17TH INTERNATIONAL CONFERENCE OF THE RESEARCH INSTITUTE OF OPHTHALMOLOGY

RIO 2025

Anterior Segment Eye Diseases
Current Status & Future Directions

Cataract Surgery In Nanophthalmos

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Outline

- Understanding Nanophthalmos
- Challenges with……..

✓ Biometry

✓ Surgical challenges

✓ Modifications

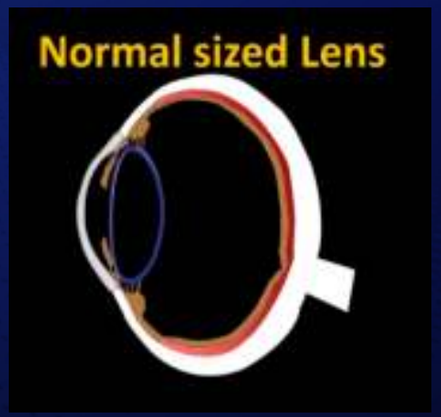
✓ Newer IOLs

✓ Post op complications

NANOPHTHALMOS

- Shortened AL (<21/ <20.5/ <18 mm)
- Small anterior segment, Shallow AC
- Normally: crystalline lens/globe volumetric ratio= 4% -- can ↑10–30% in nanophthalmos
- Angle closure
- Thick sclera - >1.7 mm
- Thick Choroid

Hoffman et al. JCRS
Wu W, et al, JCRS, 2004



Both AD and AR inheritance have been reported for Nanophthalmos
NNO1 on chromosome 11 is the first human locus associated with Nanophthalmos

Cataract surgery in Nanophthalmos

Challenges

Pre-operative

- Orbital anatomy
- Raised IOP
- IOL power calculation
- Choice of Anesthesia

Intra-operative

- Shallow AC
- Small pupil
- Rhexis
- Phaco/SICS/ECCE
- IOL placement

- Uveal effusion
- Malignant glaucoma

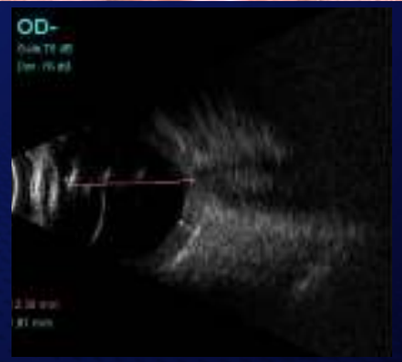
Post-operative

- Inflammation
- Uveal effusion
- Corneal decompensation
- Retinal detachment
- Cystoid macular edema
- Supra Choroidal hemorrhage
- Residual refractive error

Wladis EJ. Surv Ophthalmol. 2006
Richard S. Hoffman et al. 2015

PREOPERATIVE ASSESSMENT

- Measurement of Visual Acuity and Refractive status
- Evaluation of the oldest pair of glasses to assess preexisting hyperopia
- Presence of amblyopia
- Associated angle closure and high IOP
- Biometry, CCT, ACD, AL, LT, Specular microscopy
- Ultrasound B scan CT and uveal effusion



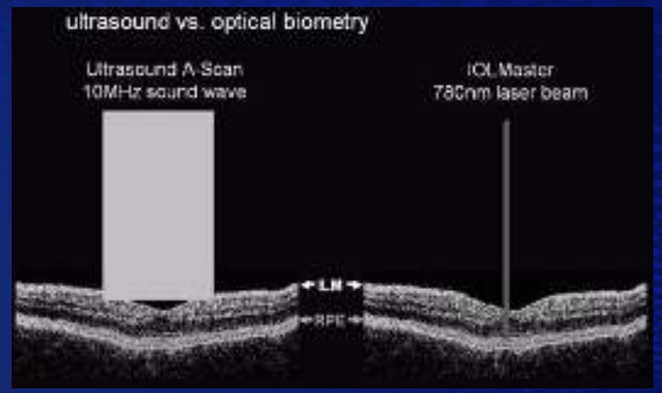
Challenges regarding IOLs

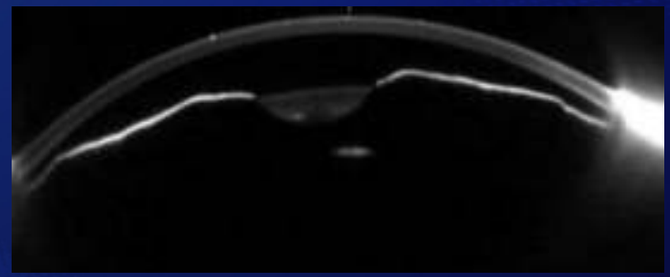
- Inaccurate IOL power calculation
- high-power IOLs not easily available
- Spherical aberration of high-power lenses
- Small error in biometry or IOL power calculation can cause significant residual error
- Thick IOL and high-IOL power affect refraction

