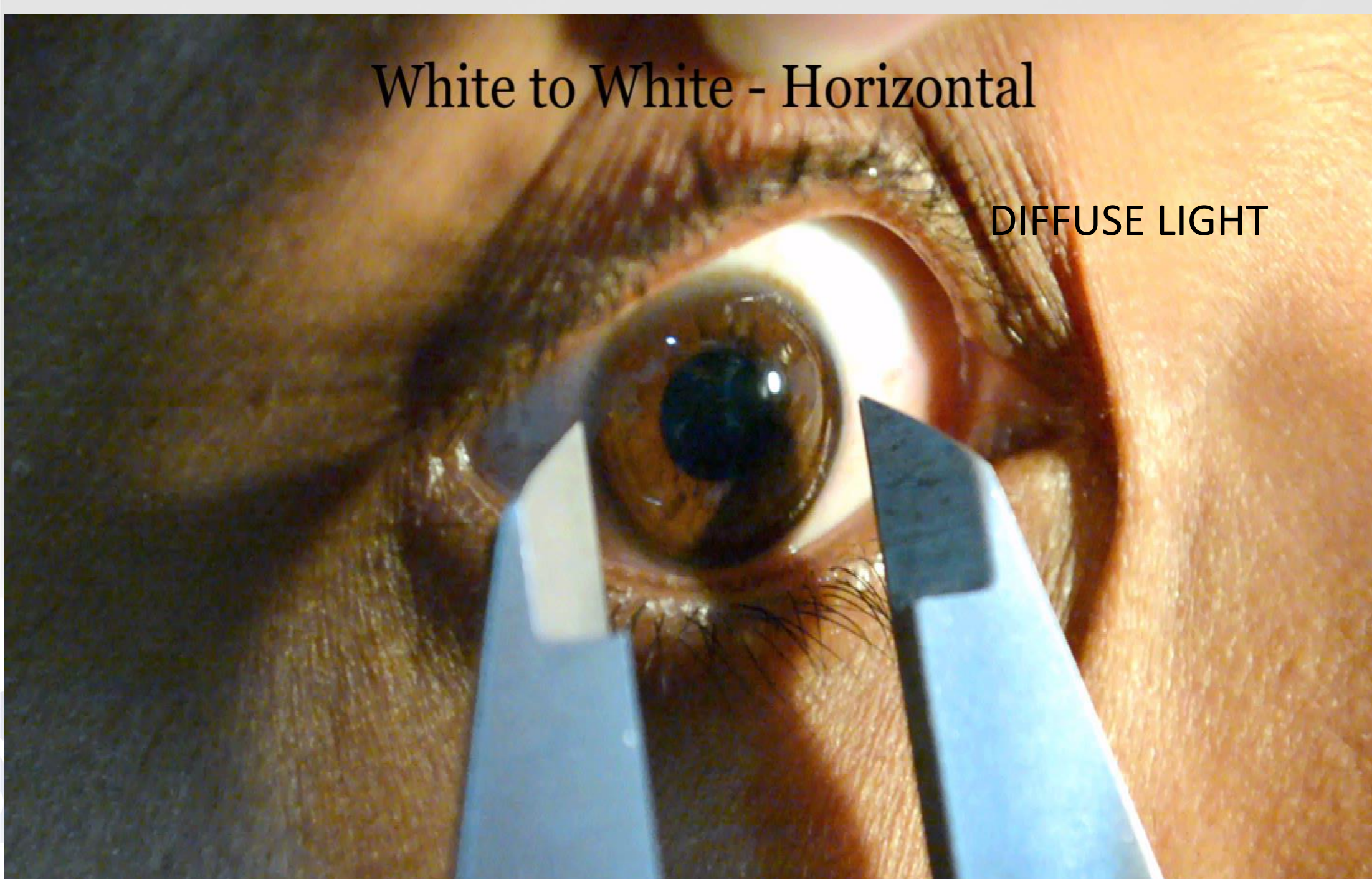
Horizontal White to white from mid limbus to mid limbus

