

Cornea Scars? What's Better?
Penetrating Keratoplasty (PK) or
Large Diameter (9-10mm) Deep Anterior Lamellar Keratoplasty (DALK)

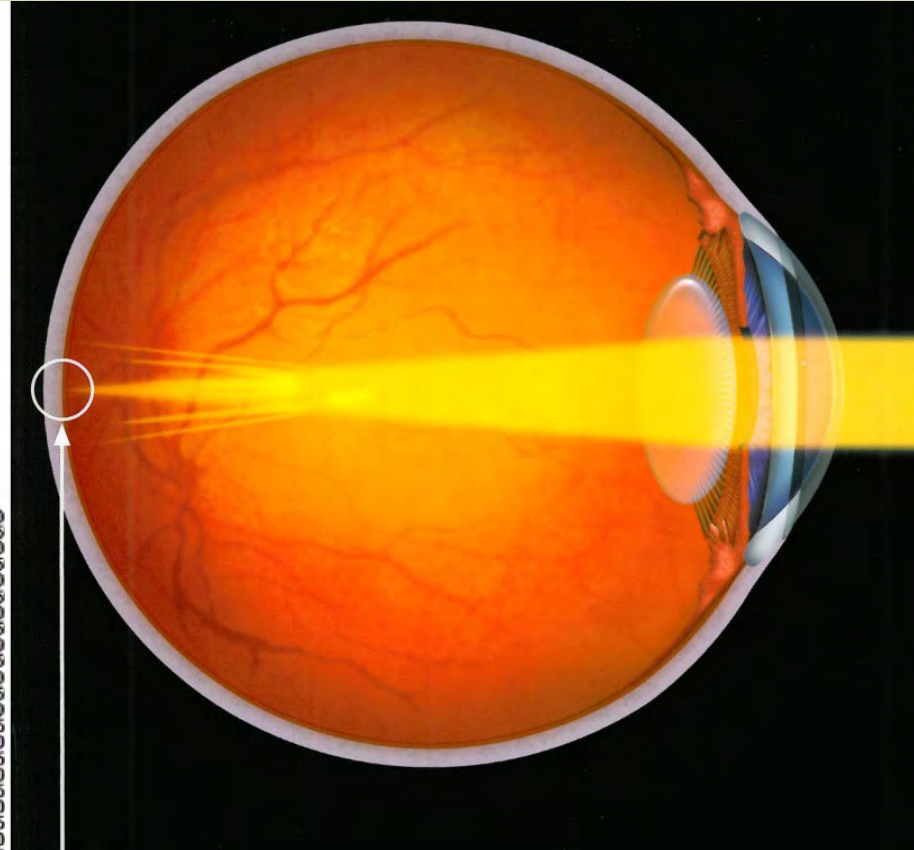
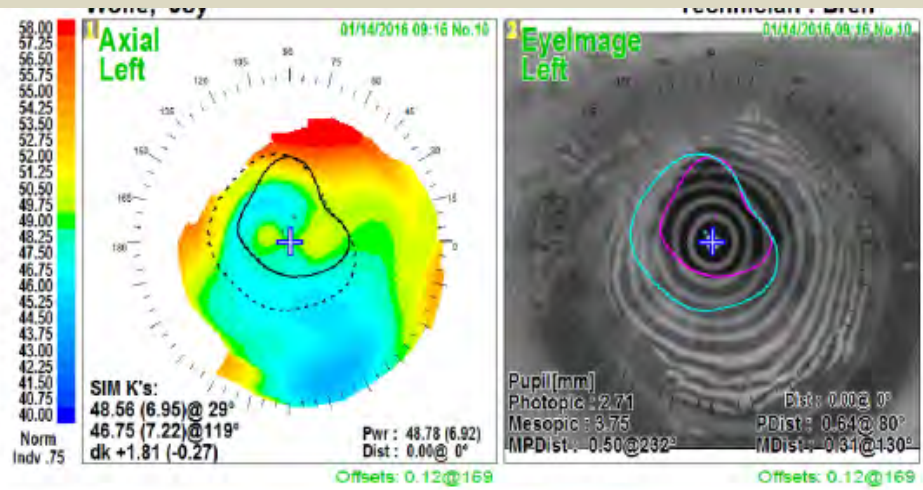


Case Reports:

Penetrating Keratoplasty (PK) for Cornea Scars

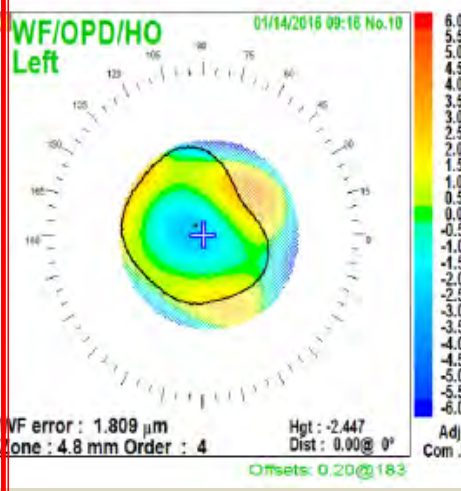
- 2 eyes of 2 patients

Case 1: OS: Cornea Scar 1.5 yr post-op PK
 8.25 mm dia., suture out -3.5+2.25x39 20/25
 cornea aberration profile: high! Long term: Graft rejection and if not,
 cornea endothelial exhaustion may risk eventual graft replacement



3. Zernike/Corn No.10 Left Zone : 6.0 Order : 4

V.Sets	0.00	0.20	0.40	0.60	0.80
Total					11.355
Tilt(S1)					7.202
High					8.110
T.Coma					2.492
T.Trefoil					1.345
T.4Foil					3.917
T.Sph					0.911
HiAstig					6.448



Richard Erdey, MD

Case #2 OD

77 yo cornea scar OD

PK 2004, repeated d/t graft failure PK 2011, rotated graft 2015

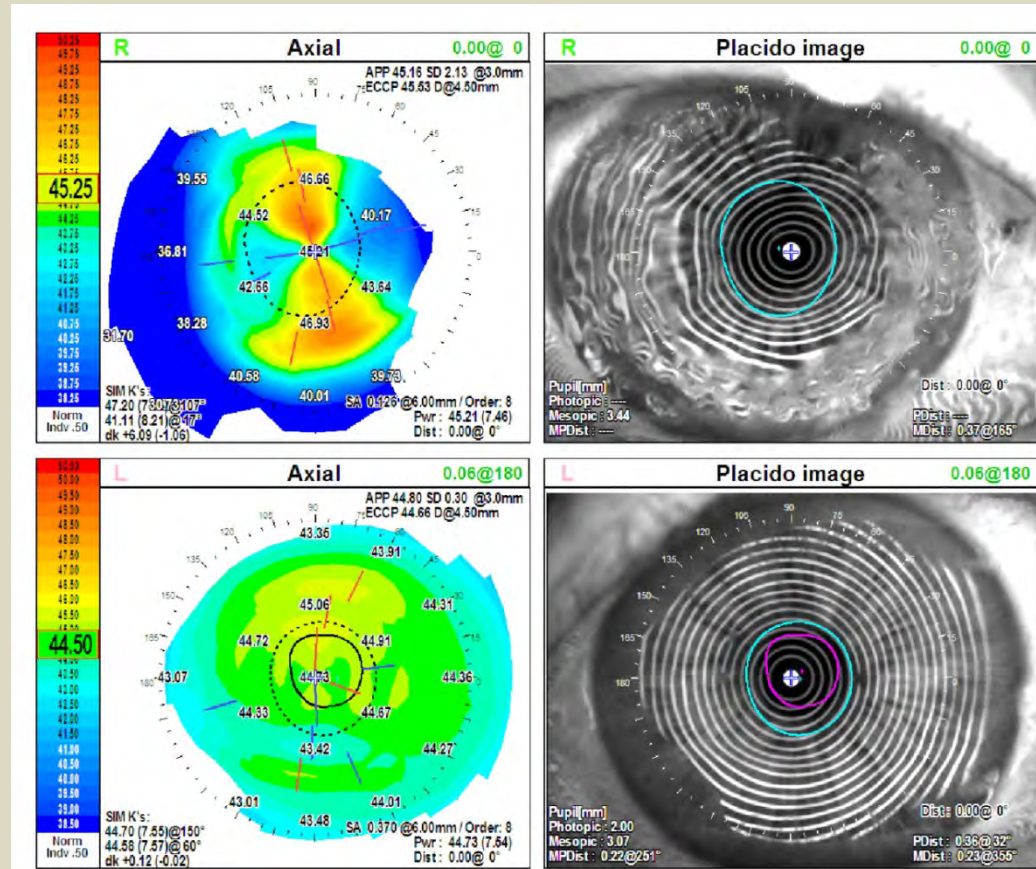
d/t high magnitude irregular astigmatism

OD cataract/IOL surg 2015

OD -1.5+4.0x100 20/25

OS +1.0

20/20



Case Reports: PK for Cornea Scars problems (vs large diameter DALK):

- Irregular astigmatism
- Higher residual astigmatism
- Higher corneal aberrations than large dia DALK
- Long term graft rejection – increased further if bed vascularized – graft failure
- Long term endothelial cell exhaustion – graft failure
- PK cornea grafts do NOT generally last a lifetime and if live long enough, need replaced
- Glaucoma

Case reports:

Deep Anterior Lamellar Keratoplasty (DALK)
for Cornea Scars

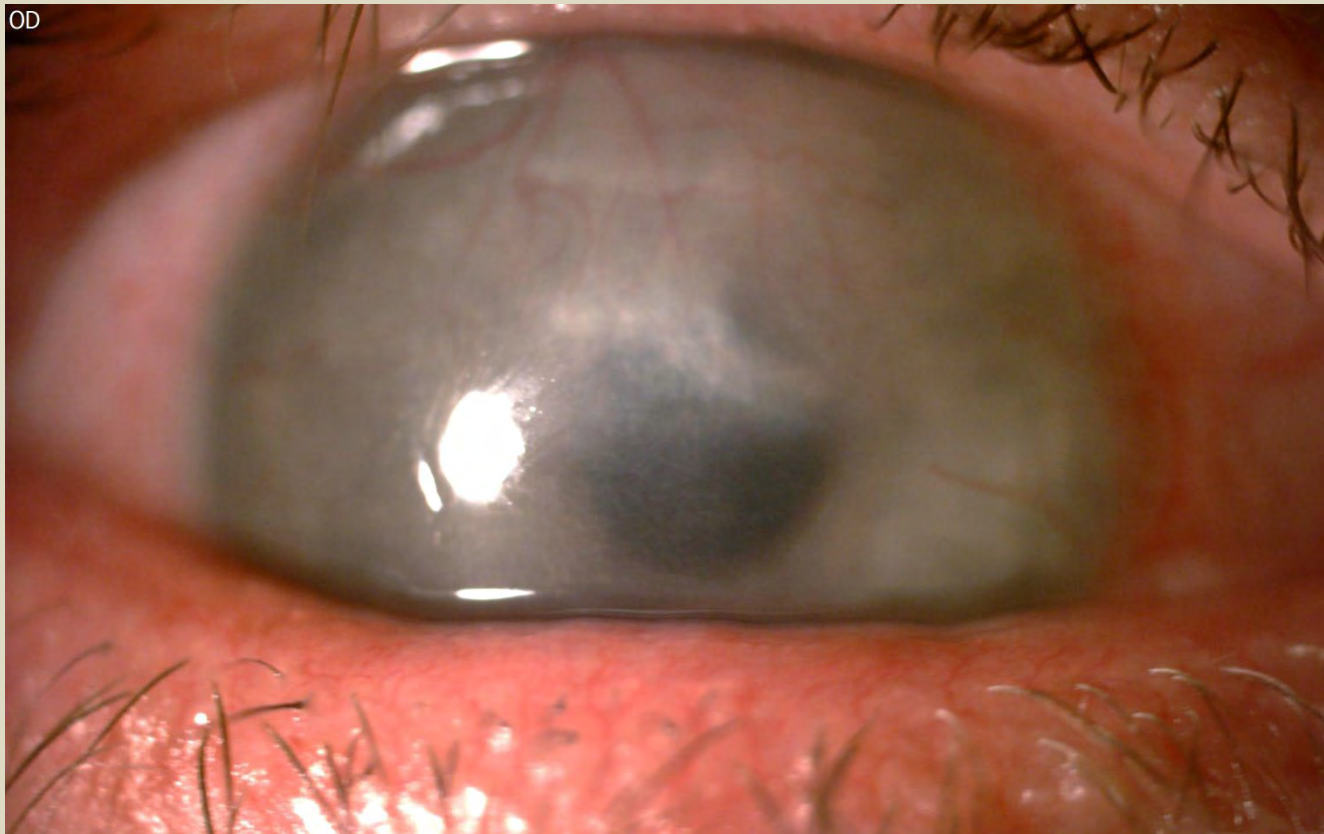
10 eyes of 9 patients

Up to 9 years post-op

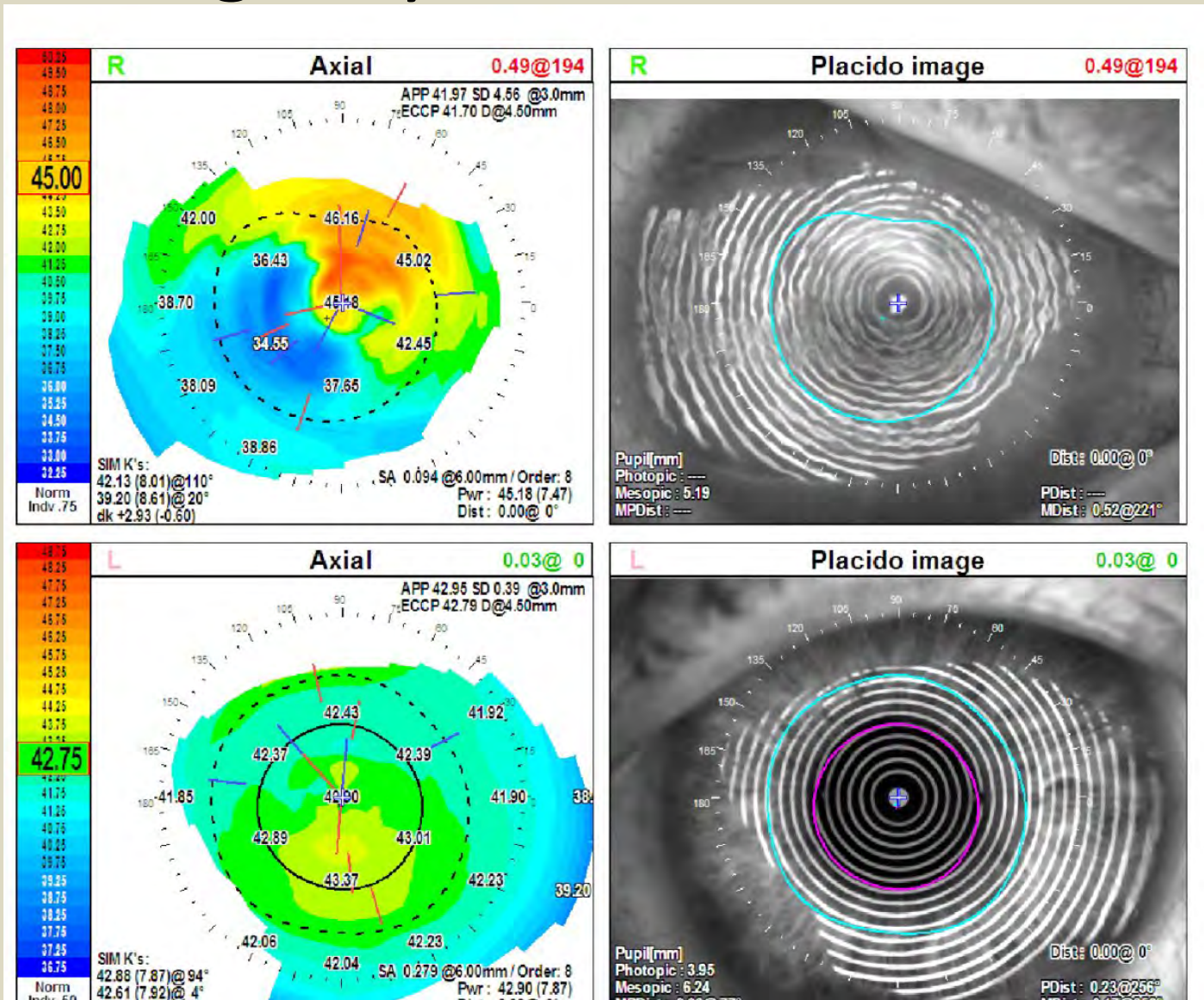
Case #1 OD

51 yo Cornea scar / Herpes Zoster (HZV)