MacLaren RE, AJO 2007

Wladis EJ, et al. 2006
Richard S. Hoffman et al. 2015

Optical biometers and appropriate formulae





IOL master and Lenstar LS 900

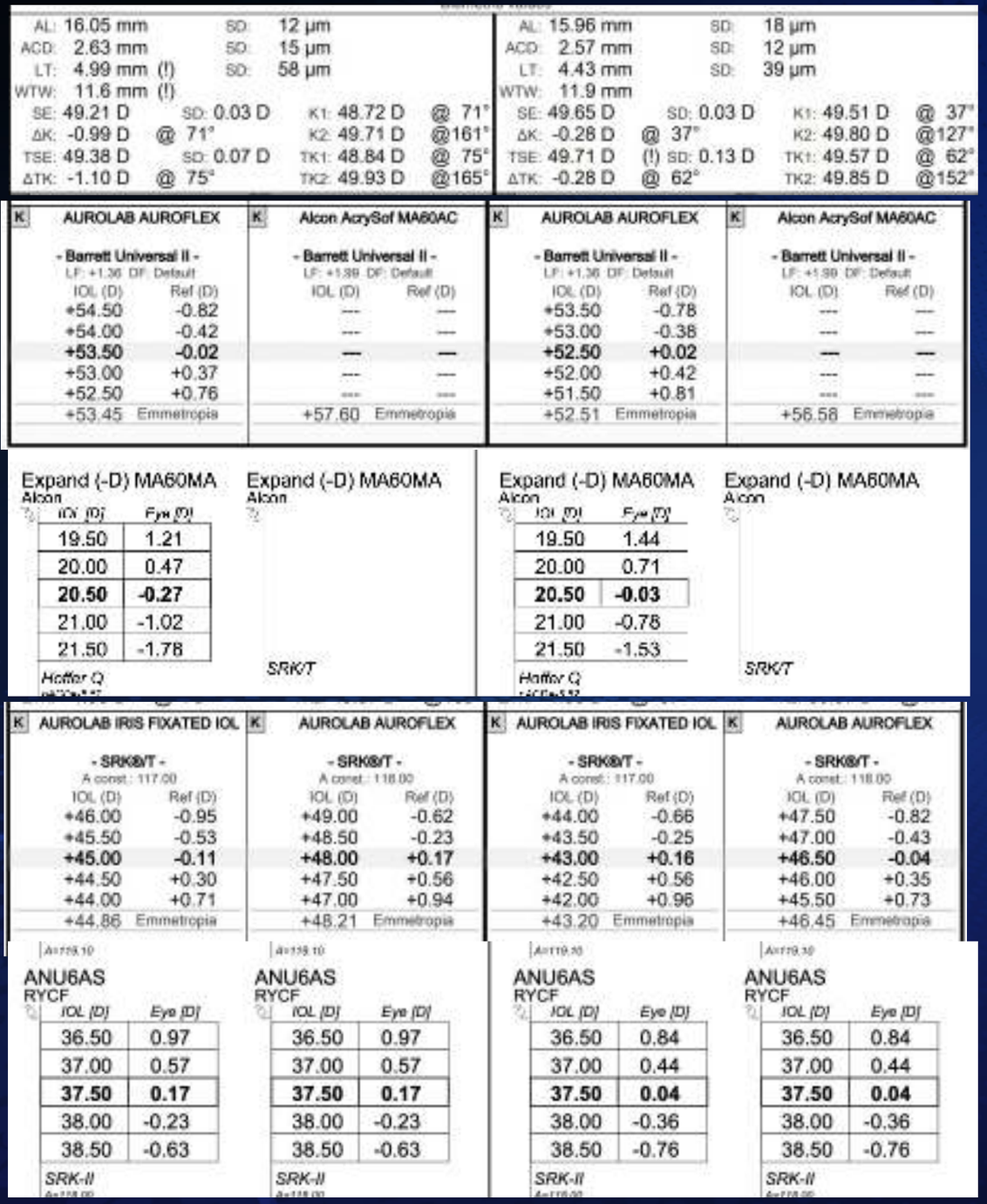
AL, white–to-white, pachymetry, lens thickness, anterior chamber depth, and retinal thickness

Clinical & Experimental Ophthalmology

Meta-analysis of accuracy of intraocular lens power calculation formulas in short eyes

- Wang et al. in short eyes (<22mm)
- 10 studies, involving 1161 eyes, were enrolled to compare six formulas:
- Haigis, Holladay 2, Hoffer Q, Holladay1, SRK/T and SRK II
- Overall evidence from the studies confirmed the superiority of Haigis over Hoffer Q, SRK/T and SRK II in prediction IOL power in short eyes

