

Richard Erdey, MD  
Erdey Searcy Eye Group

# What I'm doing differently 2024

# "Lifestyle" IOL's 2023



ReSTOR



Tecnis Multifocal



Panoptix



Tecnis Symphony



Vivity



IC-8\*



Crystalens

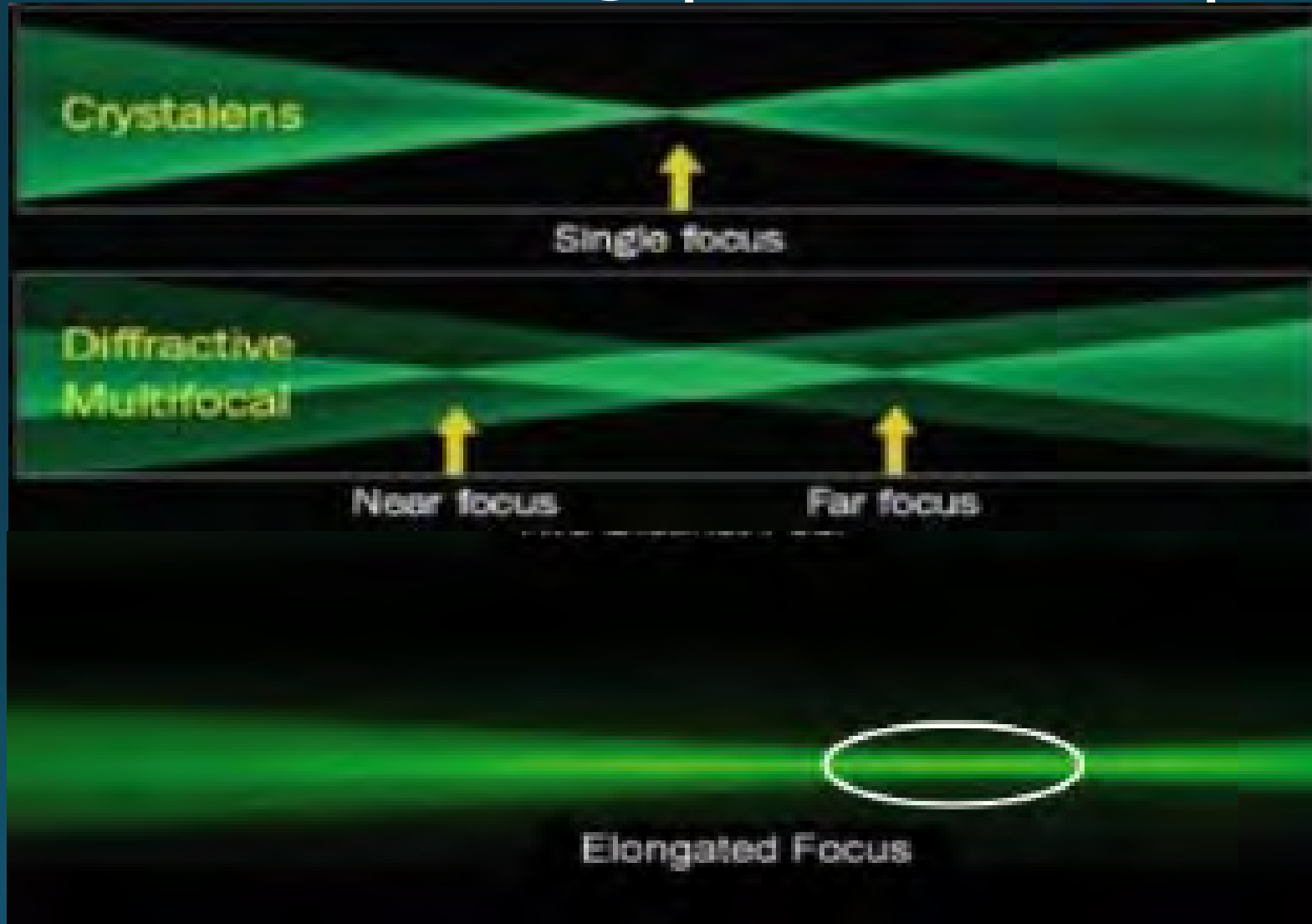
Multifocal

EDOF

"Accommodating"

# Crystalens – monofocal + hinge

## LAL – monofocal 3-piece C- loop



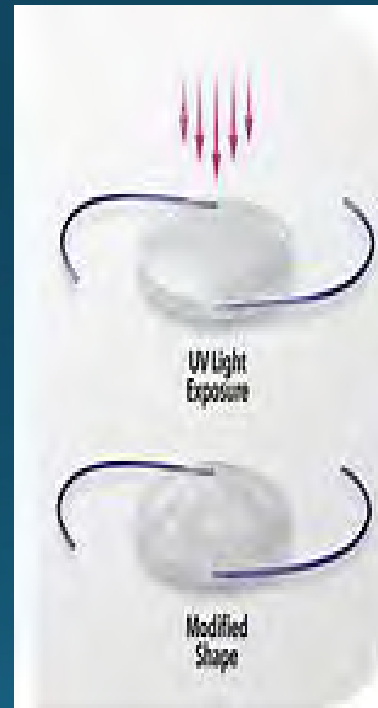
# "Lifestyle" IOL's 2024

- "Accommodating"



Crytalens/Trulign

Aspheric



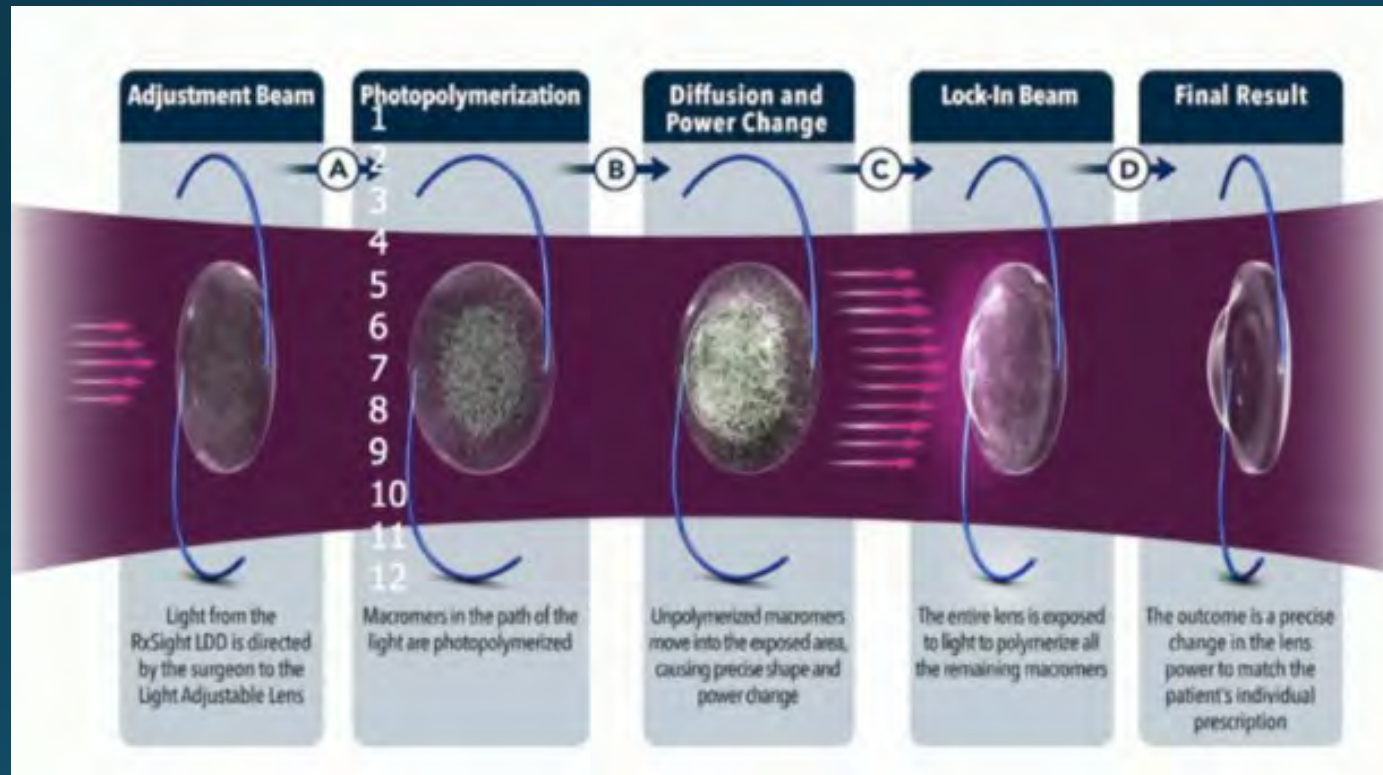
Light Adjustable Lens

Trifocal

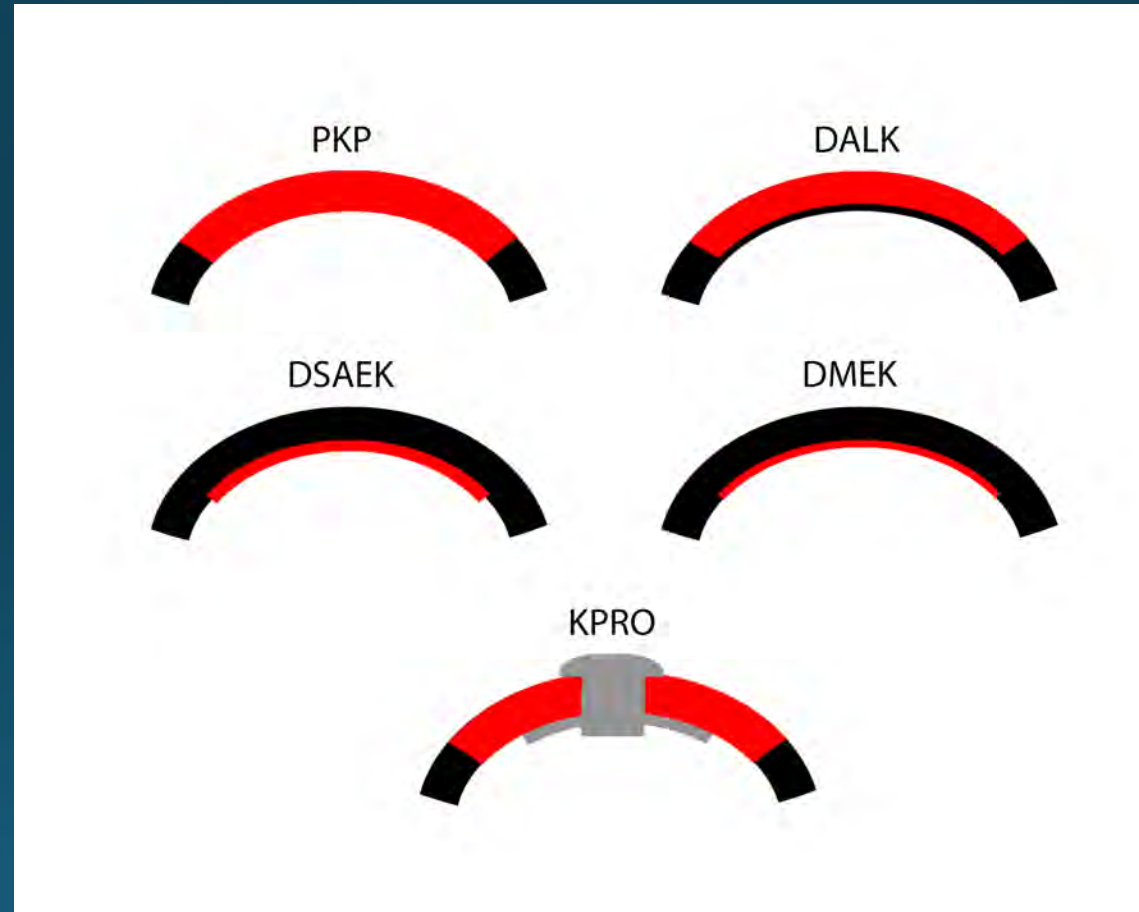


Panoptix

# Light Adjustable Lens (LAL)



# Keratoplasty: procedures

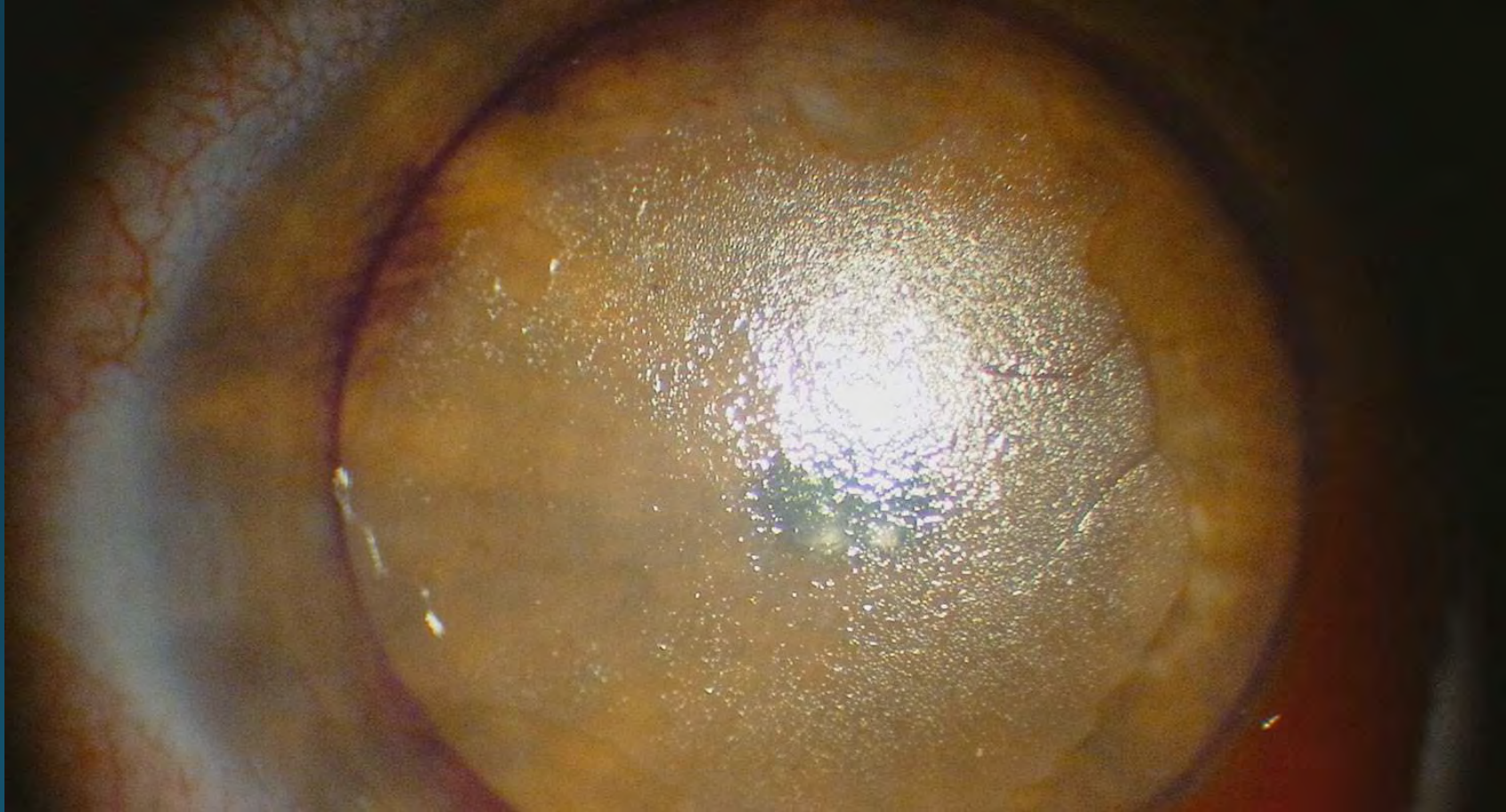


# Cornea endothelial Guttata

## Do they matter? YES!

- Raindrops: at what point do you turn on the wipers?
  - low contrast
  - dark w oncoming lights
- Fog: defroster?
  - near complete loss of view

# Guttata: Fuch's Corneal Dystrophy





# Impact of Guttata on results of Cataract Surgery

- 33,000 Cataract Surgeries (Sweeden)
- Guttata assoc with decreased Visual Results/Function

[View PDF](#) [Download full issue](#)

 **Journal of Cataract & Refractive Surgery**   
Volume 45, Issue 6, June 2019, Pages 803-809

Article

## The impact of corneal guttata on the results of cataract surgery

Presented at the XXXVI Congress of the European Society of Cataract and Refractive Surgeons, Vienna, Austria, September 2018.

