Limbal Lift Lenses

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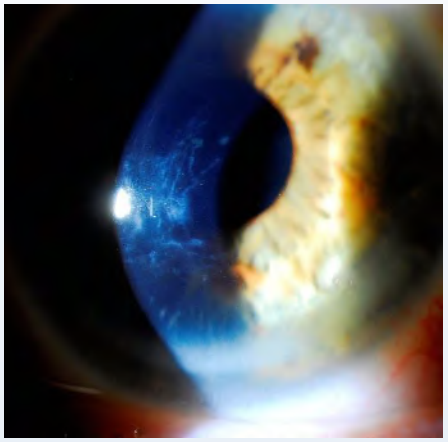
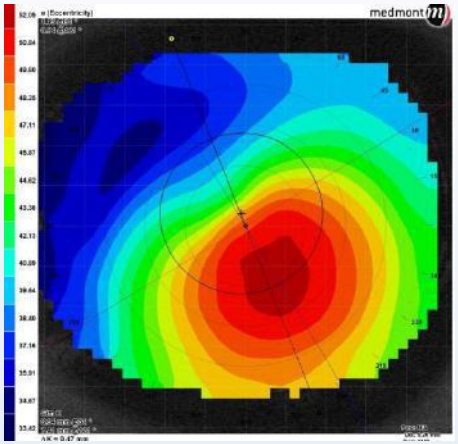
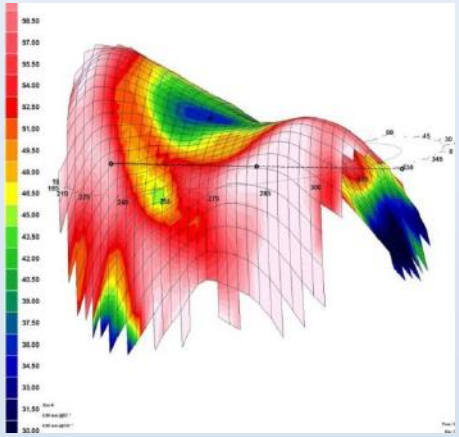
Keratoconus:





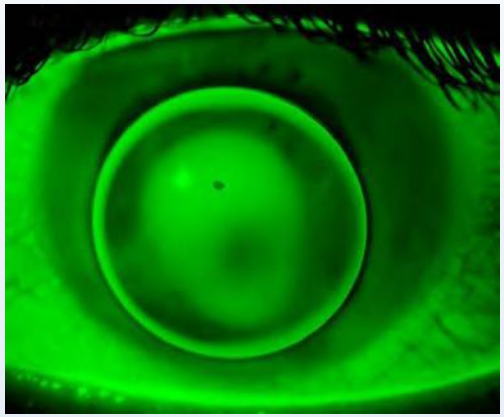
Corneal Graft:



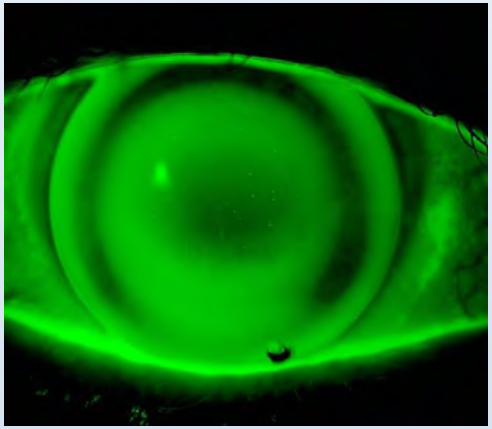
Contact Lens Options:

- Soft lenses – including KeraSoft
- Rigid Gas Permeable OD: 8.0 – 10.0 mm
- Intra Limbal: 10.1 – 12.0 mm
- Corneo scleral: 12.5 – 13.5 mm
- Silicon Hydrogel carrier lenses under RGP – "piggyback"
- Hybrid (RGP centre, Soft skirt): 14.5 mm
- Miniscleral: 15.0 – 18.0 mm
- Scleral: 18.0 – 23.0 mm

Keratoconus:

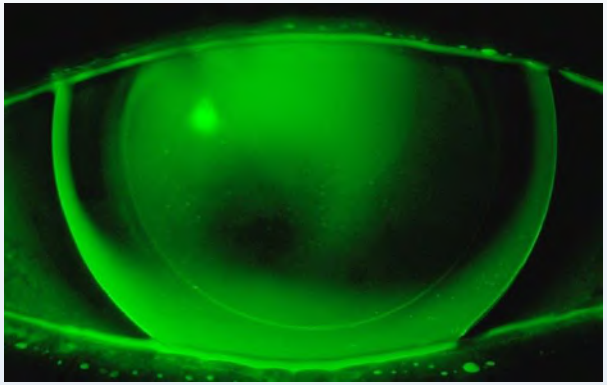


OD: 7.8mm Quad curve

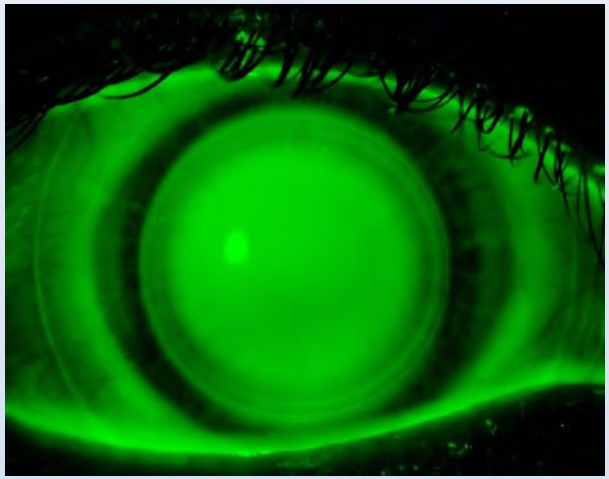


OD: 10.10 Centra PGA Bi-sym 0.3

Keratoconus:

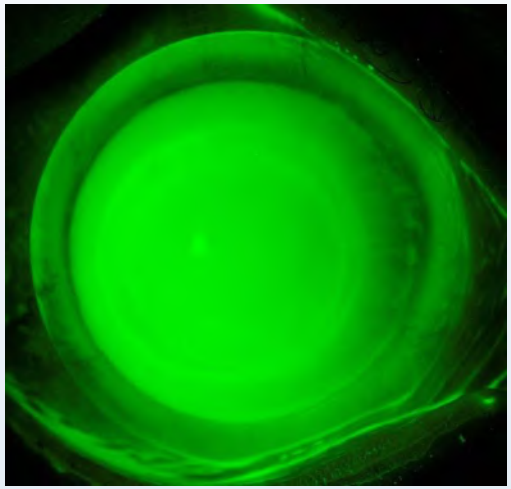


OD: 10.20mm KBA

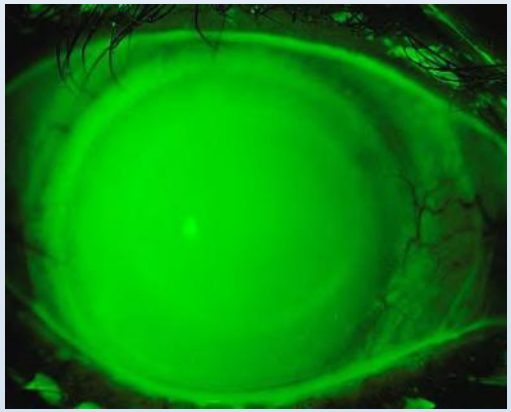


OD: 14.50mm Hybrid (ClearKone)

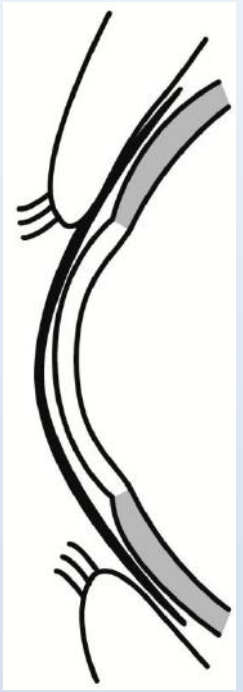
Keratoconus:



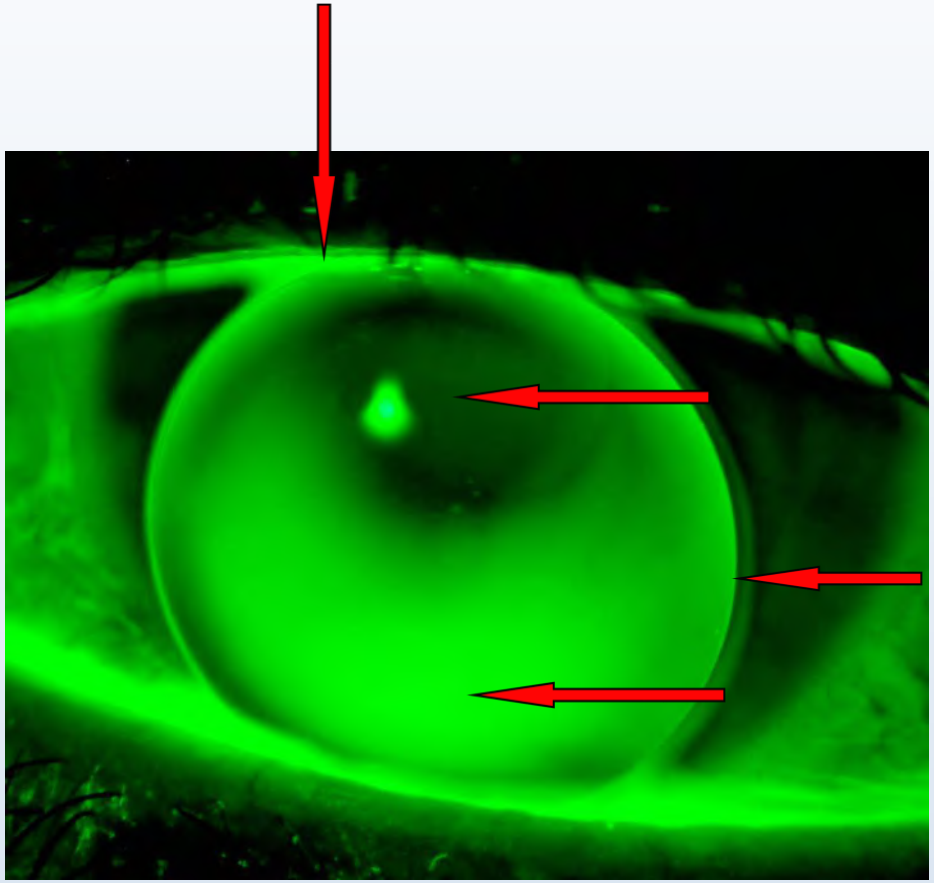
OD: 15.00mm Rose K2 XL



OD: 16.50mm KATT3



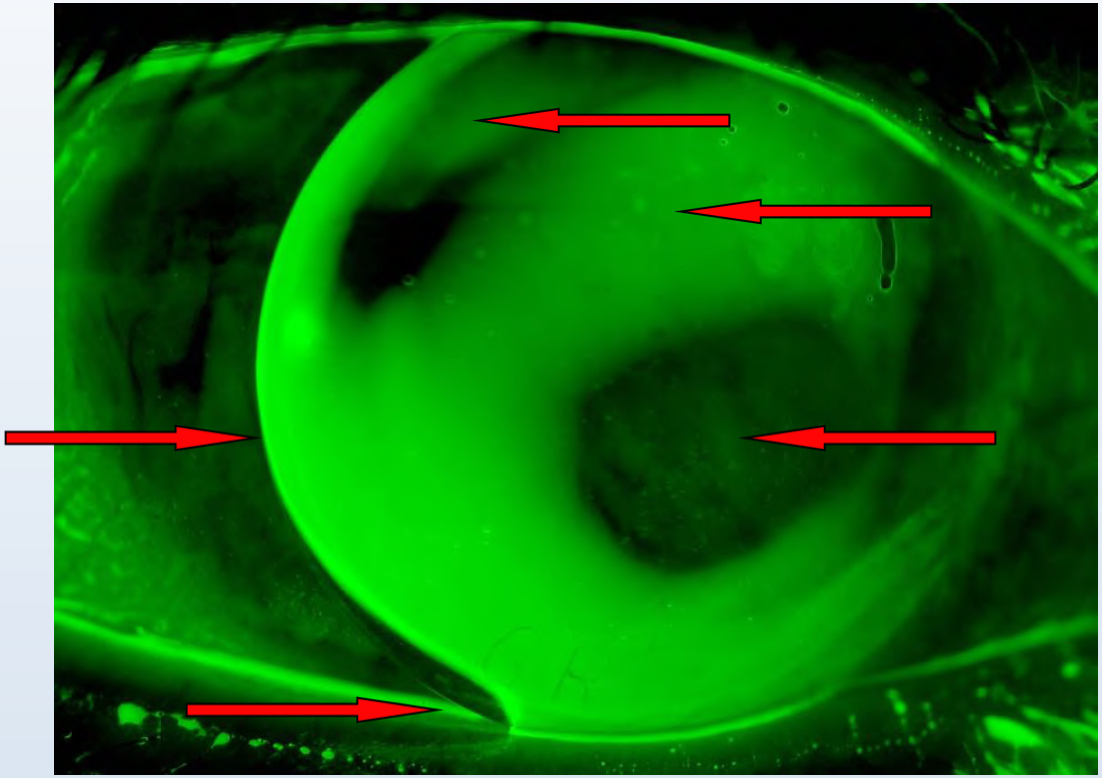
Keratoconus: 9.0mm RGP design



- Superior bearing
- Inferior clearance
- Inferior temporal decentration
- Superior edge hitting upper lid