Middle of the limbus



White to White - Horizontal

DIFFUSE LIGHT

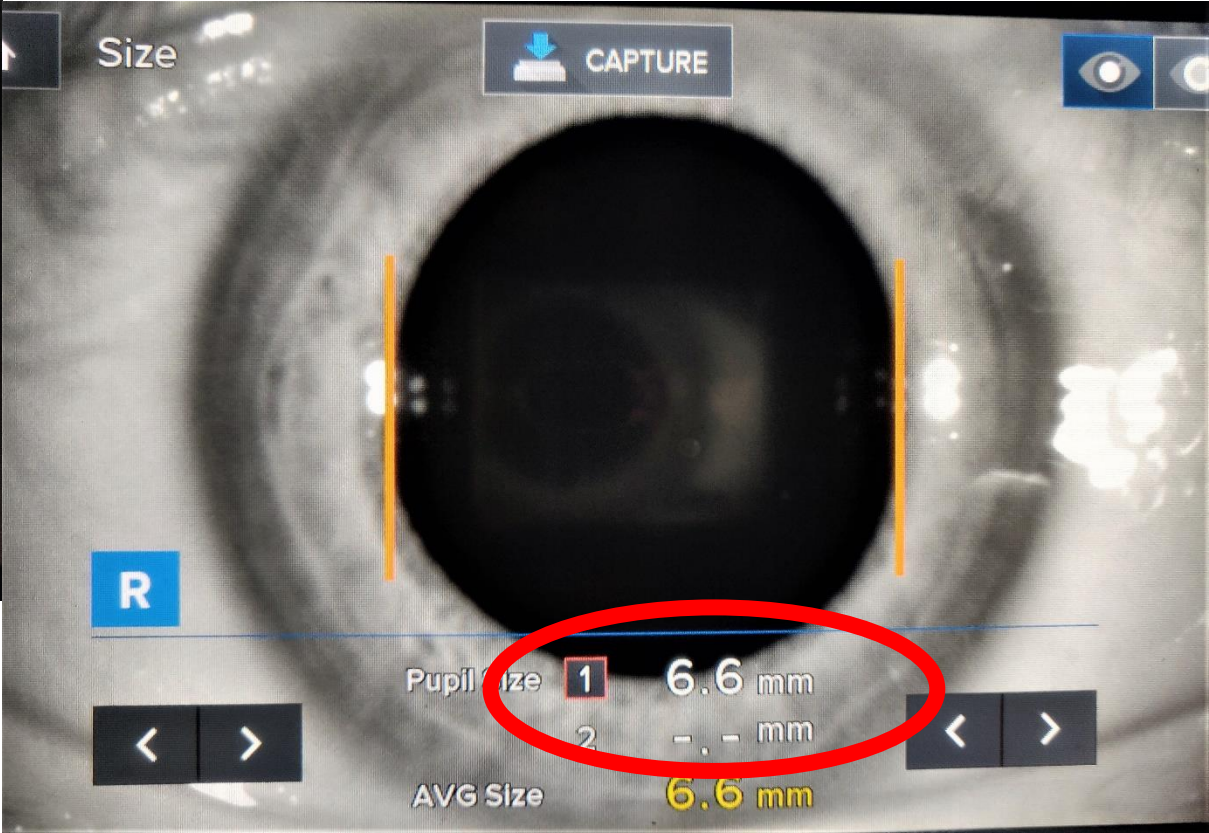


Caliper measure of WTW

- Ideally done lying down under microscope
- Most essential is **WTW** and ACD measure
- Lying down with anesthesia or maybe (Slit lamp diffuse light)



Using an ARK for HVID & pupil size



ICL-Size Determination white to white

- Direct measurement with a caliper and **Orbscan (larger), IOL MASTER (larger) SIRIUS or a PENTACAM** or others provides reliable white-to-white measure once standardized (**manual override**)
- At times varying readings (go with most consistent) but always **manually edit the readings**
- **Evaluate discrepancies between caliper measurement and topographical measurement.**
- Sometimes a pterygium, pigmented conjunctiva or other anomaly can cause a discrepancy.
- **UBM – But not much tested nomograms Sulcus to Sulcus OCT Aangle to angle**