[Andreas Viberg MD<sup>1</sup>](#), [Per Liv PhD<sup>2</sup>](#), [Anders Behndig MD, PhD<sup>1</sup>](#), [Mats Lundström MD, PhD<sup>3</sup>](#), [Berit Byström MD, PhD<sup>1</sup>](#)  

# Decisions?

## Rare scattered Guttae

- No change to refractive target
- Advise pt may eventually need DMEK
- Any IOL other than hydrophilic acrylic

## Dense Confluent Guttata

- DMEK (remove glare/haze)
- Staged with cataract surgery before or after

# Conclusions:

## DMEK and Cataract w IOL

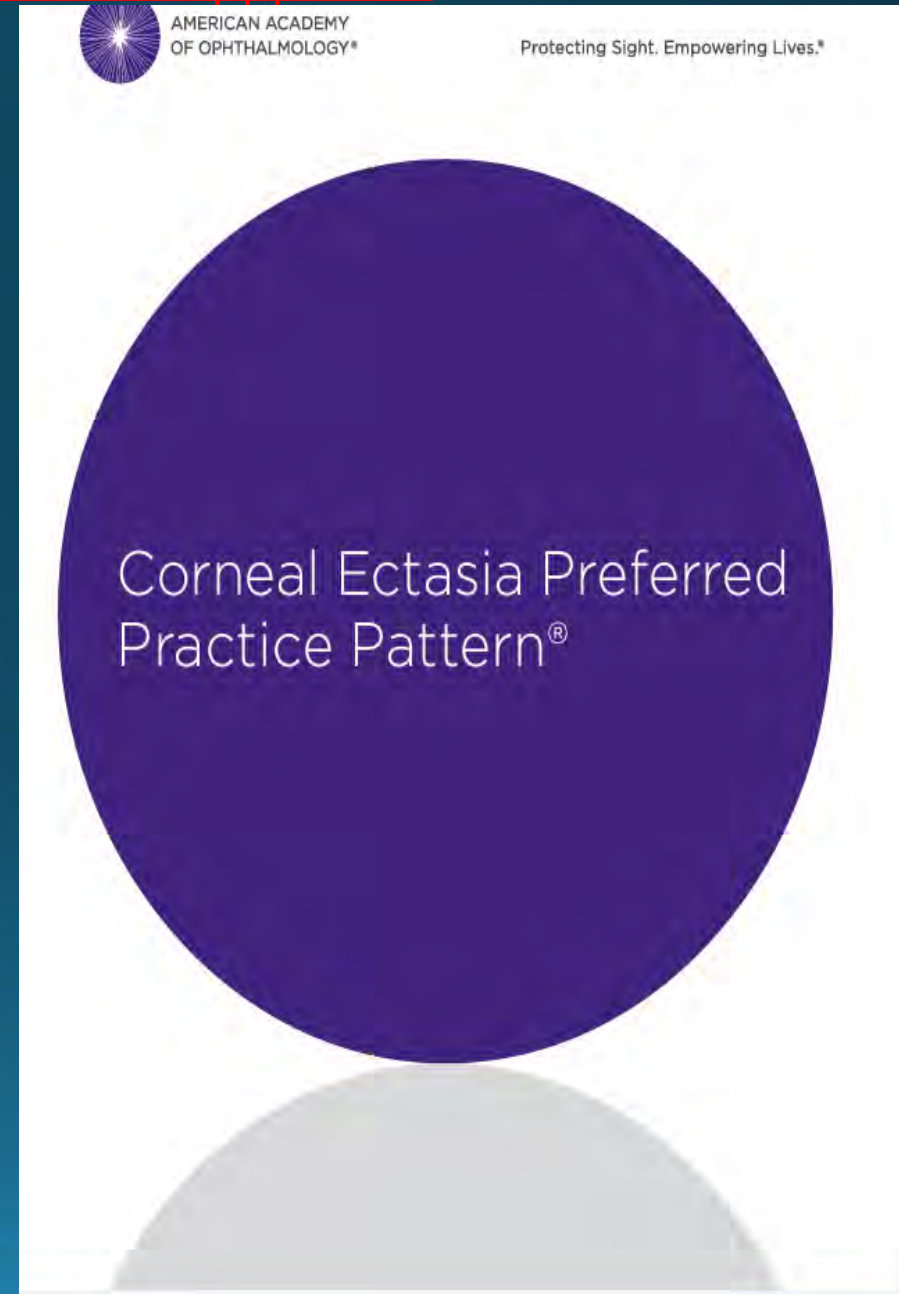
### Patients who desire optimal UCVA

- Triple or staged DMEK w Light Adjustable IOL (LAL) (95% >20/25 ):
- Phaco IOL staged AFTER DMEK w standard or crystalens
- Reduced dependence on glasses

<https://www.aao.org/education/preferred-practice-pattern/corneal-ectasia-ppp-2023>

# Cornea Ectasia 2024

- Keratoconus/globus
- Pellucid Marginal Degen
- LASIK/RK Ectasia



# Keratoconus 2024

- Incidence: 2-4% or higher
- LASIK surgeons decline at least 10% - (abnormal topography)

# Keratoconus: subset of Progressive Myopia

- onset 4-5yrs age
- Most myopia progress btw 5-25 yrs age
- Some btw age 8-12 yrs age manifest progressive astigmatism/corneal thinning

# Keratoconus – Corneal Warpage Treatment - Historical

- RGP contact lenses
- Penetrating Keratoplasty (PKP)

# Treatment corneal warpage 2024

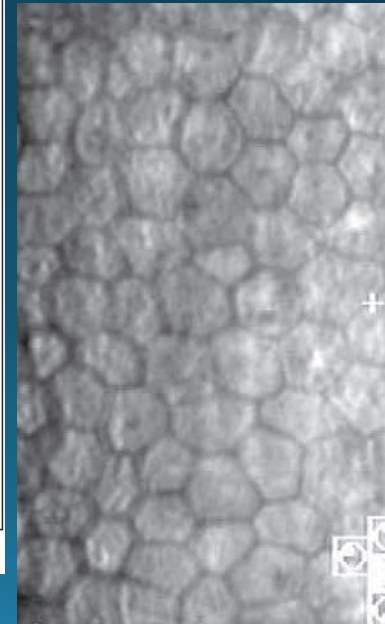
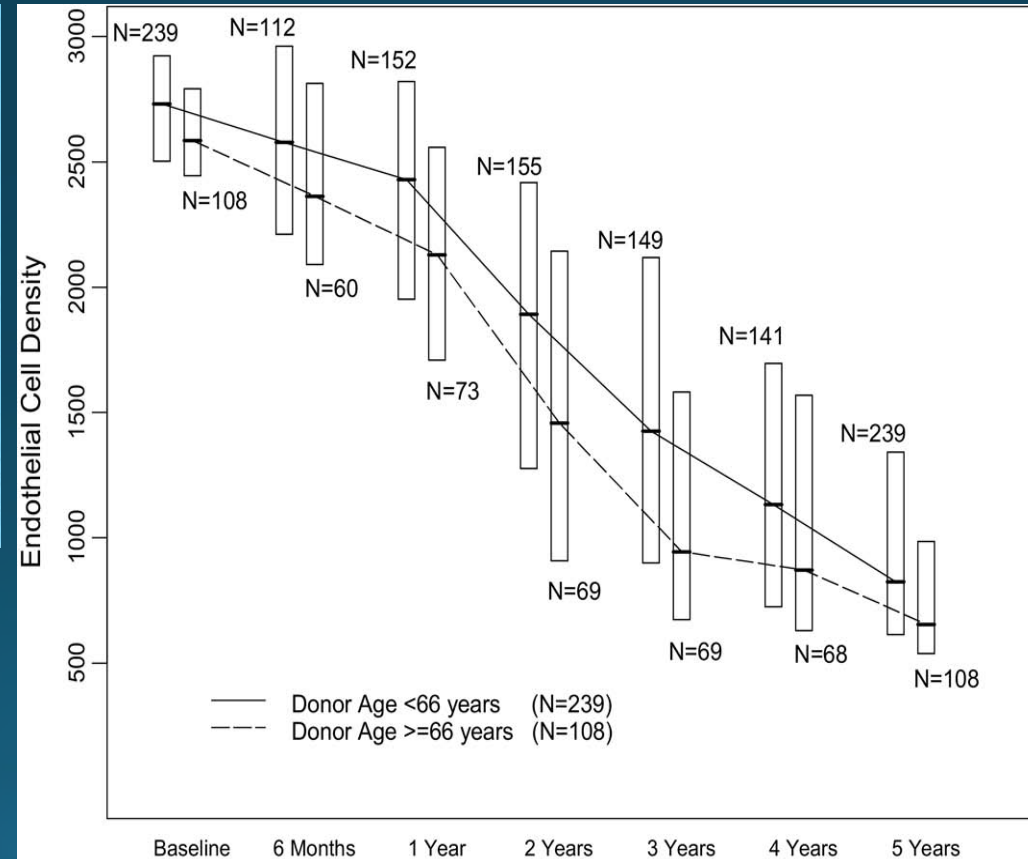
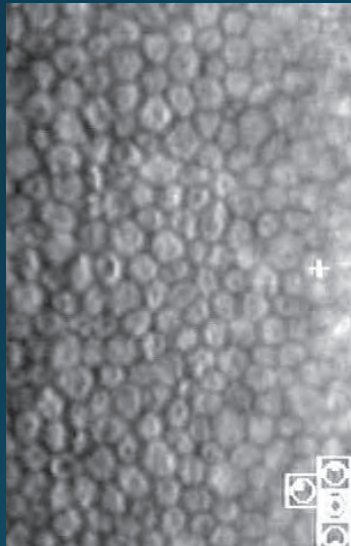
- Scleral (RGP) Contact lenses
- CXL epi-off / epi-on
- Intacs
- DALK 462 (USA 2022)
- Penetrating Keratoplasty (PKP) (15,000 USA 2022)



# Cornea Donor Study

## *Cornea Donor Study Investigator Group*

### Ophthalmology 2008



1-4 March 2018

Athens - Hilton Hotel

**32<sup>nd</sup>** International Congress  
of the  
Hellenic Society of Intraocular  
Implant and Refractive Surgery



European Society of Cataract and Refractive Surgeons

In collaboration with



Hellenic Ophthalmological Society



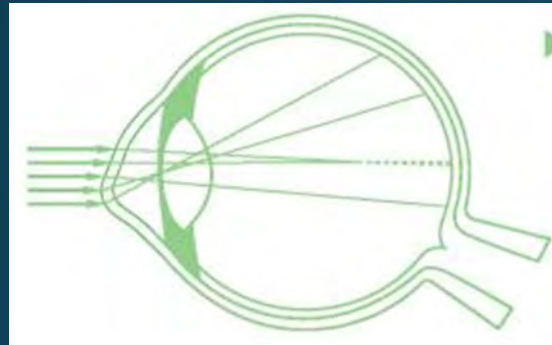
... there is no reasons for replacing an healthy

endothelium... EVER!!!

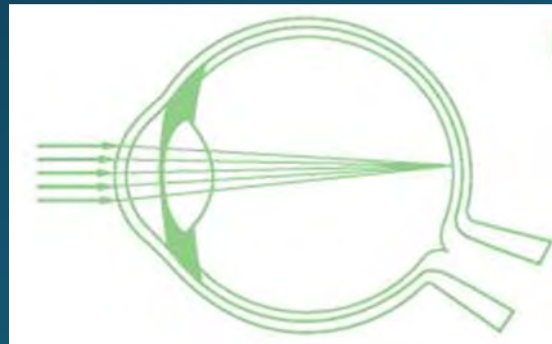
*V. Sarnicola, ESCRS, 2009*

# Corneal Cross-linking Keratoconus

- Here??



- YES!!



# 18 yo female

- Baseline glasses 2022

OD: -6.0 +2.5 x 90

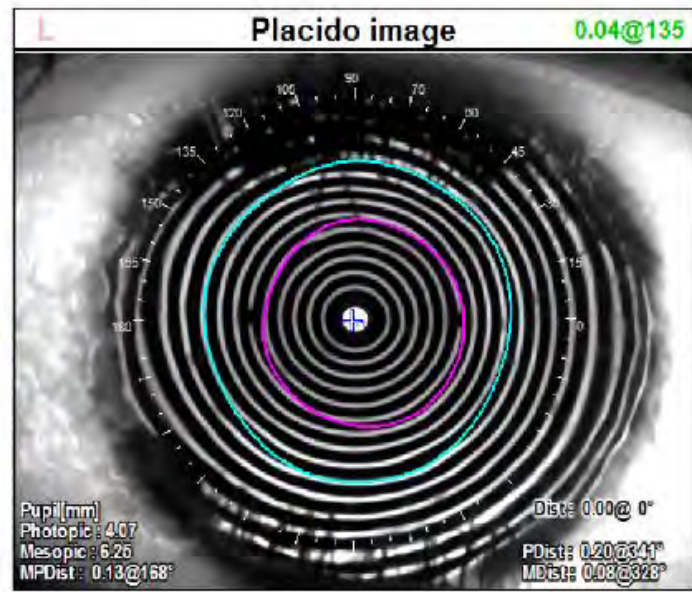
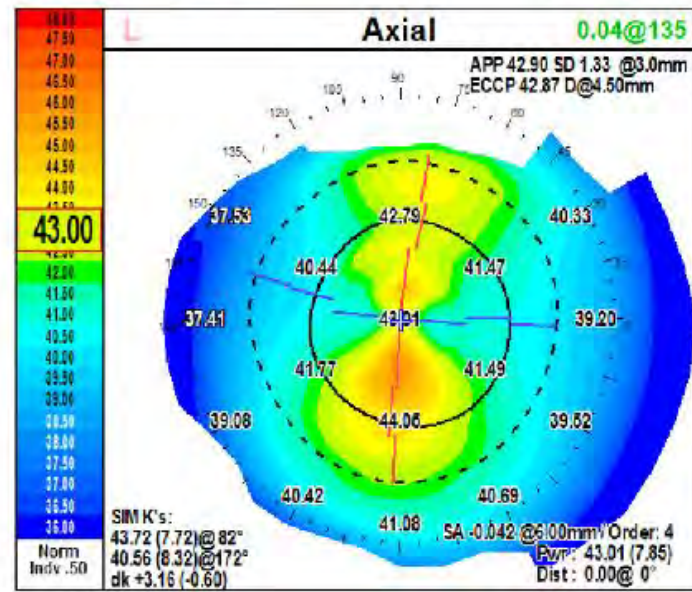
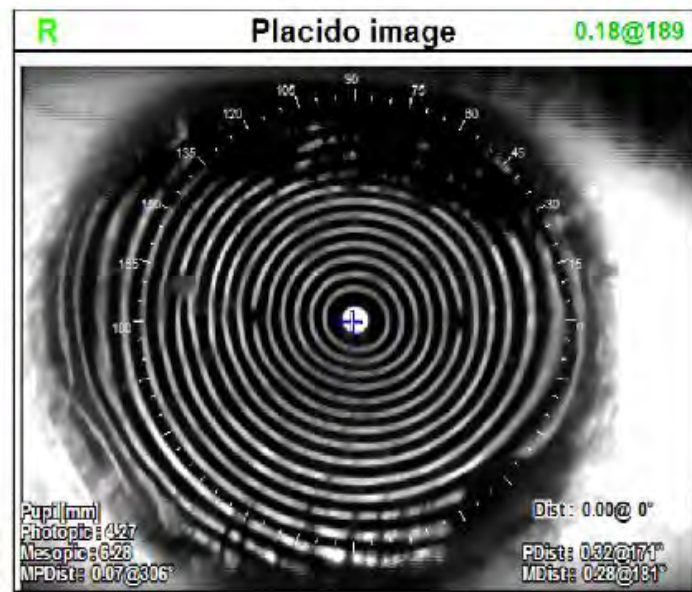
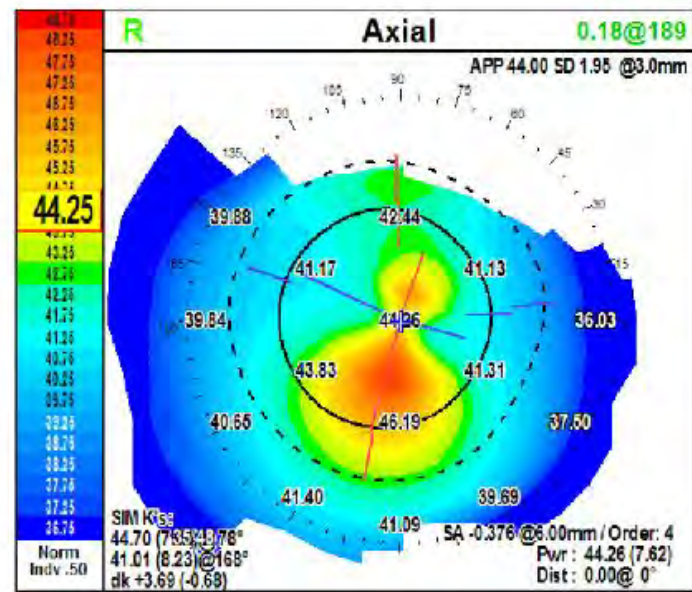
OS: -5.25+3.0 x 80

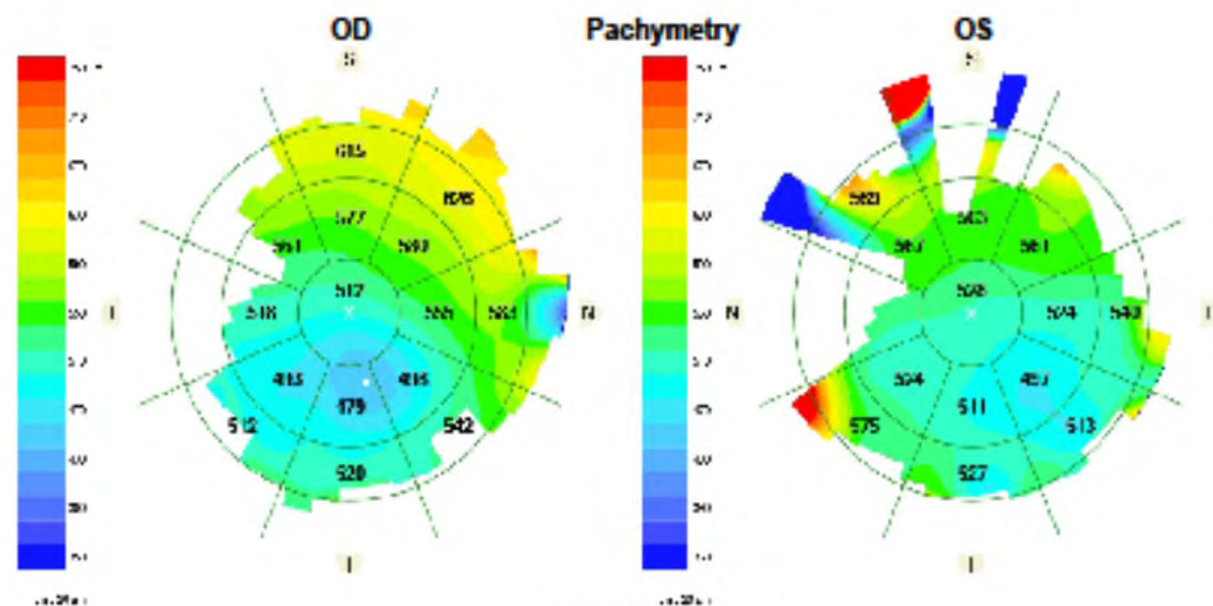
Now: March 2024

**OD: - 8.0 + 4.0 x 80 20/25**

OS: -6.25 +3.25x 85 20/25

L	03/08/2024 10:40	Comment	L	Diagnosis	L
R	03/08/2024 10:40		R		R



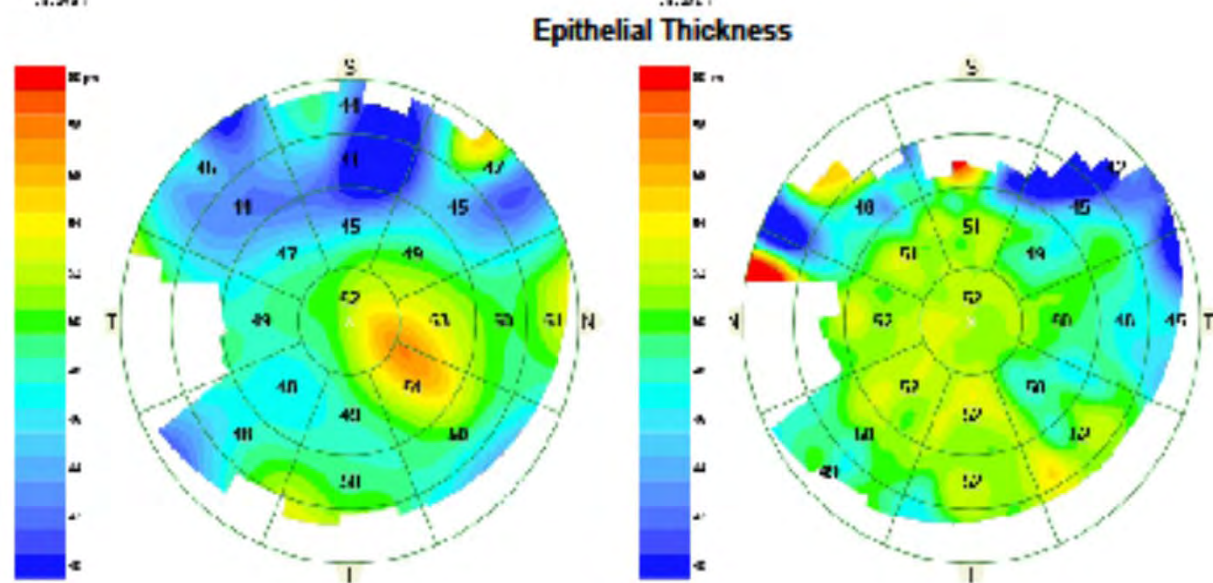


Pachymetry OD

Range (mm)	Min. (µm)	Avg. (µm)	Max. (µm)	S-I (µm)	SN-IT (µm)
0.0-2.0	458	512	554	-	-
2.0-5.0	453	533	609	98	87
5.0-7.0	493	566	651	95	114
Minimum Thickness (µm)		453	Y Min (µm)		-1295
Pachy Min-Median (µm)		-77	Central Corneal Thickness (µm)		510