Best Corrected VA 20/100



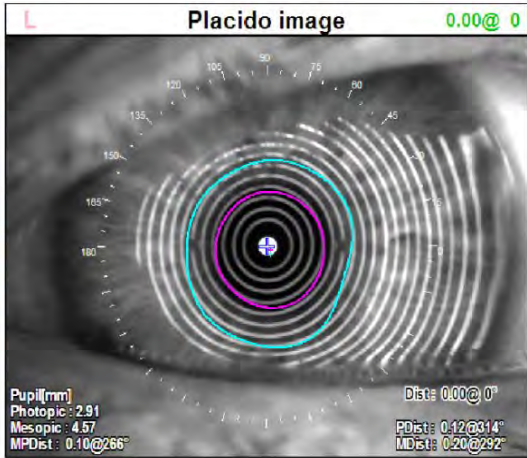
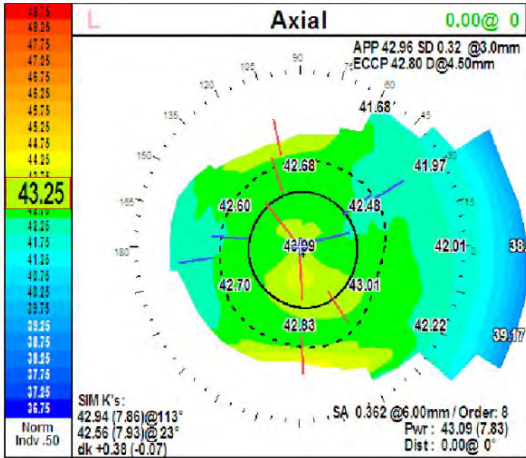
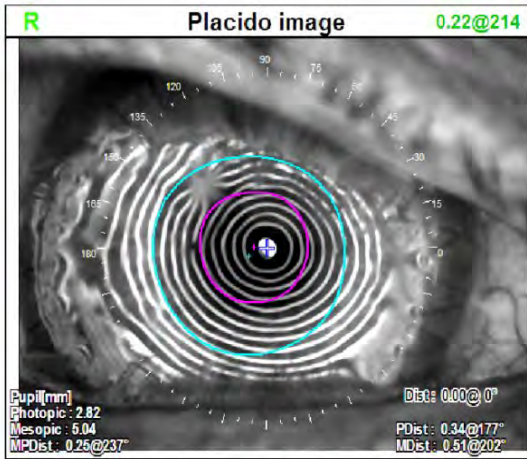
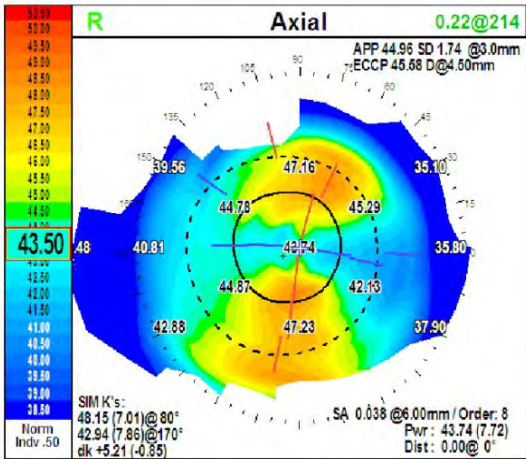
Case #1 Right Eye: Cornea scar / HZV



Case: #1: OD: Cornea Restoration d/t Cornea scar / HSV

2/11/19 Topography below: Rx: 3.25 + 4.25 x 65 20/40
 11/27/18 DALK 9.0mm

02/11/2019 07:48	Comment	L	Diagnosis	L
02/11/2019 07:47		R		R



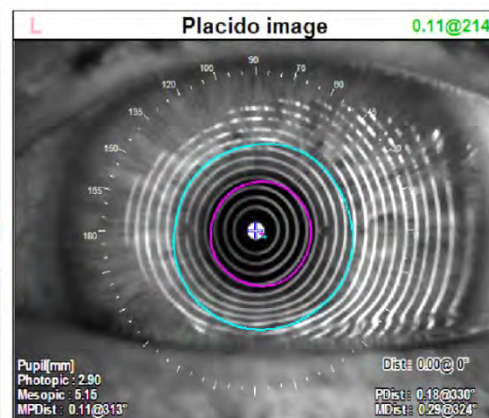
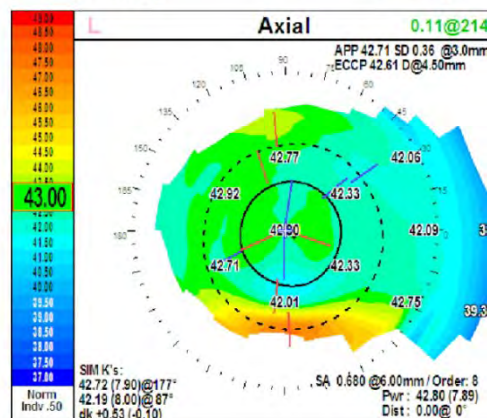
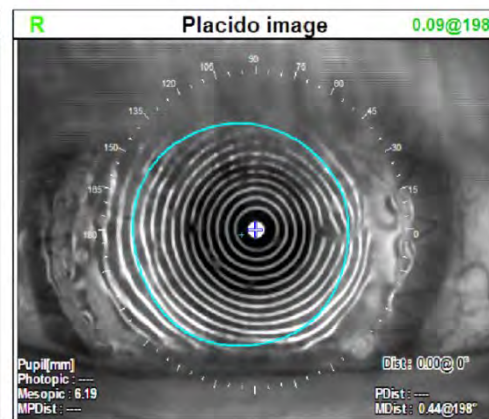
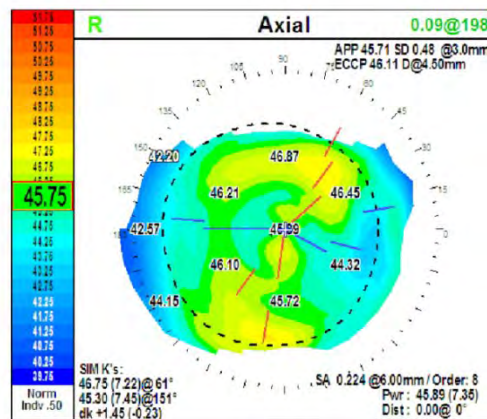
Case: #1: OD: Cornea Restoration d/t Cornea scar / HSV

03/11/2019 (topo below) -4.0+1.25x70 20/25

02/26/2019 Adjust running cornea suture under
intraoperative keratometer goal: reduce astigmatism

11/27/2018 DALK 9.0mm

L	03/11/2019 15:43	Comment	L		Diagnosis	L	
R	03/11/2019 15:43		R			R	



Case: #1: OD: Cornea Restoration d/t Cornea scar / HZV

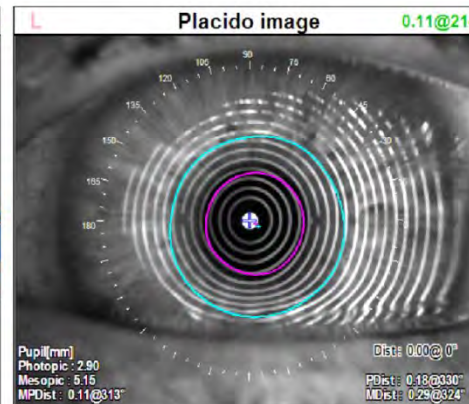
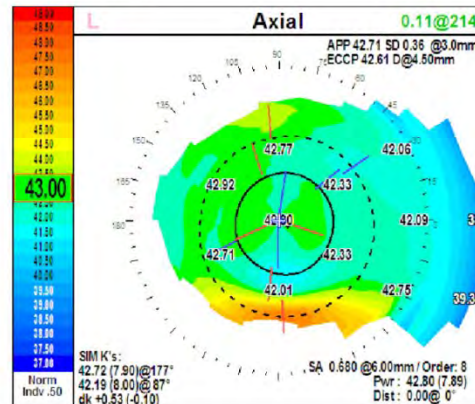
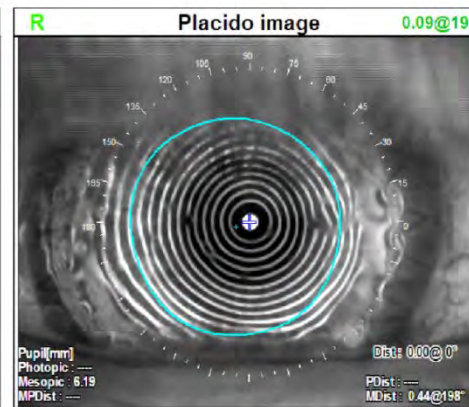
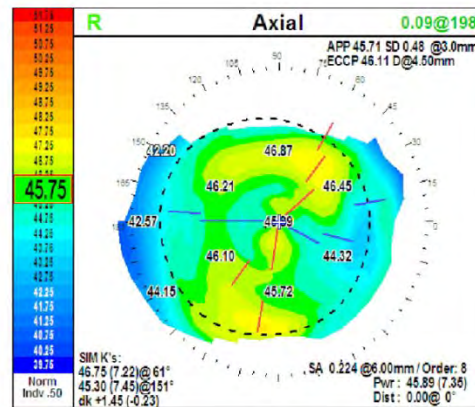
9/1/2021 -2.0+0.5x163 20/25

8/11/2021 Remove Running cornea graft suture

03/11/2019 -4.0+1.25x70 20/25

11/27/2018 DALK 9.0mm

L	03/11/2019 15:43	Comment	L	Diagnosis	L
R	03/11/2019 15:43		R		R



Case: #1: OD: Cornea Restoration d/t Cornea scar / HSV

9/7/2022 Topo below, Refx no change

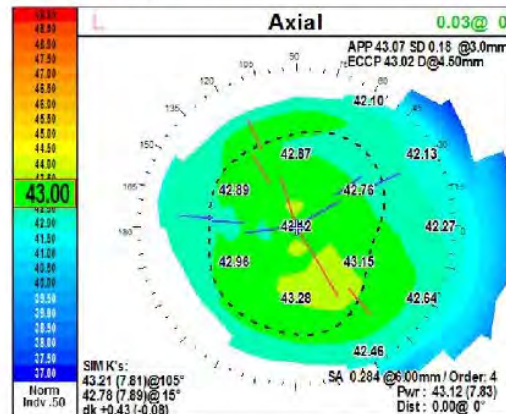
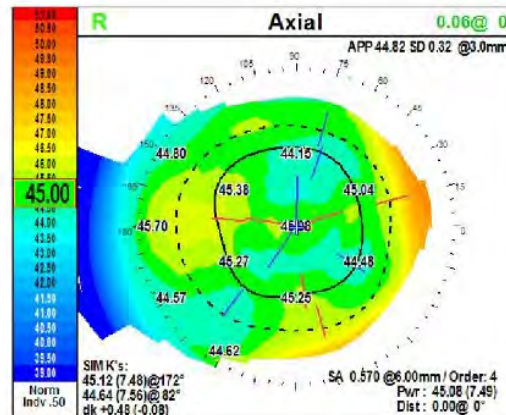
9/1/2021 -2.0+0.5x163 20/25

8/11/2021 Remove Running cornea graft suture

03/11/2019 -4.0+1.25x70 20/25

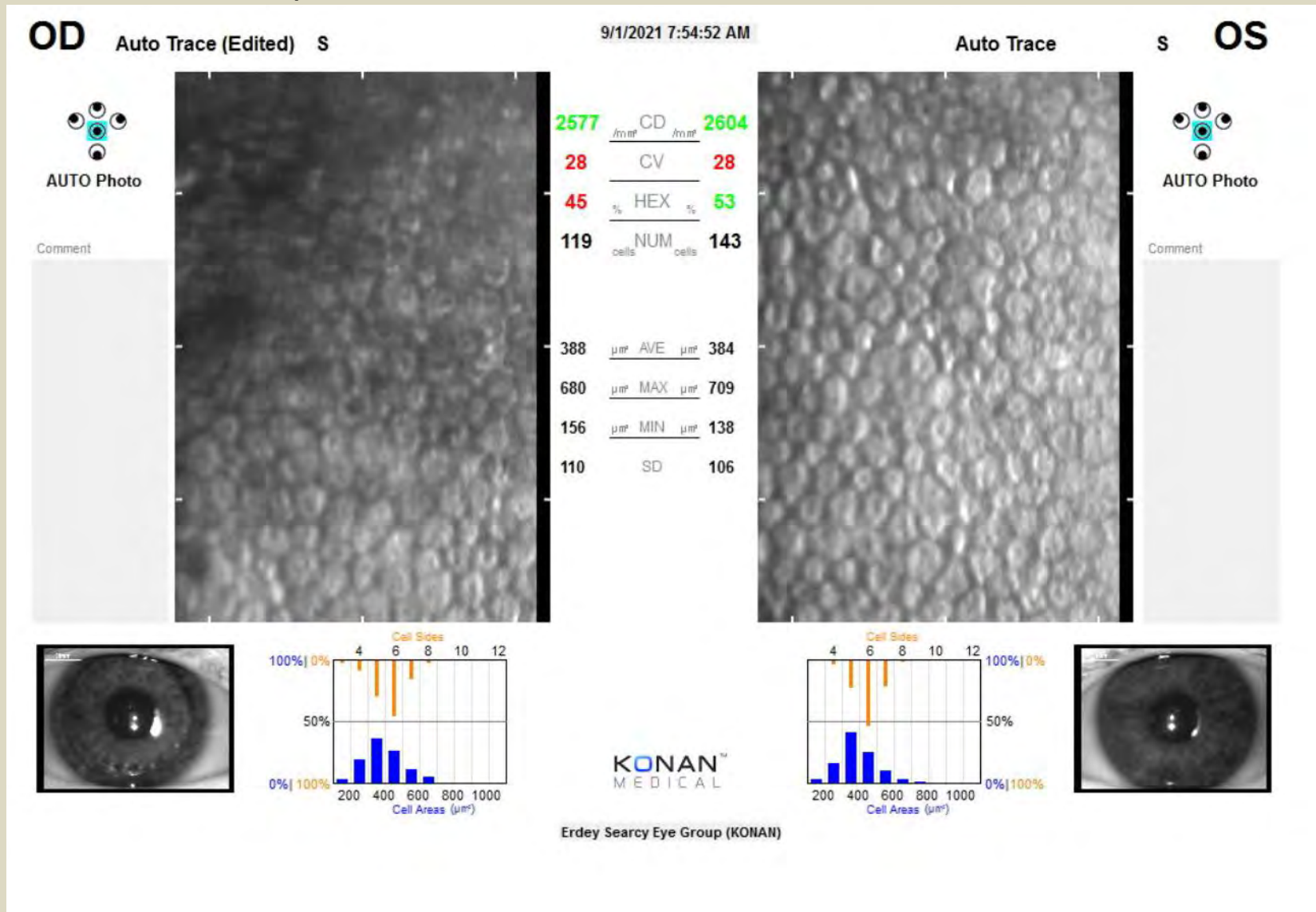
11/27/2018 DALK 9.0mm

L	09/07/2022 07:43	Comment	L	Diagnosis	L
R	09/07/2022 07:43		R		R



Case #1 OD: Endothelial Cell Count 9/21/2021

Note: NORMAL endothelial cell count as expected Why? Because Endothelial cells/Descemet's membrane RETAINED with DALK



