FEMTO CAIRS & ENDOKERATOPHAKIA FOR CORNEAL ECTATIC DISEASES

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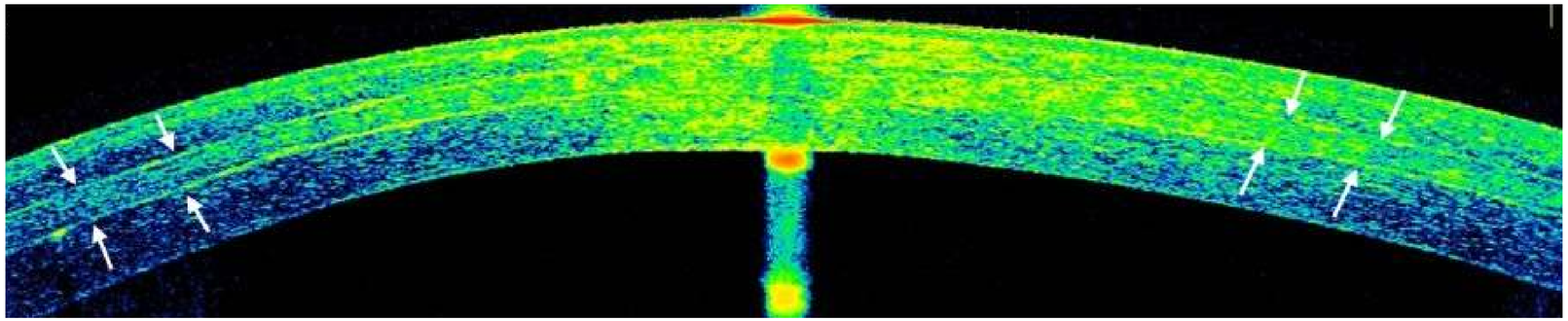
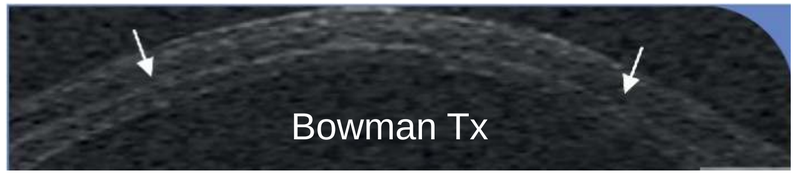
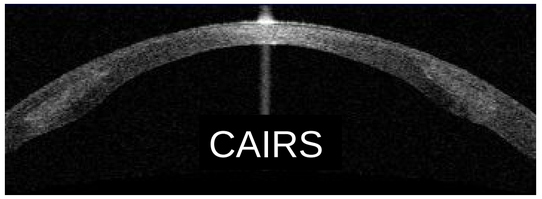
Stromal Keratophakia & KC

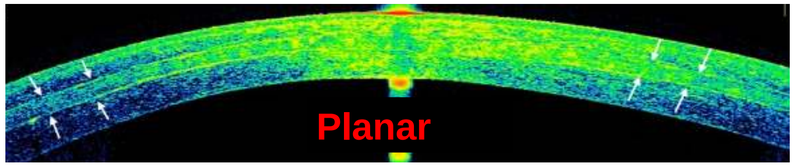
<u>Potential advantages over classical corneal transplantation for KC</u>:

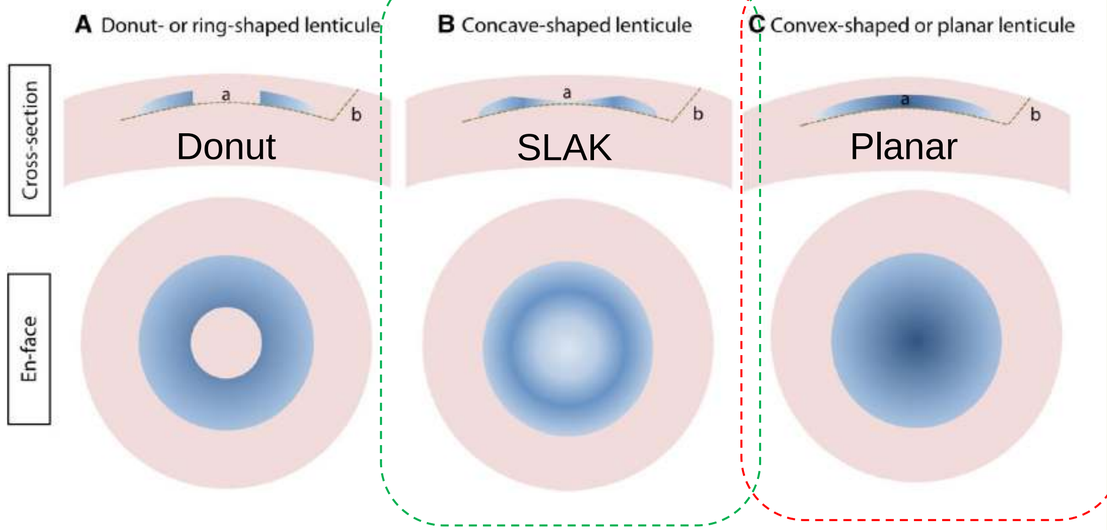
- Technical simplicity
- Immunological advantage over DALK
  1. *Less immunological load* since less tissue is transplanted
  2. The *implanted graft is away* from the limbal lymphatic vessels; & protected from the cytokines and immune cells in the tear film; and in aqueous humor.