Pachymetry OS

Range (mm)	Min. (µm)	Avg. (µm)	Max. (µm)	S-I (µm)	SN-IT (µm)
0.0-2.0	505	528	554	-	-
2.0-5.0	488	535	607	52	70
5.0-7.0	328	545	809	-	56
Minimum Thickness (µm)		301	Y Min (µm)		3478
Pachy Min-Median (µm)		-476	Central Corneal Thickness (µm)		527



Epithelial Thickness OD

Range (mm)	Min. (µm)	Avg. (µm)	Max. (µm)	S-I (µm)	SN-IT (µm)
0.0-2.0	49	52	58	-	-
2.0-5.0	39	49	58	-4	1
5.0-7.0	37	47	54	-9	-3
7.0-9.0	38	47	56	-	-
Minimum Thickness (µm)		37	Y Min (mm)		3.0
Min-Median (µm)		-11	Central Thickness (µm)		52

Epithelial Thickness OS

Range (mm)	Min. (µm)	Avg. (µm)	Max. (µm)	S-I (µm)	SN-IT (µm)
0.0-2.0	50	52	54	-	-
2.0-5.0	42	51	54	-1	1
5.0-7.0	34	49	55	-	-4
7.0-9.0	33	45	51	-	-
Minimum Thickness (µm)		25	Y Min (mm)		2.4
Min-Median (µm)		-9	Central Thickness (µm)		52

# Options?

- Change glasses
- Contact lenses
- PRK
- Intacs
- Toric ICL
- **CXL**



# 13 yo female

- 2 yrs ago vision “fine”
- Now: BSCVA “20/40” each eye
- No Topography
- K max 44
- Pachymetry 310u



# What is 20/20 Vision?

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- All of the following represent 20/20 vision

**20/20**

**20/20**

**20/20**

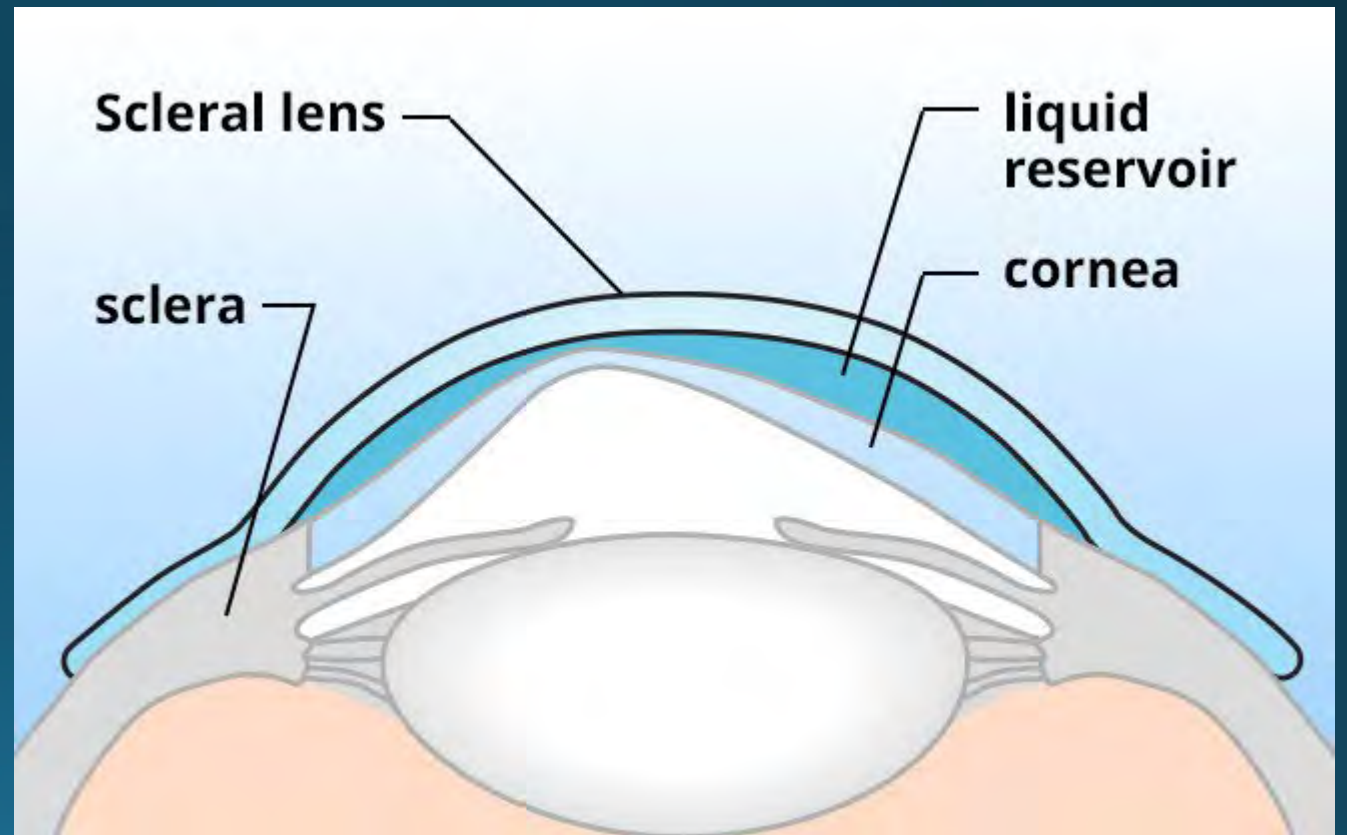
**20/20**

# 13 yo female

- Glasses?
- Scleral CL's?
- CXL? Then Scleral lenses?
- DALK?



# Scleral Contact Lenses - Short term vs Lifetime use



# Scleral Contact Lenses - Lifetime

- Cumulative risk significant
- Cumulative cost
- Non-compliance



# Scleral Contact Lenses - complications

## non-severe:

- 20% c/o difficulties w insertion/removal
- 23% abandoned Jupiter CL aft 3 mos
- 10% discomfort/pain
- 70% dec VA aft 4hrs wear Boston Scleral CL
- Transient Cornea edema
- Improve w removal/reinsertion

[Med Hypothesis Discov Innov Ophthalmol.](#) 2021 Winter; 10(4): 165–178.

PMCID: PMC10460232

Published online 2022 Feb 24. doi: [10.51329/mehdiophthal1435](https://doi.org/10.51329/mehdiophthal1435)

PMID: [37641653](https://pubmed.ncbi.nlm.nih.gov/37641653/)

Update on indications, complications, and outcomes of scleral contact lenses

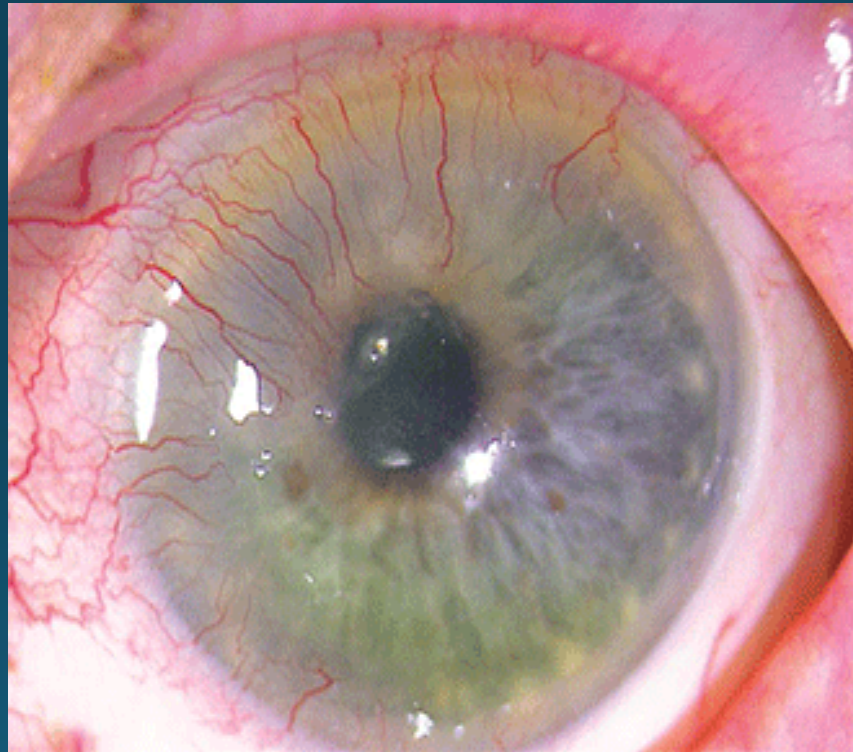
[Raul E. Ruiz-Lozano](#),<sup>1</sup> [Daniela E. Gomez-Elizondo](#),<sup>1</sup> [Maria F. Colorado-Zavala](#),<sup>1</sup> [Denise Loya-Garcia](#),<sup>1</sup> and [Alejandro Rodriguez-Garcia](#)<sup>1</sup>

Scleral Contact Lenses - Lifeti...

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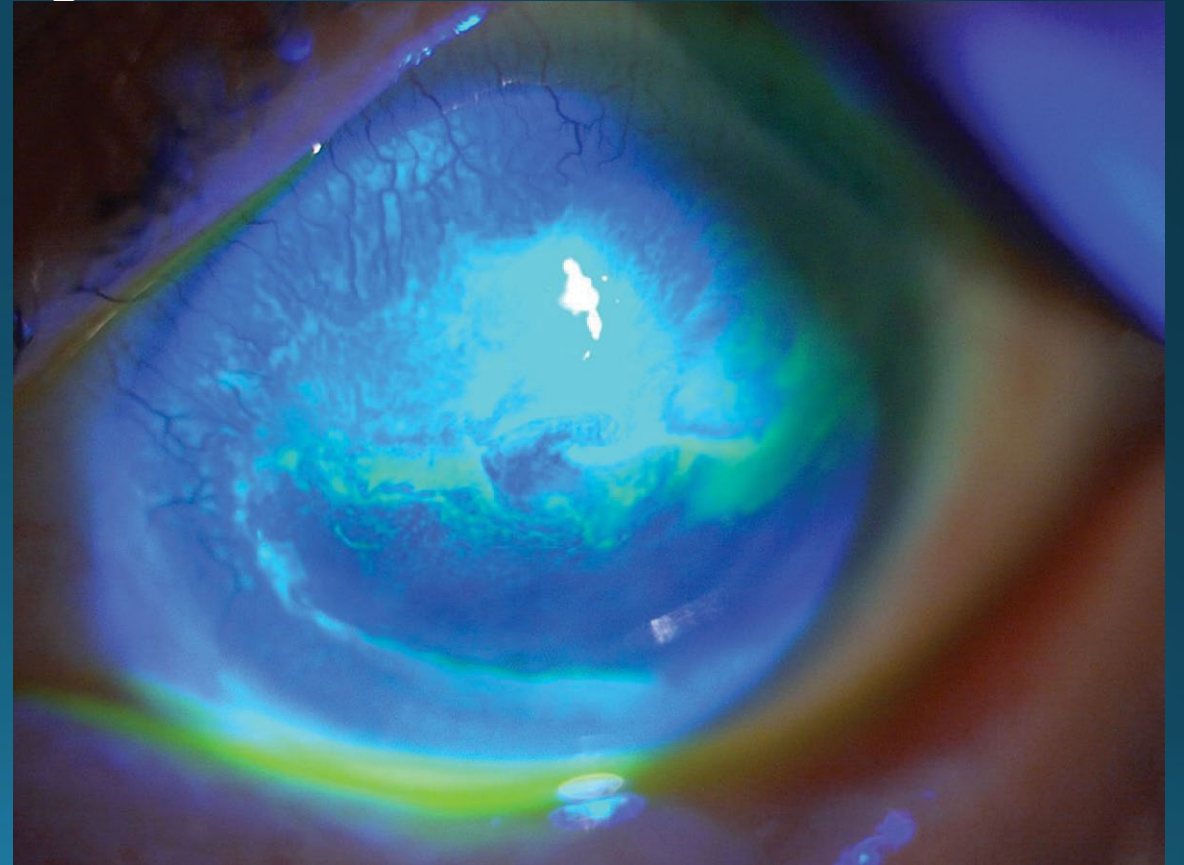
# Scleral Contact Lenses - Complications

## Long Term: Corneal neovascularization



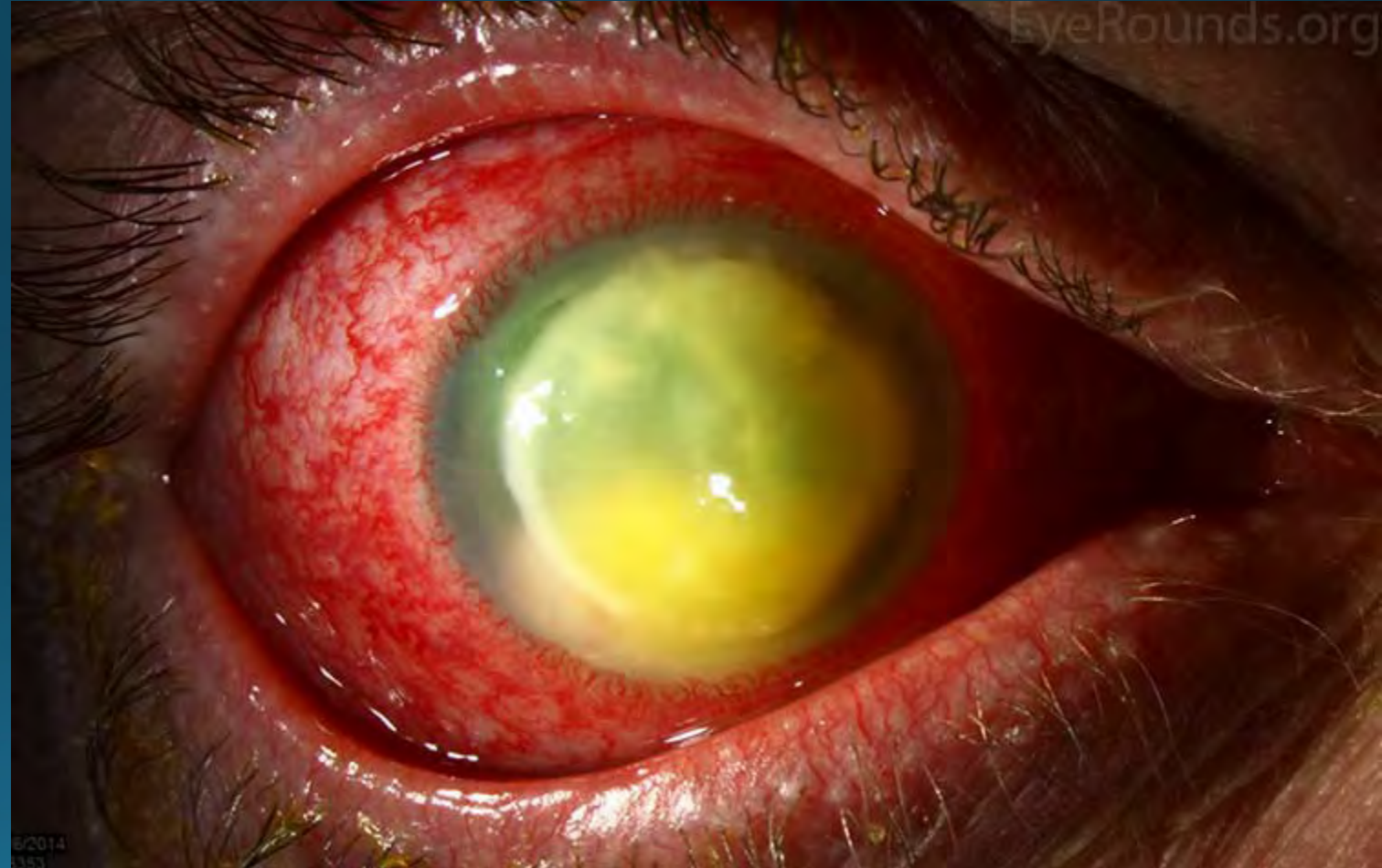
# Scleral Contact Lenses - Lifetime Cumulative risk stem cell failure