CASE #2 Both Eyes

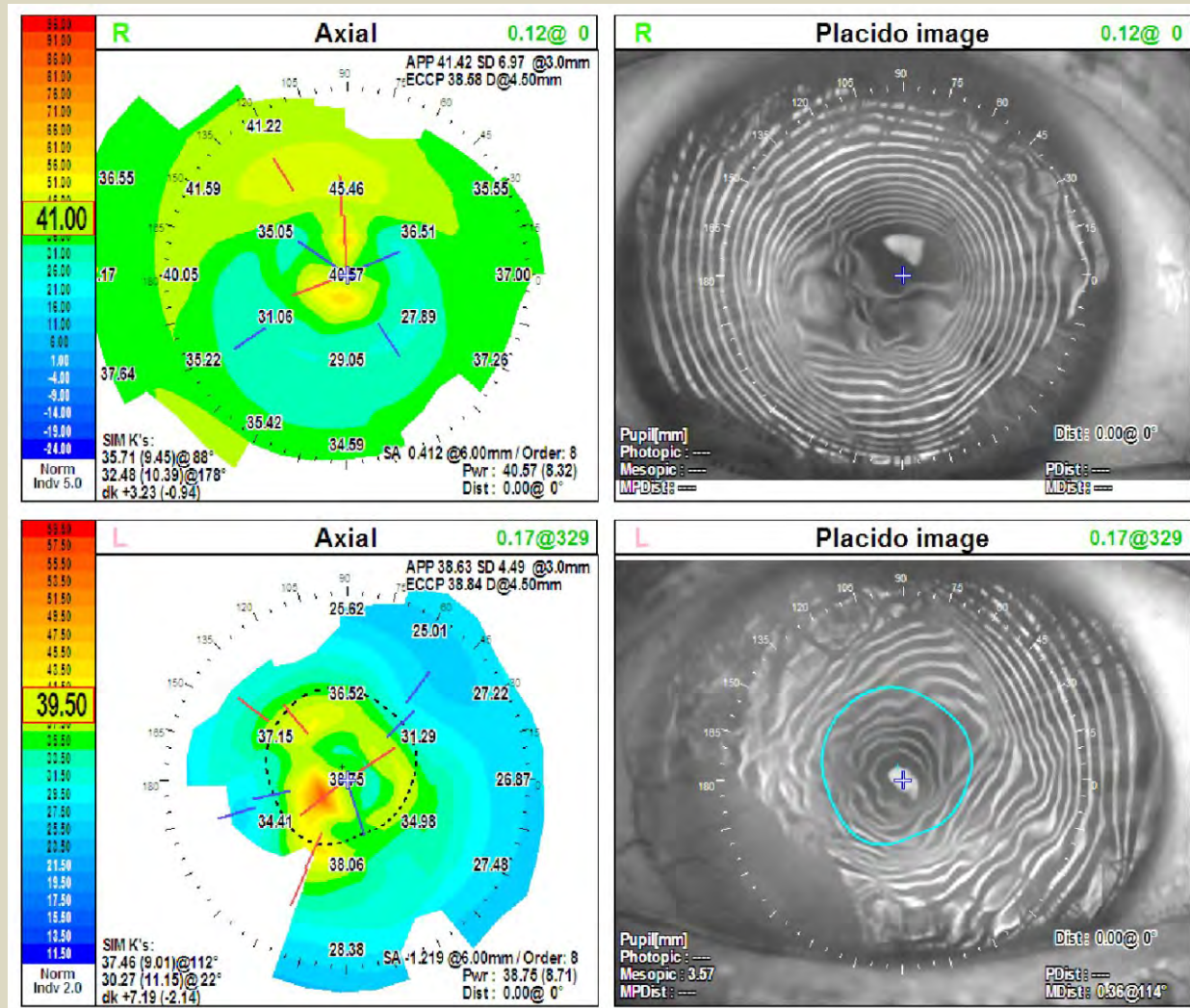
57 yo FM Bilateral Central Thinning and severe cornea scar d/t
Herpes Simplex Virus (HSV) 1982

BSCVA 20/400 EACH EYE! Visually disabled since age 21!



CASE #2 Bilateral Central Corneal Scars

Disabled since age 21!

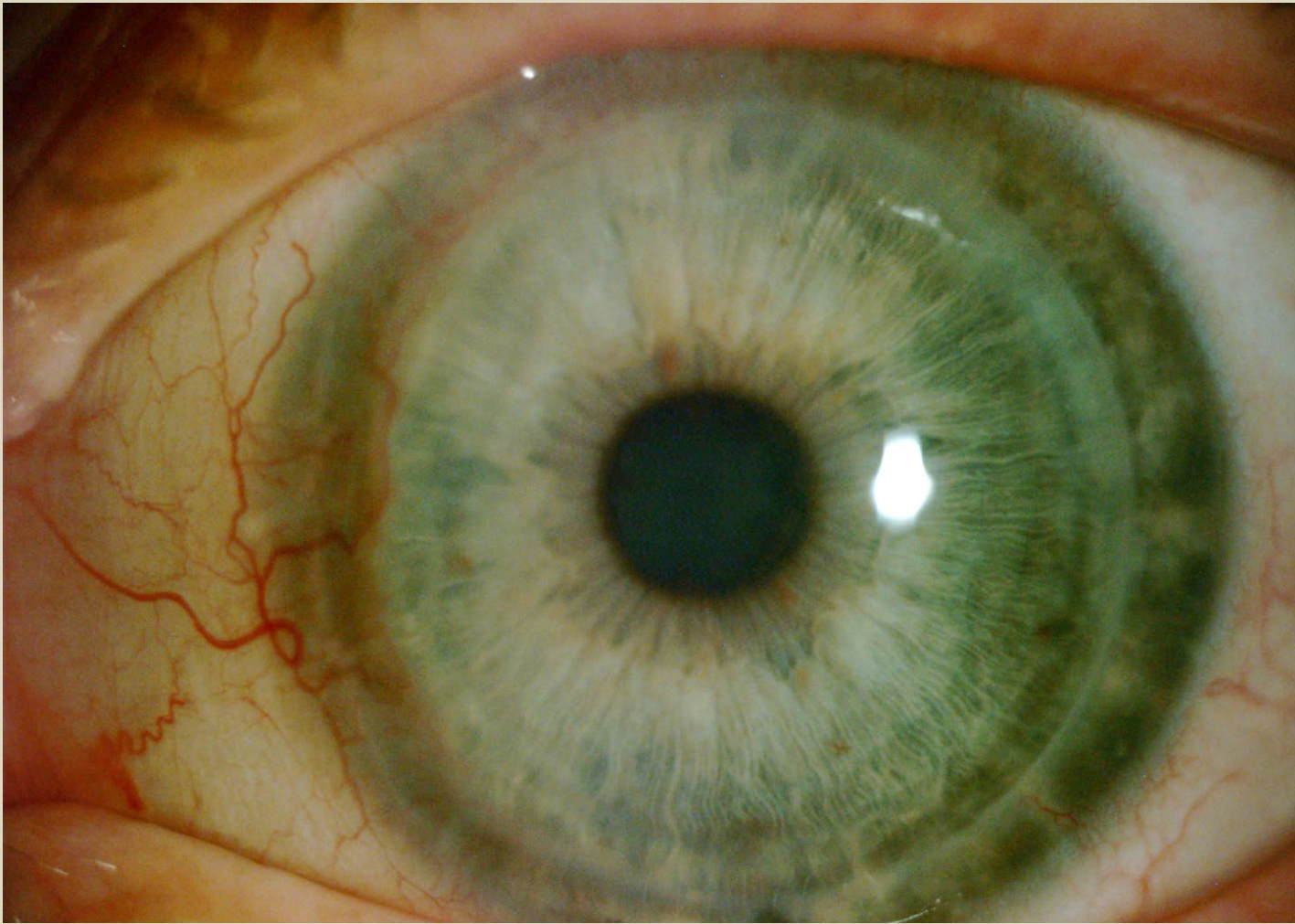


Case #2

Bilateral Central Thinning Cornea Scar/HSV since age 21

3/2019 OS Uncorrected VA 20/50 note nasal deep neovascularization in host bed. If this graft was a PK, this finding would dramatically increase chance of endothelial graft rejection and decompensation = failed graft...cannot happen with DALK!

8/2018 OS DALK 9.0mm



Case #2 Bilateral Central Thinning Cornea Scar/HSV

3/2019 OS UCVA 20/50 mild residual haze Descemet's

Membrane/Endothelial layer preferable to sacrificing it as would w PK!

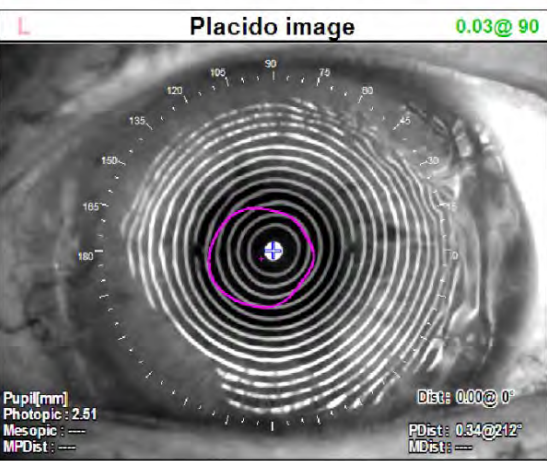
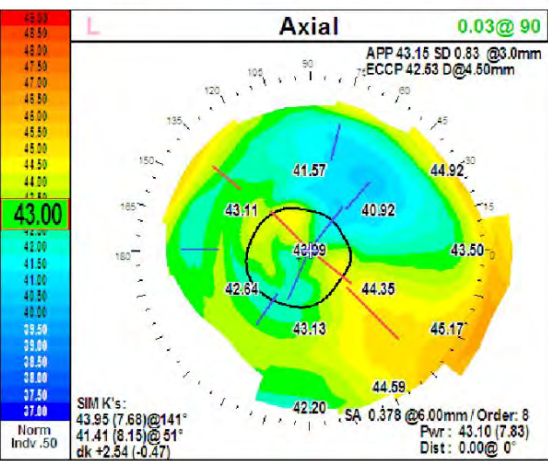
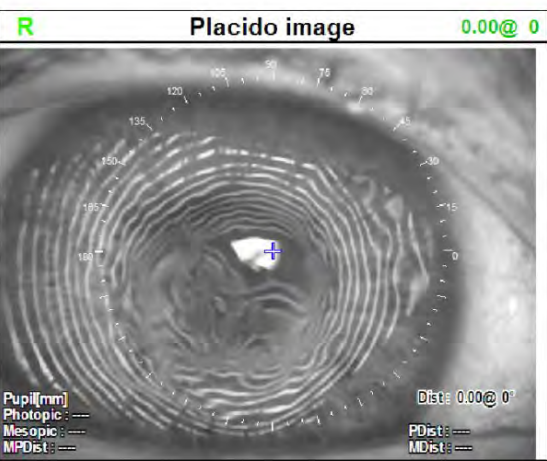
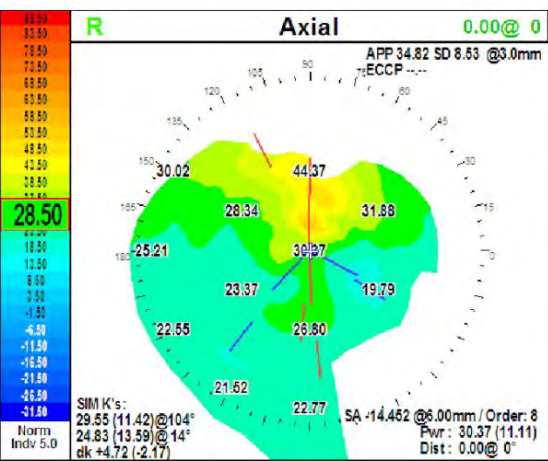
8/2018 DALK OS



Case #2 Bilateral Central Thinning Cornea Scar/HSV

3/2019 OS suture out UCVA 20/50 - Right eye: DALK not done yet...
 8/2018 OS DALK 9.0mm

03/06/2019 13:52	Comment	L	Diagnosis	L
03/06/2019 13:52		R		R



Case #2: Bilateral Central Scars (since age 21)

8/2019 Topo Below:

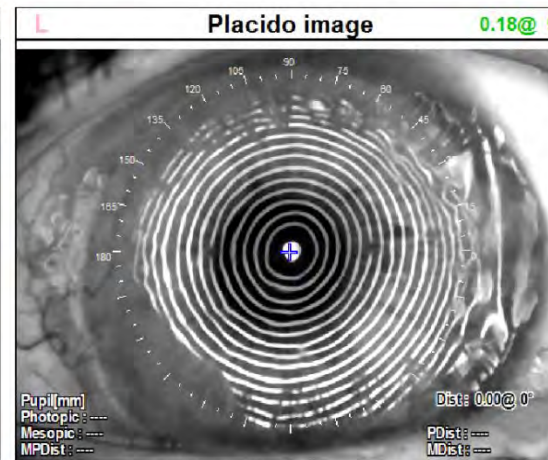
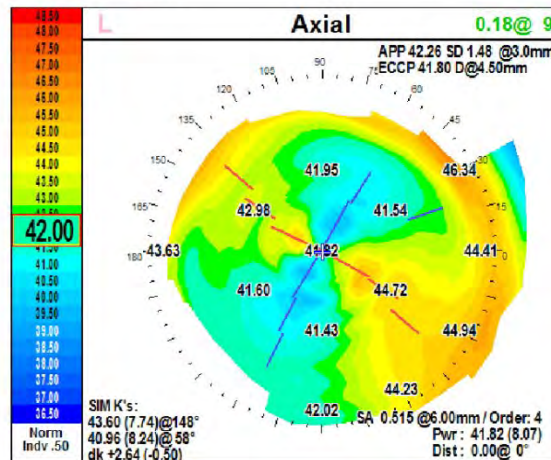
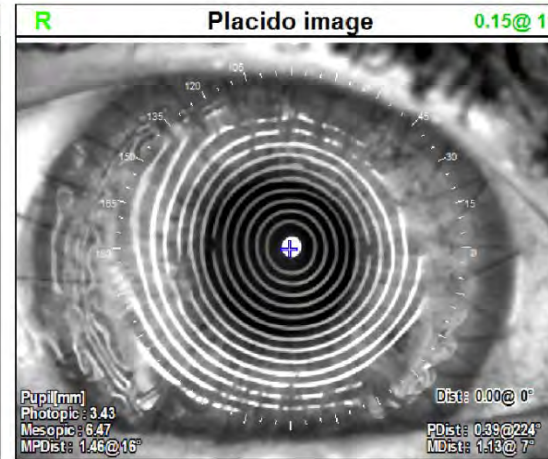
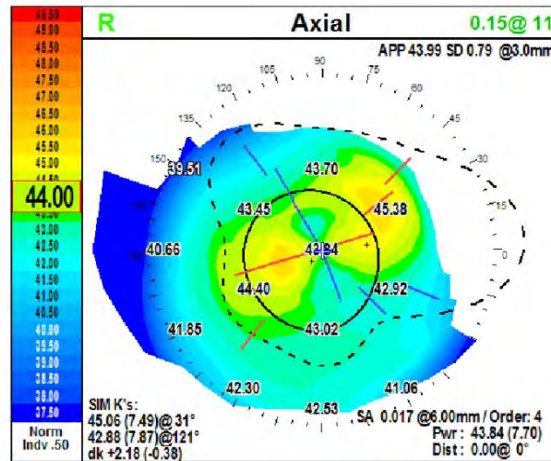
Refraction: OD -1.0+1.75x30 20/30 OS plano+1.75x150 20/40

Very rapid Corneal Restoration/visual rehabilitation OU with DALK (vs PK) !!