Wang et al. CEO, 2017



AL 16.05

WTW 11.6

LT 4.99

ACD 2.63

15.96 mm

WTW 11.9

LT 4.43

ACD 2.57

LE IOL power suggested by various formulae

- +53 Barrett II
- +20.5 Hoffer Q
- +43.5 SRK/T
- +37.5 SRK -II

ARTICLE

Intraocular lens power formula accuracy: Comparison of 7 formulas

Jack X. Kane, MB BS, Anton Van Heerden, MB ChB, FRANZCO, Alp Atik, MB BS, Constantinos Petsoglou, MB BS, MMed(Clin.Epi), FRANZCO

RESULTS: The study included 3241 patients. The Barrett Universal II formula had the lowest mean absolute prediction error over the entire AL range ($P < .001$, all formulas) as well as in the medium ($P < .001$, all formulas), medium-long ($P < .001$, except Holladay 1 and T2), and long AL ($P < .001$, except T2) subgroups. No statistically significant difference was seen between formulas in the short AL subgroup. Overall, the Barrett Universal II formula resulted in the highest percentage of eyes with prediction errors between ±0.25 diopter D, ±0.50 D, and ±1.00 D.

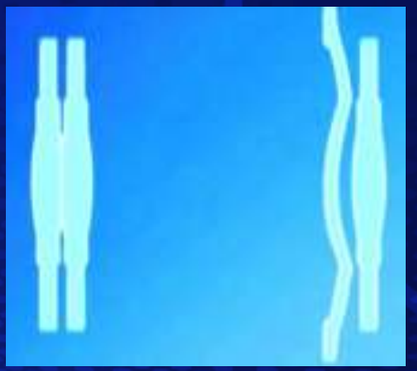
Barrett Universal II had least prediction error

J Cataract Refract Surg. 2016

Type of IOL

- ✓ Acrylic IOL in the capsular bag and another 3-piece silicone IOL in the ciliary sulcus
- ✓ One-piece thick lenses
- ✓ Custom made IOLs

- Post op residual refractive error
- AC depth
- Angle closure by oversized IOL



Anesthesia and preparation

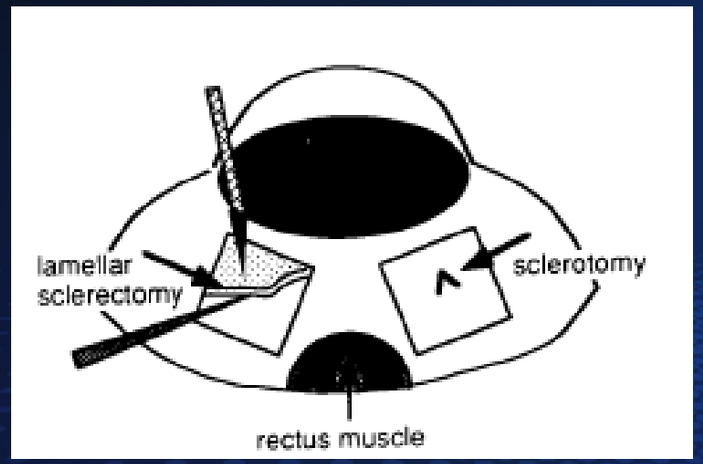
Anaesthesia Related

- Preop Mannitol
- Minimize positive pressure
- Avoid retrobulbar block
- Consider general anesthesia

- History of contralateral eye behavior
- Preoperative IOP
- choroidal thickness and scleral thickness