- Risk delayed reepithelialization /scarring after DALK



# Scleral Contact Lenses - Lifetime

- Cumulative risk significant
- Microbial keratitis





# Scleral Contact Lenses - Lifetime

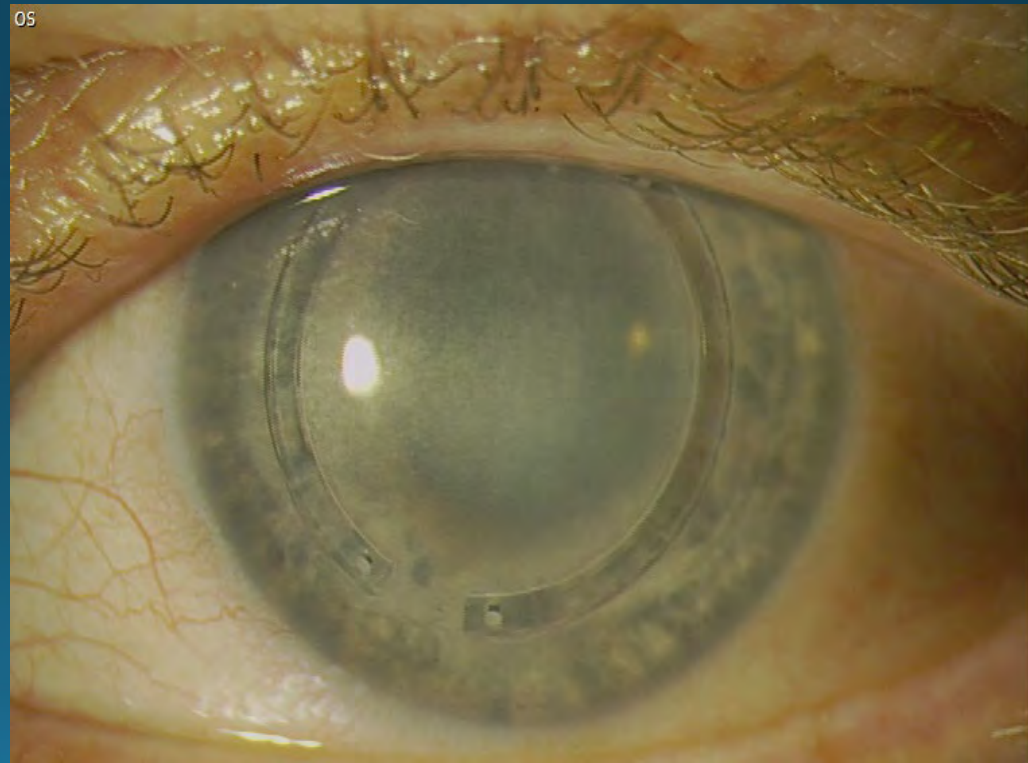
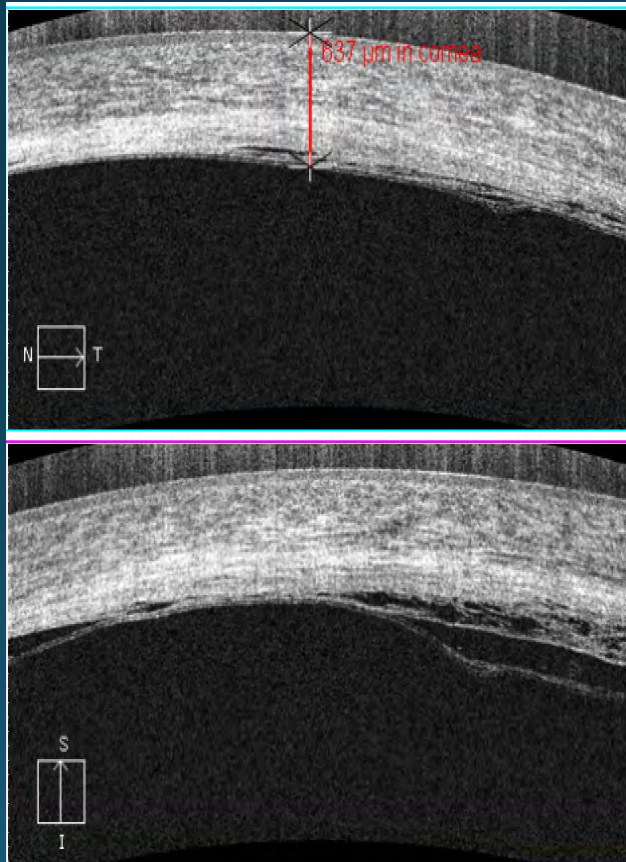
- Cumulative cost



# Cornea Cross-Linking - risks

- This pt has 310 u thickness – Thin cornea – endothelial toxicity
- Pre treat w Hypotonic riboflavin? No Long term f/u
- Delayed reepithelialization
- Haze
- Scar
- Microbial keratitis

53 yo hx Intacs/DMEK 2 yrs earlier  
2 days after CXL

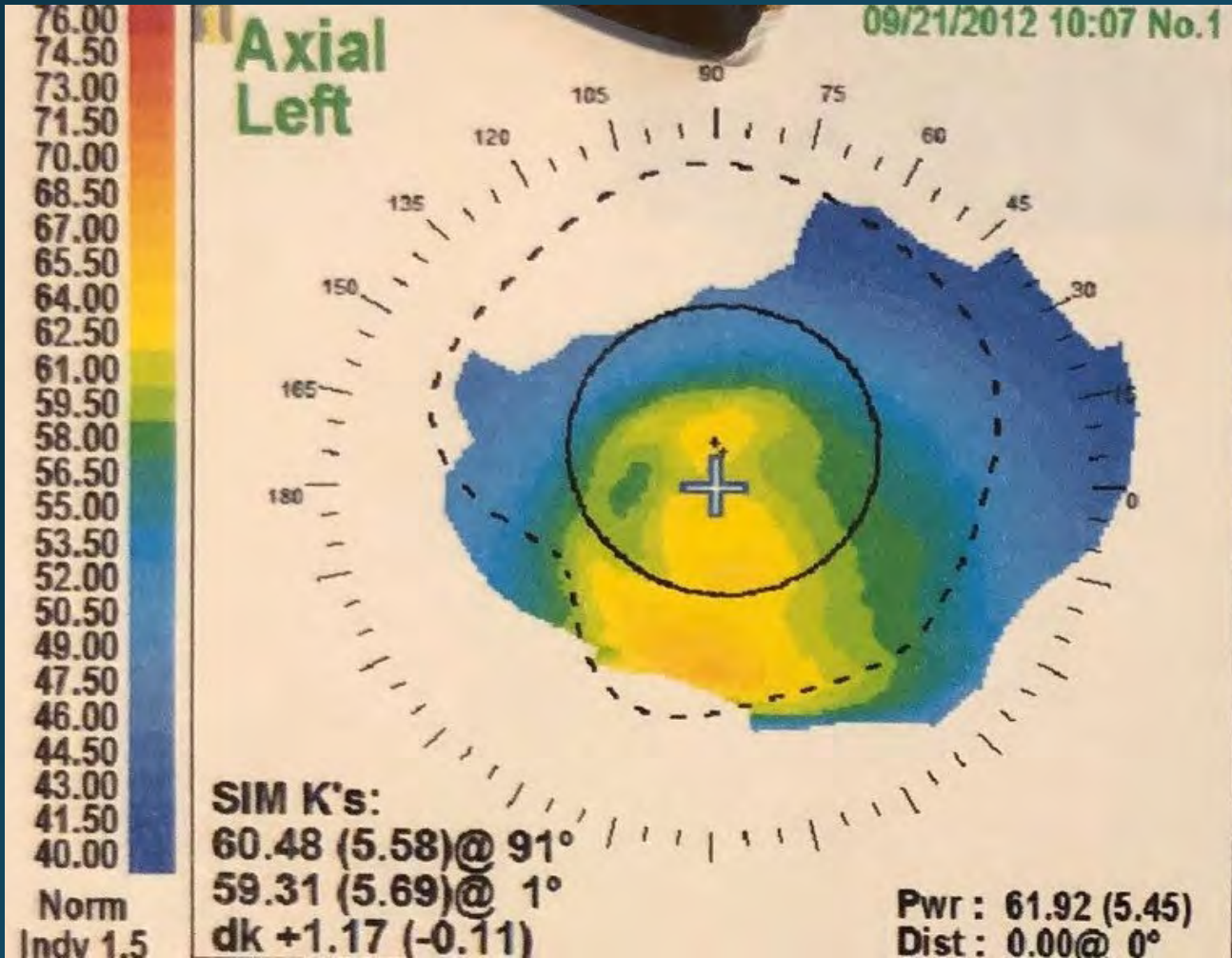


# DALK – large diameter

- Young age...Scleral CL's first?

# CASE

Dec. 2012 23yo male Keratoconus -19.0+6.25x93 20/300  
DALK 9.5mm pre-descemets dissection



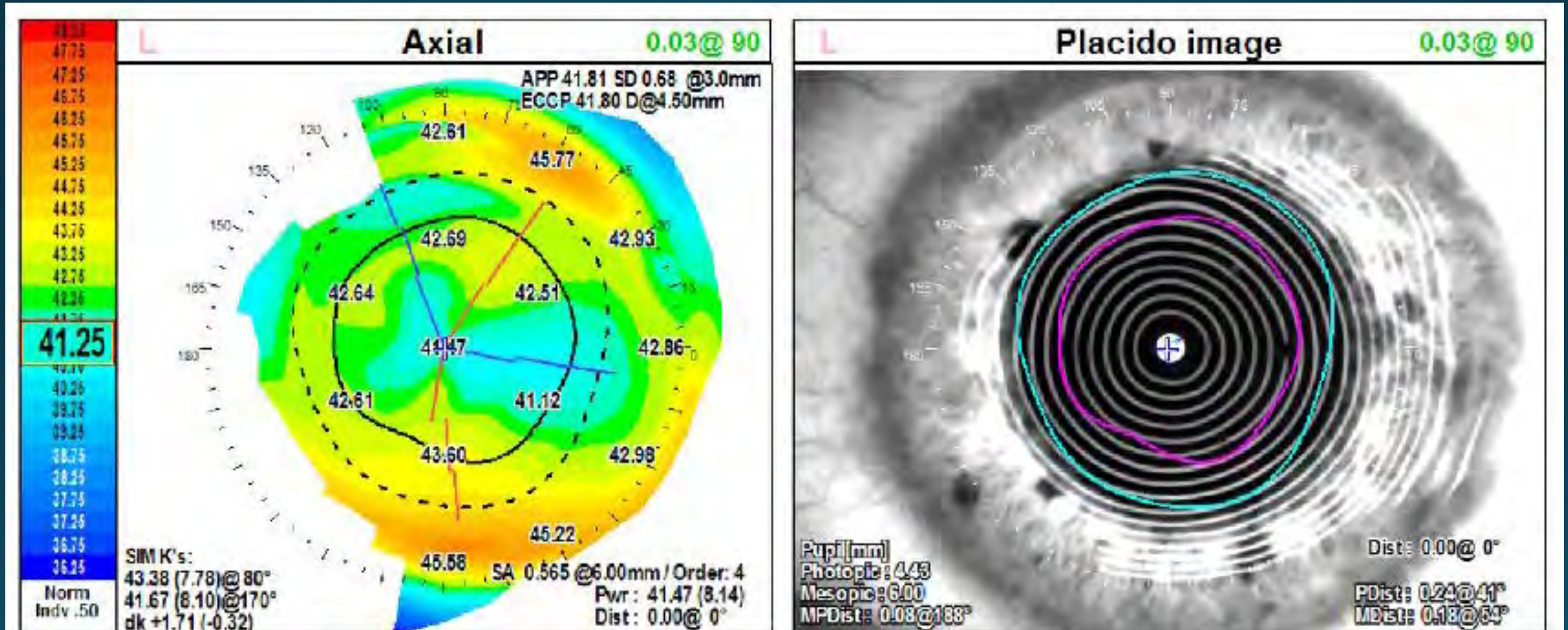
# Case

Now age 33

March 2023 (10yrs. aft DALK, 6yrs aft LASIK)

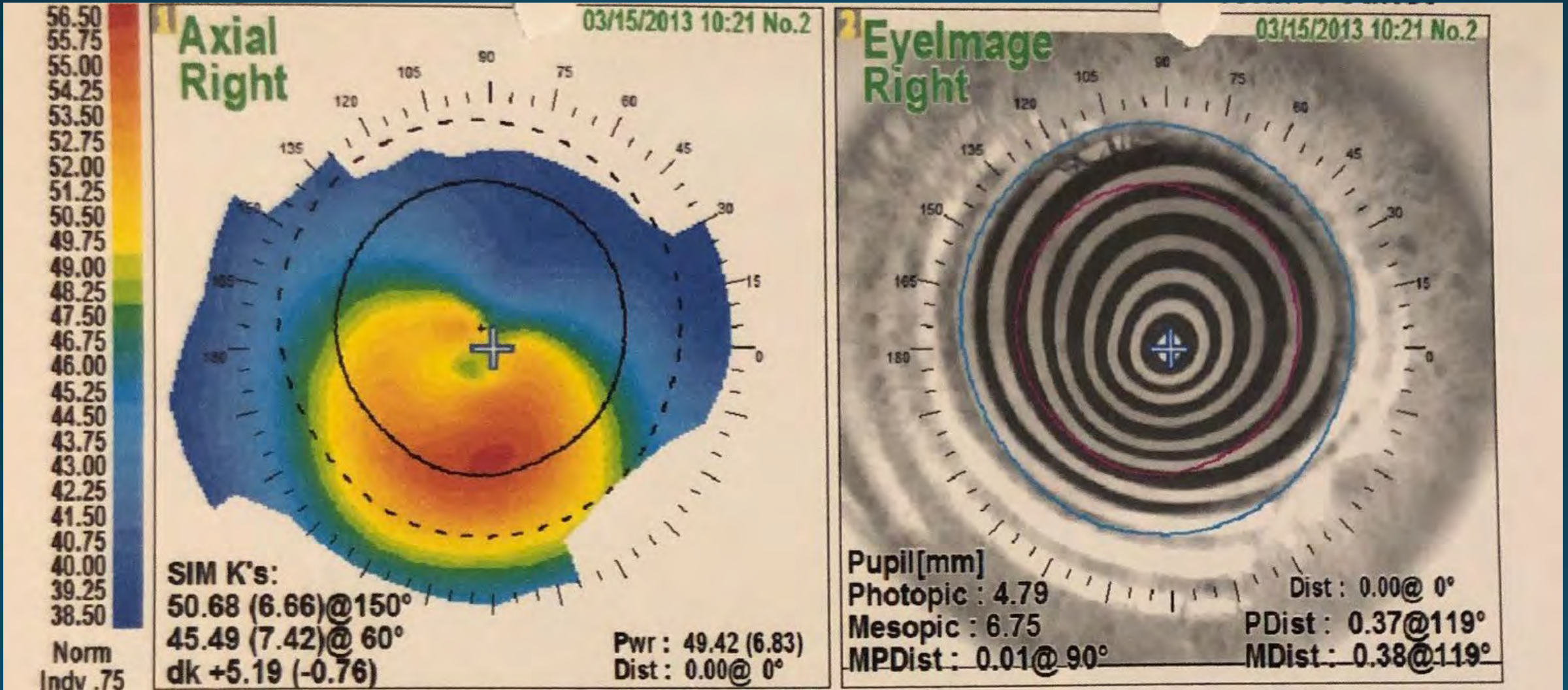
Uncorrected VA 20/25 -1+0.5x135 20/20

Left  
Eye



# Case

March 2013 24 yo male Keratoconus -6.0+3.75x133 20/40



# Case

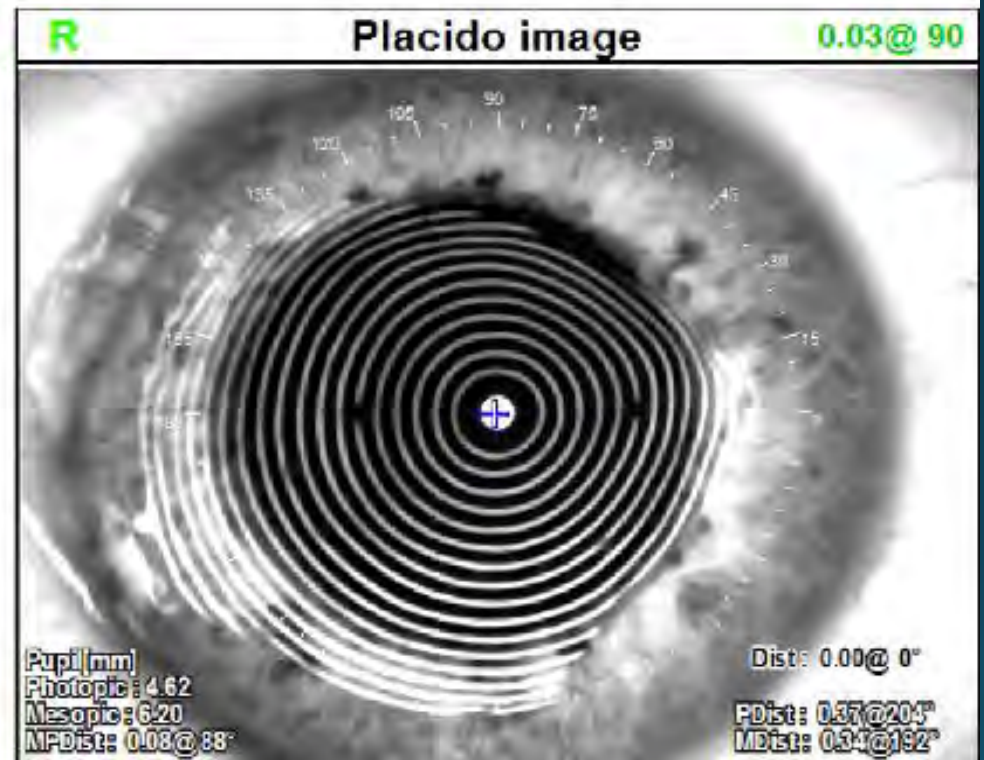
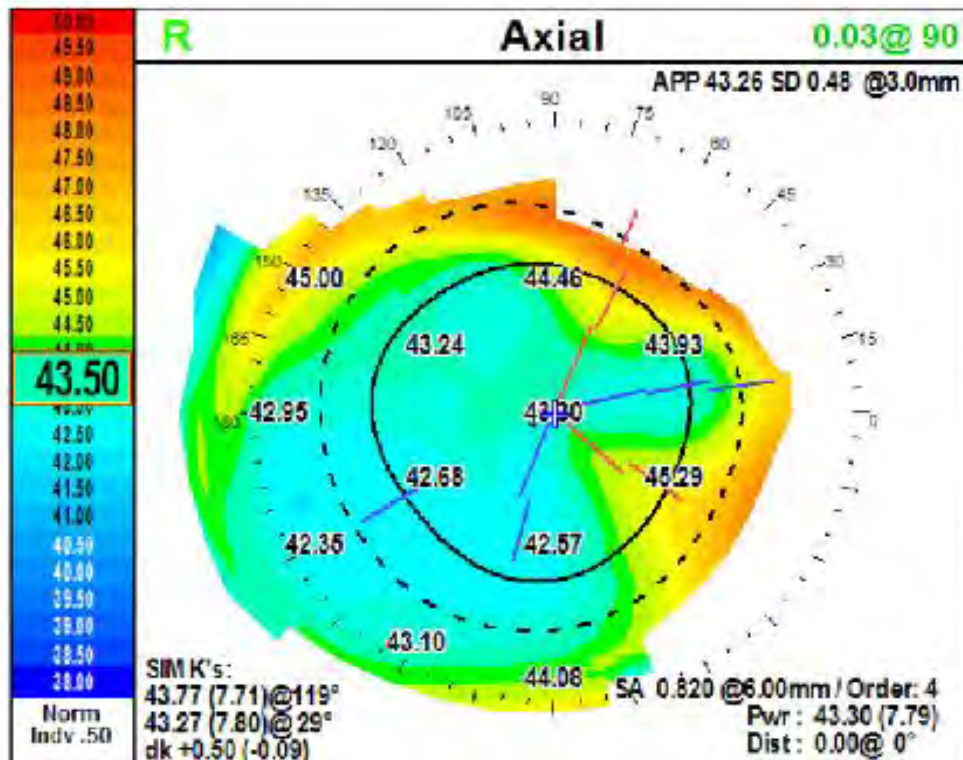
March 2023 now 33yo (9.5yrs aft DALK/5yrs aft LASIK,)