OD 4/2019 DALK 9.5mm

OS 8/2018 DALK 9.0mm

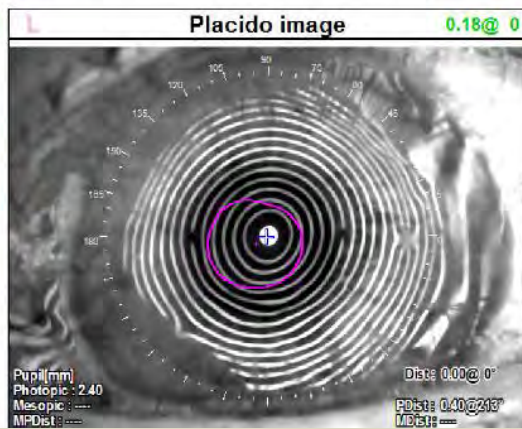
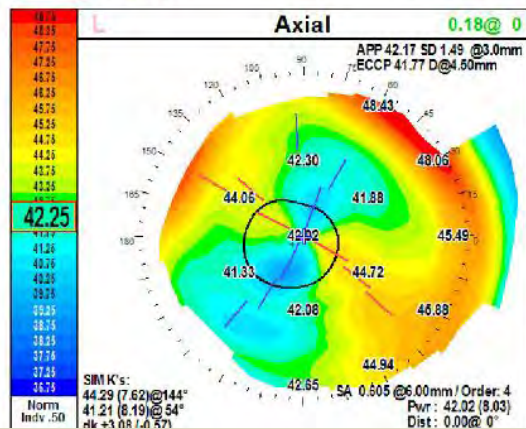
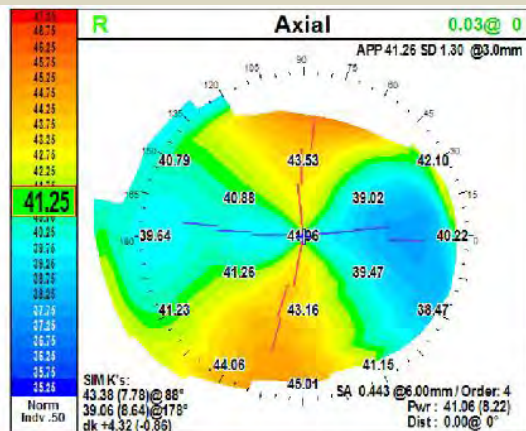
L	08/22/2019 10:22	Comment	L	Diagnosis	L
R	08/22/2019 10:22		R		R



Case #2: Bilateral Central Scars (since age 21)

7/28/2021 Massive visual improvement! -VERY Happy – “Life Changing after 39yrs of visual disability” – (now age 60) !

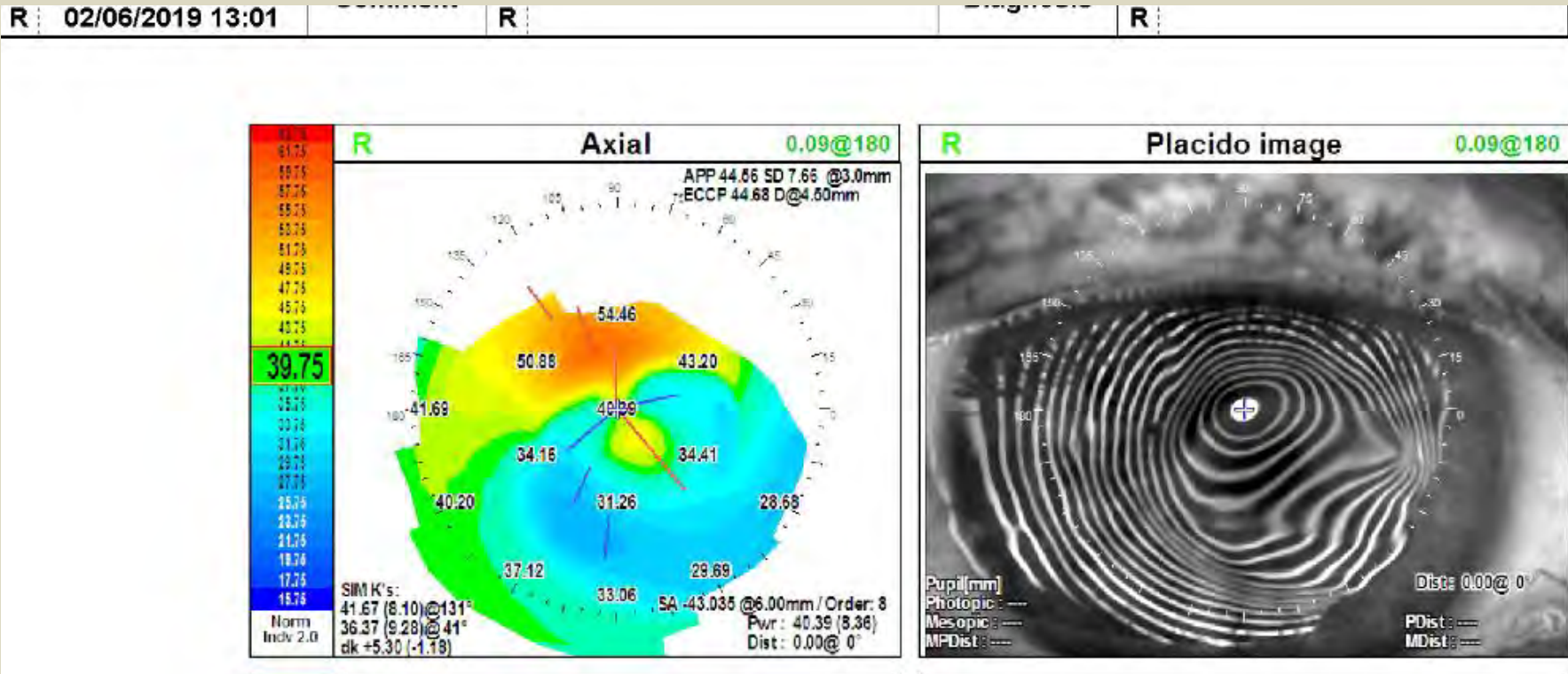
Hx: DALK OD 4/2019 OS 8/2018



- **OD: -0.25+3.5x90 20/30**
 - (vs. pre-op 20/400!)
 - Running suture out x 2 yrs
 - Topography is STABLE and is expected to remain so for life! (unlike PK)
 - Future: reduce/eliminate cylinder w cataract extraction w Toric or LAL IOL
-
- OS: -0.5+2.5x140 20/40
 - (vs. pre-op 20/400!)
 - Running suture out 2.5yrs
 - Topography is STABLE and is expected to remain so for life! (unlike PK)
 - Future: reduce/eliminate cylinder w cataract extraction w LAL

Case #3: Right Eye 70 yo woman Corneal Scar since 1943 (infectious ulcer)

Best Corrected VA 20/100



Case #3: Right Eye

Cornea Scar since 1943: Cornea Restoration w large dia DALK

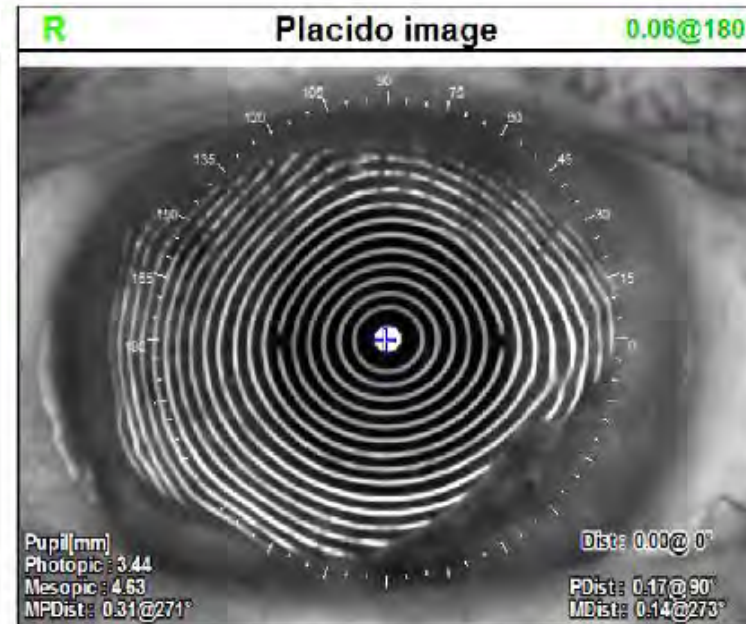
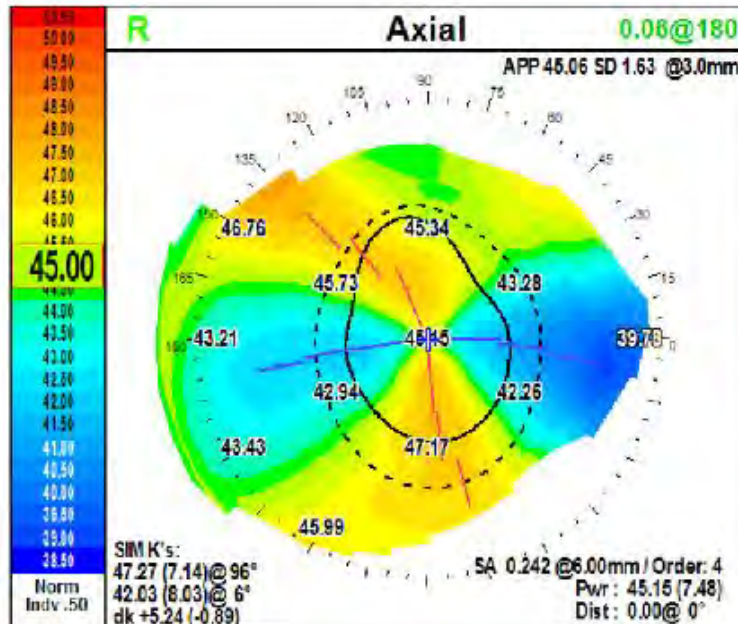
4/2022 TOPOGRAPHY (below) Refx: -1.25+0.25x150 20/30+ "thrilled"!

2/2020 optical "rescue" with Cat Ext w TORIC IOL AMO 600 15.5x90

12/2019 suture out

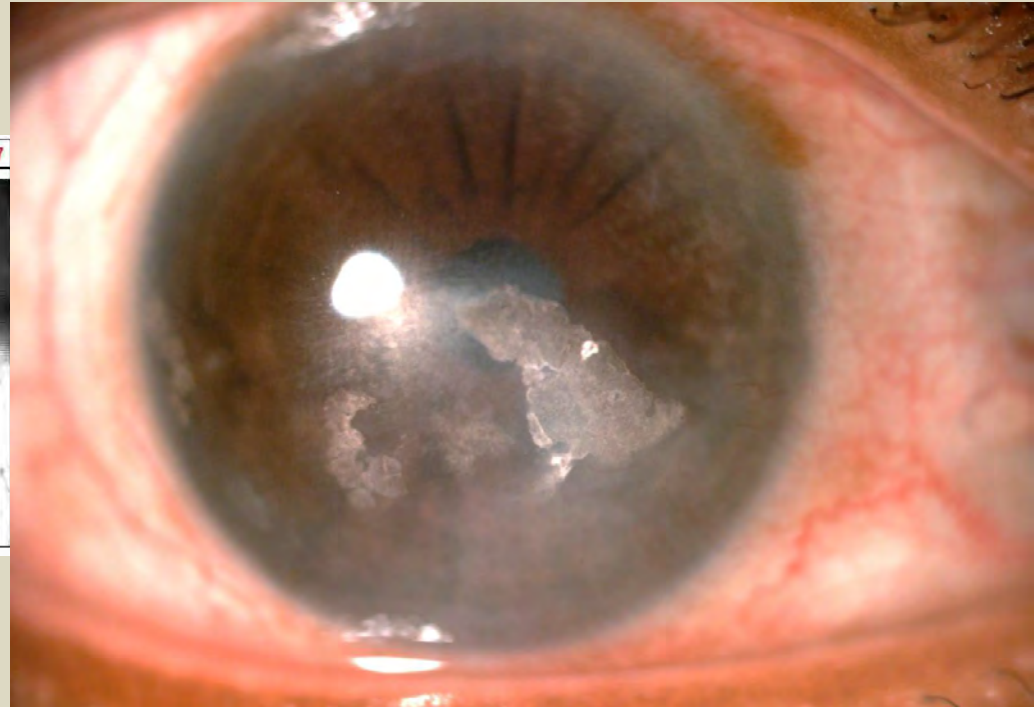
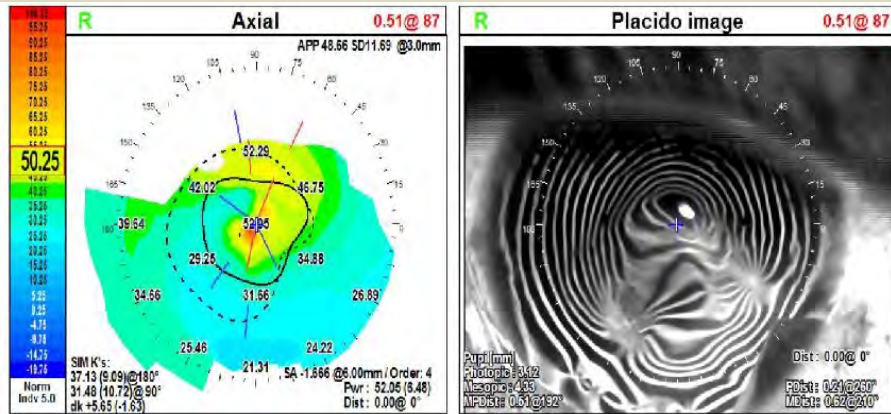
2/2019 DALK 9.5mm diameter

Date	Comment	Diagnosis
R 04/06/2022 12:38	R	R



Case #4 Right Eye

71 yo FM Corneal Scar – Band keratopathy – “Failed”
keratectomy/chelation -12.0+7.25x135 20/100

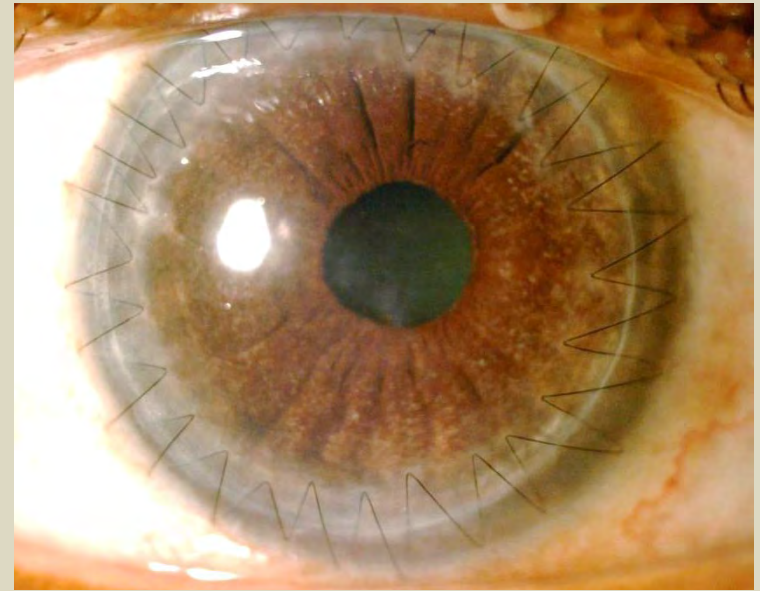
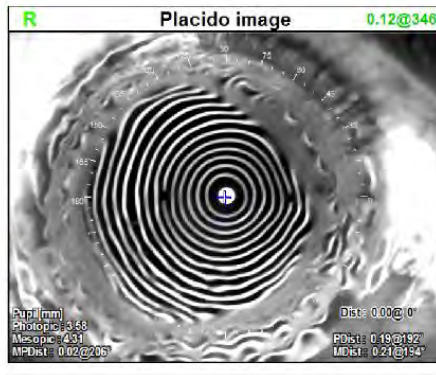
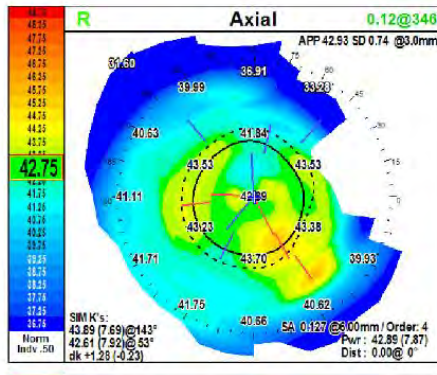


Case #4 Right Eye Cornea Scar

10/13/2021 Refx: -8.5 20/60 (limited by cataract)