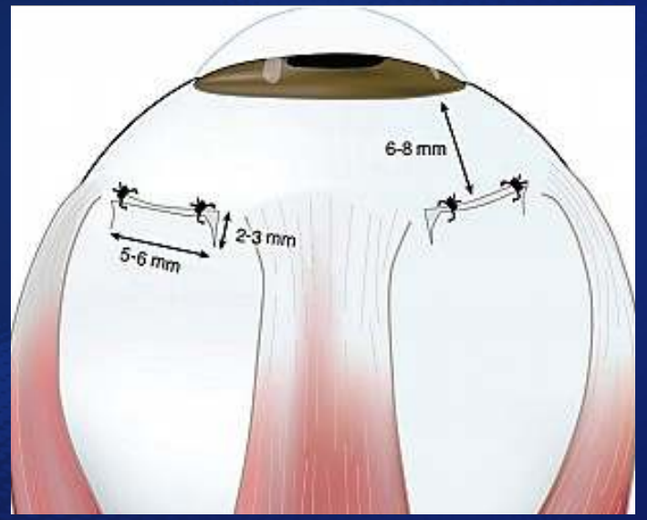
Strategies to prevent complications

Anterior lamellar sclerectomy with sclerotomy



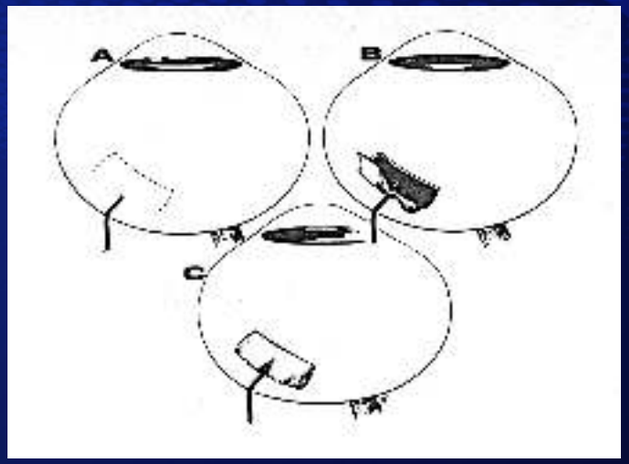
Wax MB, JOG, 1992

Posterior Sclerostomy



Kong M, KJO, 2013

Vortex vein decompression



Brockhurst RJ. Archives Oph, 1980

Role of prophylactic sclerostomy

AMERICAN JOURNAL OF OPHTHALMOLOGY®

A Randomized Controlled Trial Comparing Outcomes of Cataract Surgery in Nanophthalmos With and Without Prophylactic Sclerostomy

SHARMILA RAJENDRABABU, NARESH BABU, SAPNA SINHA, VIJAYAKUMAR BALAKRISHNAN, ASHOK VARDHAN, GEORGE VARGHESE PUTHURAN, AND PRADEEP Y. RAMULU

Conclusions: Cataract surgery in eyes with nanophthalmos is associated with a high risk for vision threatening complications. Performing a simultaneous prophylactic sclerostomy with cataract surgery reduces complication rates, particularly uveal effusions. Cataract surgery at earlier stages by phacoemulsification may be more beneficial than undergoing manual SICS.

Table 4: Complication rates in nanophthalmic eyes by method of cataract surgery (phacoemulsification vs. SICS)

Type of surgery	Group	Complications*	p value$
Phacoemulsification (n=33)	Sclerostomy (n= 17)	1(6%)	0.13
	Control (n= 16)	4(25%)	
SICS (n=27)	Sclerostomy (n= 12)	4(33%)	0.38
	Control (n= 15)	8(53%)	

* Includes both intra and post operative complications.

$- Chi square test.

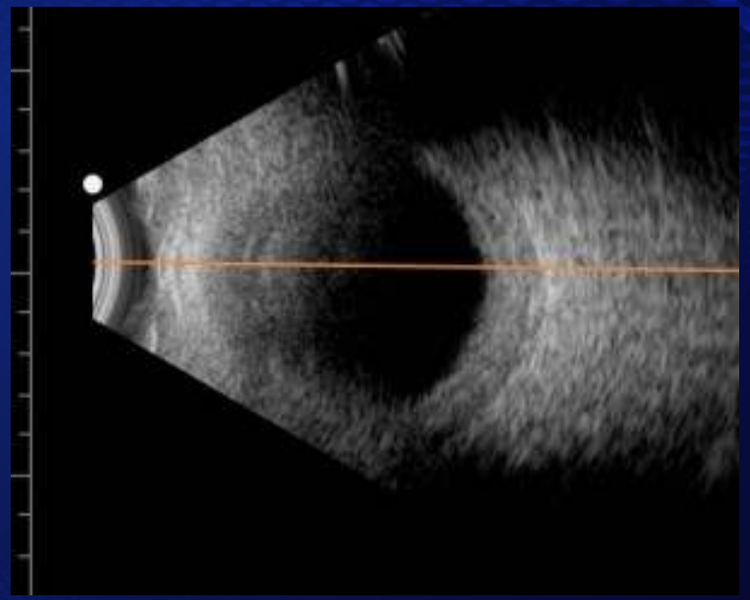
Larger incision and No sclerostomy--- increased the risk of uveal effusion