Uncorrected VA 20/20

-0.50 20/20

# Right Eye

R	03/01/2023 13:46	Comment	R	Diagnosis	R
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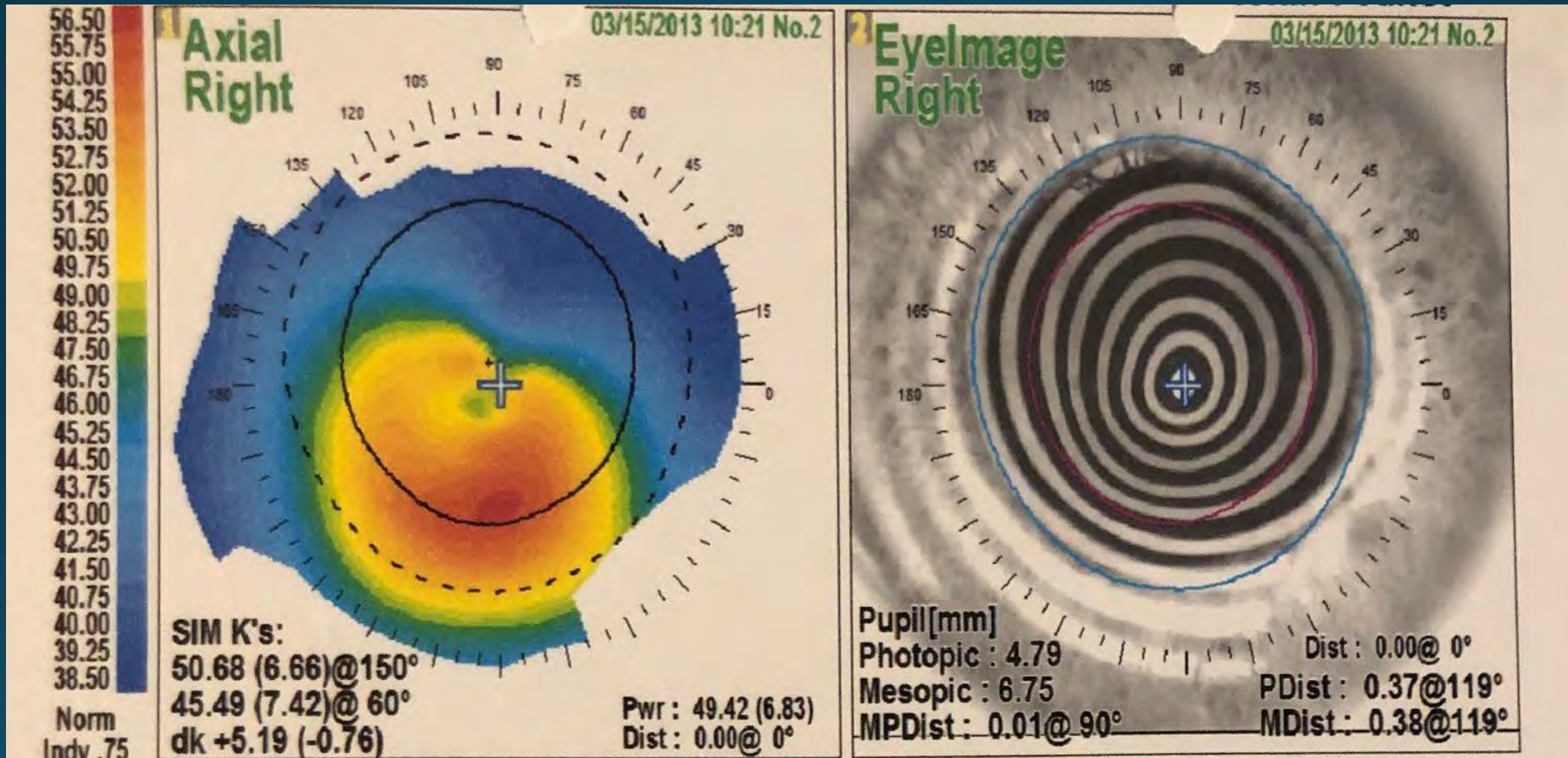




# Case back in time... CXL instead

Right Eye

March 2013 24 yo male Keratoconus -6.0+3.75x133 20/40



Let's assume pt above was 65 yo  
warped corneas entire life  
wears scleral CL's now with cataracts

Instead of LASIK for optical rescue

Could have cataract extraction w Light Adjustable Lens (LAL)

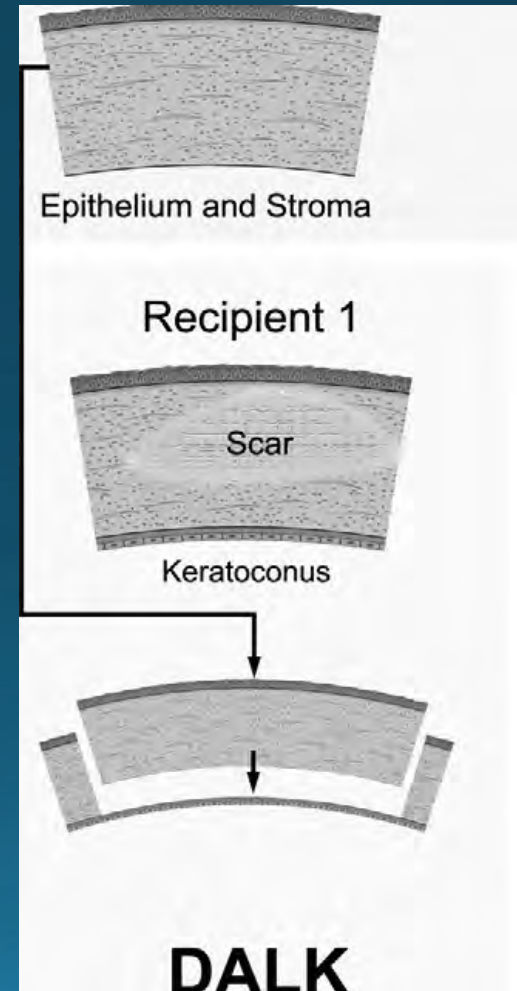
# Discussion w family

- What if not insured/cannot afford DALK?
- CXL?

# CXL warped corneas?

- Not ideal...When DALK surgeon is available with low conversion rates to PKP

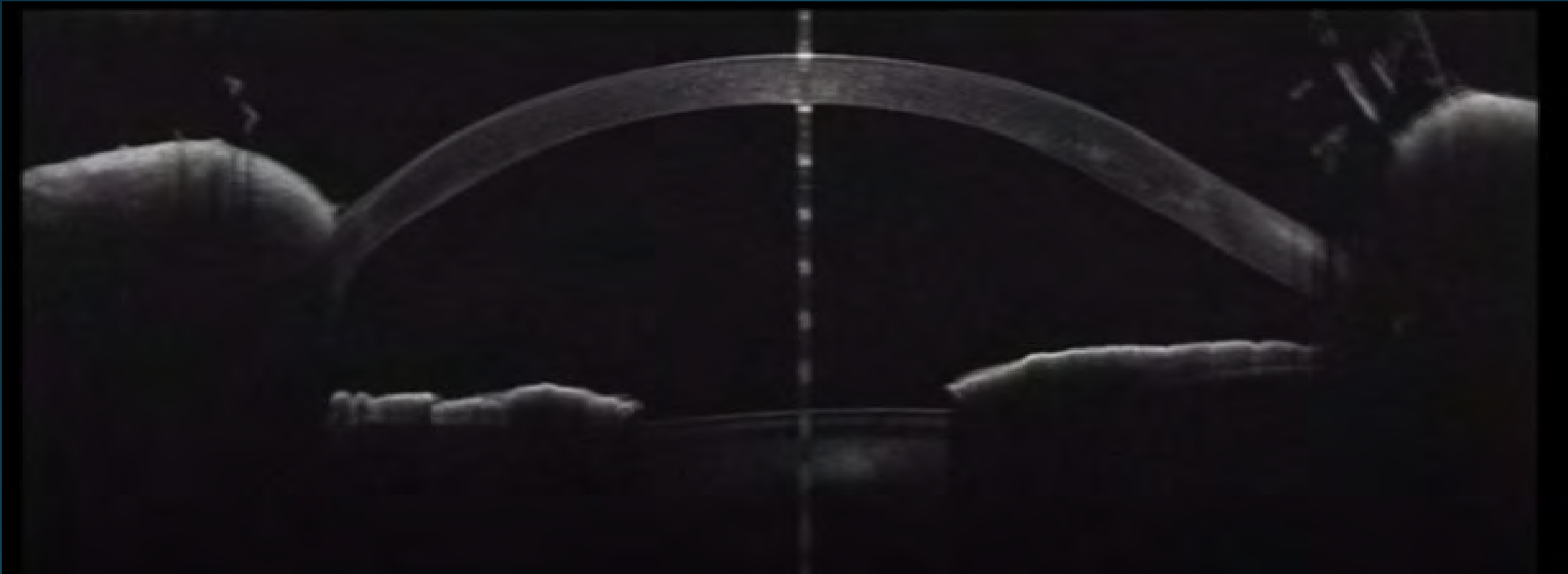
# Deep Anterior Lamellar Keratoplasty (DALK) Challenge:



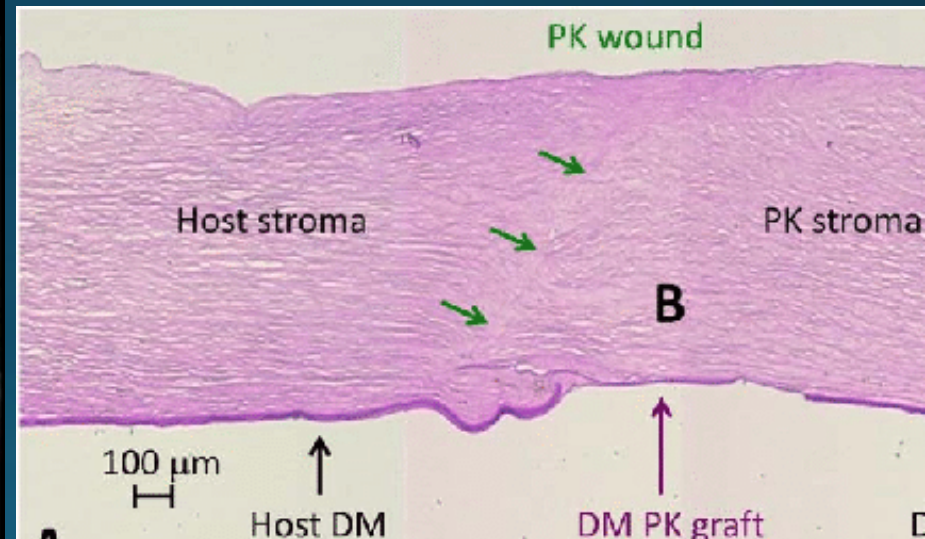
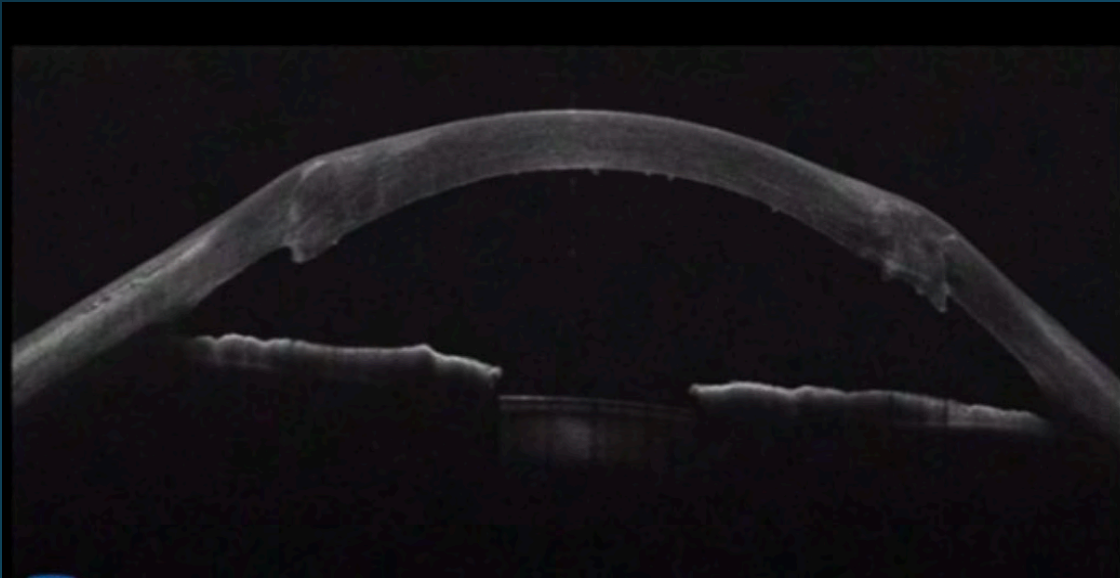
# DALK – Big Bubble Descemet's membrane dissection



# DALK: coaptation - optically best



# Penetrating Keratoplasty: PKP

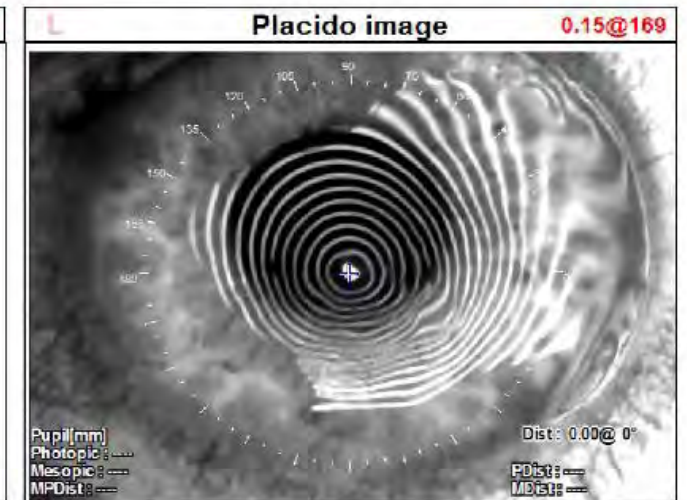
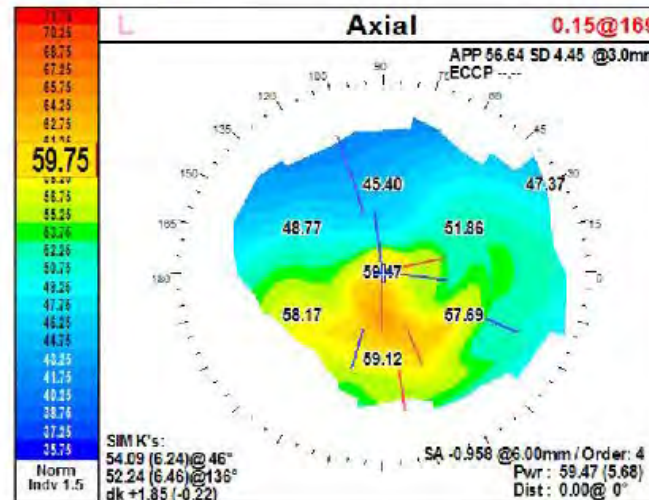
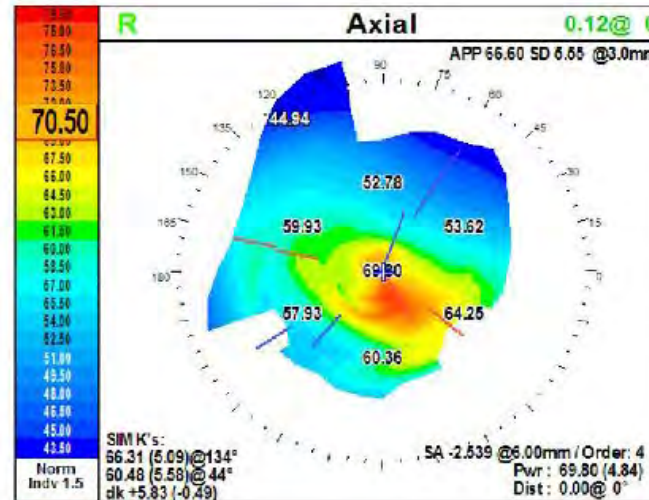




# 48 yo male Keratoconus scleral CL intolerant

2013 CXL OU  
2012 CXL OU

R	10/23/2023 14:48	Comment	R	Diagnosis	R
L	10/23/2023 14:48		L		L



# Deep Anterior Lamellar Keratoplasty (DALK) Conversion to PK? Richard Erdey, MD

- 300 attempted = 0 conversion to PK
- Micro/Macroporations fixed
- All grafts 9.5-10mm diameter



CLINICAL SCIENCE

## Outcomes of Conventional 8.0-mm Versus Large 9.0-mm Diameter Deep Anterior Lamellar Keratoplasty for Keratoconus

Lucisano, Andrea MD<sup>\*</sup>; Lionetti, Giovanna MD<sup>\*</sup>; Yu, Angeli Christy MD<sup>†,‡,§</sup>; Giannaccare, Giuseppe MD<sup>\*</sup>; D'Angelo, Sergio MD<sup>¶</sup>; Busin, Massimo MD<sup>†,‡,§</sup>; Scordia, Vincenzo MD<sup>\*</sup>