9/14/2021 DALK 9.0mm

R	10/13/2021 08:46	Comment	R		Diagnosis	R	
L	10/13/2021 08:46		L			L	

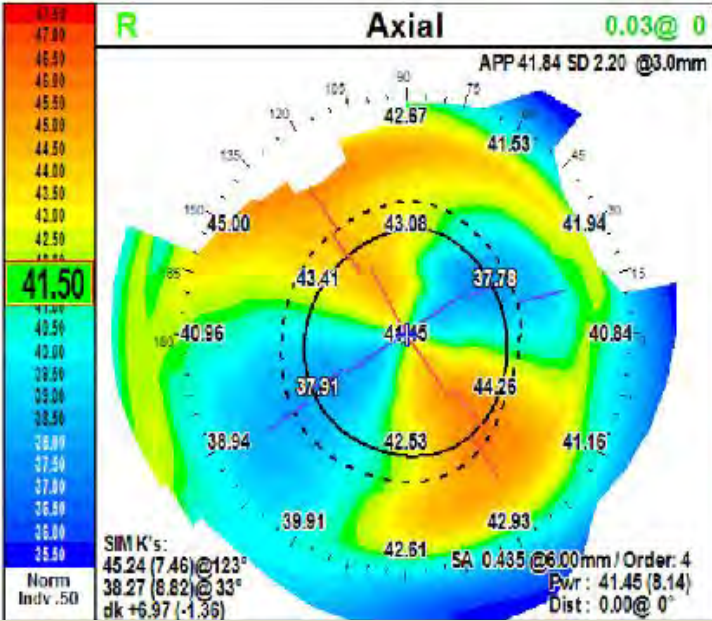


Case #4 Right Eye Cornea Scar

8/26/2022 High magnitude astigmatism 7.0 Diopters (regular)

9/14/2021 DALK 9.0mm

L	08/26/2022 07:42	Comment	L	Diagnosis	L
R	08/26/2022 07:42		R		R



Scleral Recession: Astigmatic Keratotomy technique to reduce corneal astigmatism using a long scleral tunnel on steep axis to relax the cornea in that meridian

The Incision

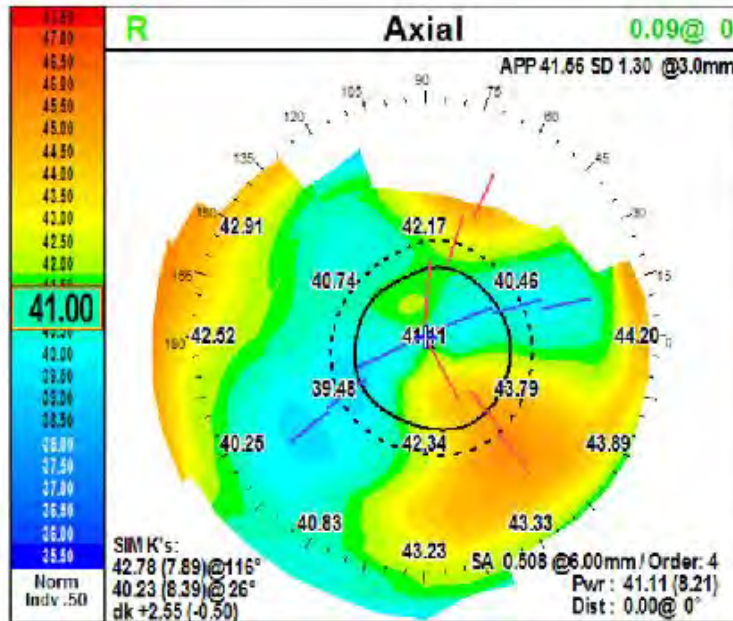


3-7. Shelf of the incision. The shelf portion of the incision holds the iris back and helps prevent iris prolapse.

Case #4 Right Eye

9/14/2022 topographic cylinder reduced to 2.5 D
8/30/2022 AK - Scleral pocket lamellar incision x 120 deg

Date	L	09/14/2022 09:12	Comment	L		Diagnosis	L	
	R	09/14/2022 09:12		R			R	



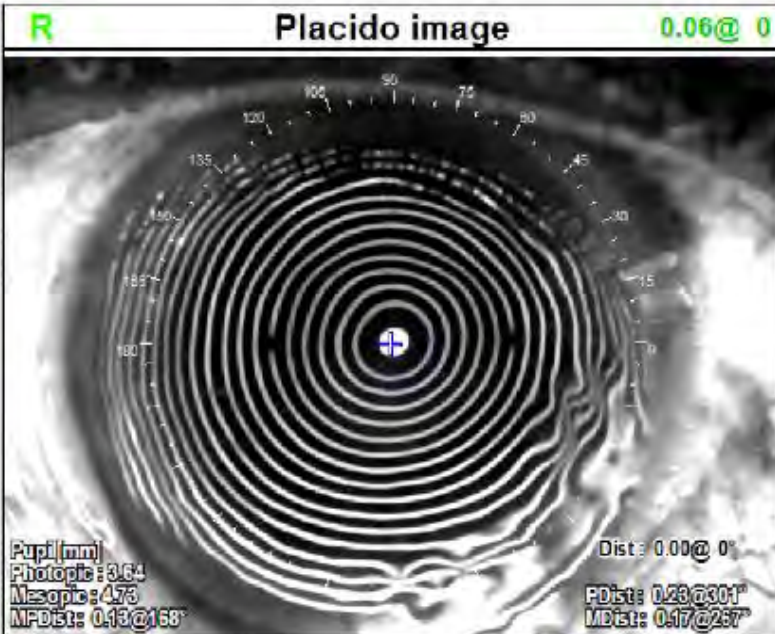
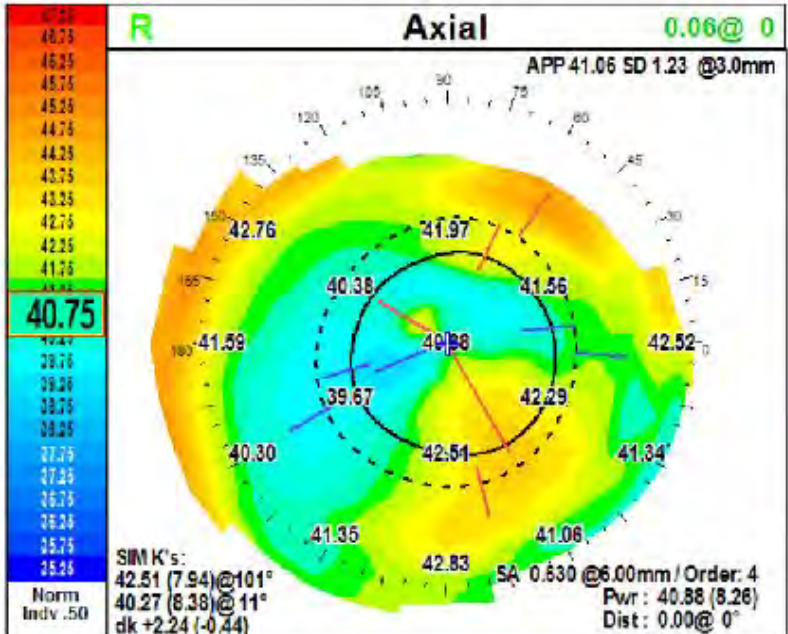
Case #4 Right Eye Cornea Scar

1/28/2023 topographic cylinder further normalized – future cat ext w LAL

12/2022 AK scleral pocket incision x 305

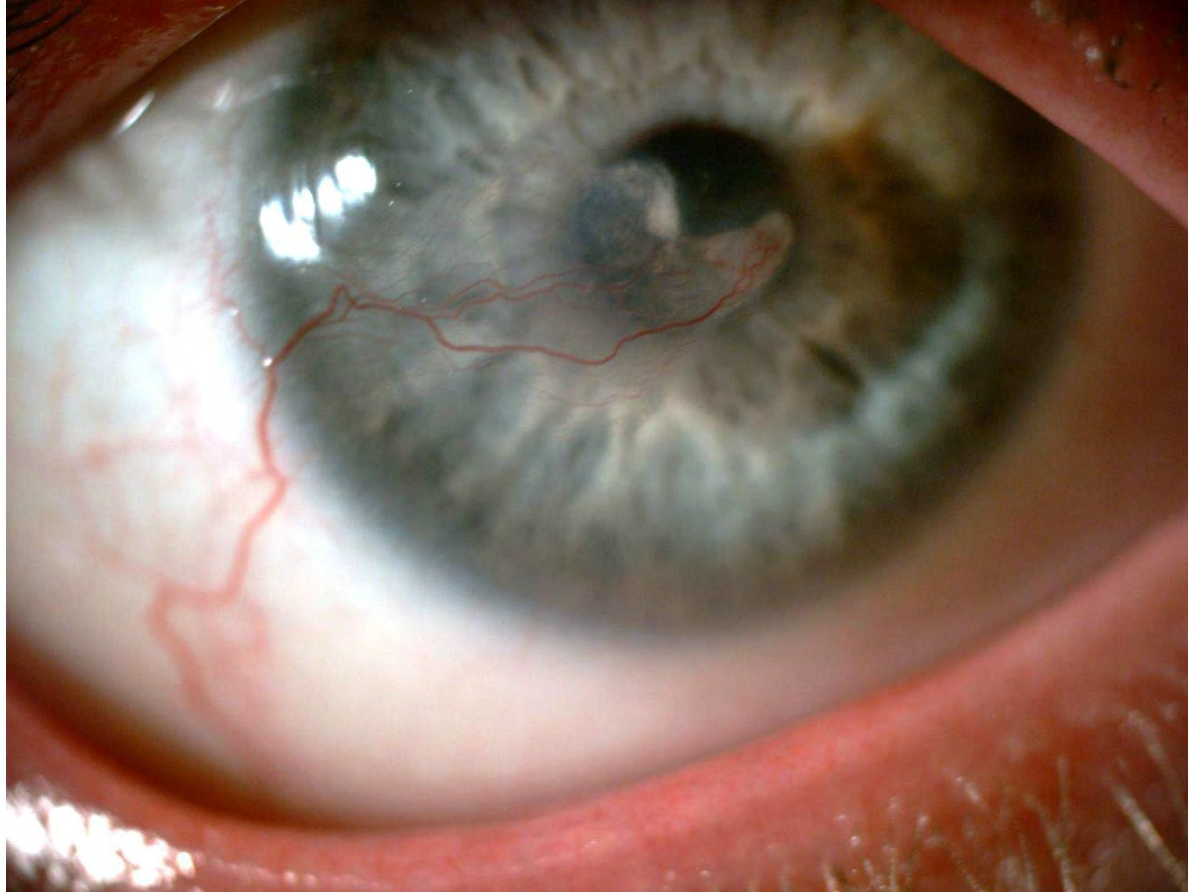
8/30/2022 Scleral pocket incision x 120 deg

L	01/26/2023 10:16	Comment	L		Diagnosis	L	
R	01/26/2023 10:16		R			R	



Case #5 OD

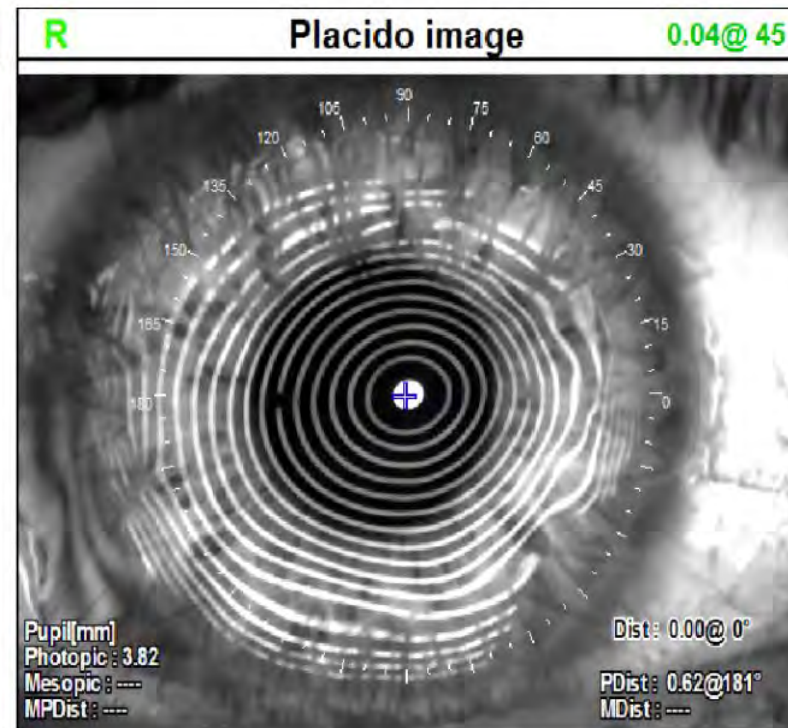
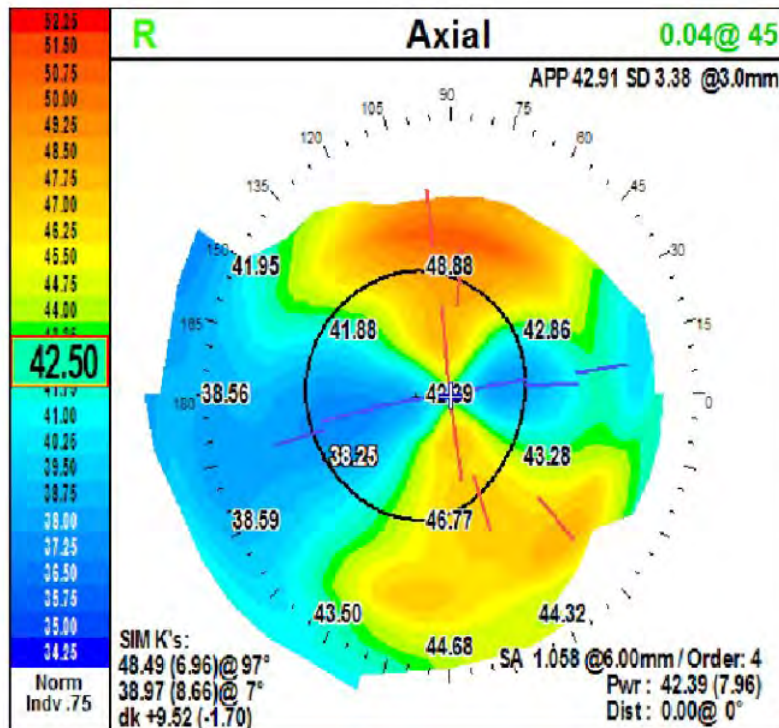
18yo Male w Cornea Scar (HSV)



Case #5: OD 18yo male Cornea Scar (HSV)

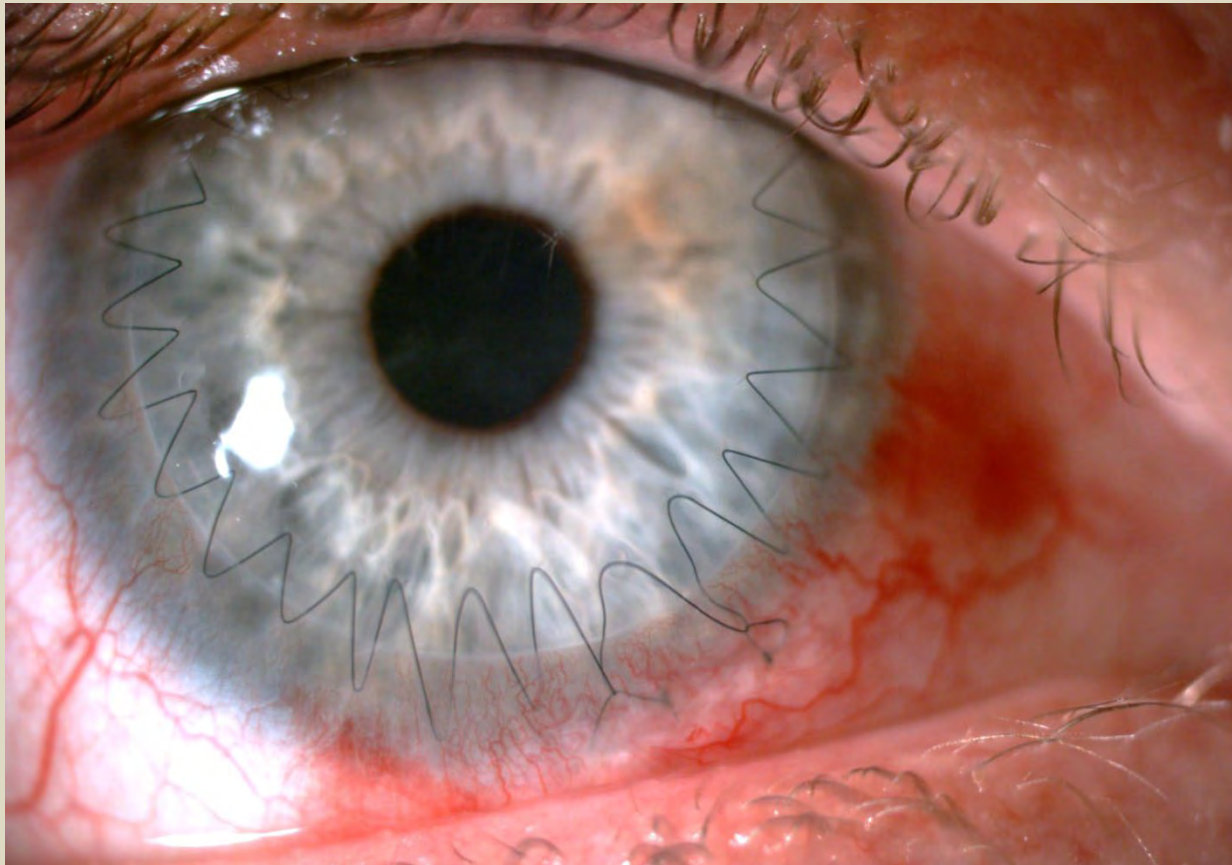
7/16/2019 5 wks aft DALK 9.5mm: high cylinder – loose running suture loops

R	08/23/2019 11:13	Comment	R	Diagnosis	R
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Case #5: OD 18yo male Cornea Scar (HSV)

Loose running suture loops: fixed with interrupted plication sutures at 4 & 5 o'clock. Adjusted suture tension under guidance of intraoperative keratometer.