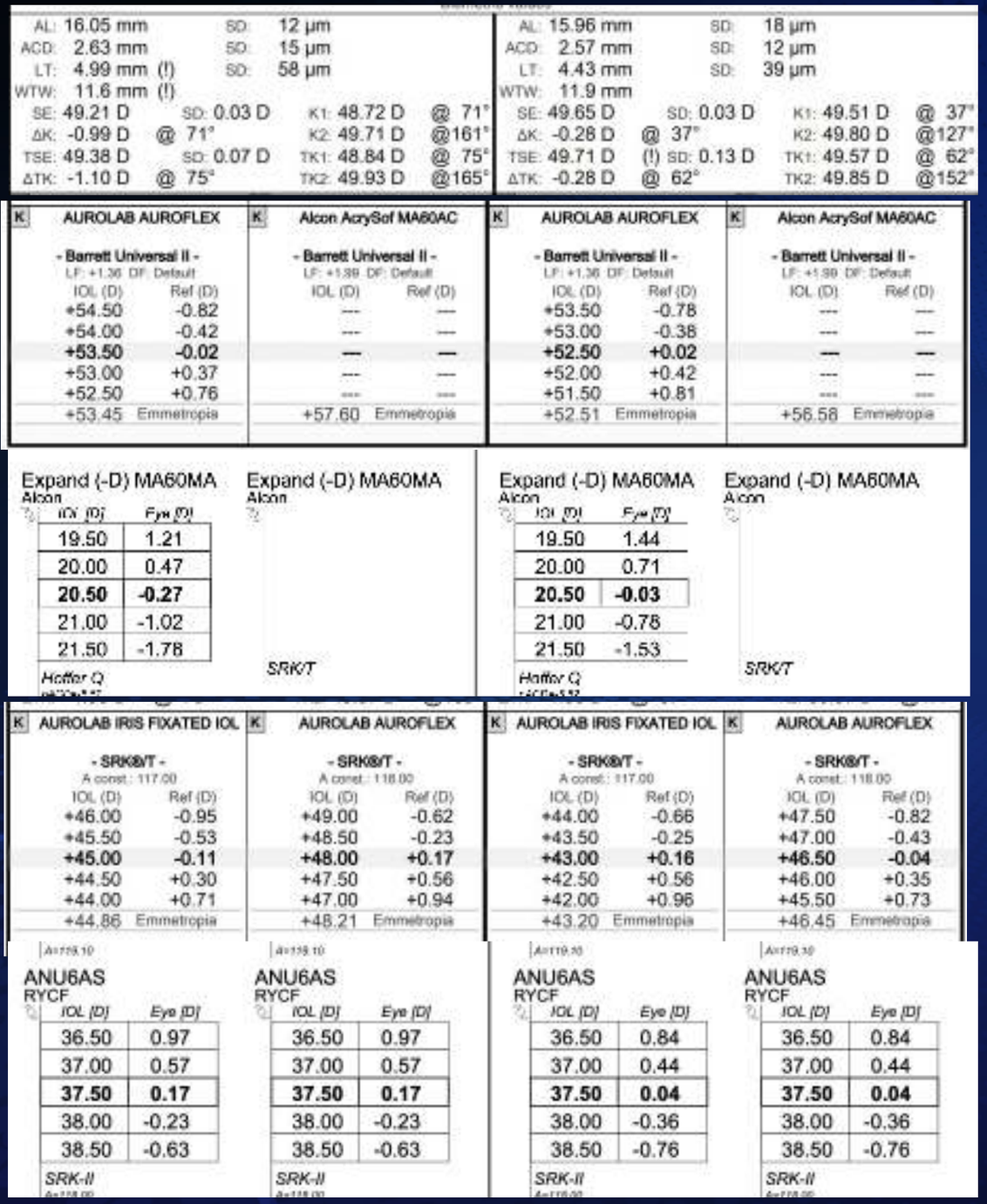
(1) 6% vs (8) 53%

66 male, IOP under control

20/80 with +18, +17 D

CT 1.92mm AL 16.05, 15.96 mm





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LE IOL power suggested by various formulae

- **+53 Barrett II**
- +20.5 Hoffer Q
- +43.5 SRK/T
- +37.5 SRK -II

- Difficulty with capsulorrhexis
- Iris prolapse
- Endothelial cell loss
- Posterior capsular rupture

- Deal with thick sclera—prophylactic sclerotomy
- Posterior pressure—PPV/IZHV
- Proper wound construction
- Maintaining the anterior chamber
- Viscoelastic use to keep Ac formed and avoid hypotony