Author Information 

*Cornea* 42(7):p 815-820, July 2023. | DOI: 10.1097/ICO.0000000000003082



Cite



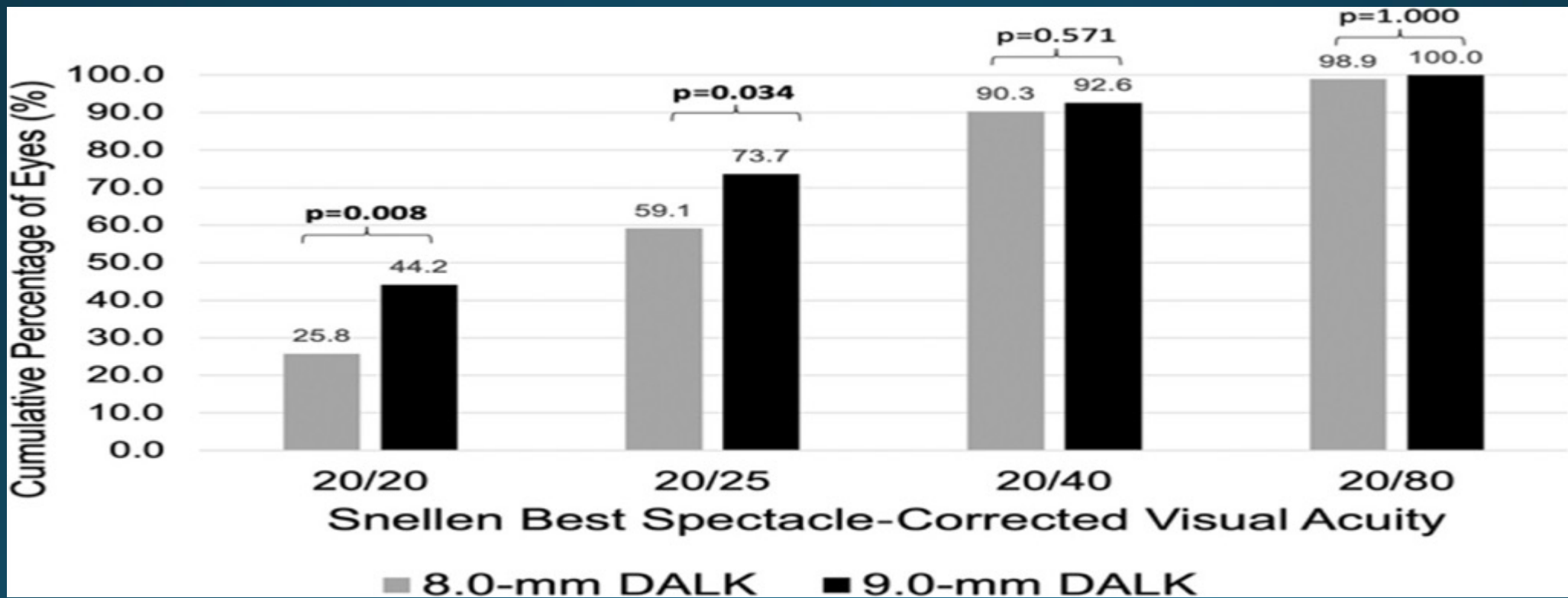
Share



Favorites



Permissions



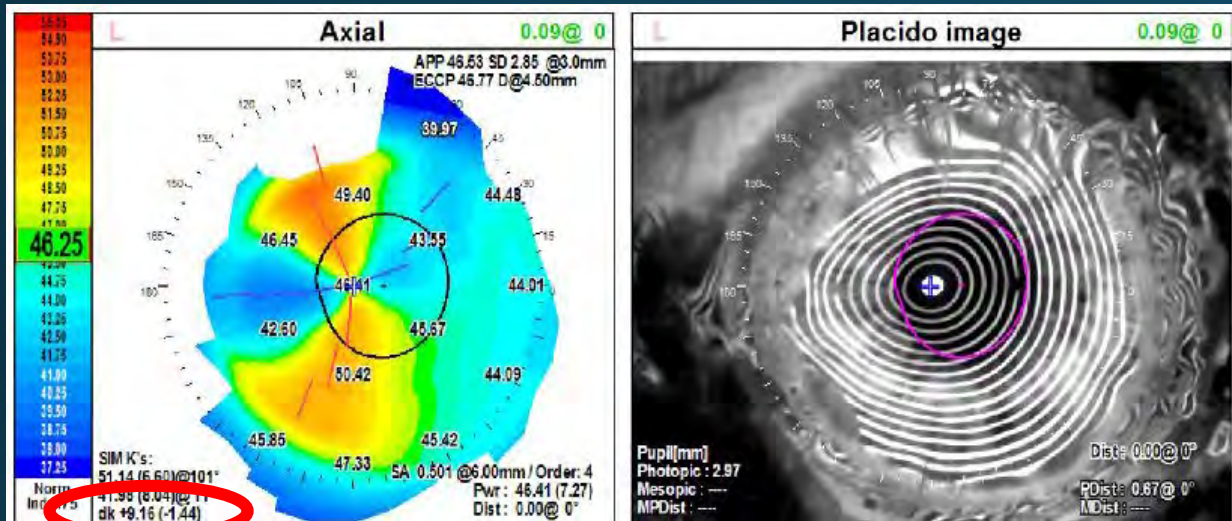
# Is DALK Adjustable in early post-op period?

- Yes! Running suture adjustment under intraoperative keratometer

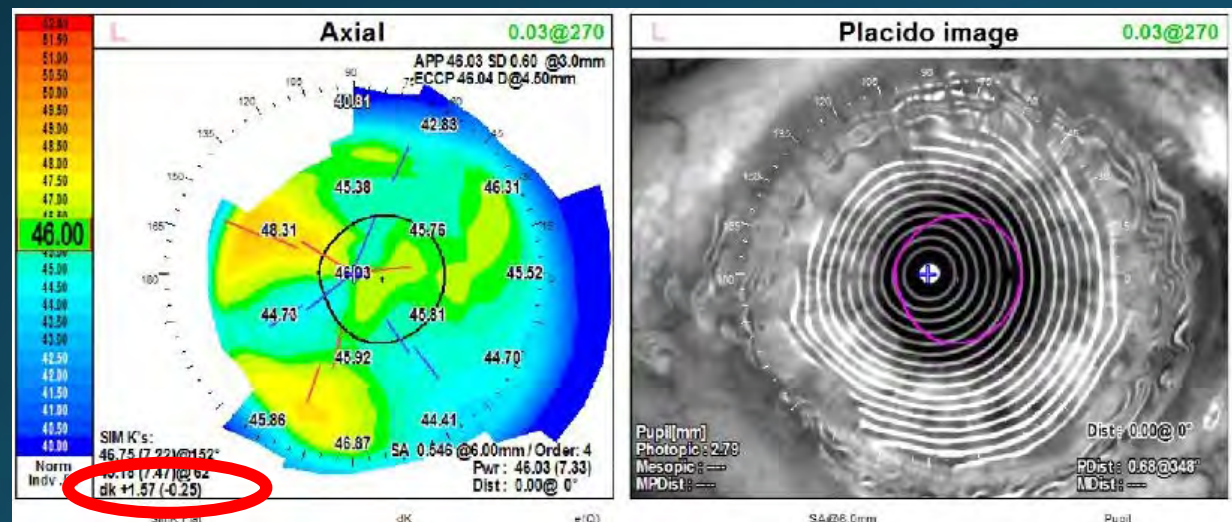
# Case : 47 yo male Severe keratoconus

Left Eye

2/6/2024 OS DALK 9.5mm bed/9.75mm donor



3/5/2024 running suture adjustment



# When suture out...about a yr

- Optical rescue:
  - Glasses
  - Soft CL's
  
- surgical rescue:
  - LVC
  - ICL
  - LAL

# Is DALK Astigmatism Adjustable after suture removal?

- Yes! With scleral tunnel incisions made on steep axis.



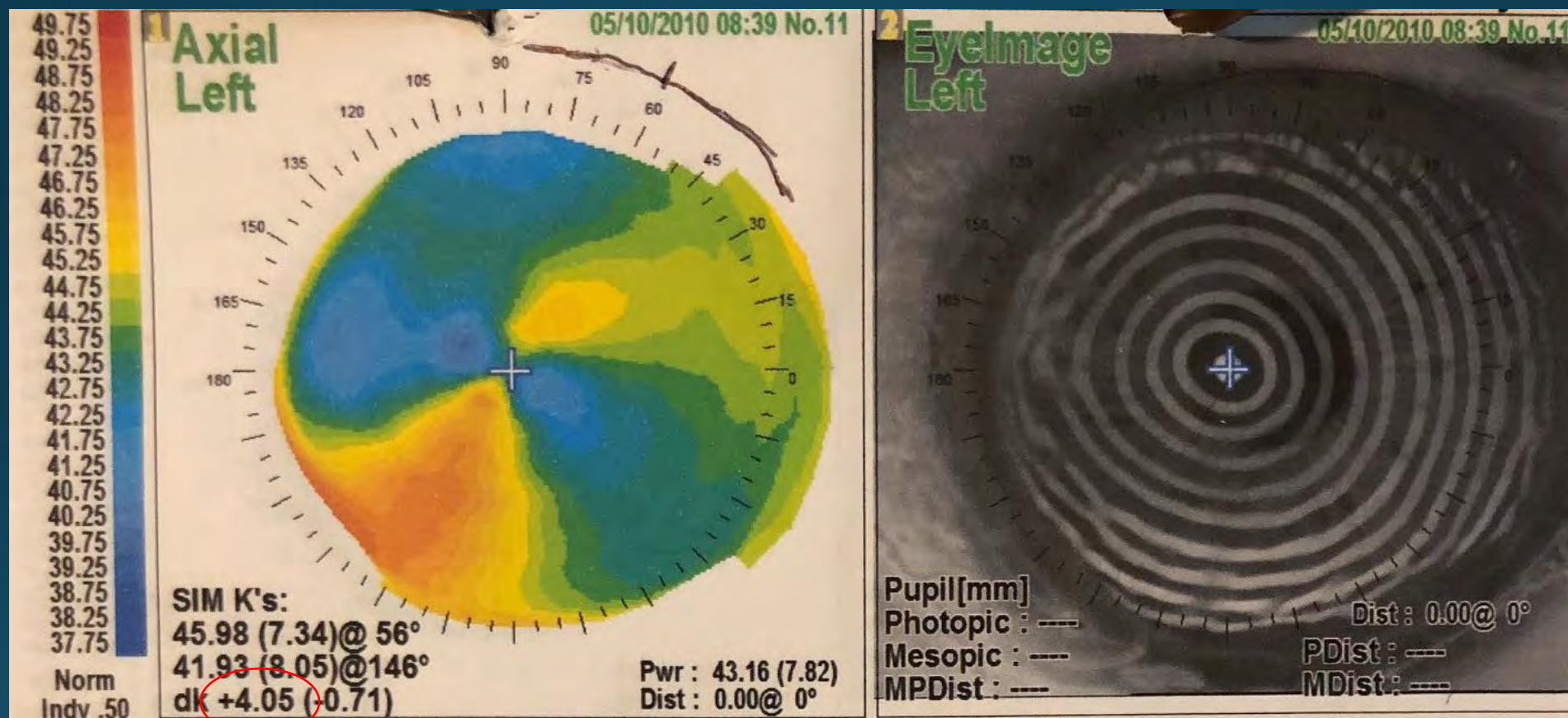
## *The Incision*



*3-7. Shelf of the incision. The shelf portion of the incision holds the iris back and helps prevent iris prolapse.*

## Case 1

May 2010 Cataract Extraction with single long (7mm) Scleral tunnel incision x 60 (on steep axis) and Staar AQ2010V 18.5 IOL  
Mar. 2010 (8mos aft DALK) Running Cornea Suture Out

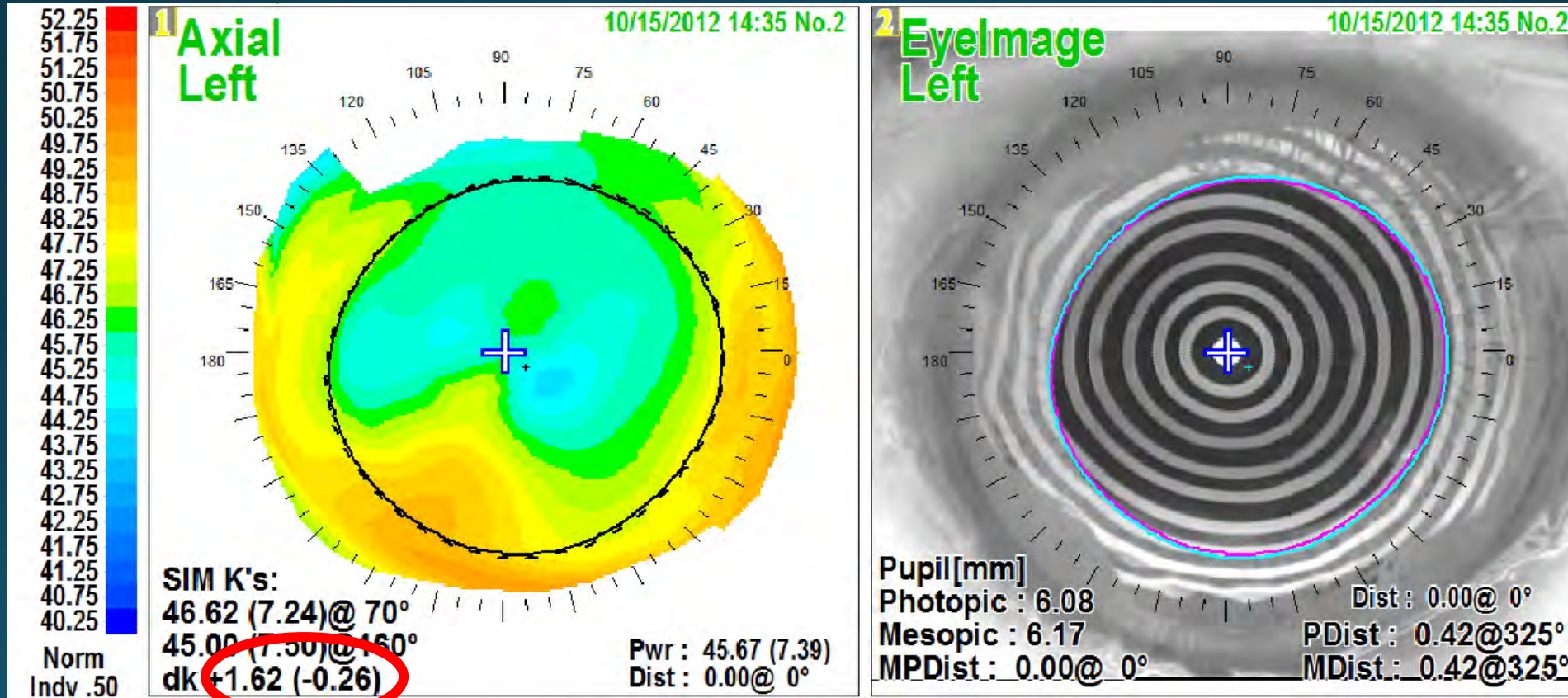


# Case 1

Left Eye

Oct. 2012

3yrs aft DALK, 2yrs aft Cat Ext monofocal IOL long scleral tunnel steep axis  
-3.5+0.50 x 22 20/25-2 (note low topo cyl 1.62 – circled in red)



# Case 2

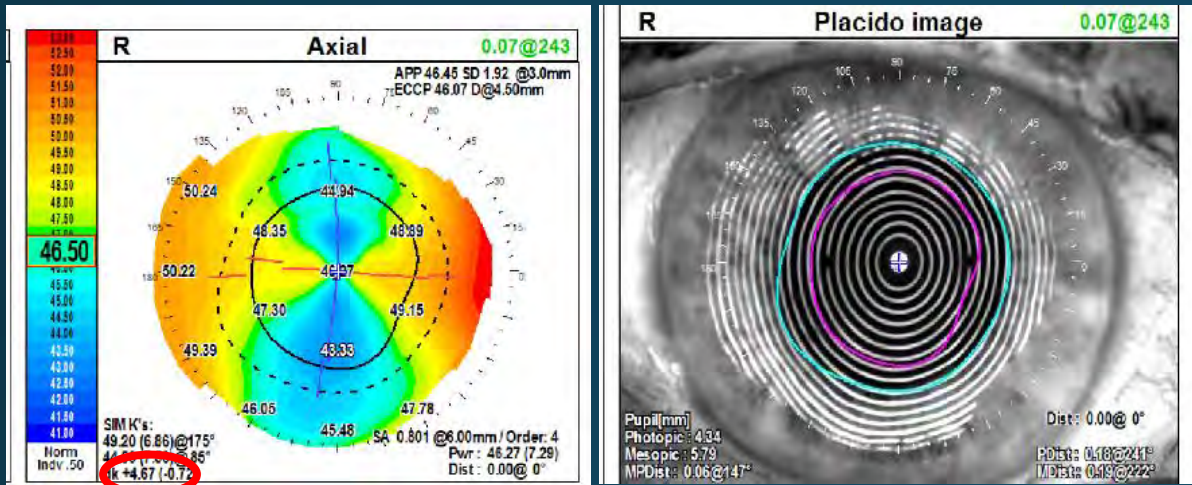
# Right Eye

64 yo male Severe Keratoconus

8/10/23 removed running cornea graft suture

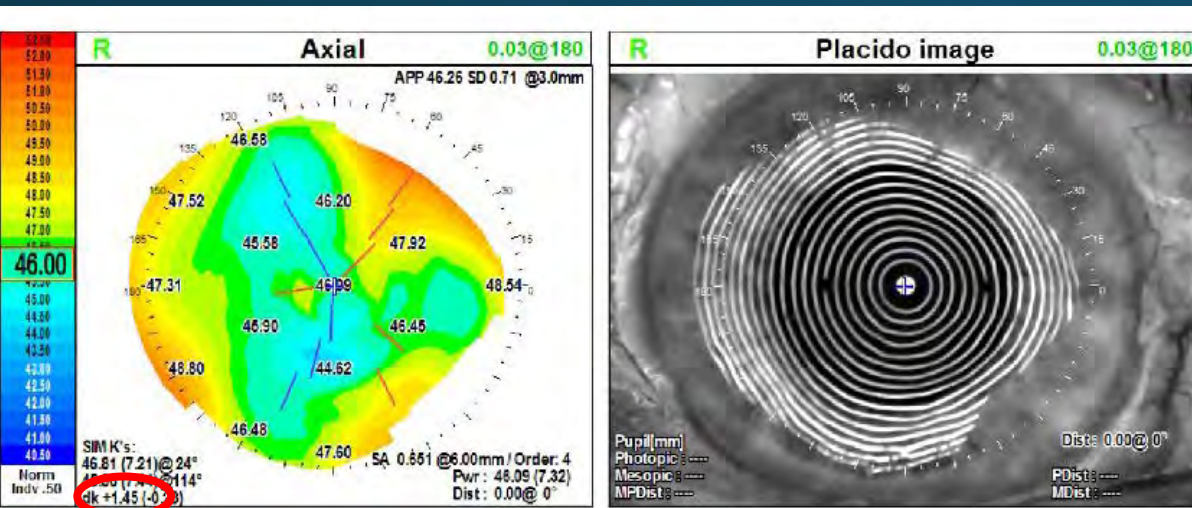
2/14/23 removed Intacs/DALK 10.0mm bed/10.5mm donor

2007 Intacs



- OD -14.0 +6.0 x 173 20/40

1/16/24 AK paired scleral tunnel x 180



- OD -13.5 +1.25 x 160 20/60 (scheduled for cataract with LAL)