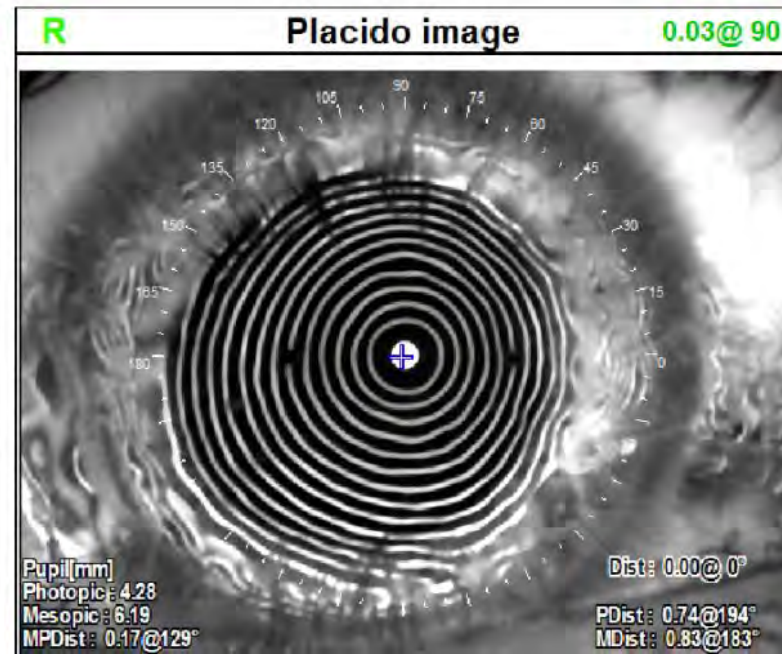
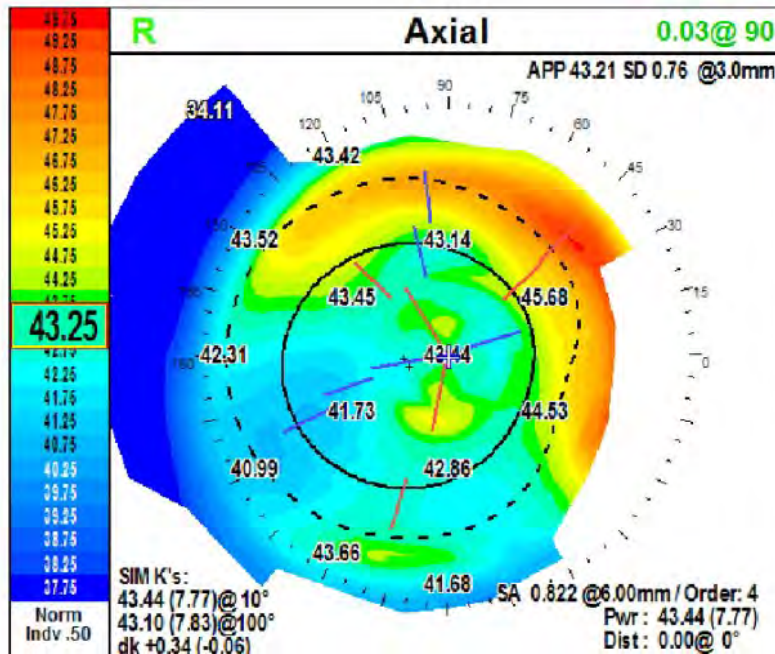


Case #5: OD 18yo male Cornea Scar (HSV)

2 wks after running suture adjustment:

Uncorrected VA 20/40 +0.5+0.75x78 20/30

R	09/09/2019 10:56	Comment	R	Diagnosis	R
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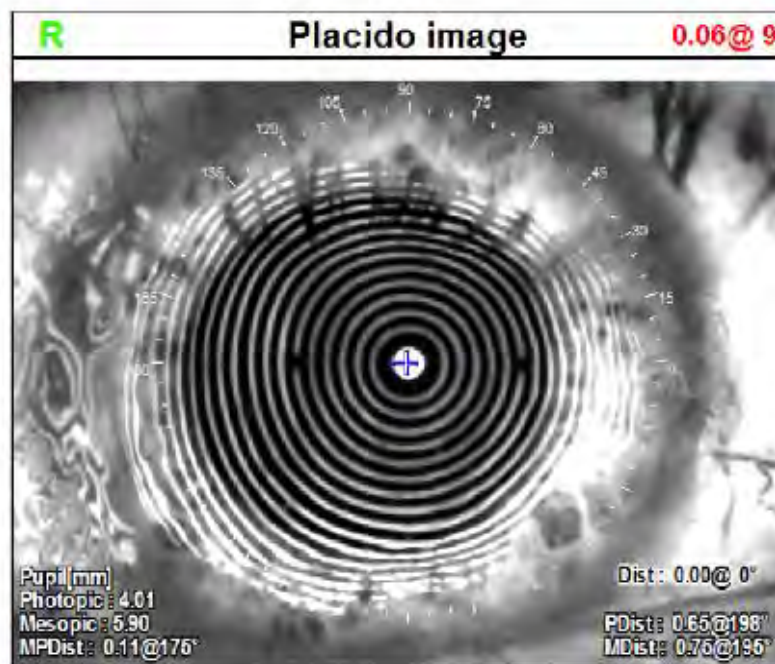
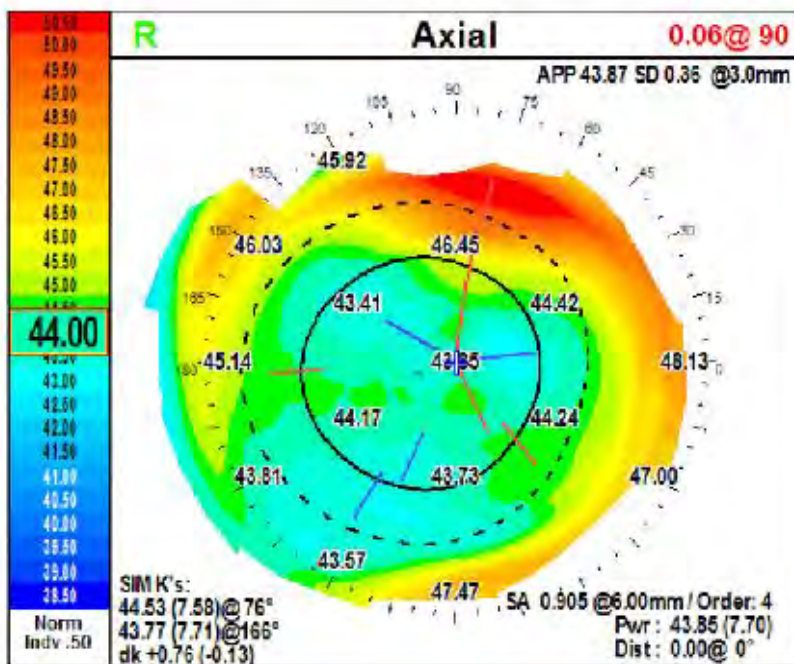
Case #5: OD 18yo male Cornea Scar (HSV)

6/25/22 (Topo below) Plano +1 x 65 20/25

11/12/2020 Removed running corneal suture Uncorrected VA 20/40

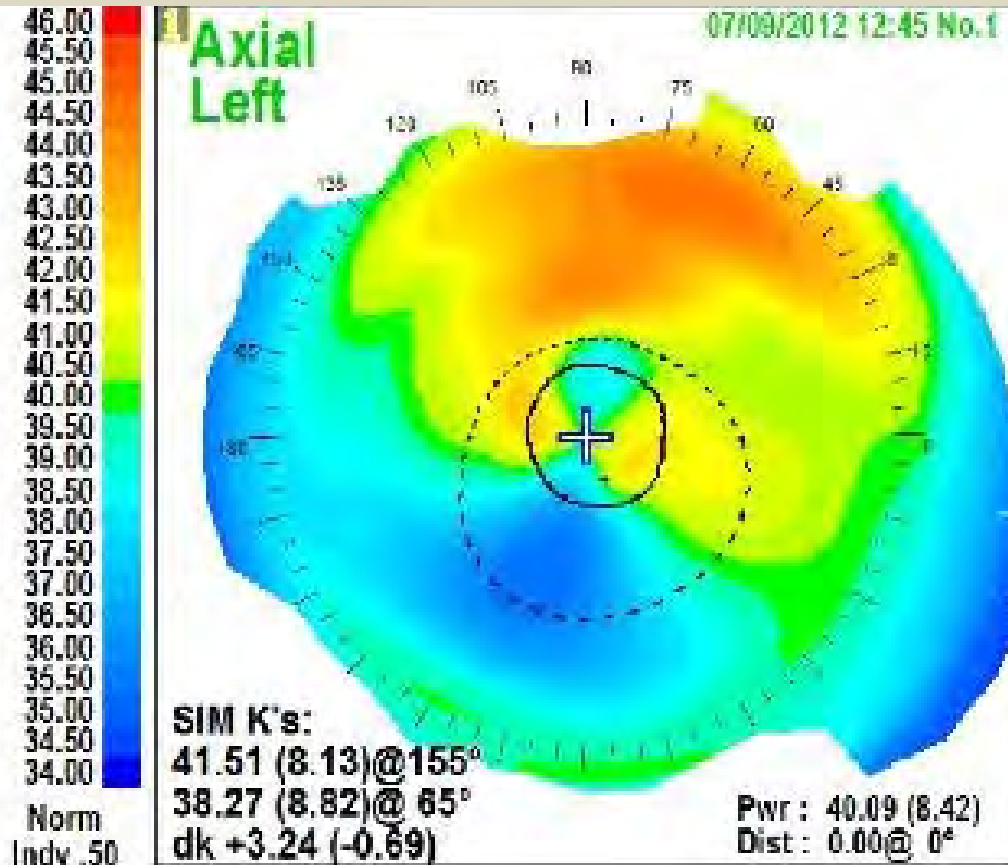
7/16/2019 DALK 9.5mm

R	05/25/2022 14:20	Comment	R	Diagnosis	R
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Case #6 Left Eye

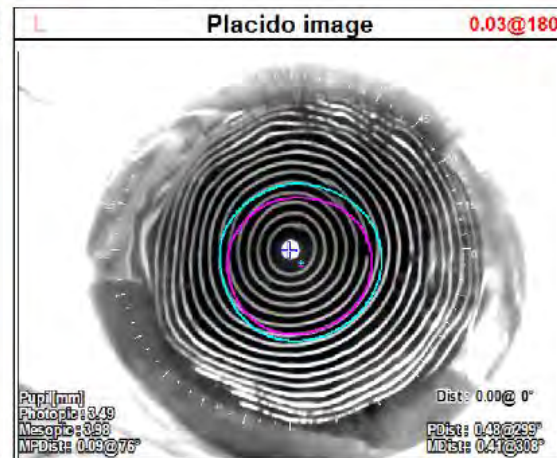
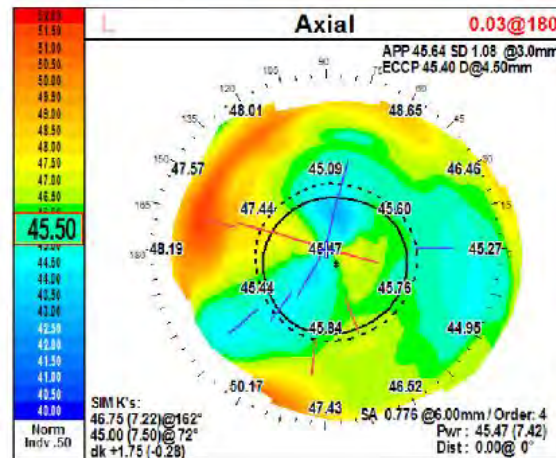
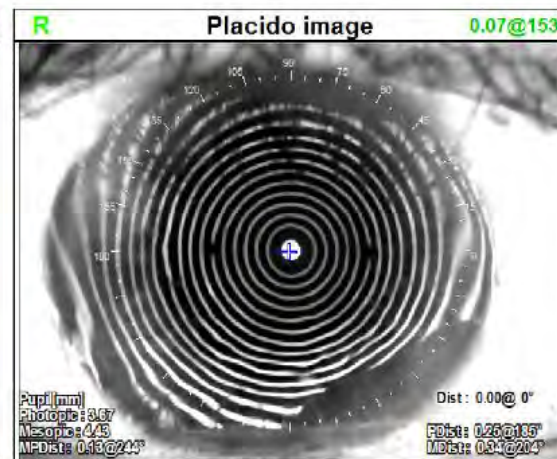
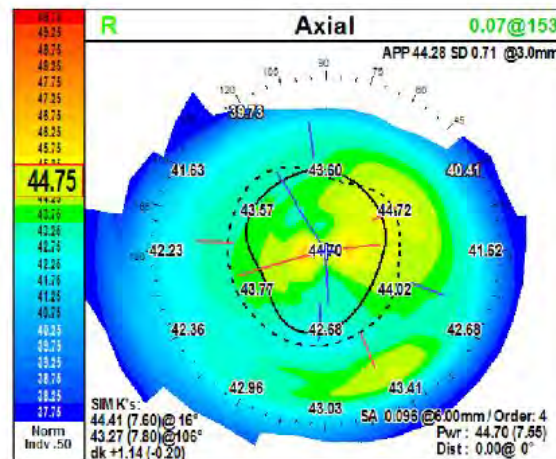
58 yo Cornea Scar since age 20



Case #6 Left Eye

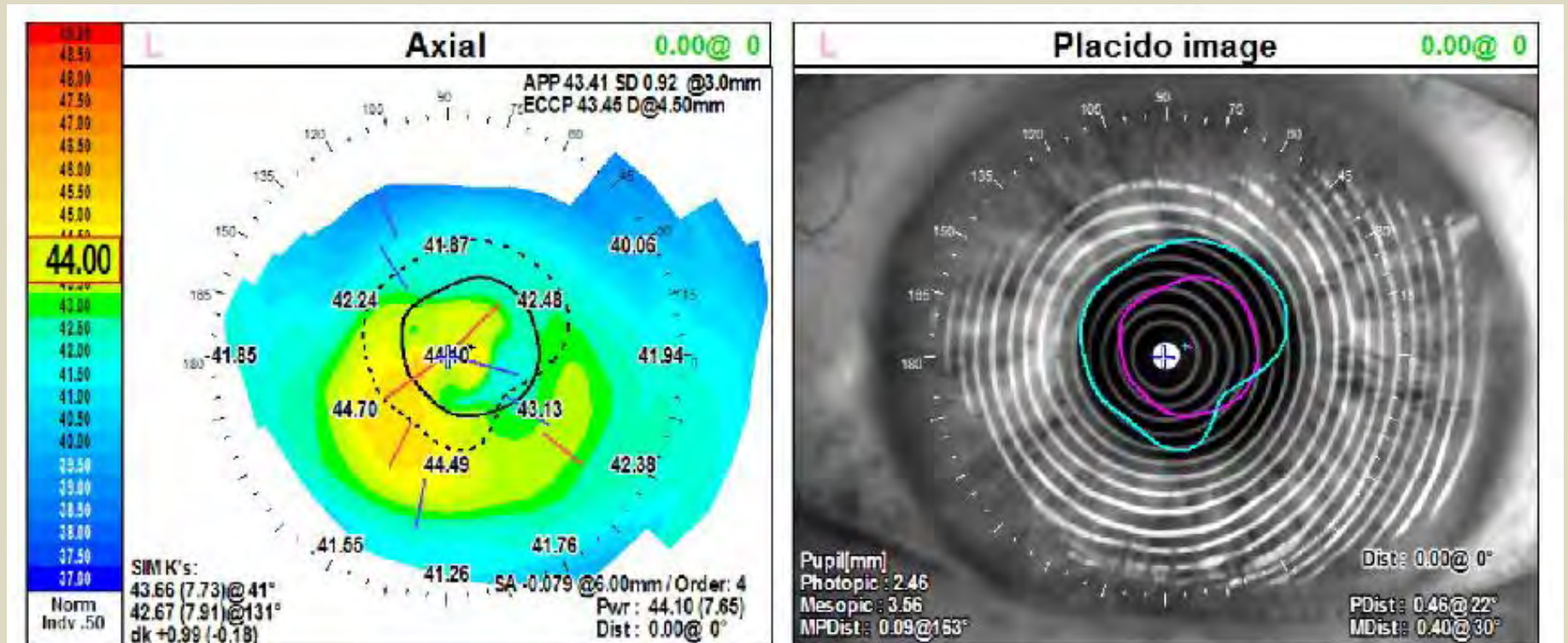
12/2021 Topo (below) still stable after 9 years
 7/21/2012 DALK 9.0mm