+55 D IOL power, Thinner optic special design

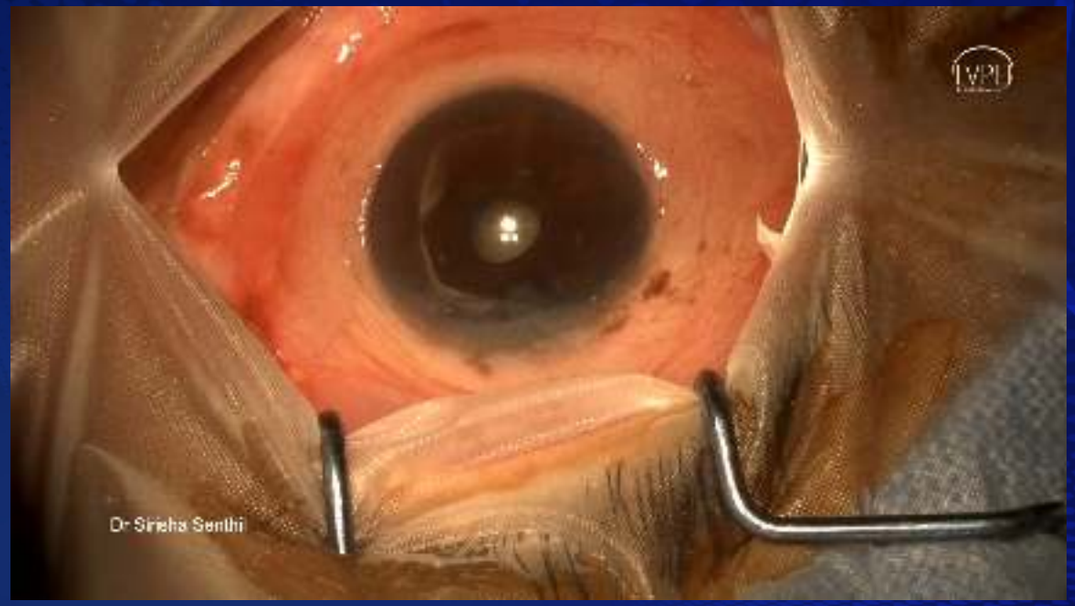
Postoperatively

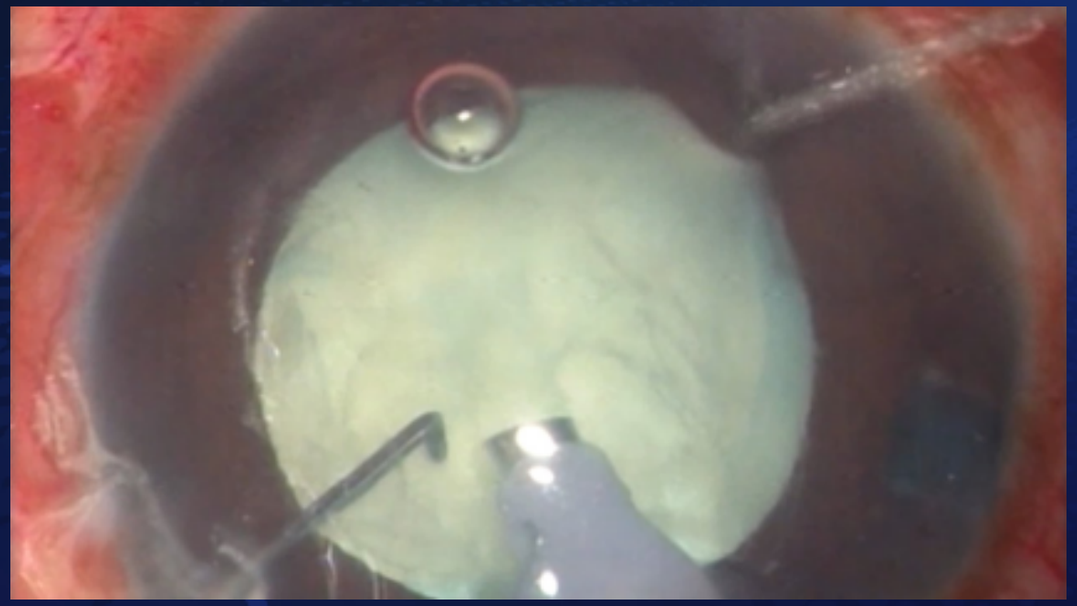
Final Subjective Refraction							
	Sph	Cyl	Axis	PRISM	BASE	BCVA	Add for Near Vision
Right Eye	-1.50	0.00	0	--	--^{0} --	20/60p	+3.00 6/6
Left Eye	0.00	0.00	0	--	--^{0} --	20/60p	+3.00 6/6