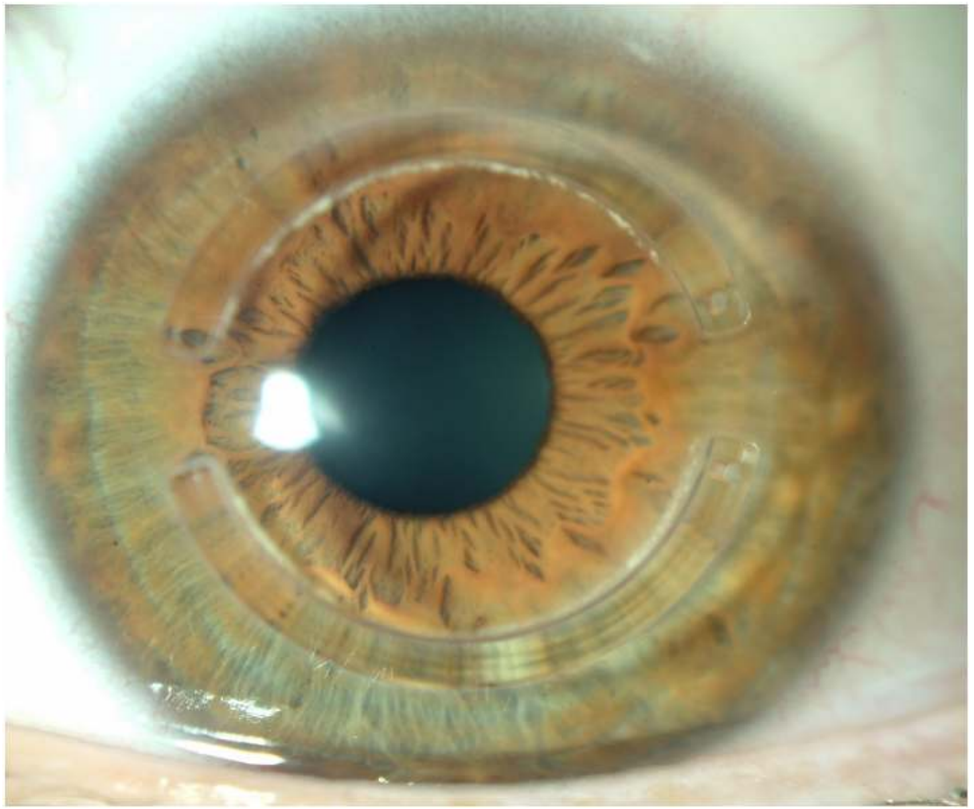


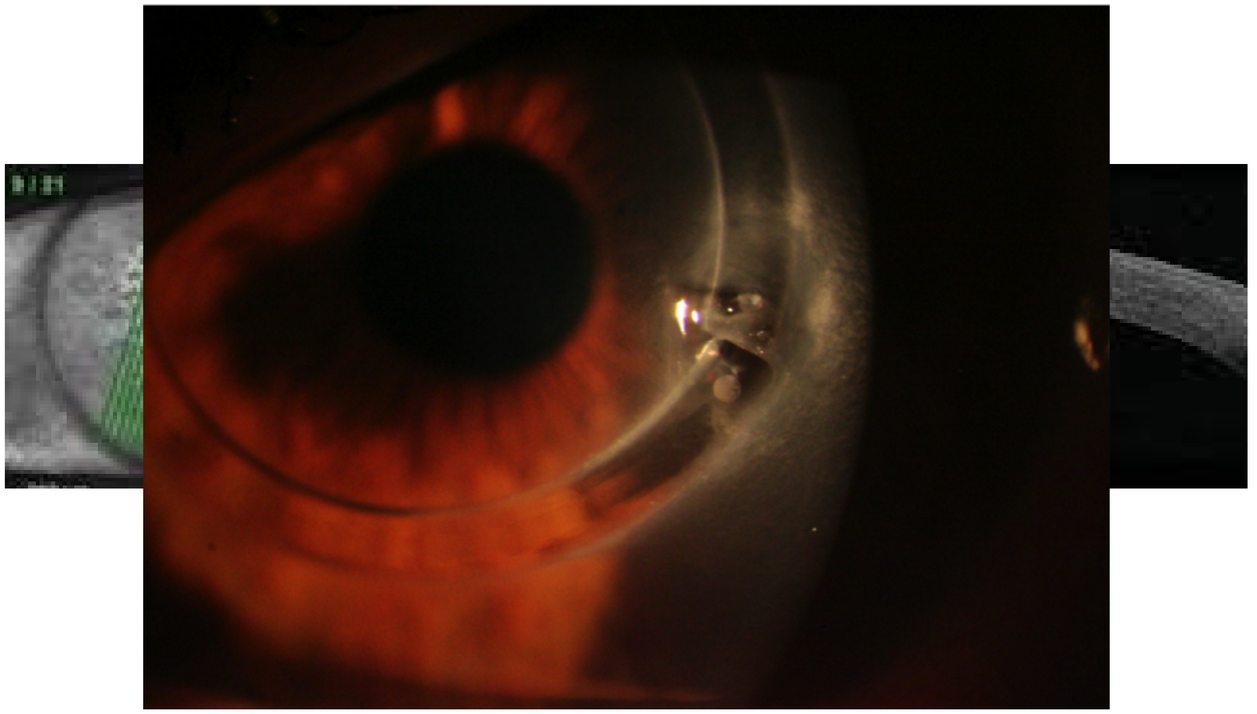




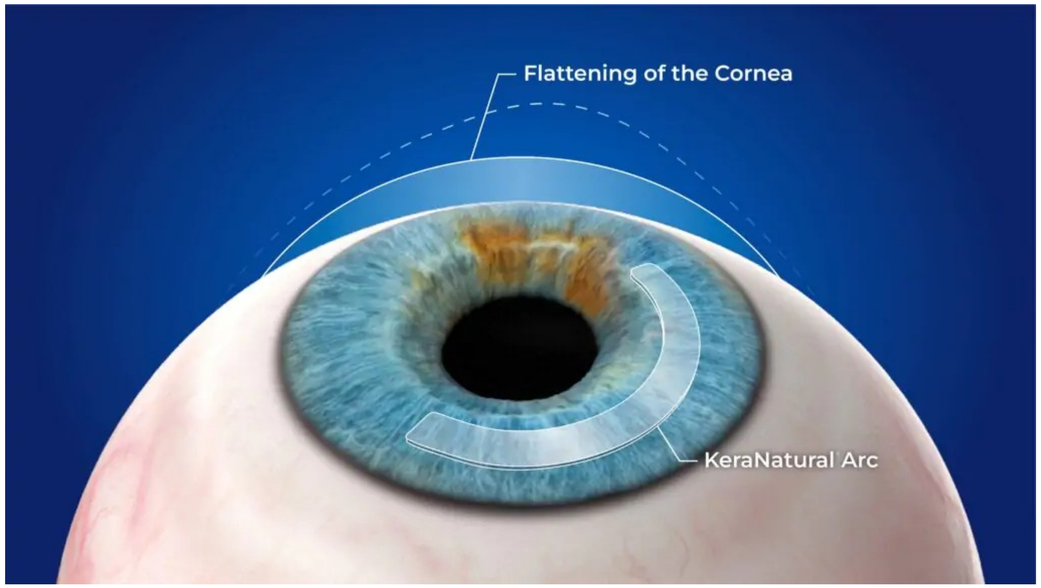
	Km Flattening	SE Change	CCT Increase (µm)	CDVA Lines Gain	Central/ Eccentric cone	Harvest Easiness	Donor Corneas
Planar Lenticules	**+** (-1.8D)	**+** (+1.7D)	**117**	**2**	**Both**	**+++**	**1/3**
SLAK	**++** (-5.1D)	**++** (+3.8D)	**47**	**1.4**	**Central only**	**++**	**1**
Bowman's Tx	**++** (-4.8D)	**++** (+3.6D)	**21**	**1**	**Both**	**-**	**1**
CAIRS	**+** (-2.8D)	**++** (+4.1D)	**0**	**2**	**Both**	**++**	**1** (rim)
Donut Lenticule	**++** (-3.4D)	**+** (+1.7D)	**18**	**3.5**	**Central only**	**+++**	**0** (SMILE lentic)

Intrastromal Rings Segments



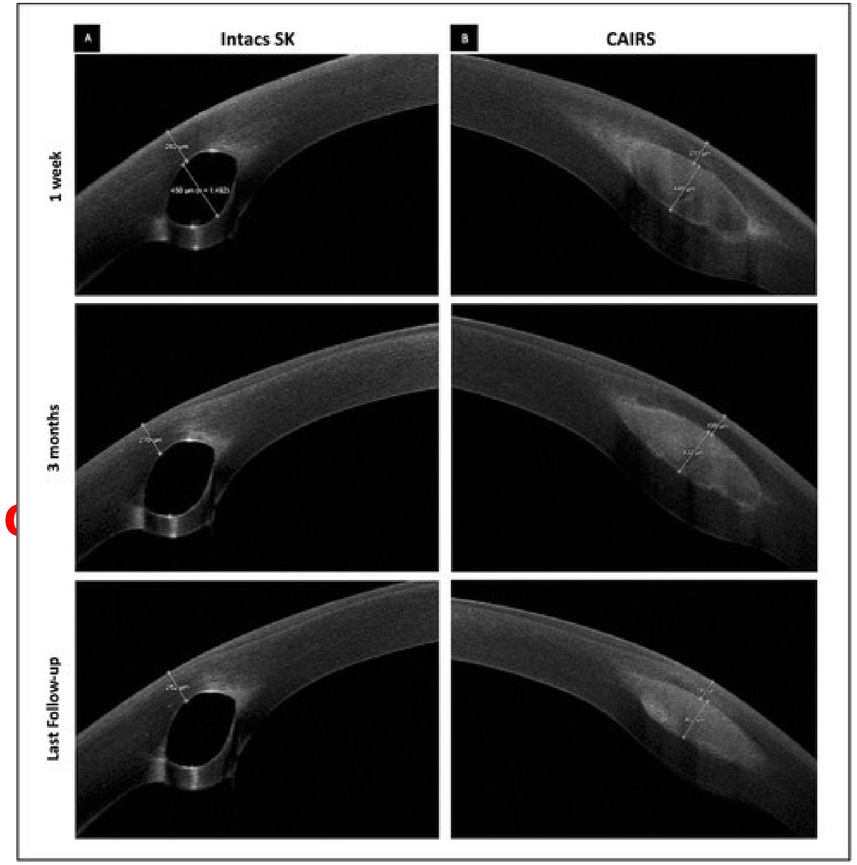


Corneal Allogeneic Intrastromal Rings Segments

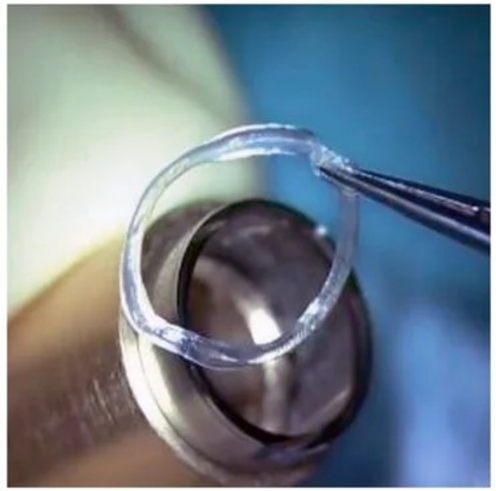


CAIRS versus ICRS

- **Theoretical no risk of extrusion**
  - Allowing for more superficial implantation
  - And so greater effect
- **Minimal antigen implantation, marginal risk of rejectio**
- **Same refractive index as the host corneal stroma**
  - Less photic phenomena



Corneal Allogeneic Intrastromal Ring Segments (CAIRS)



Femto-CAIRS: Brisbane Nomogram

(David Gunn)

173 Table 1. Femto-CAIRS parameters for use with the Brisbane nomogram

Size	Small	Medium	Large	Extra Large
Segment width (µm)	700	800	900	1000
Segment thickness (µm)	200	300	400	500
Cross sectional area (mm^2)	0.14	0.24	0.36	0.50
Channel Inner Diameter (mm)	4.8	4.6	4.5	4.4
Channel Outer Diameter (mm)	7.0	7.0	7.3	7.6
Resulting Channel Width (mm)	1.1	1.2	1.4	1.6
Inferior cone apex approx. K (D)	46-48	48-50	50-55	> 55