L	12/13/2021 15:17	Comment	L	Diagnosis	L
R	12/13/2021 15:17		R		R



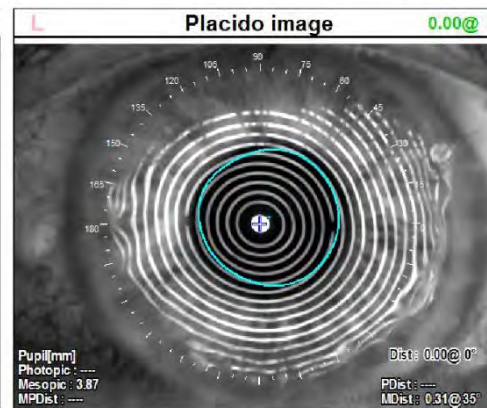
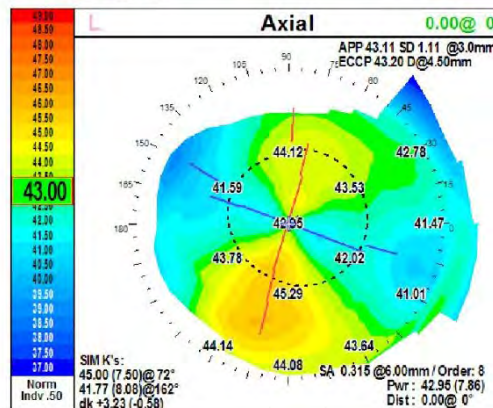
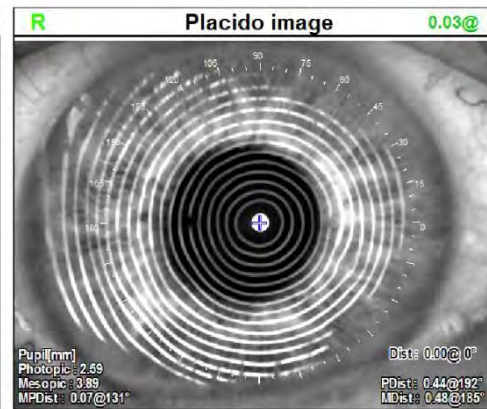
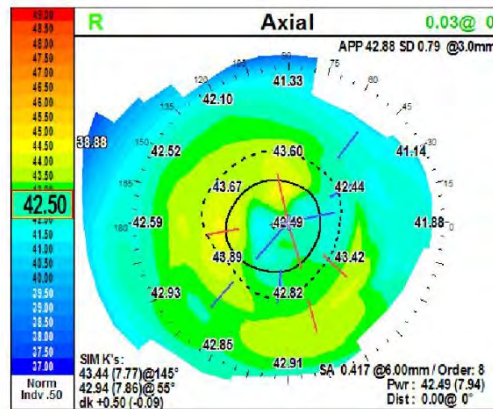
Case #7 Left Eye

67yo male central cornea scar and monocular diplopia hit in cornea w pine needle during college referred from Denver Colorado



Case #7 Left Eye 67yo male central cornea scar
 2/2024 returned to Columbus to have running suture removed
 2/2023 DALK 9.5mm (flight home after 1 day post-op exam to be followed by local referring ophthalmologist)

L	02/21/2024 14:12	Comment	L	Diagnosis	L
R	02/21/2024 14:12		R		R



Case 7 Left Eye 67yo male central cornea scar

12/2024 Uncorrected VA 20/25 VERY HAPPY!

11/2024 Cataract Extraction w Toric IOL by referring ophthalmologist

2/2024 suture removed

2/2023 DALK 9.5mm

Case #7 OS

67yo male central cornea scar

DALK 9.5mm dia uncut surgical video



- Part 1: <https://youtu.be/rUe2bEdC8h0>
- Part 2: https://youtu.be/3D_A07NU6vg
- Part 3: <https://youtu.be/qqKPgMSJQrl>

Case 8 Left Eye

53yo male central cornea scar severe exposure
d/t lid trauma MVA (windshield)
after initial facial reconstruction:

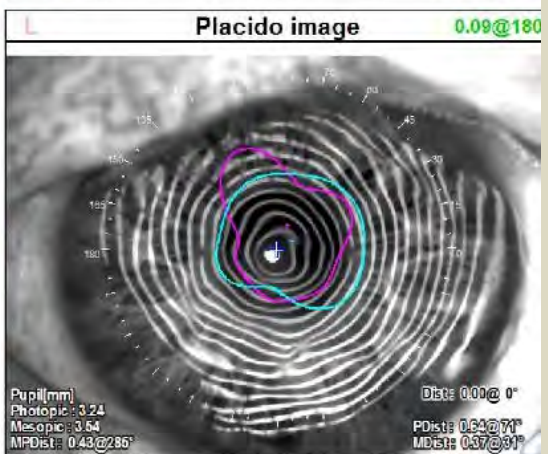
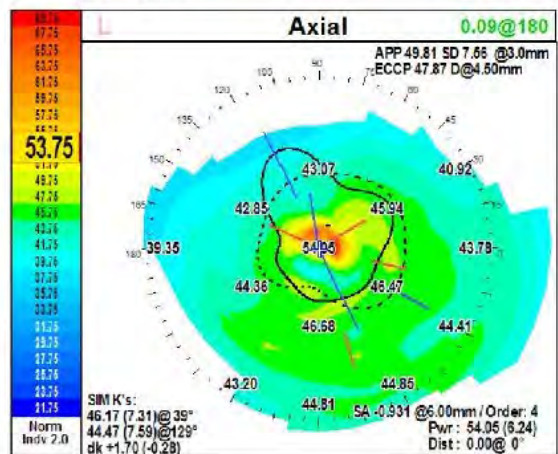
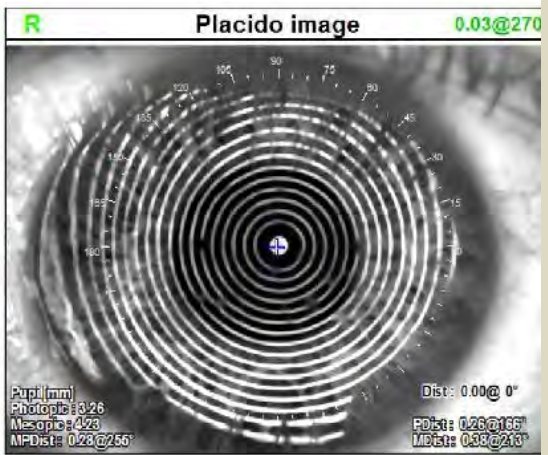
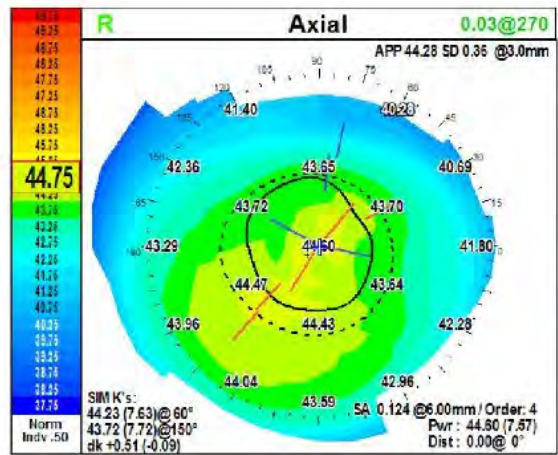


Case #8 LEFT EYE

53yo male central cornea scar

severe exposure d/t lid trauma MVA (windshield)

L	10/23/2024 08:31	Comment	L	Diagnosis	L
R	10/23/2024 08:31		R		R



VA 20/400

Case #8 Left eye: 53yo male central cornea scar
10/29/2024: DALK 9.5mm bed/9.75mm donor
predescemets dissection laterality matched, nasal marked

Case #8 Left Eye

53yo male central cornea scar

12/19/2024: Left lower lid ectropion causing cornea graft exposure / SPK

Left Lower Lid reconstruction revision to improve lid apposition to globe: Sam Gallo, MD

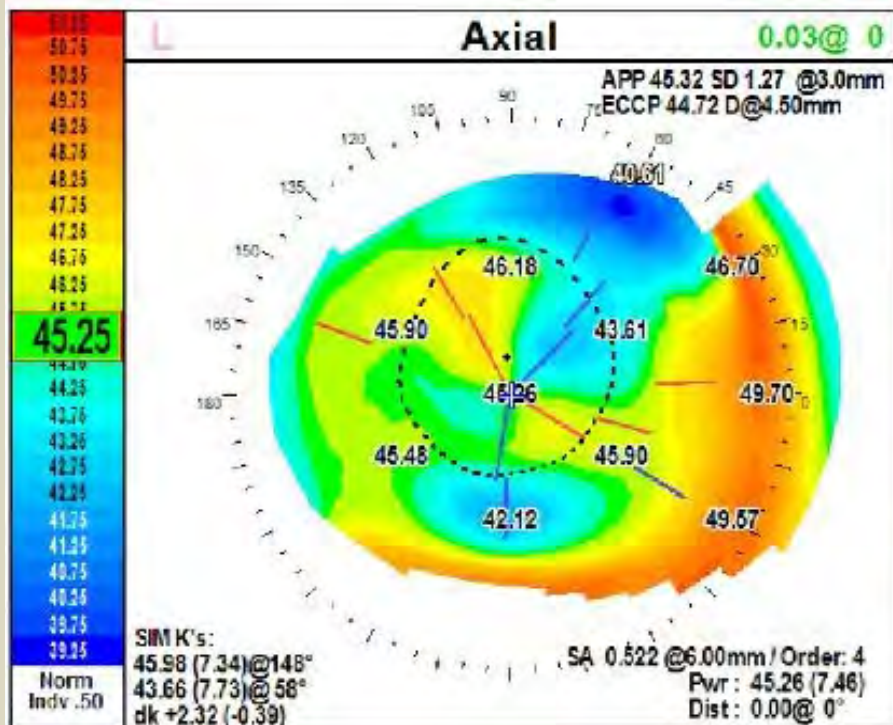


Case #8 Left Eye

53yo male central cornea scar

2/5/2025 Topo below -4.0+2.0x160 20/40

10/29/2024: DALK 9.5mm bed/9.75mm donor
predescemets dissection laterality matched,
nasal marked

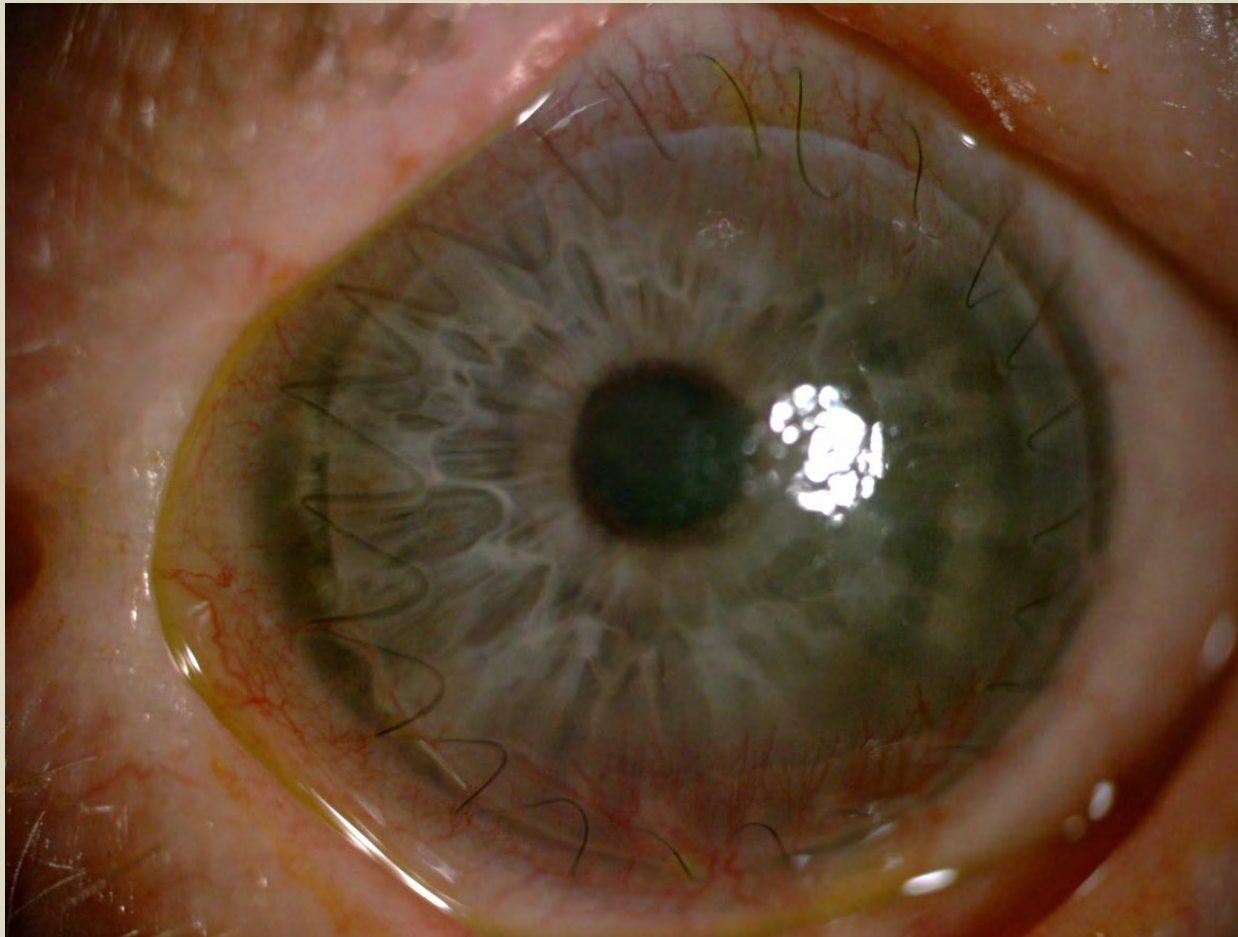


Case 8 Left Eye

53yo male central cornea scar

2/5/2025 loose running suture loops w deep neovascularization
– accelerated fibrosis graft/host interface: suture removed after
only 3 months - added lotamax