AL [mm] 15.51*
CCT [µm] 514
AD [mm] 3.54
ACD [mm] 4.06
LT [mm] 1.27

AL [mm] 15.69*
CCT [µm] 515
AD [mm] 2.89
ACD [mm] 3.40
LT [mm] 1.14

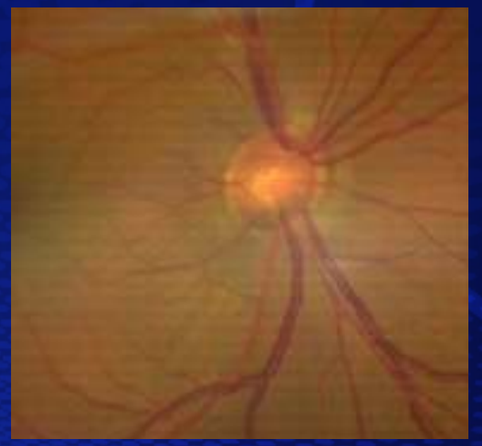

Dr.Sirisha Senthil

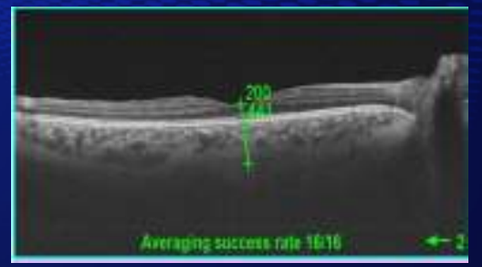

Dr Sirisha Senthi

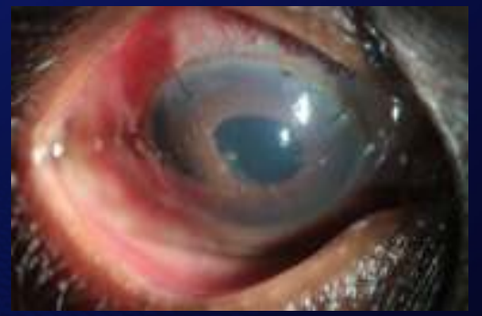


POSTOPERATIVE ISSUES TO BE ADDRESSED

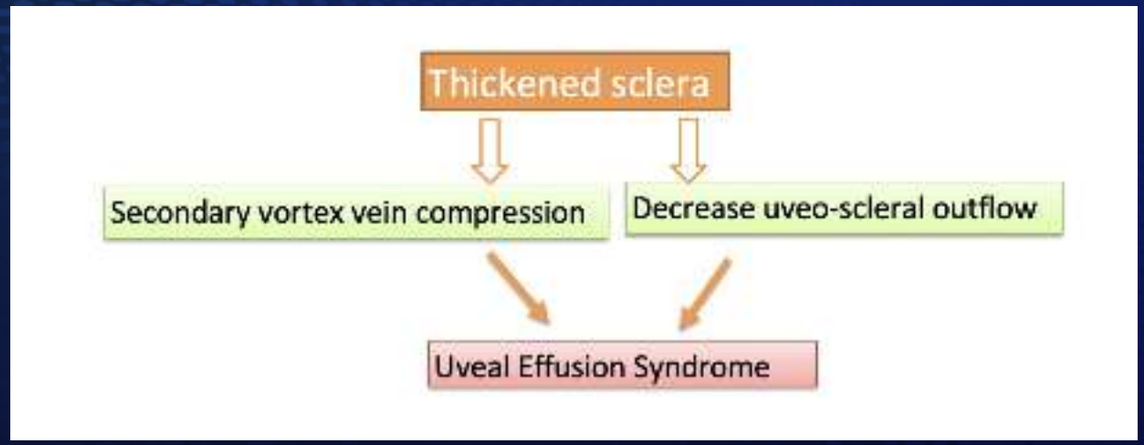
- Residual Refractive Error--Hyperopic
- Severe Inflammation, Aqueous Misdirection
- Uveal Effusion—9.3% eyes