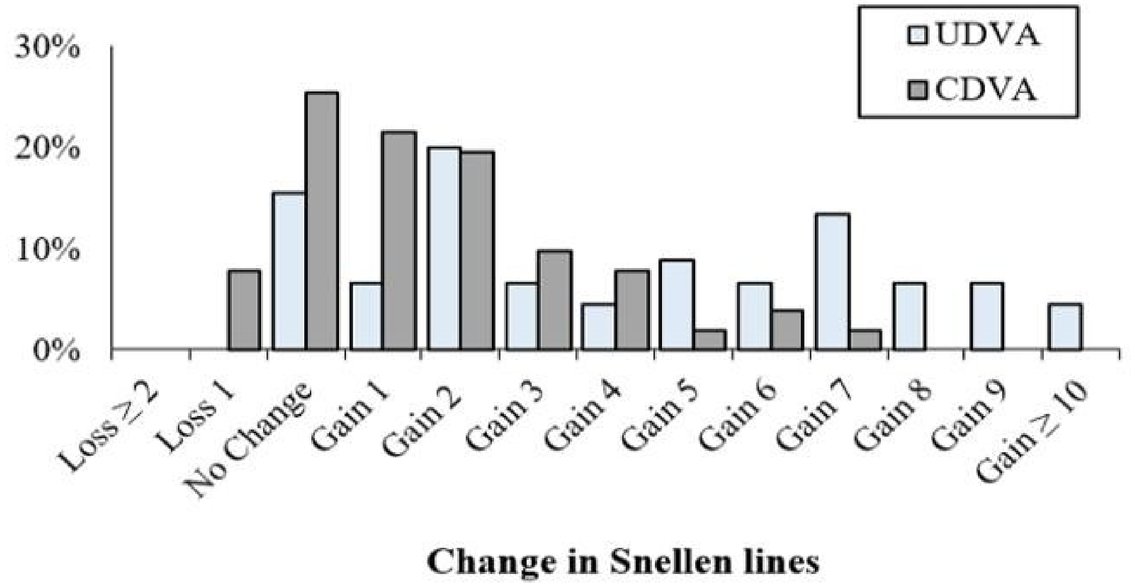


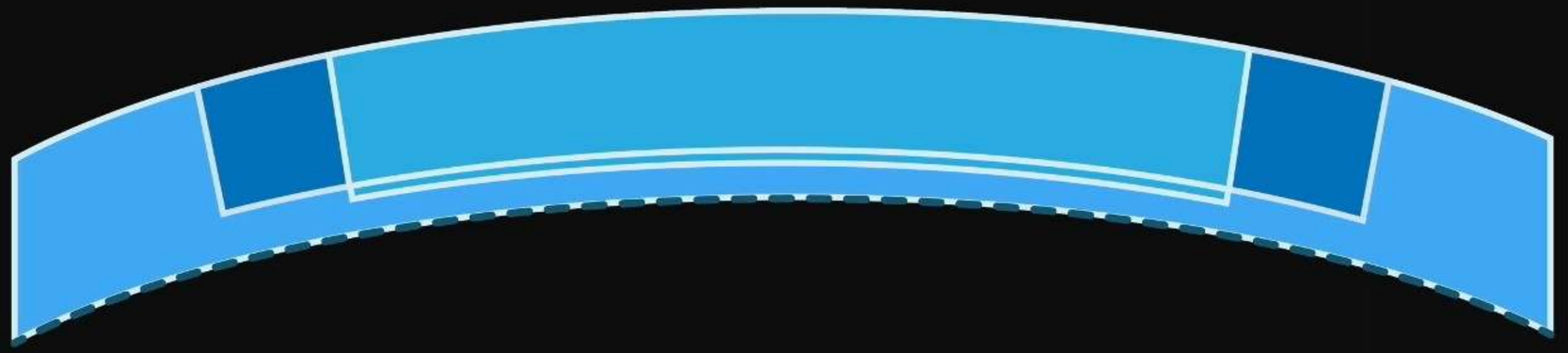
Figure 3. Change in Snellen lines of visual acuity after CAIRS for both uncorrected distance visual acuity (UDVA) and corrected distance visual acuity (CDVA)

Before or After CXL?

- CAIRS surgery has a flattening effect on both the corneas with and without CXL.
- The cornea with prior CXL treatment had less flattening effect due to the stiffening effect of prior CXL

Yucekul B, Tanriverdi C, Taneri S, Keskin Perk FFN, Karaca Y, Kilic A. **Effect of Corneal Allogenic Intrastromal Ring Segment (CAIRS) Implantation Surgery in Patients With Keratoconus According to Prior Corneal Cross-linking Status**. J Refract Surg. 2024;40(6):e392-e397. doi:10.3928/1081597X-20240501-01

FS Creation Of The Ring



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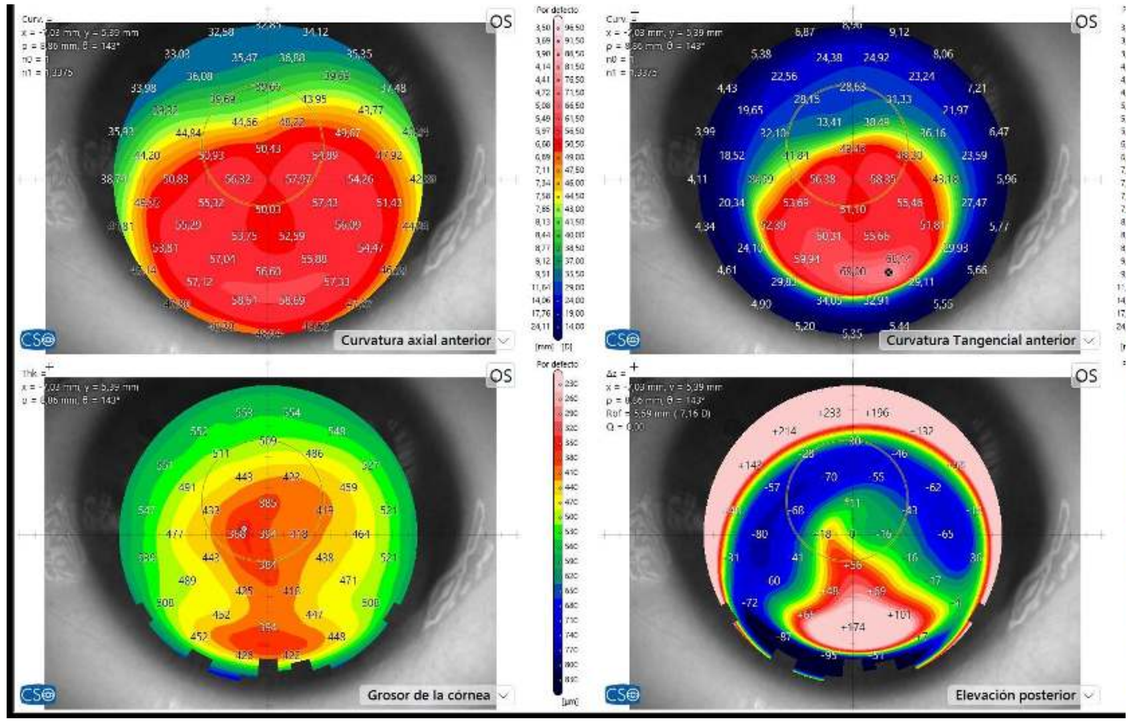
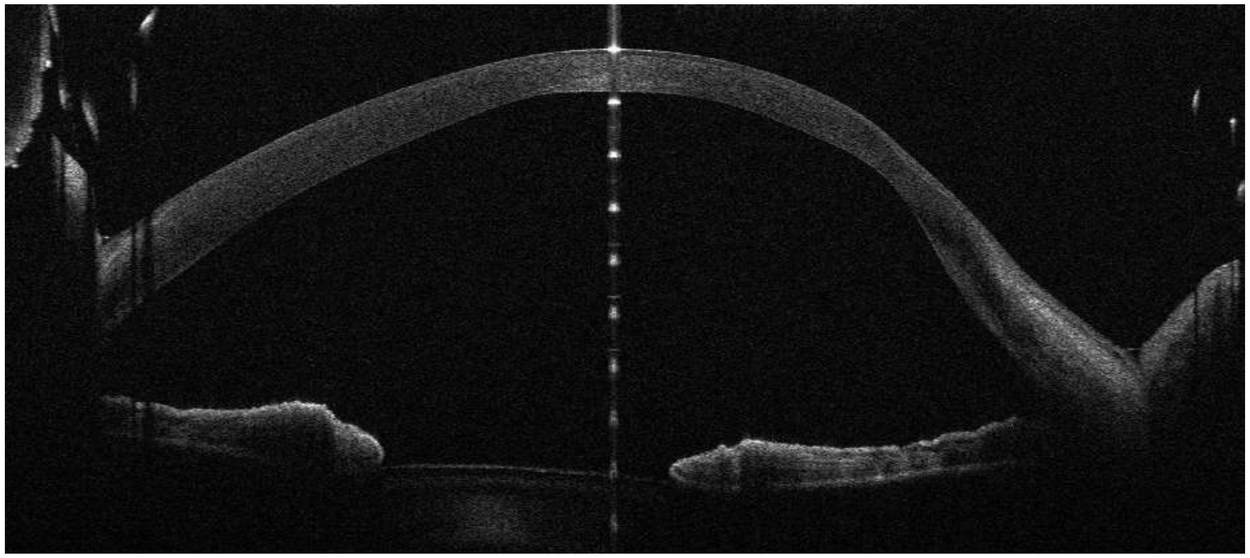
My First CAIRS



<u>Preop</u>:

- UDVA: CF 2m
- CDVA: 0.4
- Rx: -6 -7 x 100º

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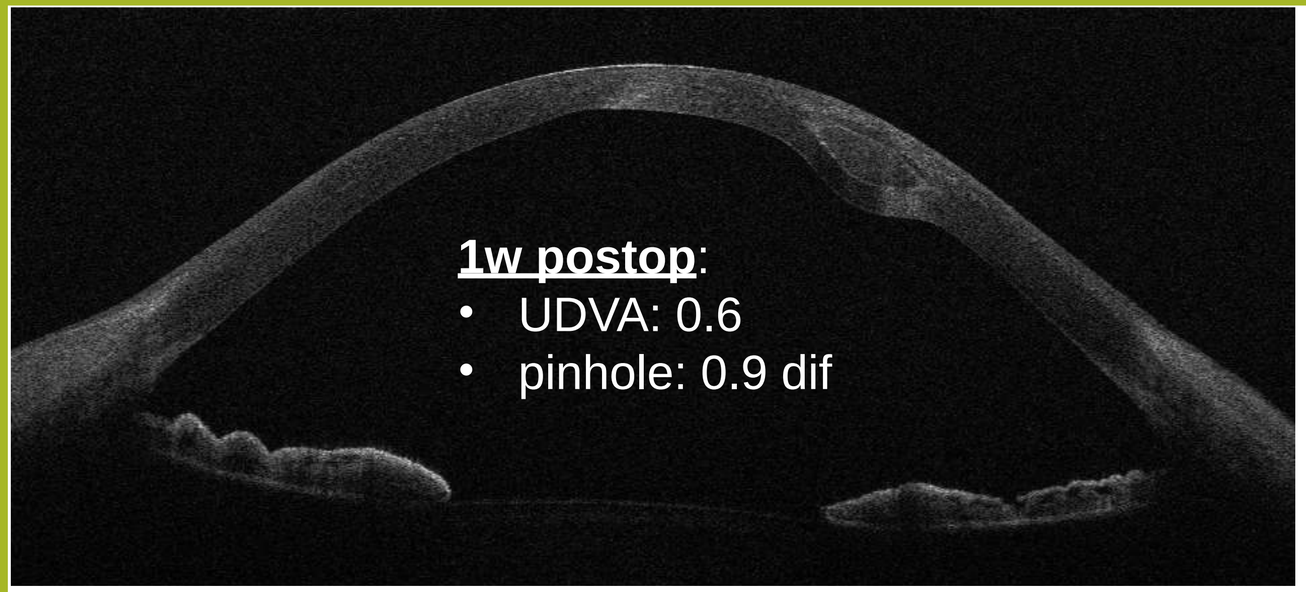
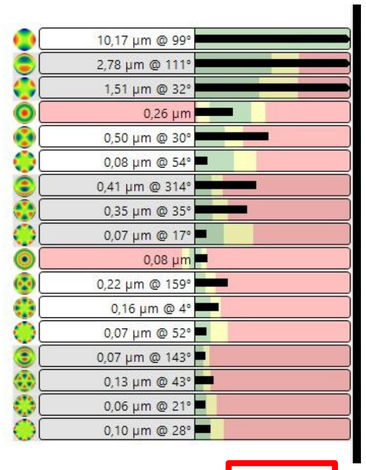
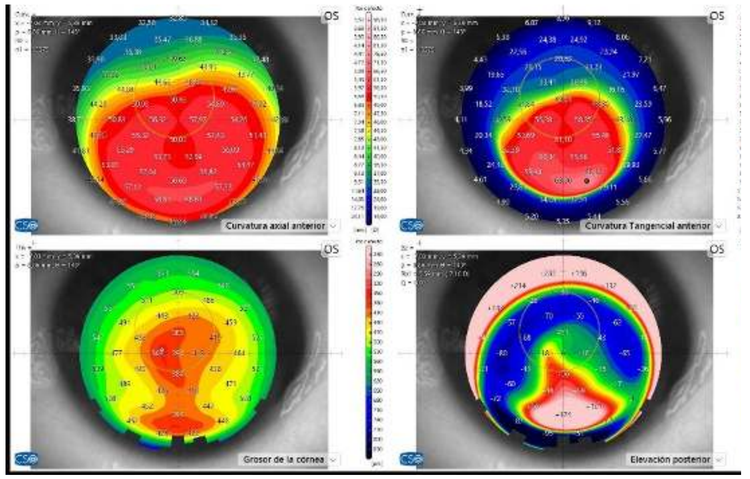
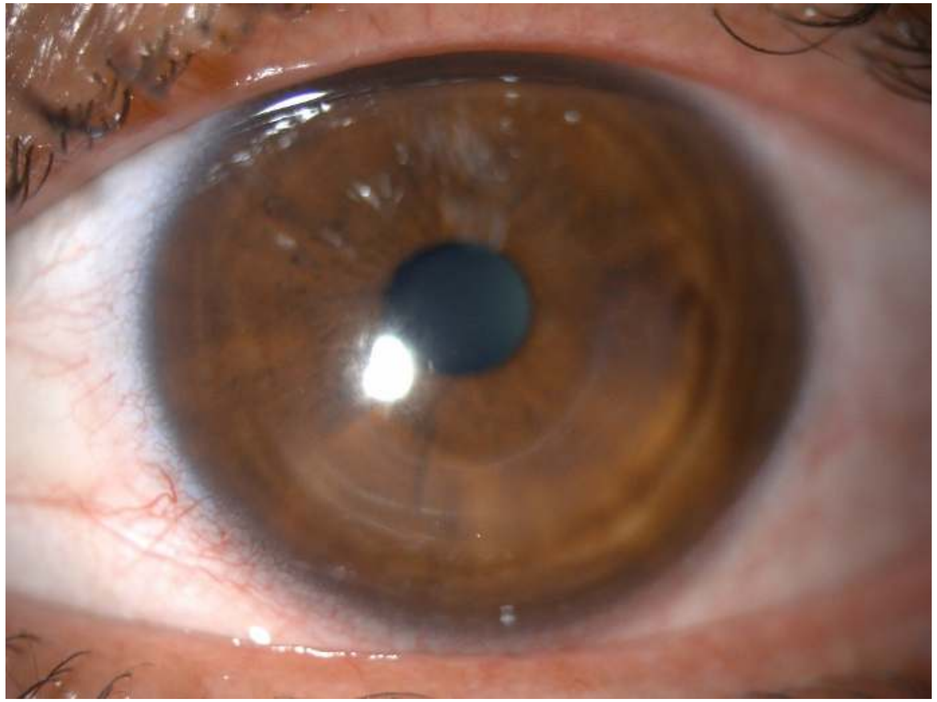


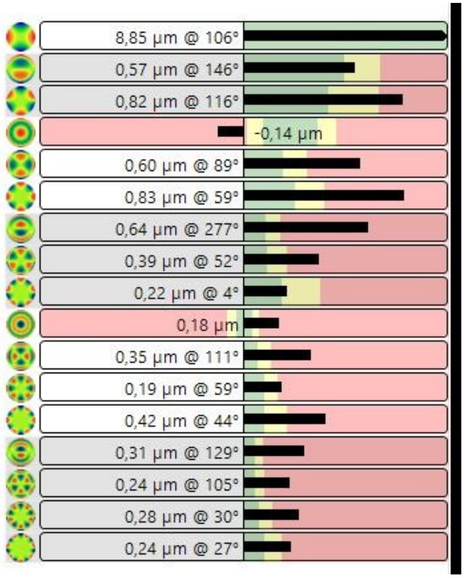
1w postop:

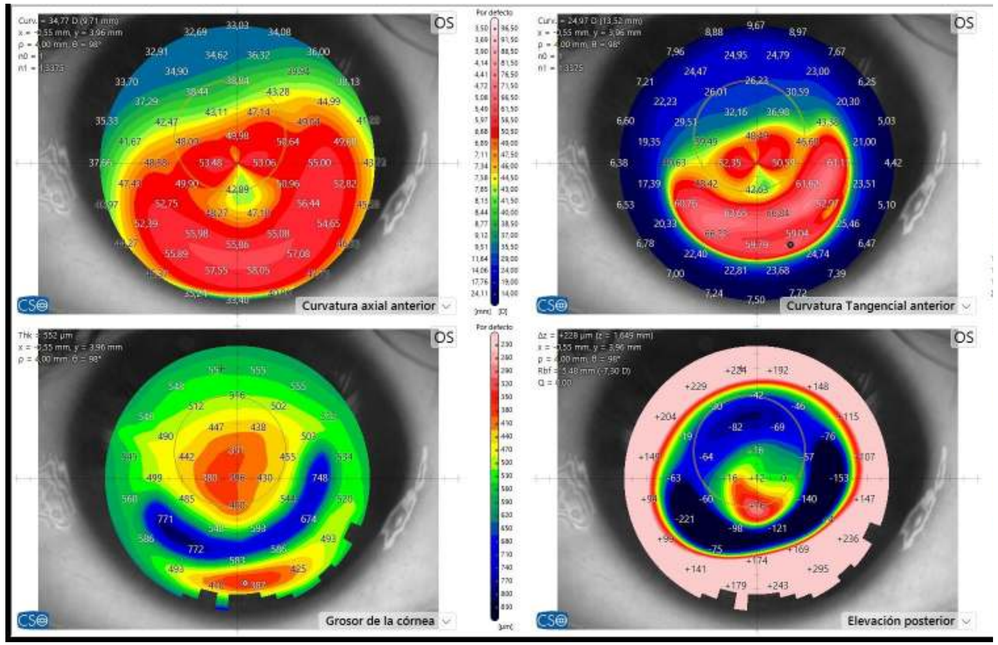
- UDVA: 0.6
- pinhole: 0.9 dif









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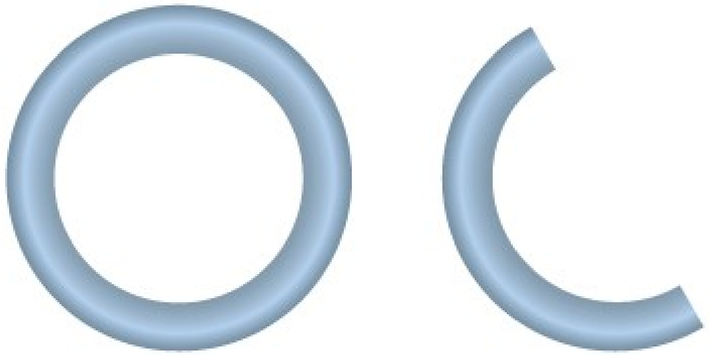
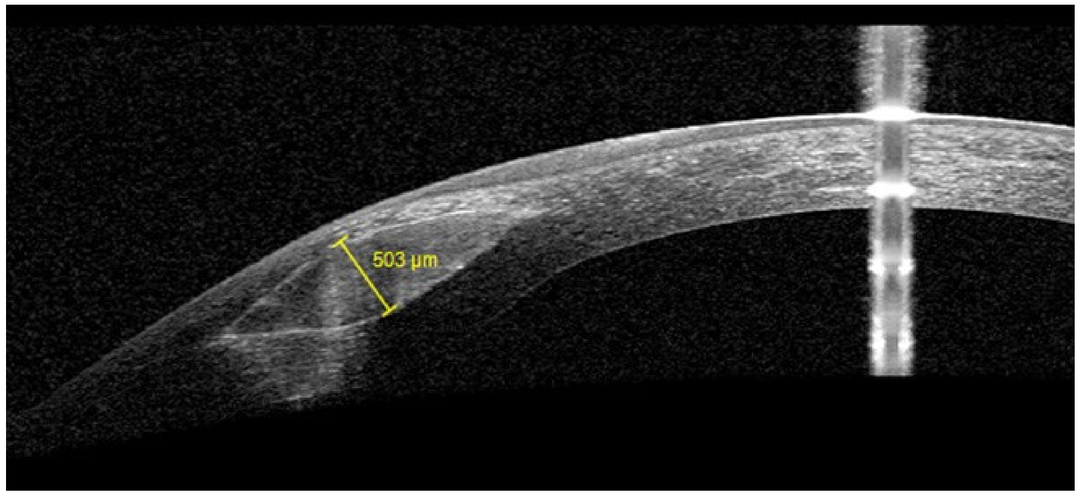
Keranatural Rings

- Sterilized human collagen tissue
- Commercially available
- Ideal if no availability of Eye Banks or Femtosecond laser technology



KeraNatural Ring

KeraNatural Arc

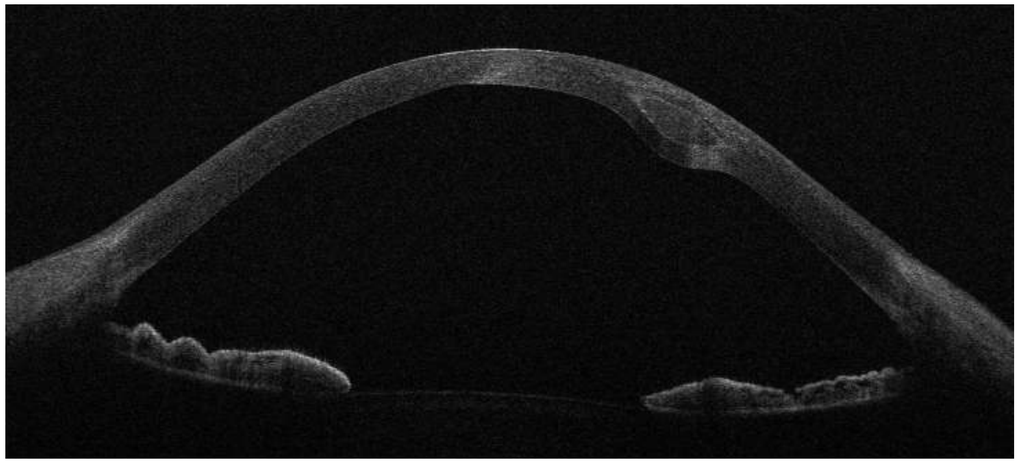


- Two-year room temperature shelf life

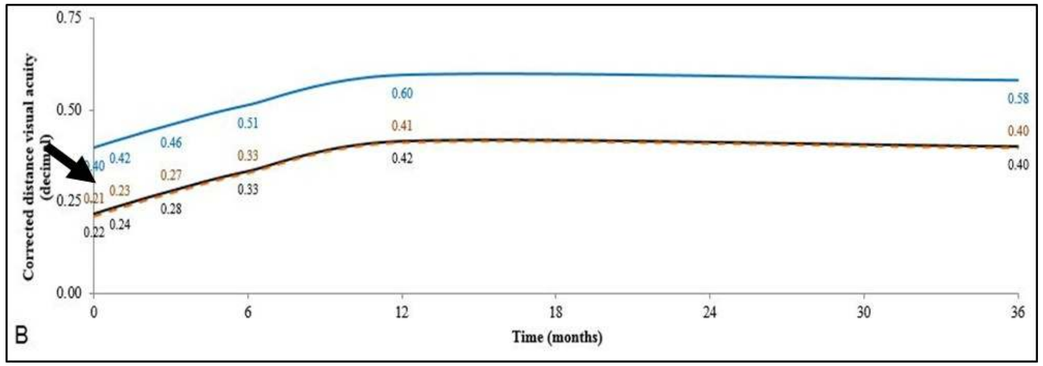
PRODUCT	SHAPE	ARC/RING	SIZE	ORDER#
Kera Natural®		sterile arc	6mm x 1mm	KA6
Kera Natural®		sterile arc	6mm x 1mm	KA8
Kera Natural®		sterile ring	8mm x 1mm	KR8
Kera Natural®		sterile ring	6mm x 1mm	KR6

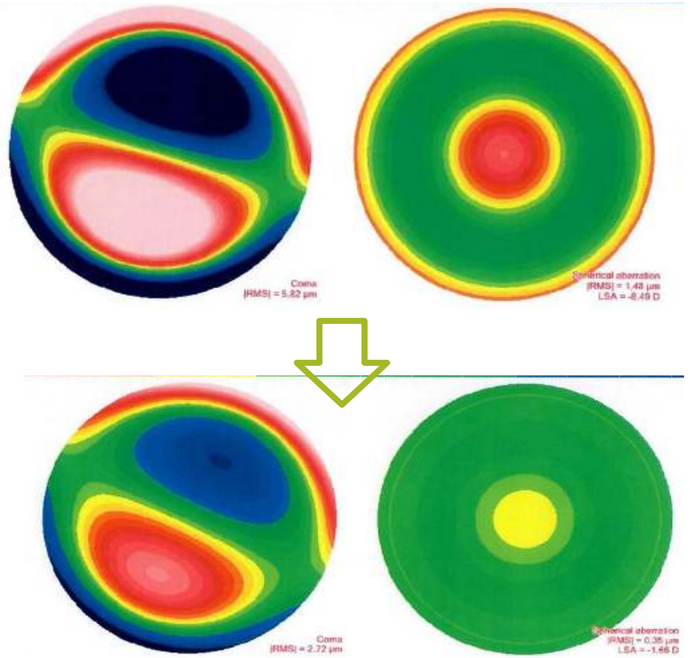
Conclusions FemtoCAIRS- Advices:

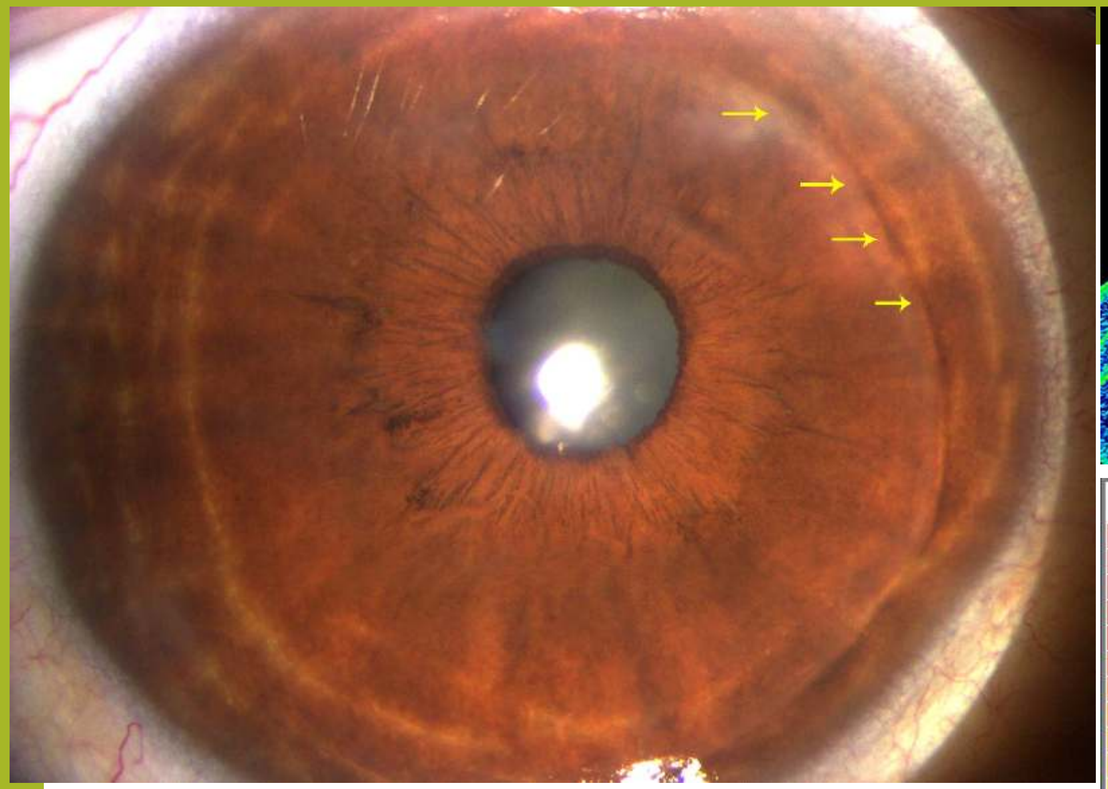
- Use cheaper corneas with unsuitable endothelium and transparent stroma
- Alternatively DMEK remnants (if legal on each country)
- Femto allows broader customization than manual techniques
- Brisbane nomogram can be applied with any femto laser
- Let CAIRS dehydrate (*Jerky technique S. Awwad*). 90 min at least
- Two tunnel incisions are mandatory
- Alternative commercial Keranatural tissue
- Porcine material in future?