# 64yo Bilateral severe RK ectasia

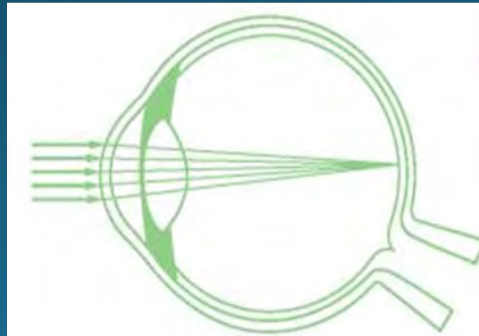
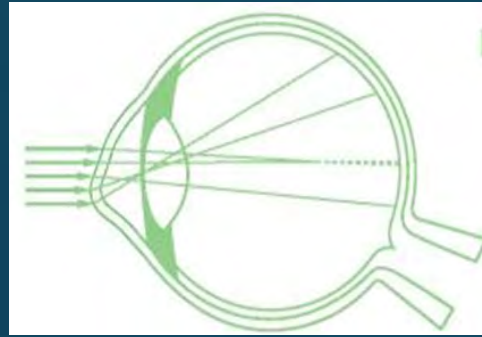
OD 20/150                      OS 20/200



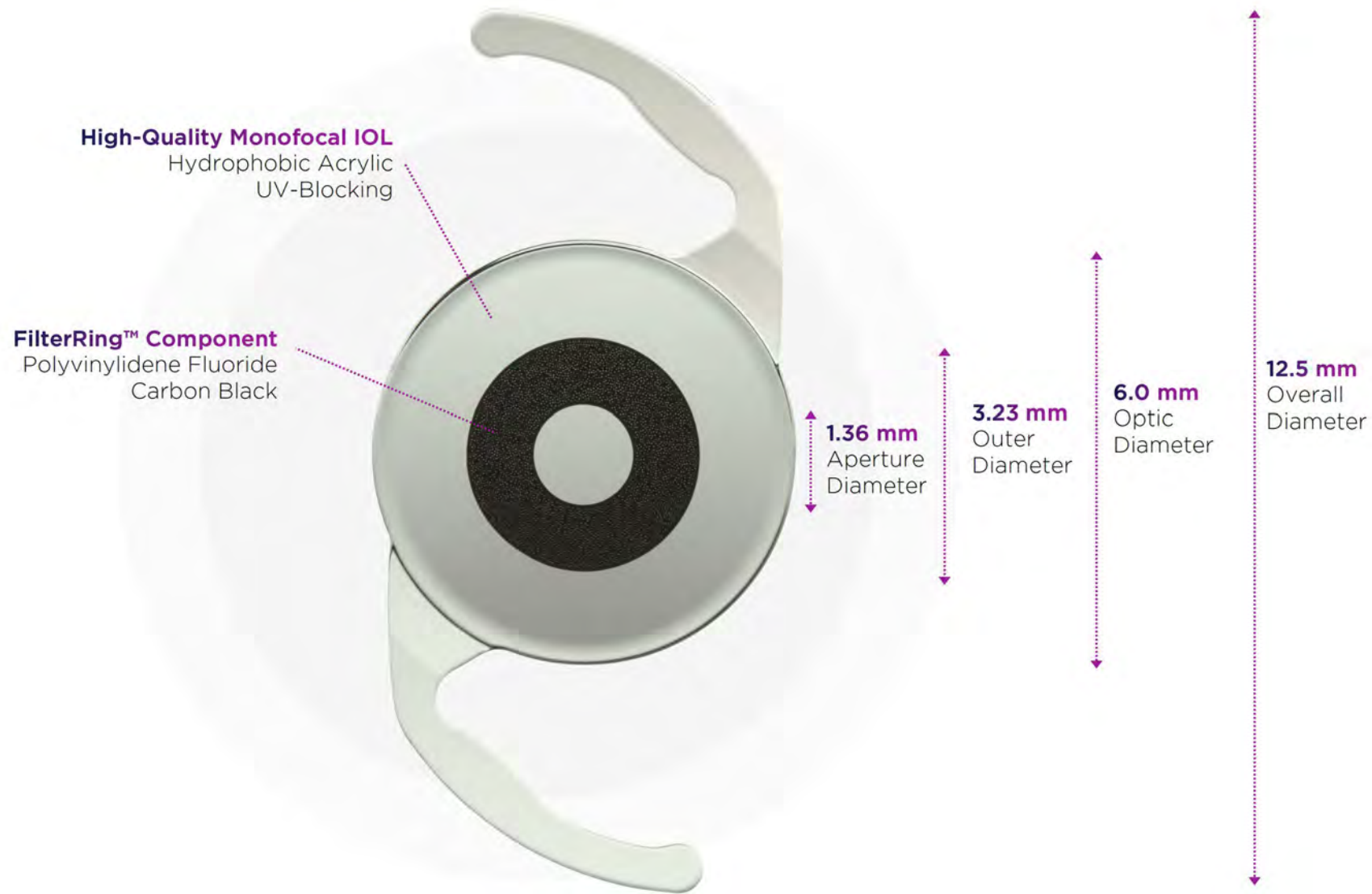
# Surgical

- Corneal X-Linking
- IC-8 IOL
- Corneal Transplantation: DALK

# Corneal Cross-linking? RK / LASIK ectasia

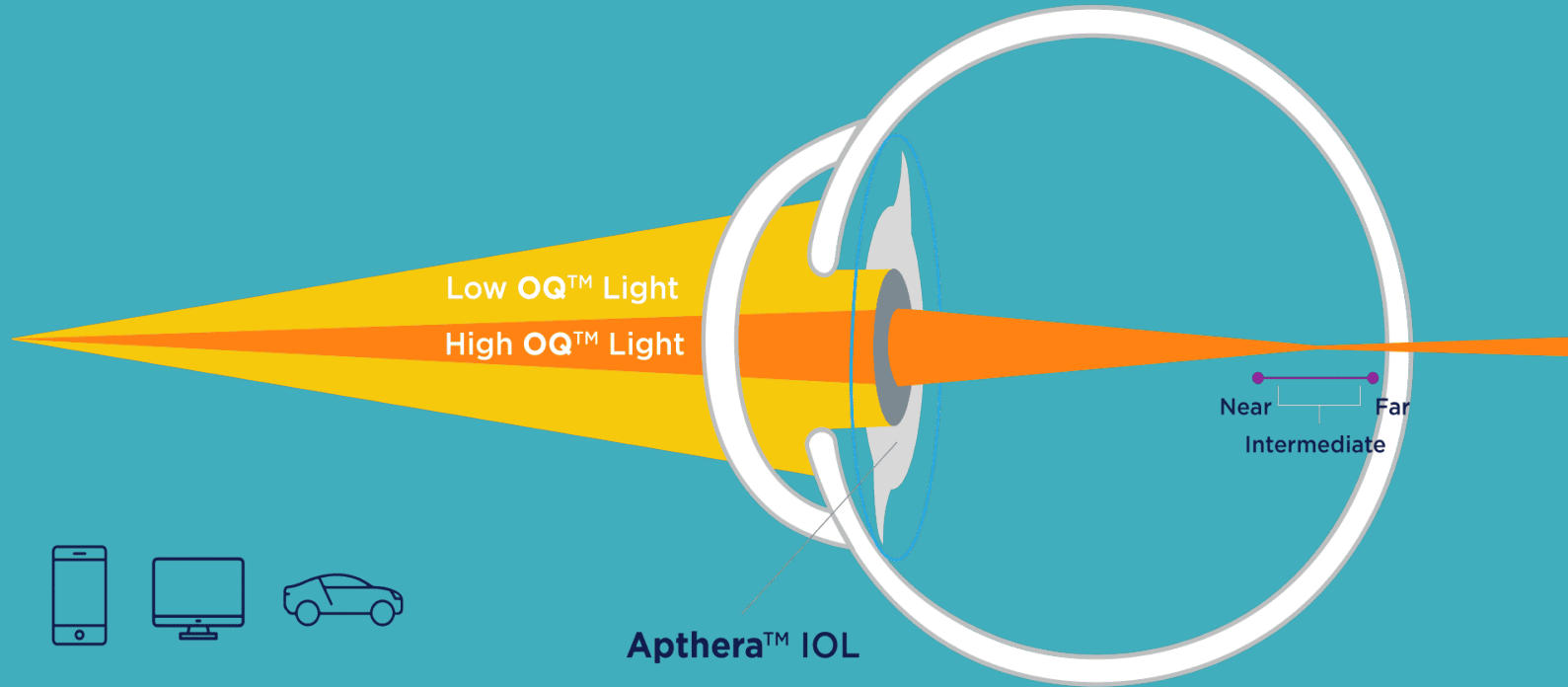


# IC-8<sup>®</sup> Aphera<sup>™</sup> IOL Features





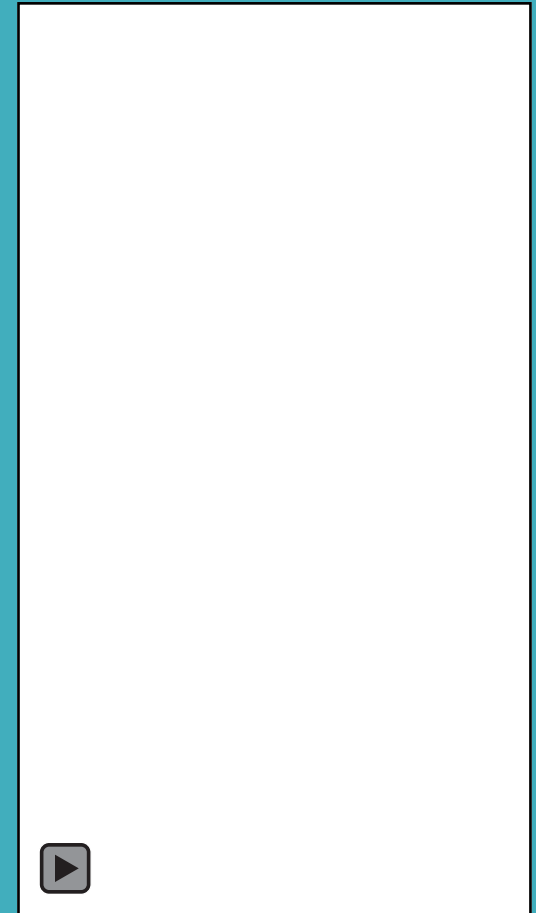
# Apthera IC-8



Apthera™ IOL



\*Simulated Image



# Case: RK Ectasia Cataract ext w Aphthera IC-8 Will's Eye – Ground Rounds Oct. 2023

- 20/"happy" for a month until noticed persistent night glare
- Now on pilocarpine



# Eye Connect list serve - March 2024

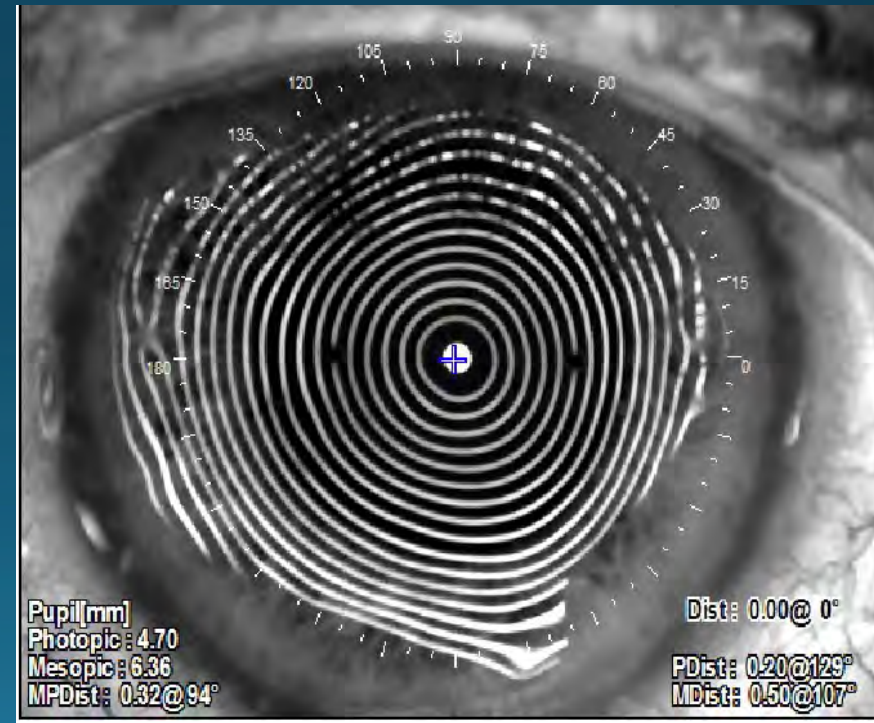
- One USA ophthalmologist reported 12 Aphera explantations

# RIGHT eye 9 years after DALK Great result!!

## 10/2019 Cataract Ext with low power toric IOL OS

- UCVA 20/30
- -0.50+ 0.75 X 20 20/30
- pre-op

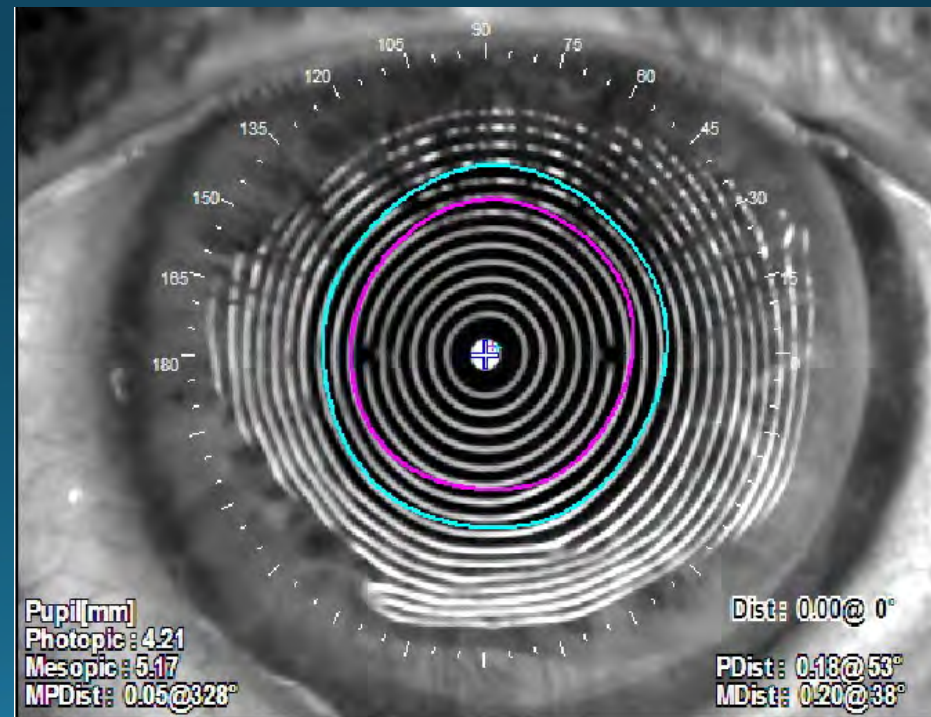
9 yrs after DALK!



# Left eye: 9 yrs after DALK, Great result!! 8/2019 Cataract Ext with low power toric IOL

- UCVA 20/30
- -0.75+ 0.75 x 50 20/20
- Pre-op

9 yrs after DALK!



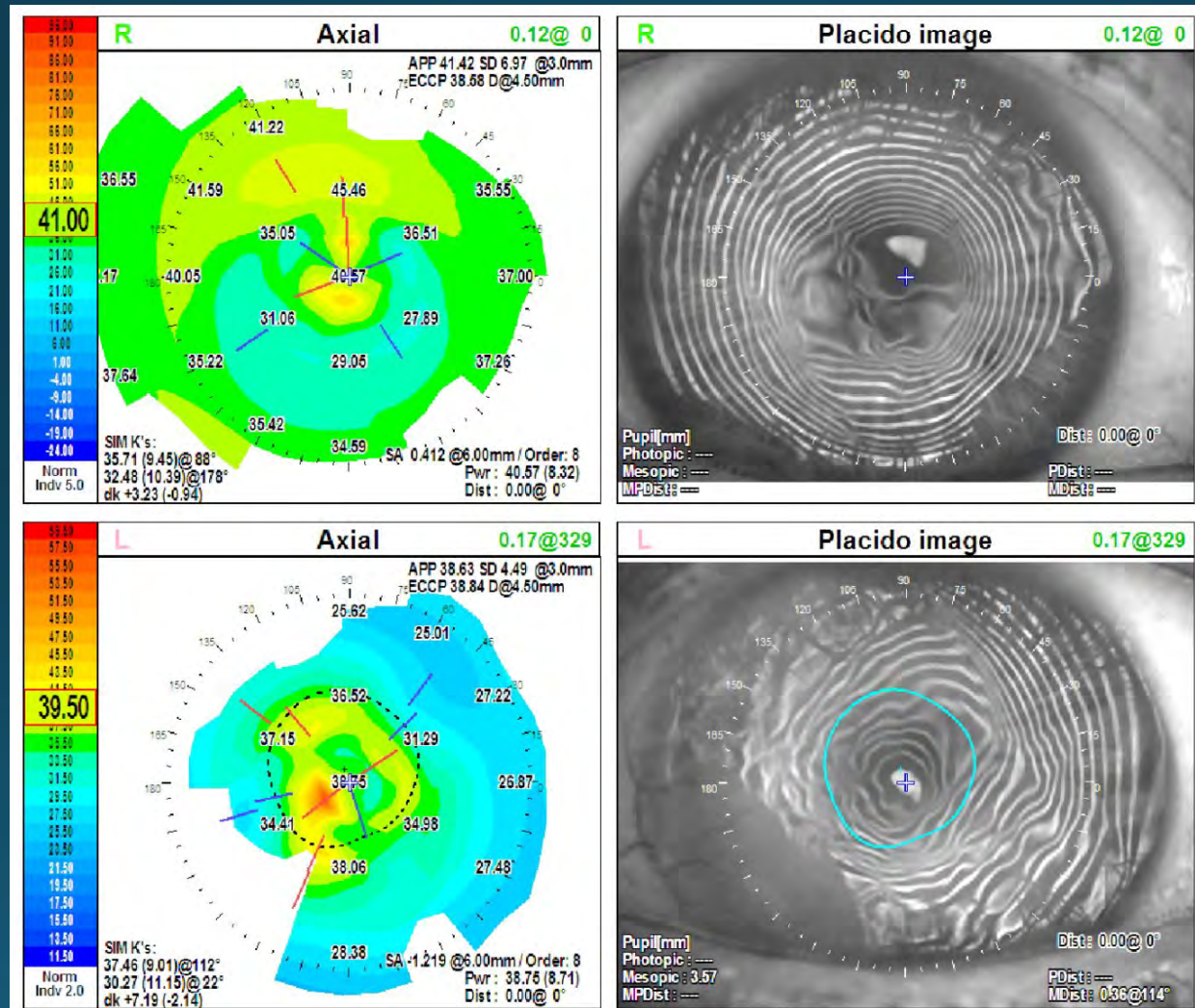
# Cornea Scars

57 yo woman Bilateral Central  
Thinning and Cornea scars /HSV 1982  
BSCVA 20/400 EACH EYE!