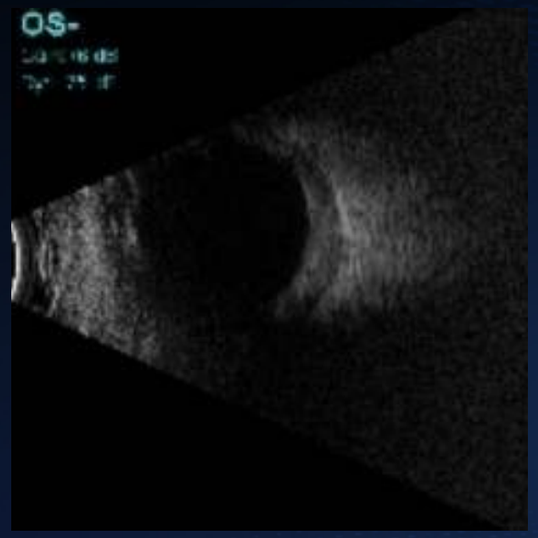


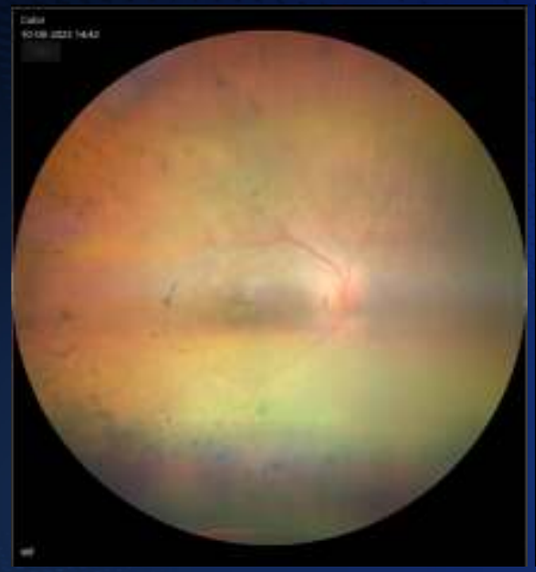




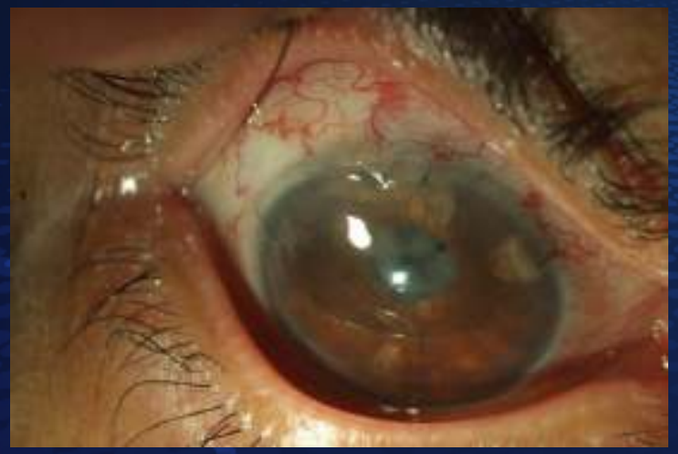
Steijns et al.

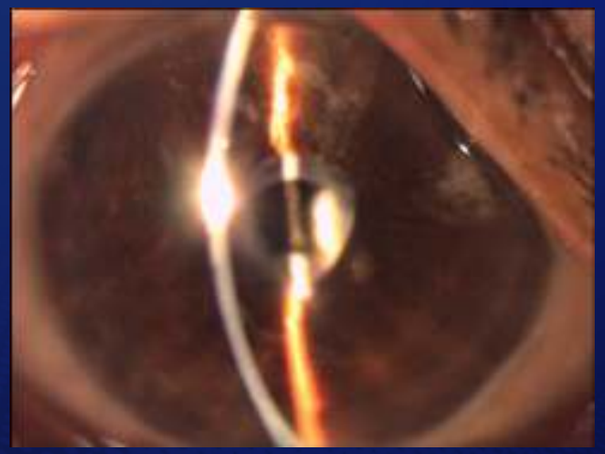






- 46-year-old
- 13.4 mm AL
- Capsular phimosis
- Retinitis pigmentosa





Examine the posterior segment for associated retinal dystrophy

Outcomes and Complications of Cataract Surgery in Nanophthalmic Eyes with Preexisting Angle Closure

- 61 eyes from 46 patients (mean age: 51.5±11 years)
- The mean axial length was 16.75±1.5 mm
- BCVA significantly improved from 1.2±0.7 to 0.9±0.5 LogMAR ($p<0.05$)
- Mean IOP decreased by 3.7 mmHg and mean number of AGM reduced by 0.6
- **IOP controlled with no meds in 40% eyes, 50% eyes needed AGM but controlled IOP and intervention for IOP control needed in 10%**
- Complications were observed in 11 eyes (18%), most common being malignant glaucoma (5 eyes, 8.2%) and uveal effusion (3 eyes, 4.9%)

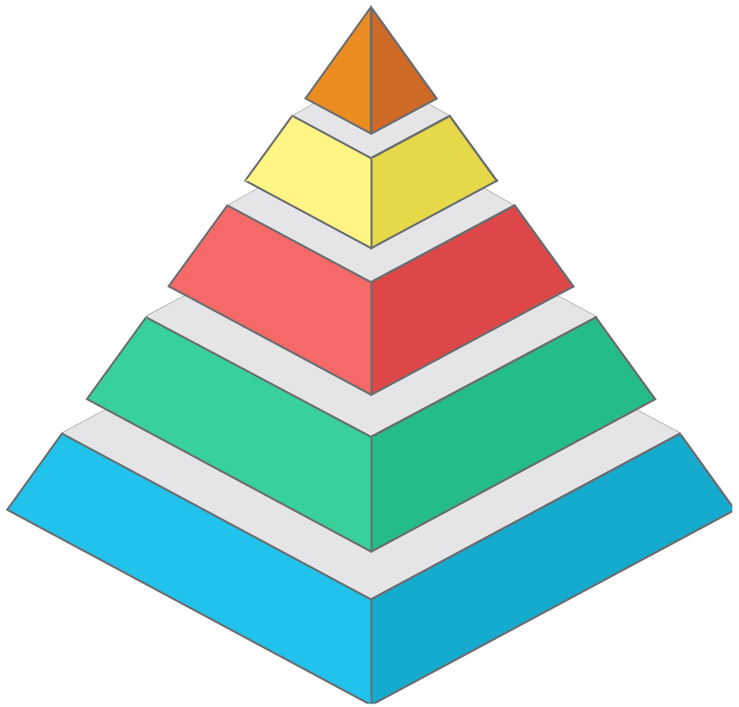
Under review

Summary

- Cataract surgery in Nanophthalmos eyes is challenging
- Preoperative mannitol
- Preop biometry and B scan, IOL power and type
- Anesthesia, sclerostomy, meticulous surgery
- Prepare for intra-op surprises
- Post op monitoring for complications
- Cataract surgery alone can control IOP in 90% eyes

LVPEI
So that all may see

L V Prasad Eye Institute



Thank You