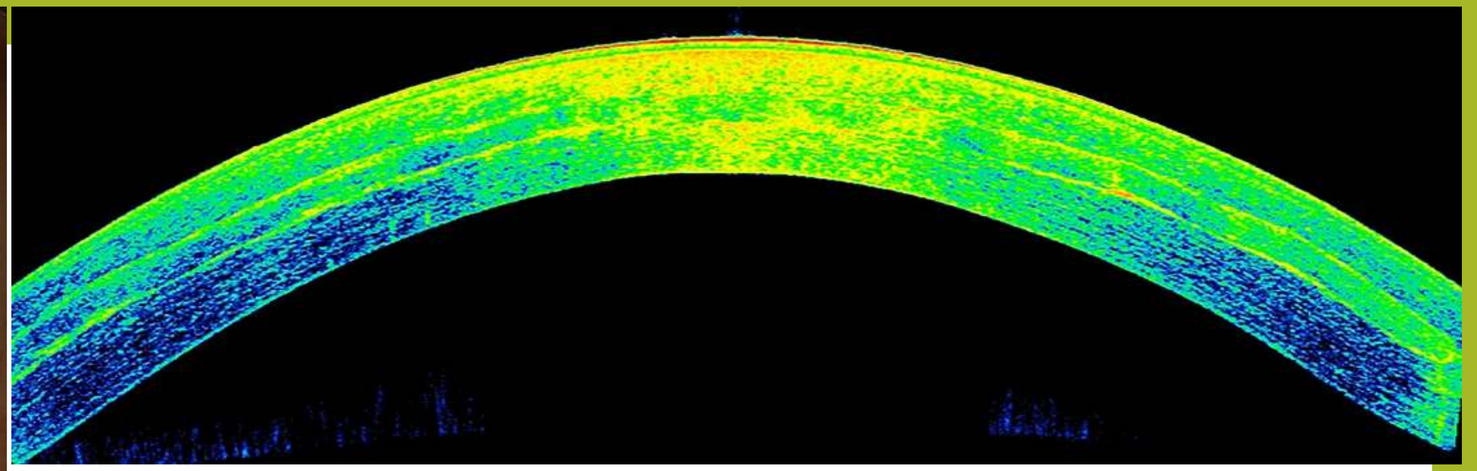


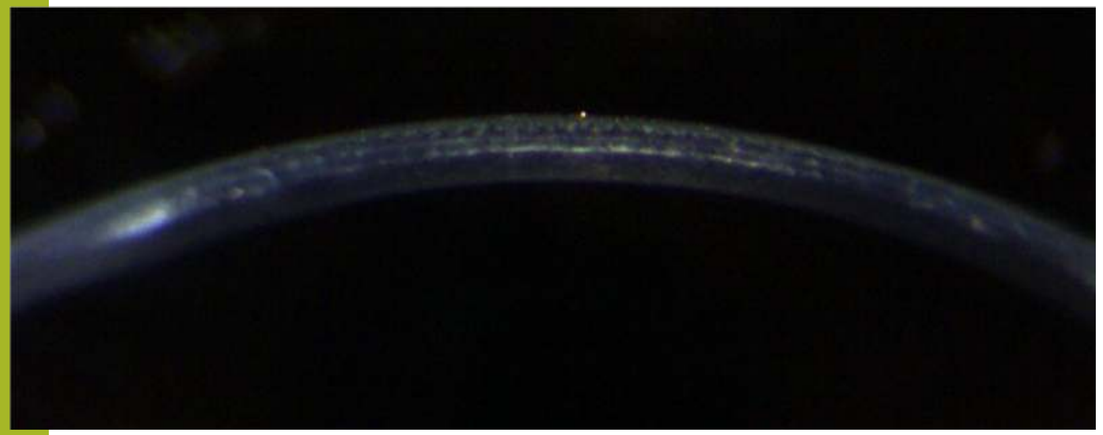
Stromal Lenticule Additive Keratoplasty (SLAK)