Pearls: White-To-White

- Use Orbscan/ SIRIUS/ARK to validate caliper measurement:
 - Automated & Manual: Eye Metrics Tool
- If you use the IOL-Master or similar make sure you validate the outputs:
 - some reports of IOL-Master's overestimation of the wtw
- Ubm ??
- Evaluate discrepancies between measuring devices and between eyes:
 - Both eyes should have about the same wtw

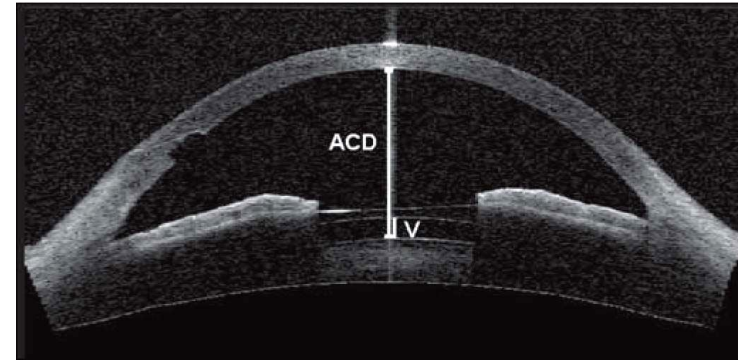
Max Upto 0.2 mm variance until high astigmatism, if more ..note recheck

If astigmatism more than 2 diopters give vertical measure too

PHIOL-Size Determination

- At times **varying readings** (go with most consistent) 0.2 mm difference between both **watch out**
- IPCL is Ideally usually 1.25 mm larger than Mid limbal WTW (case to case)
- Advantage 0.25 mm steps
(Exception of larger optic size -0.75 to 1mm)
- Vertical Measurement in higher astigmatism of over 2 diopters is a great idea
- Non rotation of smart TORIC makes more predictable vault
- Keratoconus patients High astigmatism, High AC depth (measure Angle) plan smaller size
- 0.25 mm size change alters vault by approx. 125-150 microns

PHAKIK IOL & Sizing- Vault



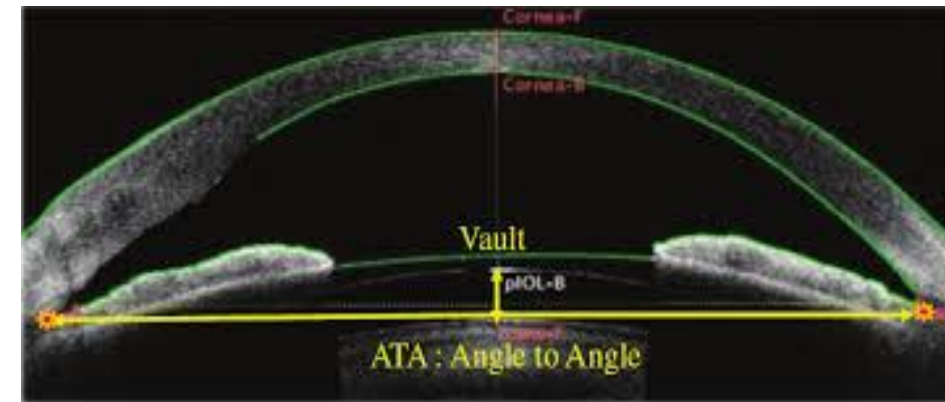
- Vault - central distance between anterior surface of the crystalline lens and posterior surface of the IPCL) within a range of 0.350 to 0.600 mm ($\frac{1}{2}$ CT to 1 & $\frac{1}{2}$ CT) .