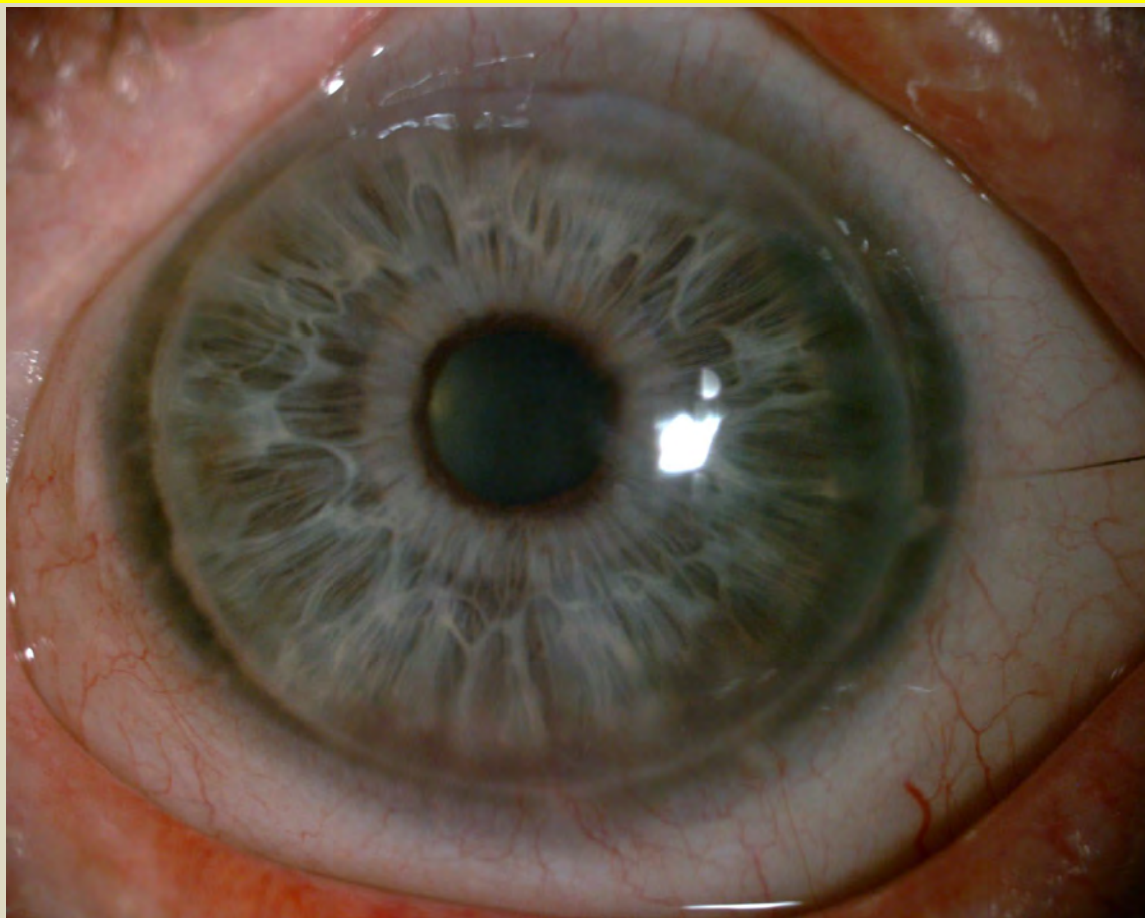
10/29/2024: DALK 9.5mm bed/9.75mm donor



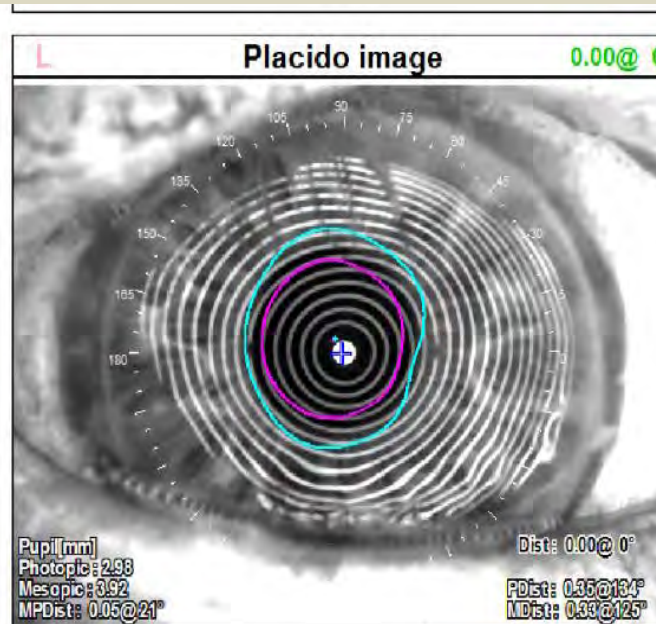
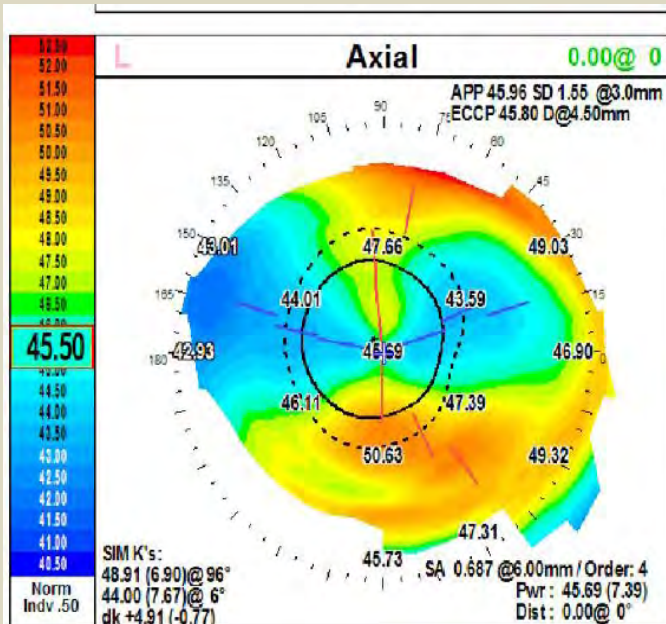
2/5/2025 -4.0+2.0x160 20/40

Case #8 Left Eye: 53yo male central cornea scar
3/3/2025 suture out 1 mo. Note: regression of
corneal neovascularization

10/29/2024: DALK 9.5mm bed/9.75mm donor



Case #8 Left Eye: 53yo male central cornea scar
 3/3/2025 suture out 1 month
 10/29/2024: DALK 9.5mm bed/9.75mm donor



Best Corrected
 Va 20/20!

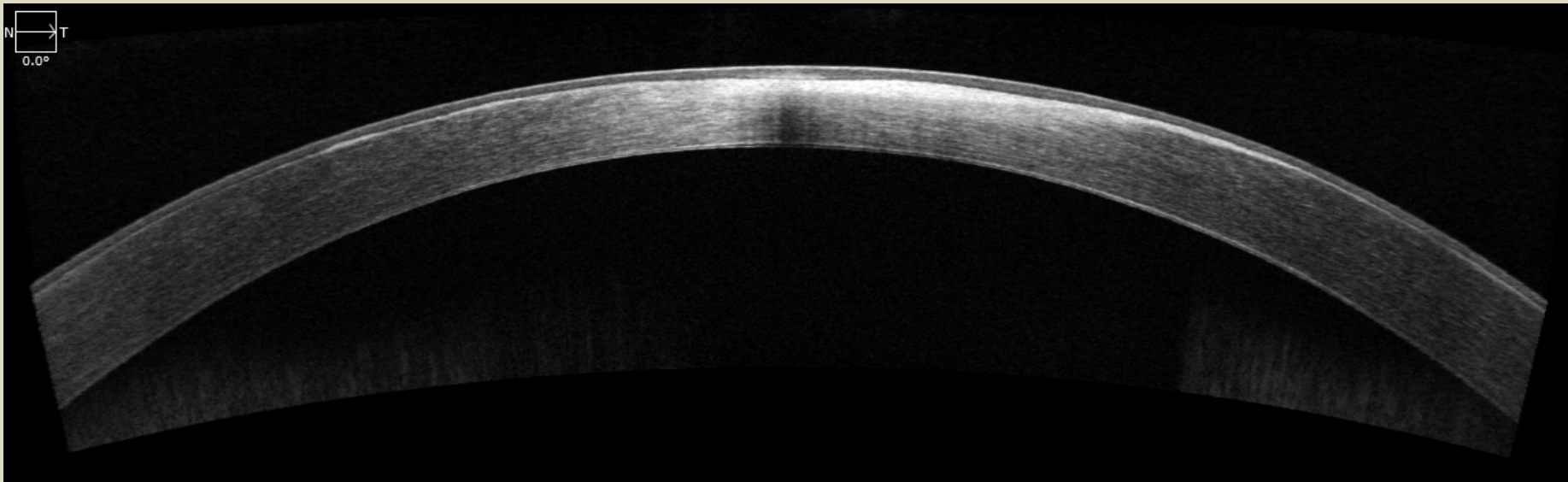
Case #9 Left Eye

53yo female central corneal scar
referred from Kansas City with history of
infectious keratitis (*Acanthamoeba*) after PRK



Case #9 Left Eye

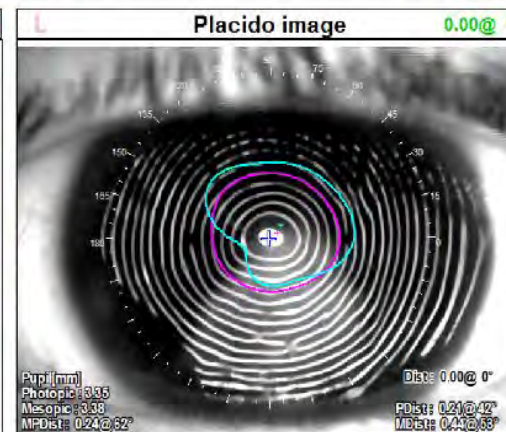
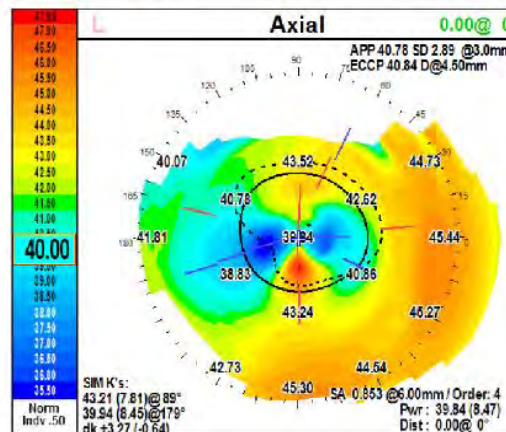
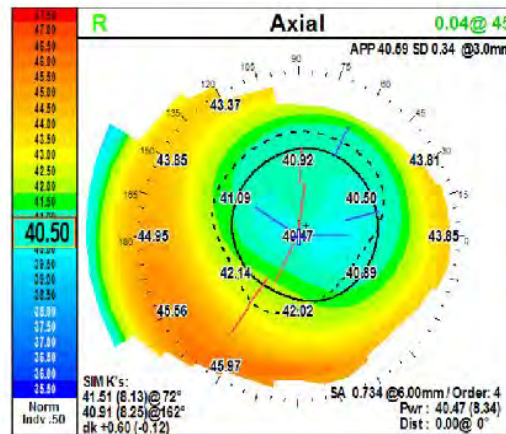
53yo female central corneal scar
referred from Kansas City with history of
infectious keratitis (*Acanthamoeba*) after PRK



Case #9 Left Eye

53yo female central corneal scar
 referred from Kansas City with history of
 infectious keratitis (Acanthamoeba) after PRK

L	11/18/2024 13:57	Comment	L	Diagnosis	L
R	11/18/2024 13:57		R		R



Case #9 Left Eye

53yo central corneal scar

11/19/2024 DALK 9.5mm donor/9.5mm bed
laterality matched nasal marked

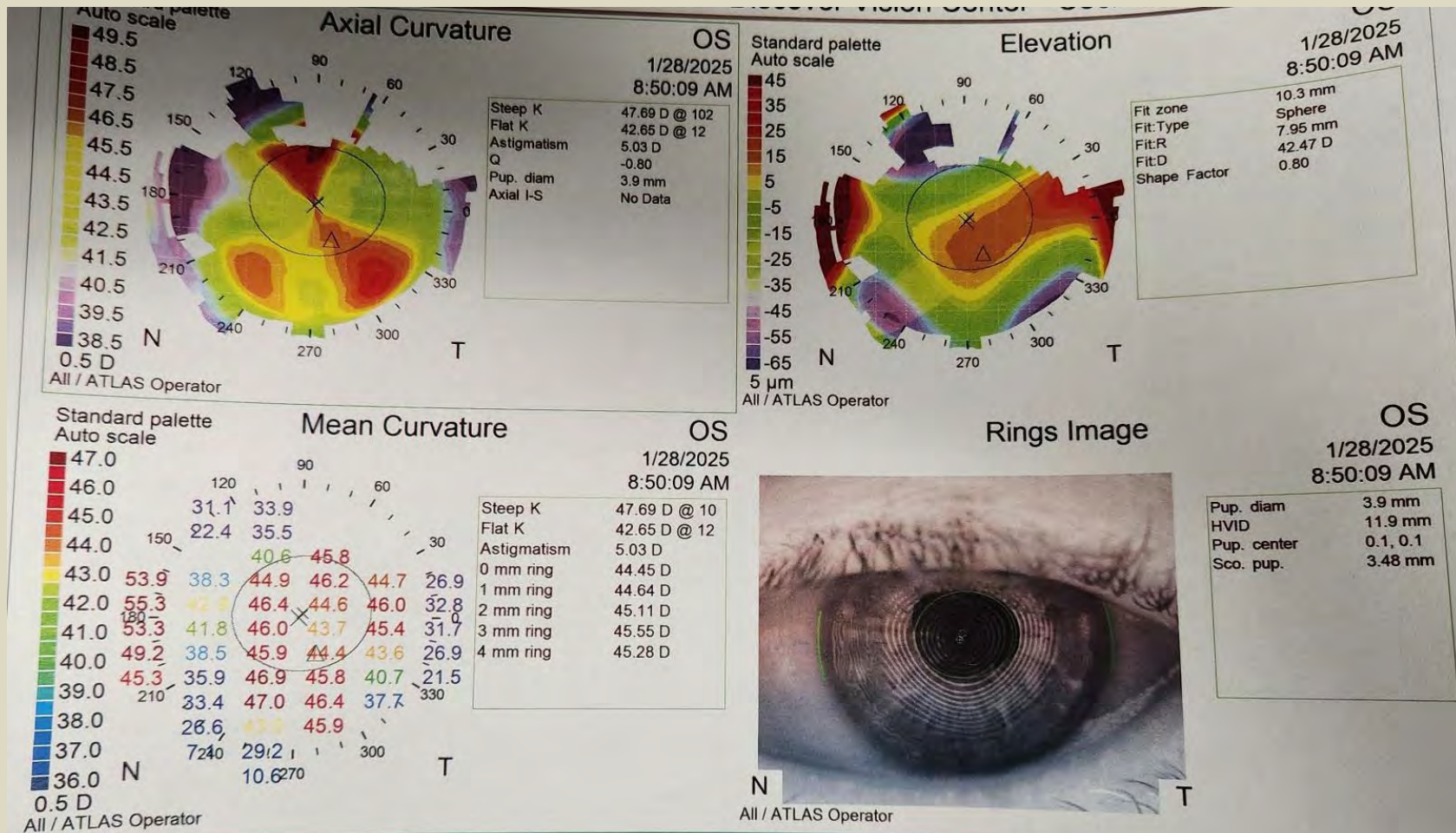
- online full unedited case links to surgical video below.
- DALK pt 1: <https://youtu.be/d3JFSqPqjQY>
- DALK pt 2: <https://youtu.be/66wv7RowpmQ>
- DALK pt 3: <https://youtu.be/yFfe1rM8wYI>
- DALK pt 4: https://youtu.be/B_az1SPJsEo

Case #9 Left Eye

53yo central corneal scar

1/28/2025: topo below. Dense cataract limits VA
once suture out, planned Cataract extraction with Light Adjustable Lens

11/19/2024 DALK 9.5mm donor/9.5mm bed



Case Reports:

Large Diameter DALK for Cornea Scars

Conclusion:

- Faster visual rehabilitation.
- Running cornea suture technique is ADJUSTABLE if necessary to reduce early astigmatism and rx glasses or soft contact lens early optical rehabilitation
- Far less corneal aberrations than PK
- Long term graft endothelial rejection/exhaustion – graft failure eliminated
- If donor/bed centered, residual astigmatism is almost always regular
- Cornea Topography VERY stable over time – NO long term ectasia more often seen with PK and rarely reported with smaller dia DALK
- Closed procedure – unlike PK, does not disturb trabecular meshwork - No increase in Glaucoma