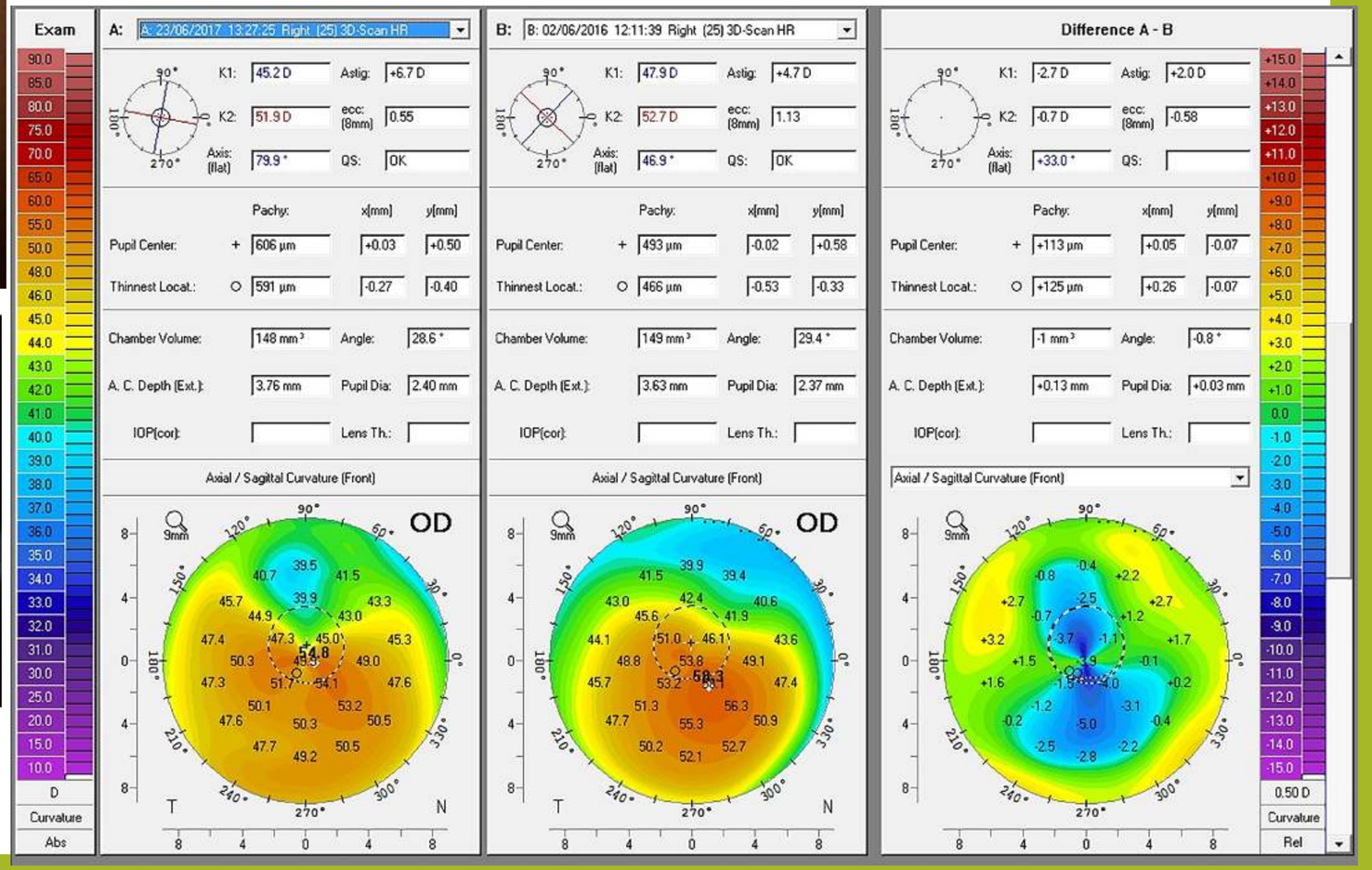











Exam
A: A: 23/06/2017 13:27:25 Right (25) 3D-Scan HR
B: B: 02/06/2016 12:11:39 Right (25) 3D-Scan HR
Difference A - B
K1: 45.2 D
K2: 51.9 D
Axis: (flat) 79.9 °
Astig: +6.7 D
ecc: (8mm) 0.55
QS: OK
K1: 47.9 D
K2: 52.7 D
Axis: (flat) 46.9 °
Astig: +4.7 D
ecc: (8mm) 1.13
QS: OK
K1: -2.7 D
K2: -0.7 D
Axis: (flat) +33.0 °
Astig: +2.0 D
ecc: (8mm) -0.58
QS:
Pachy: x[mm] y[mm]
Pupil Center: + 606 µm +0.03 +0.50
Thinnest Locat.: 591 µm -0.27 -0.40
Pupil Center: + 493 µm -0.02 +0.58
Thinnest Locat.: 466 µm -0.53 -0.33
Pupil Center: + +113 µm +0.05 -0.07
Thinnest Locat.: +125 µm +0.26 -0.07
Chamber Volume: 148 mm³
Angle: 28.6 °
A. C. Depth (Ext.): 3.76 mm
Pupil Dia: 2.40 mm
IOP(cor):
Lens Th.:
Chamber Volume: 149 mm³
Angle: 29.4 °
A. C. Depth (Ext.): 3.63 mm
Pupil Dia: 2.37 mm
IOP(cor):
Lens Th.:
Chamber Volume: -1 mm³
Angle: -0.8 °
A. C. Depth (Ext.): +0.13 mm
Pupil Dia: +0.03 mm
IOP(cor):
Lens Th.:
Axial / Sagittal Curvature (Front)
Axial / Sagittal Curvature (Front)
Axial / Sagittal Curvature (Front)
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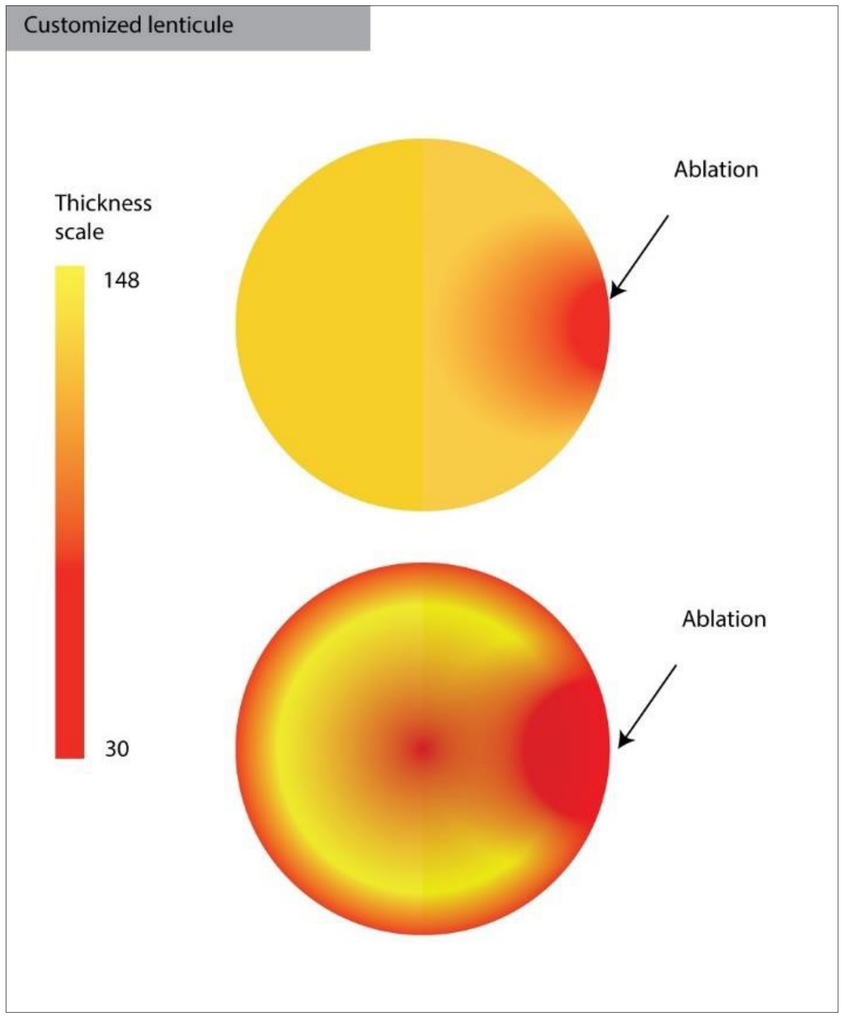
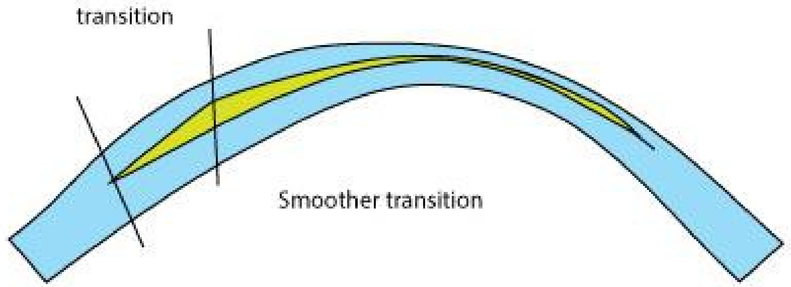
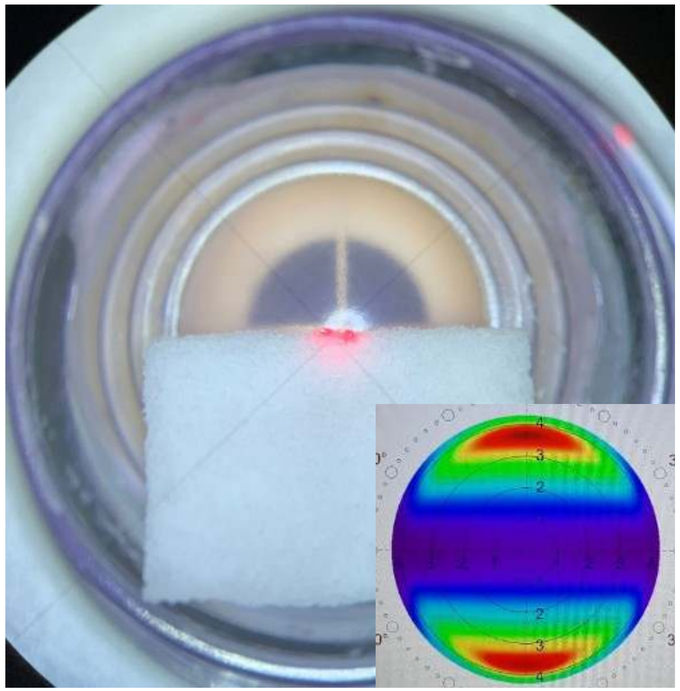
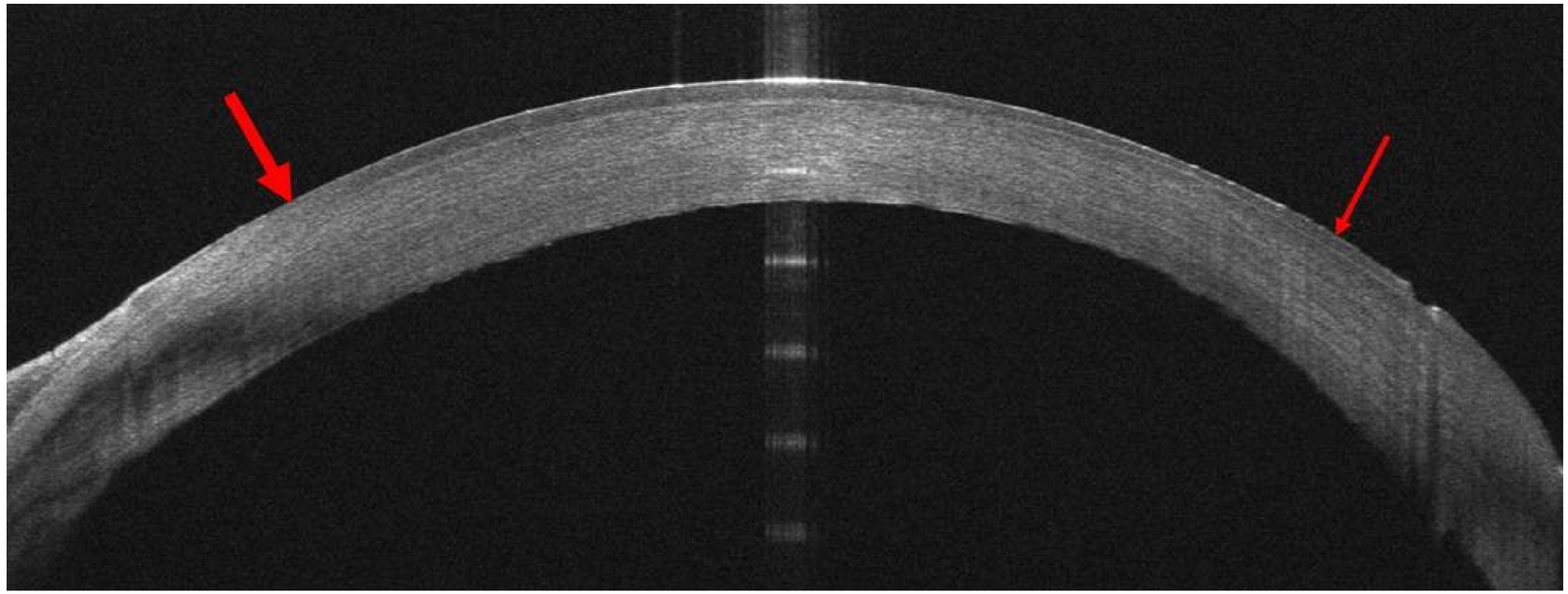
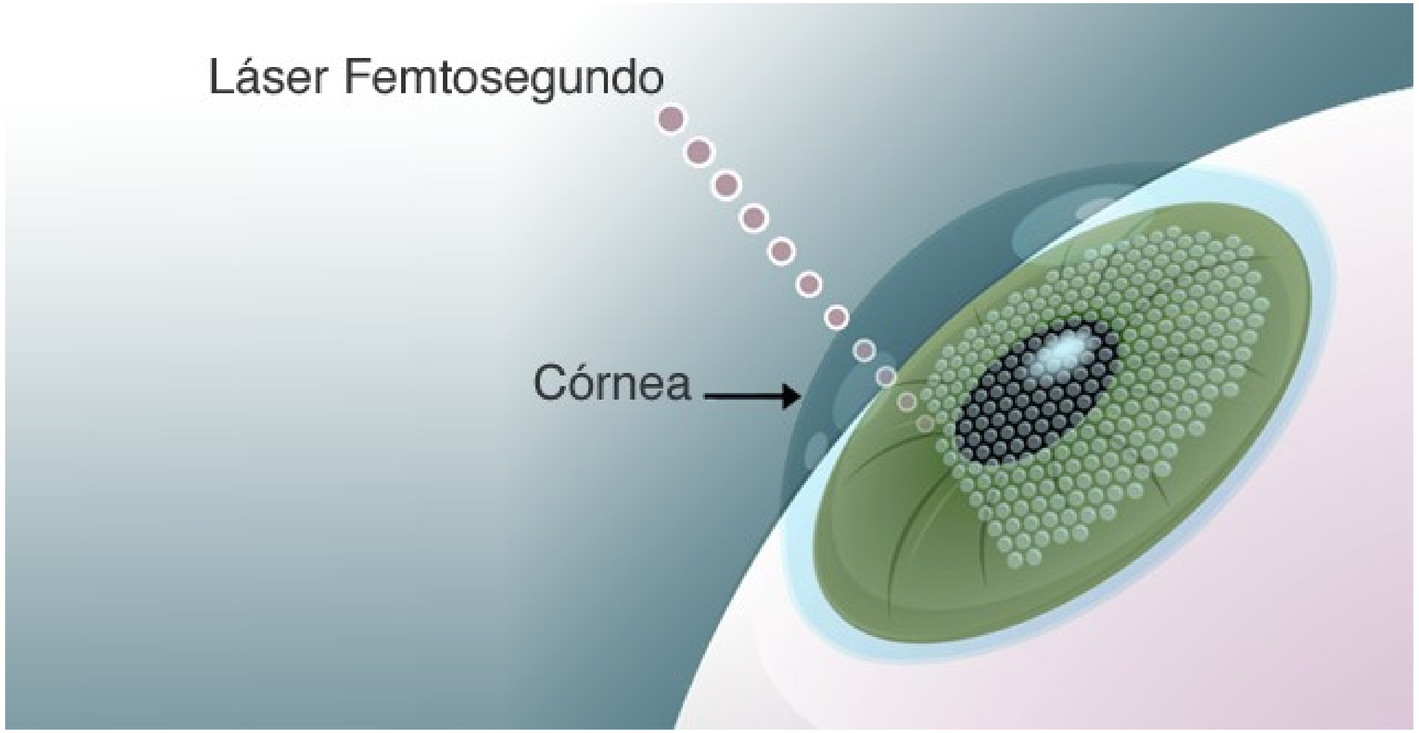
Customized SLAK