We use the term “Vault” to refer to this space

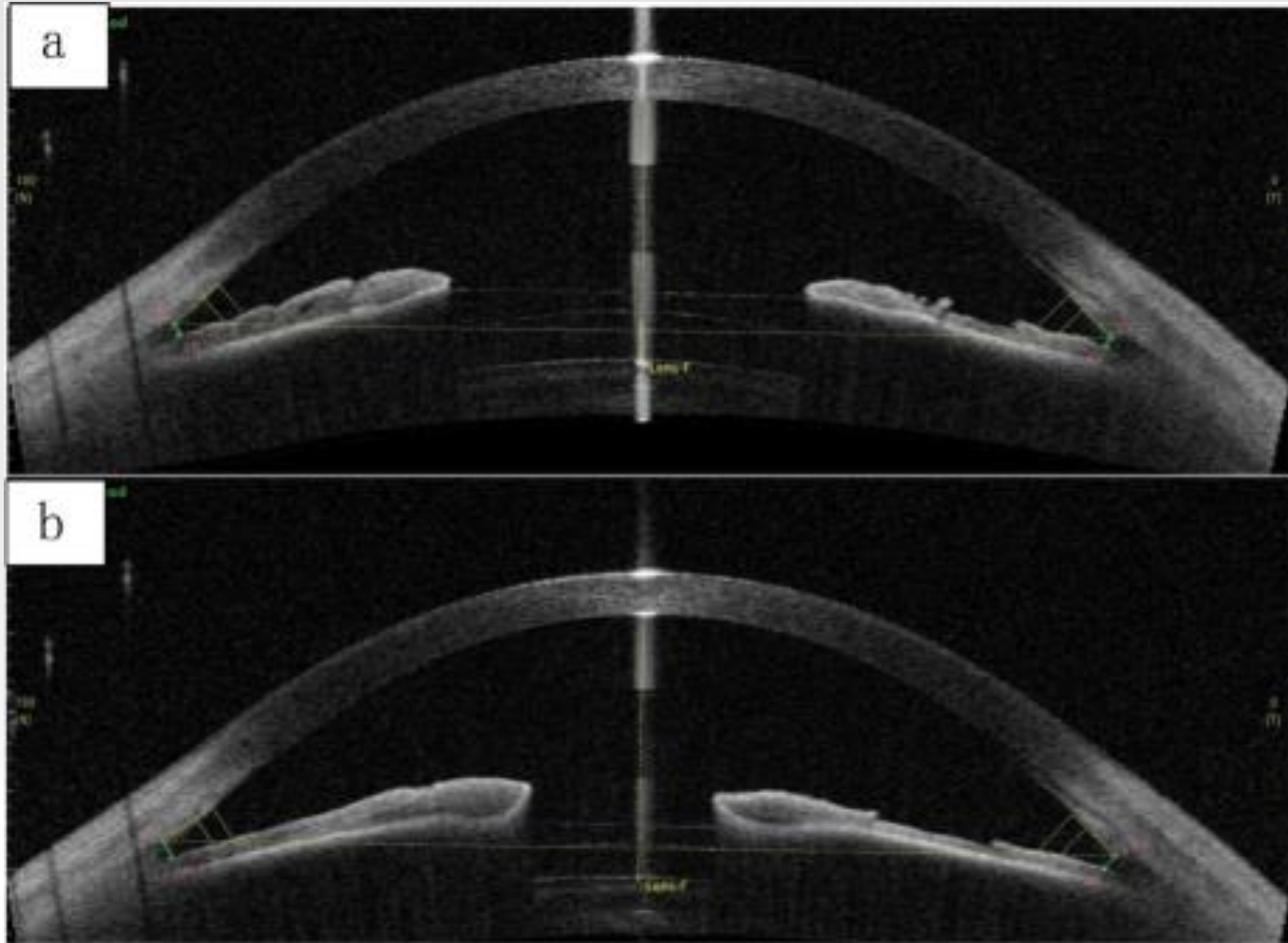
- Ideal sized PHIOL will provide a vault of 400-700 mic.