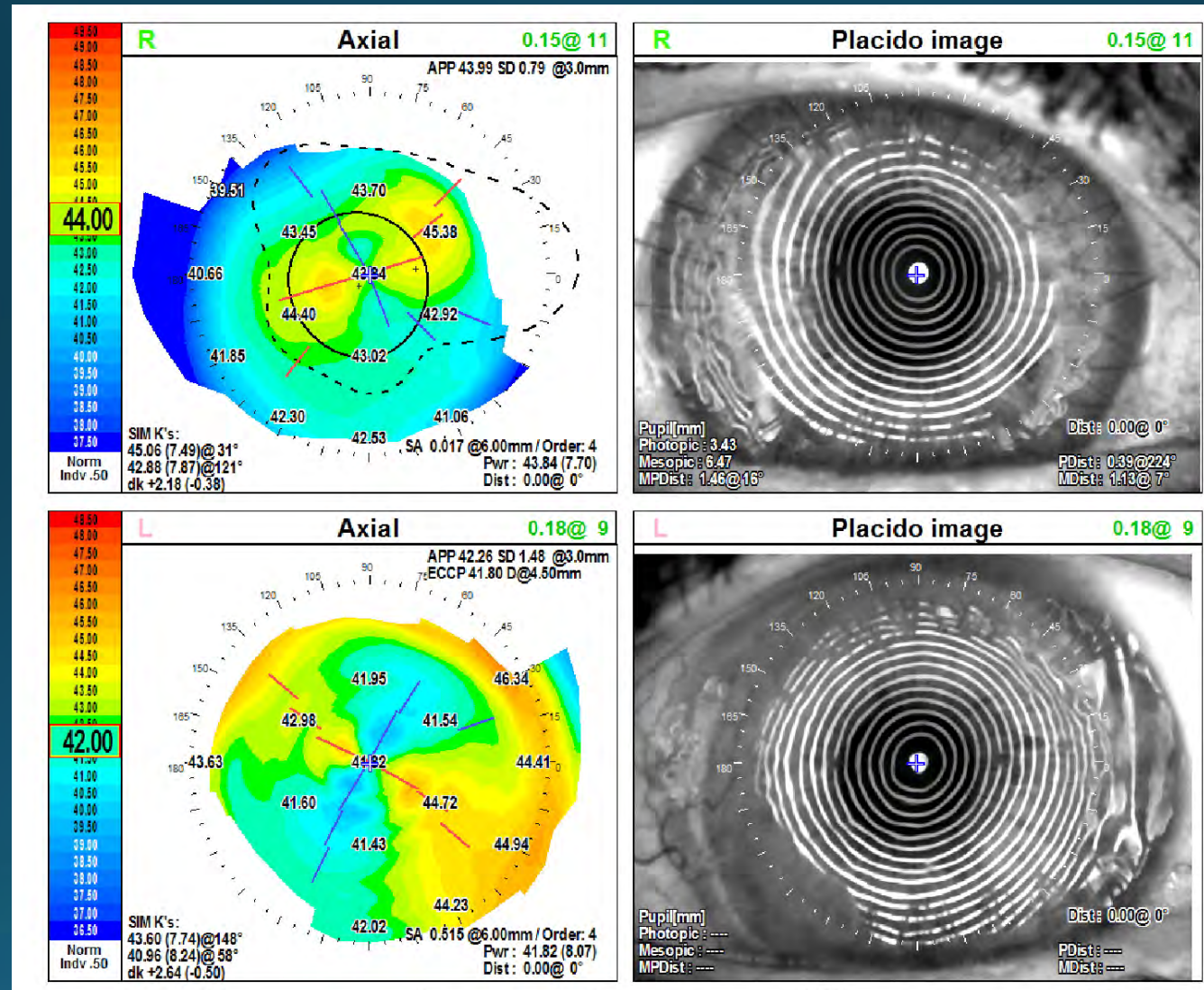
# 57 yo FM Bilateral Central Disabled since age 21!



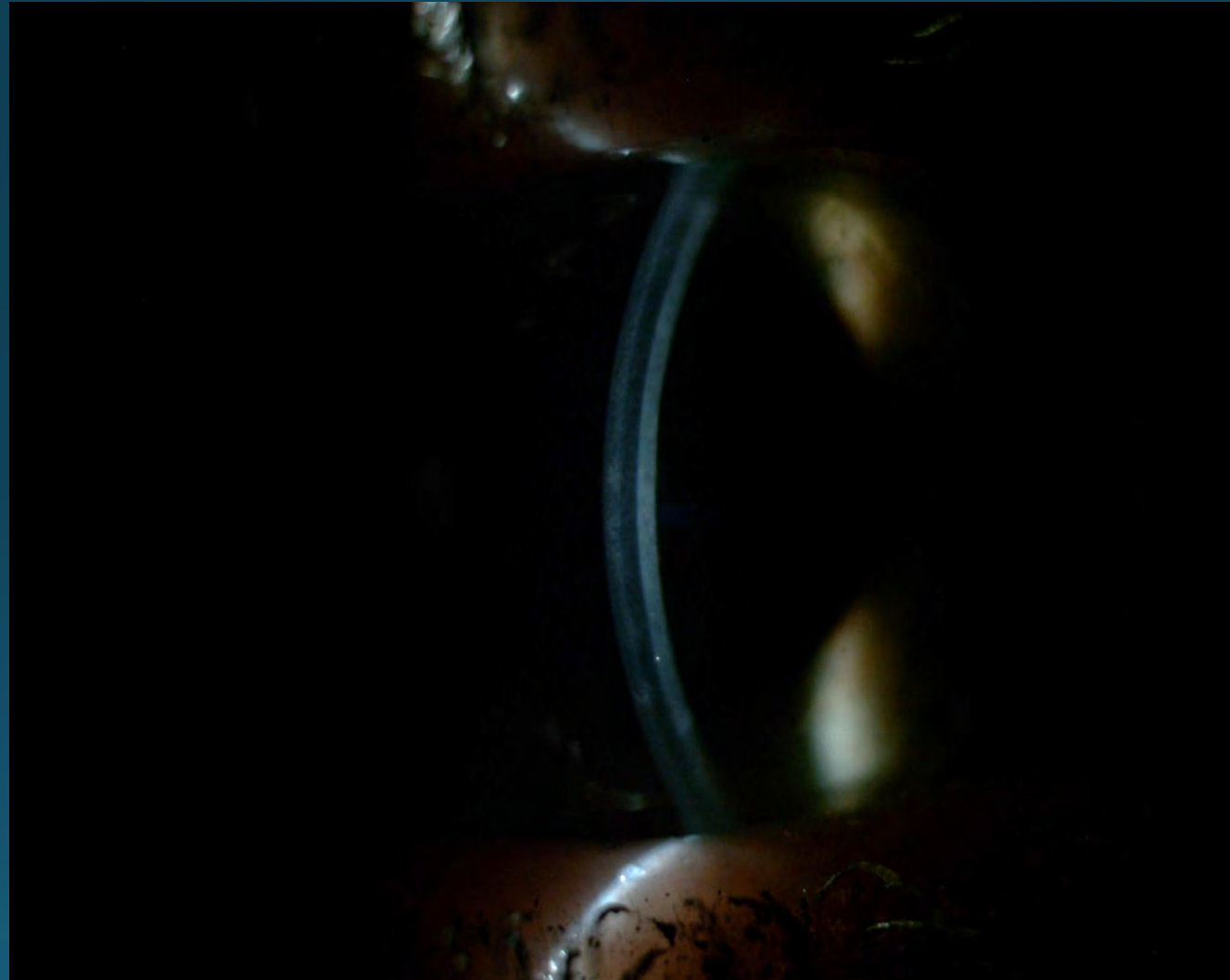
57 yo FM Bilateral Central Thinning Cornea scars /HSV  
8/2018 OS DALK 9.0mm  
3/2019 OS UCVA 20/50



57 yo FM Bilateral Central scars (since age 21)  
 8/2019 OD -1.0+1.75x30 20/30 OS plano+1.75x150 20/50  
 8/2018 OS DALK 9.0mm 4/2019 DALK OD 9.5mm



57 yo FM Bilateral Central Thinning and Cornea scars /HSV  
3/2019 OS UCVA 20/50 mild residual haze DM preferable  
to sacrificing it as would with PK!  
8/2018 DALK OS

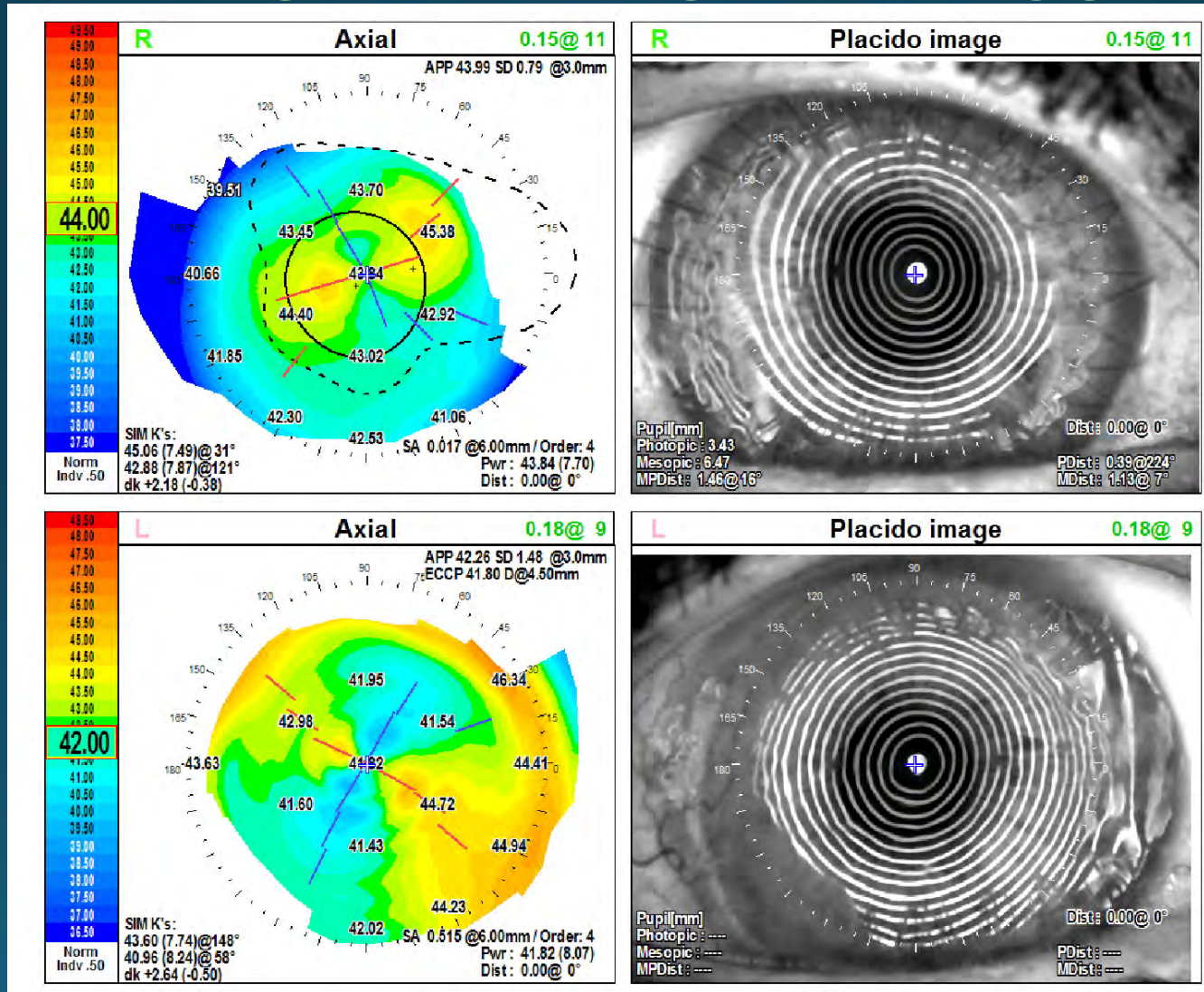


57 yo FM Bilateral Central scars (since age 21)

11/2023 OS improved to 20/25 predescemets haze CLEARED!

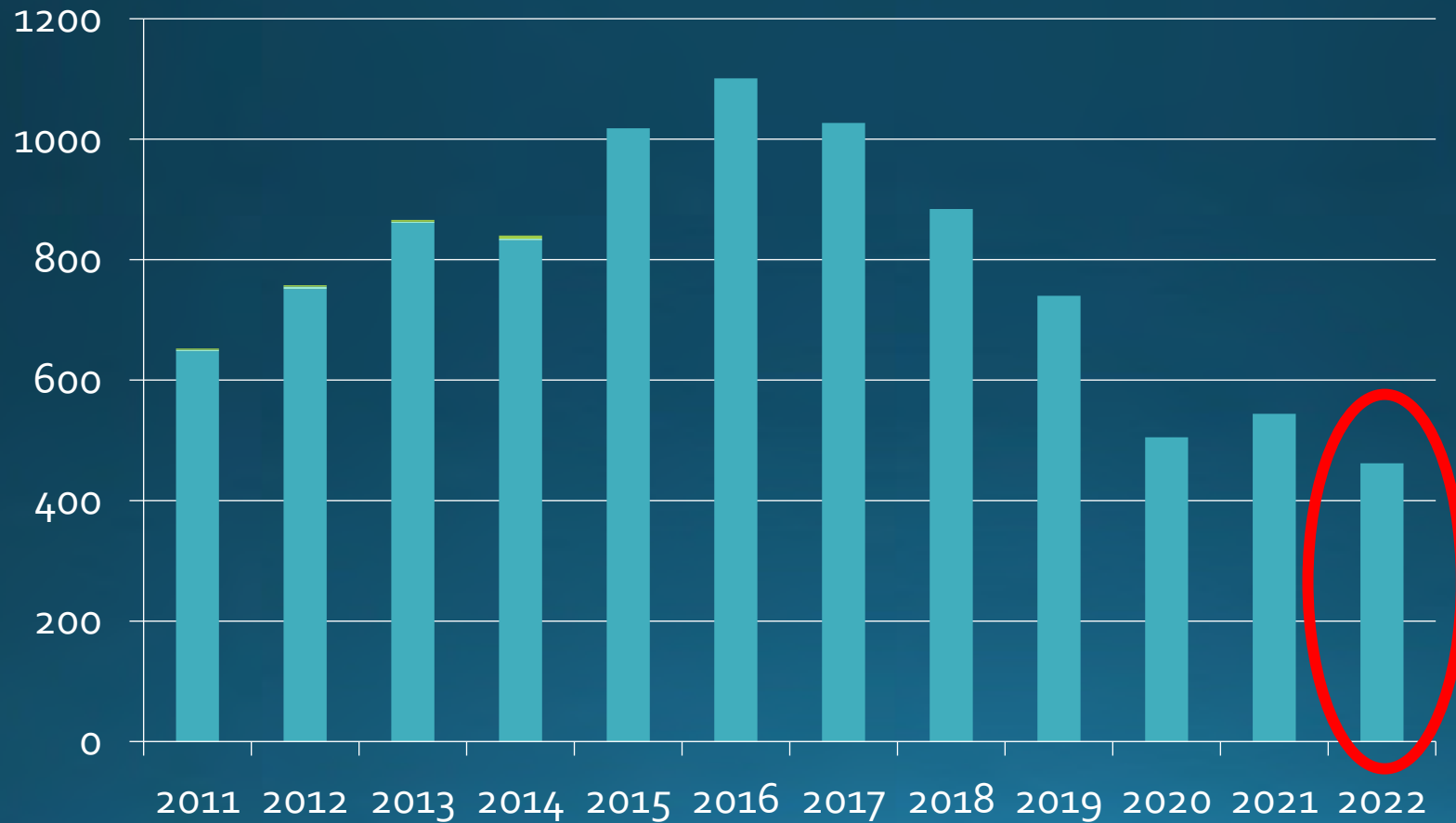
8/2019 OD -1.0+1.75x30 20/30 OS plano+1.75x150 20/50

8/2018 OS DALK 9.0mm 4/2019 DALK OD 9.5mm



# USA - DALK procedures 2011-2022

2022: 462



# Why are DALK cases dropping?

- Better scleral CL designs/fitting
- CXL if caught EARLY – potentially eliminates need for keratoplasty
- Poor reimbursement
- Fewer DALK capable surgeons – Covid accelerated retirement
- New trainees?

# Large Diameter DALK – BEST!

- ACCESS?





## CORNEA TRANSPLANT SURGERY

There are approximately 50,000 Cornea Transplant surgeries performed each year in the United States. This is actually a small number when compared with approximately 5 million cataract procedures each year in this country. Of all transplant surgery done today, including heart, lung and kidney, corneal transplants are by far the most common and successful. [Richard A Erdey, MD](#) and [Daryl D Kaswinkel, MD](#) are Corneal Specialists; they have been performing Cornea Transplant Surgery since 1988 and 1996 respectively.

View: [10TV News Report](#)

View: [Our cornea transplant patient throws out first pitch!](#)

View: [testimonials](#)

The Normal and Diseased Cornea +

Corneal Transplant +

Corneal Transplantation – Variations +

Penetrating Keratoplasty (PK) – full thickness transplantation +

Deep Anterior Lamellar Keratoplasty (DALK) – selective anterior transplantation +

DALK - View: [Dr Erdey's Case Reports for various indications](#) +

Descemet's Stripping Endothelial Keratoplasty (DMEK), (DSEK), – selective posterior transplantation +

Cornea Transplant Complications +

The Diseased Cornea – Research +



Meet our Doctors

Cataract Surgery >

Lasik/Refractive Surgery >

Implantable Contact Lens >

Cornea Transplant Surgery

Keratoconus

Cornea Cross Linking (CXL)

Other Services >

Understanding the Eye >

Doctors Only

DALK - View: Dr Erdey's Case Reports for various indications

View: Dr. Erdey's case studies utilizing large (9.5-10mm) DALK to achieve rapid restoration of natural corneal curvature and transparency:

1. Keratoconus: [Case Studies](#)
2. Keratoconus: with early and late onset Cornea Hydrops: [Case Studies](#)
3. Keratoglobus: [Case Study](#)
4. Pellucid Marginal Degeneration: [Case Studies](#)
5. LASIK complications - corneal ectasia: [Case Studies](#)
6. Radial Keratotomy (RK) complications - corneal ectasia: [Case Studies](#)
7. Cornea Scars: [Case Studies](#)
8. Cornea Dystrophies: [Case Studies](#)
9. Corneal Infections recalcitrant to treatment: [Case Study](#)



# Conclusion:

- DALK large diameter is restorative for corneal ectasia/scars
- CXL warped corneas goal: stabilization (not guaranteed) -lifetime scleral / RGP CLs'
- Light Adjustable Lens (LAL) and important new addition:  
DMEK/DALK