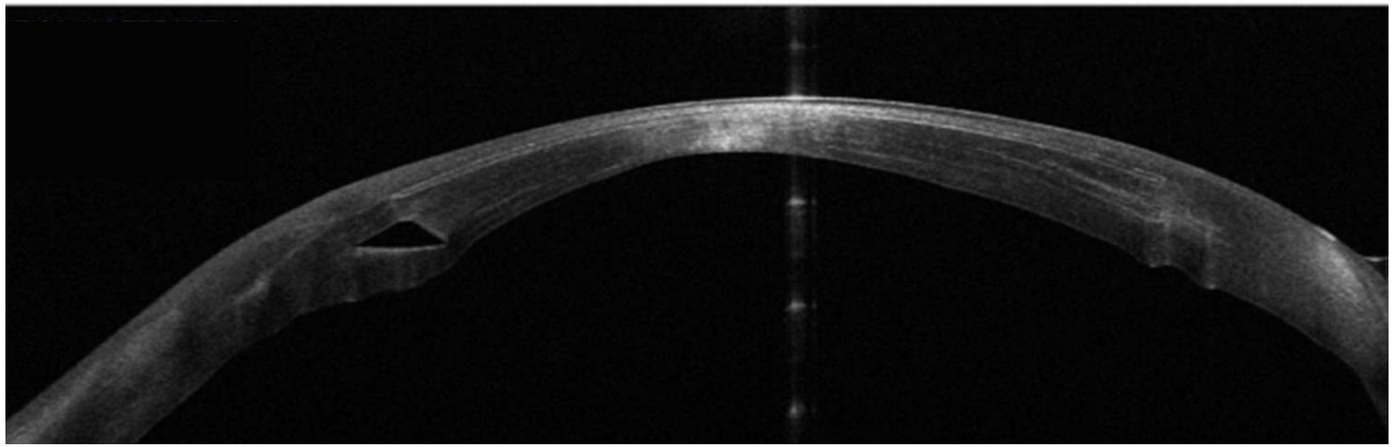




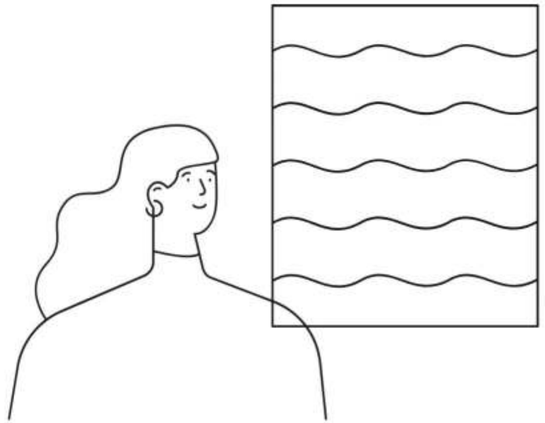
Collaborate with industry to sculpt asymmetric lenticules with customized shapes

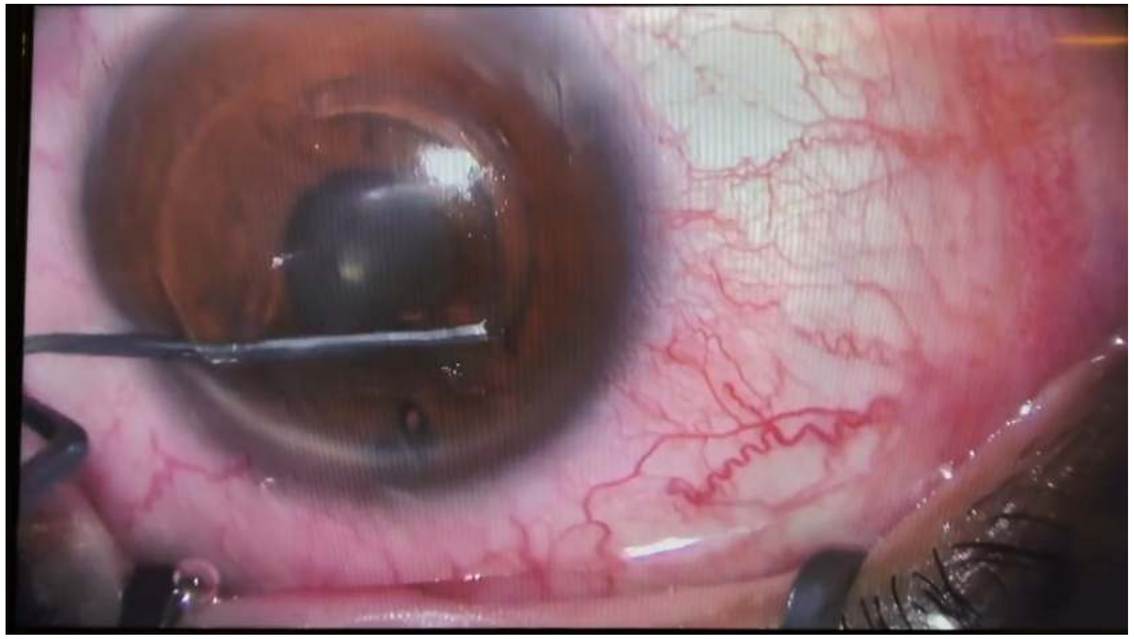
according to each patient specific cone morphology and thickness

Xenogeneic Lenticules



The Xenogenic Corneal Implant Technology





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