- An undersized Lens (less than 0.250 mm vault) may increase the risk of anterior subcapsular opacification/ cataract.

- An oversized Lens (more than 1 mm vault) may push the iris forward and close the angles which could lead to IOP rise and Iris malfunction. Deep AC more forgiving 3.1 mm



Vault does change with pupil size



Tricks of sizing ICL

ICL available sizes

10.7 to 11.1 = 12.1 ICL
11.2 to 11.6 = 12.6
11.7 to 12.3 = 13.2
>12.3 = 13.7

EyePCL available sizes

10.40 - 10.64 = 11.75
10.65 - 10.94 = 12.00
10.95 - 11.22 = 12.25
11.23 - 11.35 = 12.50
11.36 - 11.64 = 12.75
11.65 - 11.93 = 13.00
11.94 - 12.22 = 13.25
12.23 - 12.51 = 13.50
12.52 - 12.80 = 13.75
>12.80 - 13.0 = 14.00

WTW of patient

ICL size

- 11.70 mm → 13.2 mm ICL (1.5 mm larger)
- 12.30 mm → 13.2 mm ICL (0.9 mm larger)

Which one will have the higher vault?

So the bad combination is shallow AC (<3.0mm) and...

Playing with the sizes to our advantage

Especially **Toric IPCL**

WTW of patient

EyePCL size

- 11.65 mm → 13.0 mm IPCL (1.35 mm larger)
- 11.93 mm → 13.0 mm IPCL (1.07 mm larger)

Which one will have the lower vault?

More chances of rotation, hence select one size higher

So for 11.93 mm instead of 13.0 mm (1.07 mm larger) take 13.25 mm (1.32 mm larger)!

10.40 - 10.64 = 11.75
10.65 - 10.94 = 12.00
10.95 - 11.22 = 12.25
11.23 - 11.35 = 12.50
11.36 - 11.64 = 12.75
11.65 - 11.93 = 13.00
11.94 - 12.22 = 13.25
12.23 - 12.51 = 13.50
12.52 - 12.80 = 13.75
>12.80 - 13.0 = 14.00

11/08/2016

PATIENT NAME		AGE-YR/M	
Rinky Gupta		30/M	
RIGHT EYE		LEFT EYE	
Refraction		Refraction	
WT TO WT FROM	11.7		11.8
AXIS			11.8
CLIPER	11.2		
052004			11.6
SIRUS WITH EDIT	11.6		
Pachy	506	Pachy	498
acd from endo	3.07	acd from endo	3.12
K1	44.36	K1	44.39
Axis	179	Axis	178
K2	46.97	K2	46.75
AXIS	89	Axis	88
AXIAL LENGHT	24.90	AXIAL LENGHT	26.65
SCOPTIC	5.88	SCOPTIC	6.44
PHOTOPIC		PHOTOPIC	
DILTED AR	-5.50/-2.25 x 74		-10.00/-1.25 x 183
FINAL ACC	Done		
P I BEFORE SX			
IOP	Done		
RETINA	Done		
POG	-7.75 / +1.50 x 92		-11.00 / +1.00 x 24

REMARKS RE :-
LE :-

Red. $\left\{ \begin{array}{l} -6.50 / -2.00 \times 10^\circ \text{ 6/9 L} \\ -10.75 / -1.50 \times 180^\circ \text{ 6/9 R} \end{array} \right.$

- Gonio - open

- PI Done

Y.S. Raw

Per-operative learnings

- Achieve max dilatation
- Ensure proper orientation and loading
- Always Open IOL on iris
- Avoid iris manipulation
- Avoid over visco-inflation pushes iris backwards
- Hydro assisted Insertion possible
- Avoid touching centre of the phakic IOL
- Ensure proper unfolding of IOL behind Iris by moving it
- Meticulous visco elastic removal
- Observe for IOP after One hour if possible-BURPING



IPCL TORIC LOADING AND INSERTION technique



Salient points

- Make two side ports 5 clock hours
- Correct wound architecture 2.8 mm ipcl – 3mm icl
- Do not over inflate the ac with viscoelastic
- Very large or mid dilated pupil very tricky
- Very deep anterior chamber 3.4 mm and above avoid over inflation
- Use of cold visco elastic (methyl cellulose) and lignocaine in smaller pupil helps
- Loading IPCL very careful note the holes and the nubs
- Keep an eye on unfolding avoid touching the central optic
- Prefer using side for dialing and positioning
- Nudge and free up IPCL after implantation
- Hydrate wound before Visco removal
- Avoid going over central with IA port
- Ensure wound sealing

LEARNINGS



Remember!

- Pre Operative
 - Case selection- exclusion criteria
 - Investigations
 - Measurements
 - Special situations
- Per operative
 - Marking Steps and Methods
 - Managing special situations
- Post operative
 - Immediate post operative , IOP
 - intermediate and late post operative IOP, Vault , 6 monthly ASOCT

Immediate IOP spike post op

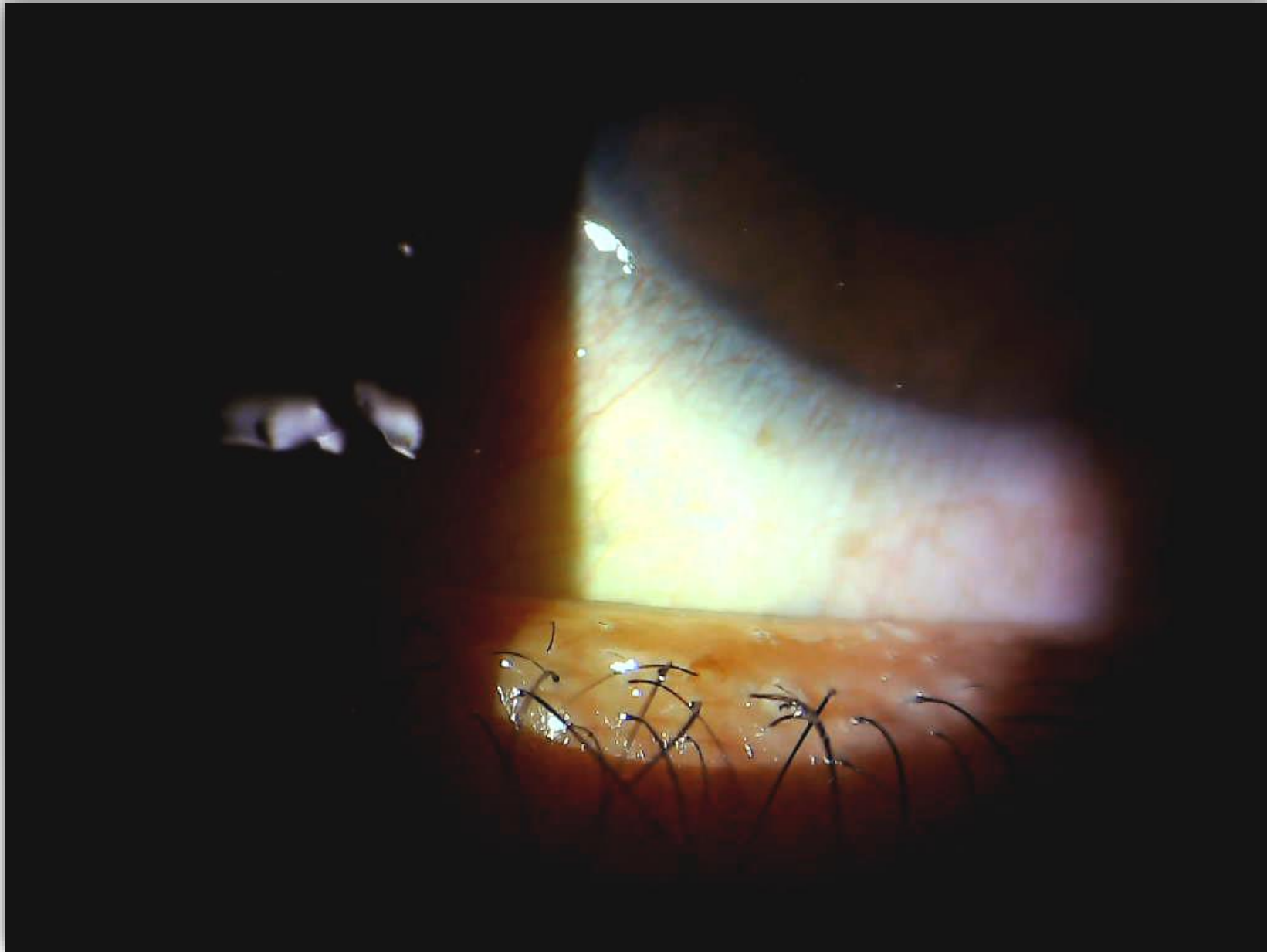


10TH EVOLVING PRACTICE OF OPHTHALMOLOGY
MIDDLE EAST CONFERENCE

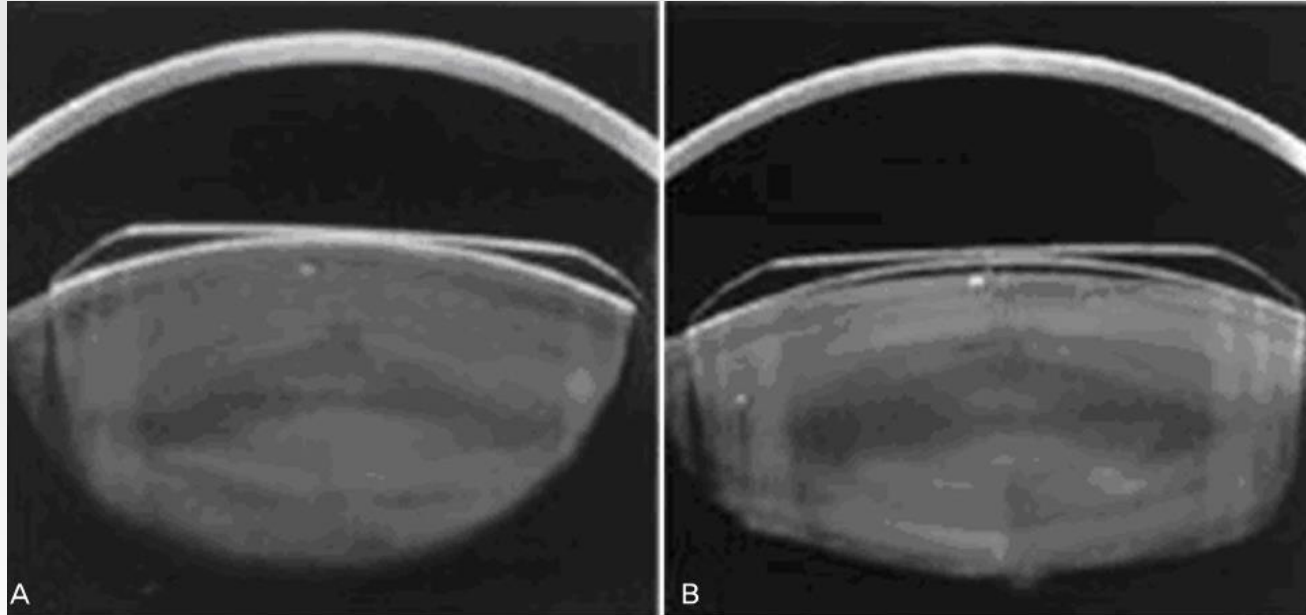


Occasional Immediate Post Op-IOP spike

- Managed by wound Burping



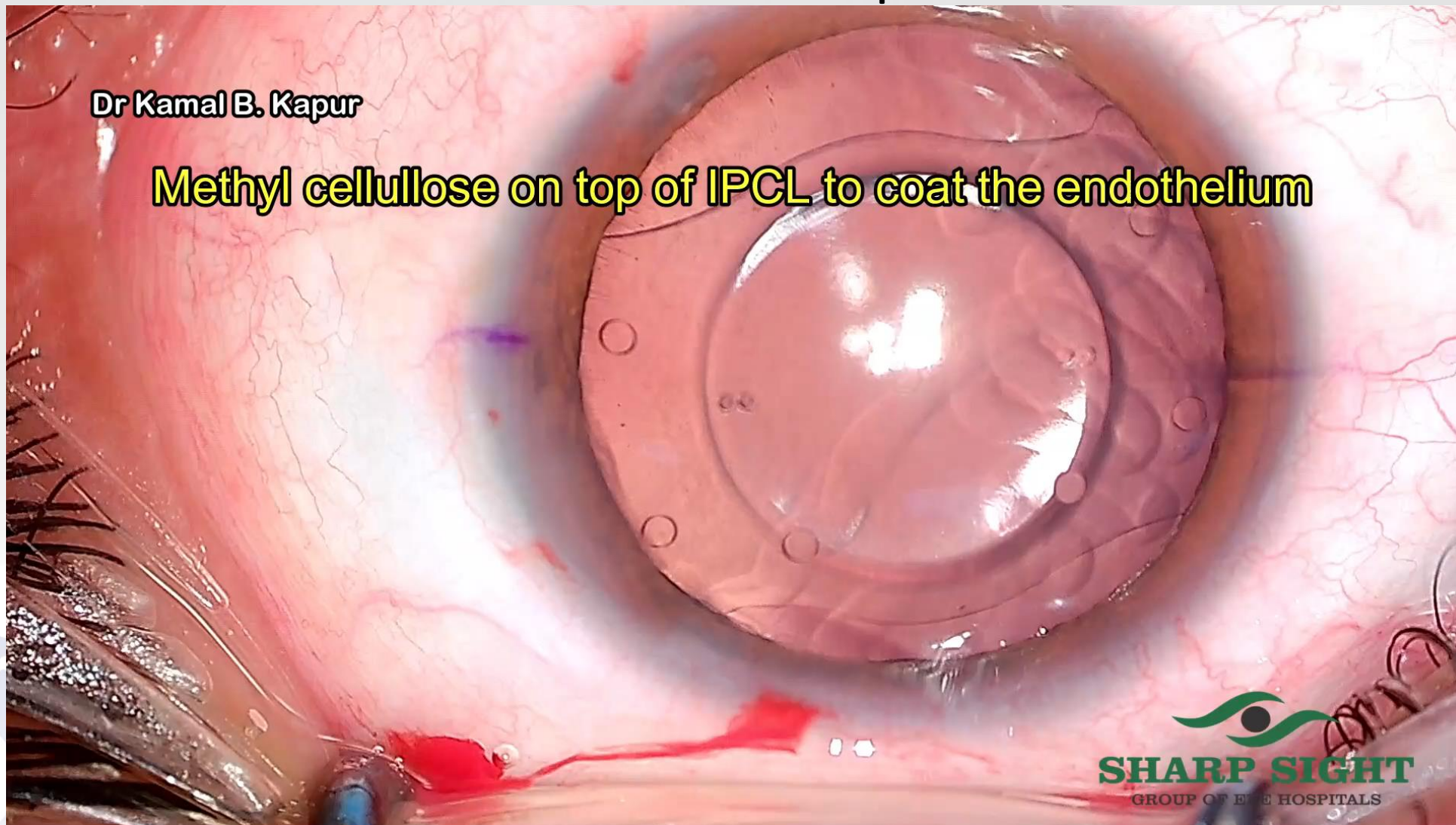
Shallow vault IPCL explant technique



Dr Kamal's Hook Technique

Dr Kamal B. Kapur

Methyl cellulose on top of IPCL to coat the endothelium





THANK YOU!

आओ अच्छा देखें...