- Discomfort
- Corneal staining
- Poor quality vision
- Easily displaced
- Vulnerable to foreign bodies

Corneal Graft: 11.0mm post graft RGP



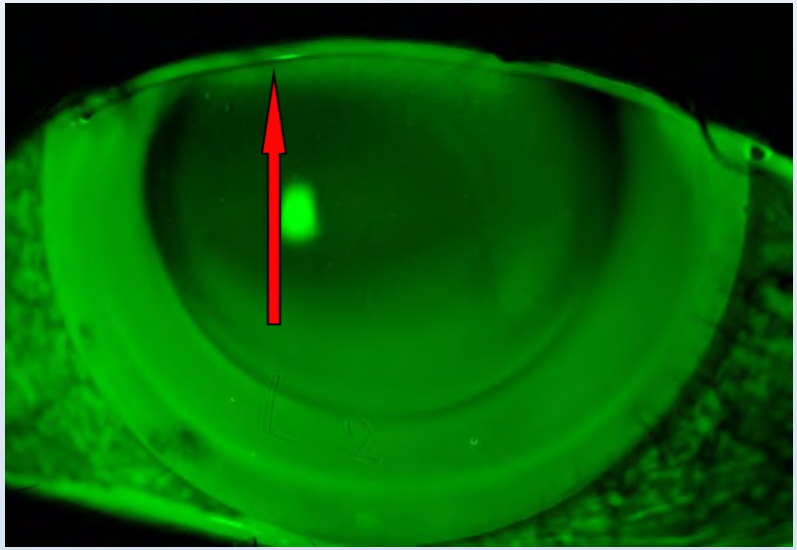
- Central clearance
- Significant superior temporal and inferior nasal bearing
- Inferior nasal decentration
- Inferior edge lift

Limbal Lift Design:

- Developed by Bruce Herbert (Australian Contact Lenses) in 2004.
- Concept - Large diameter RGP with lid attachment
    - To improve comfort
    - To improve centration
    - To improve vision quality
    - To maintain tear exchange

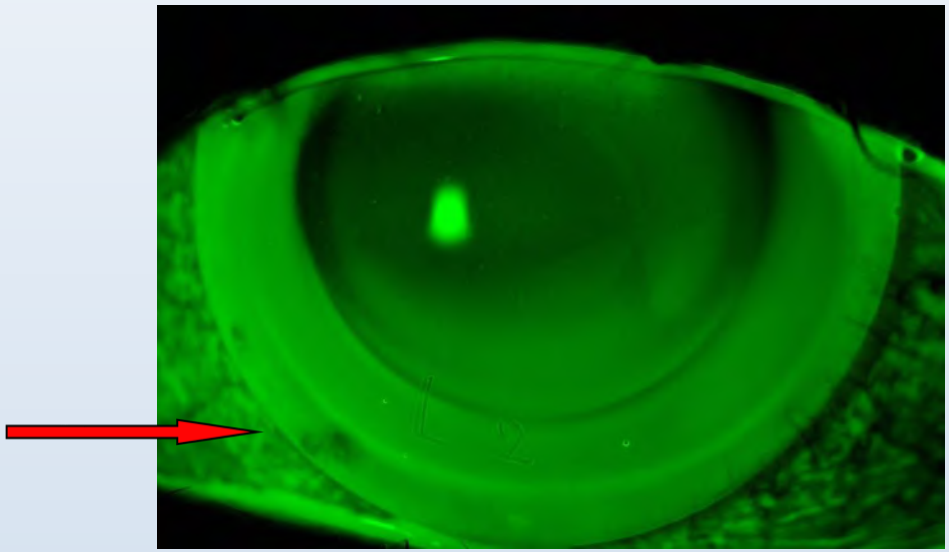
Limbal Lift Design:

- Overall Diameter - 13.00mm
  - Over the limbus
  - Lid attachment – significantly improved comfort



Limbal Lift Design:

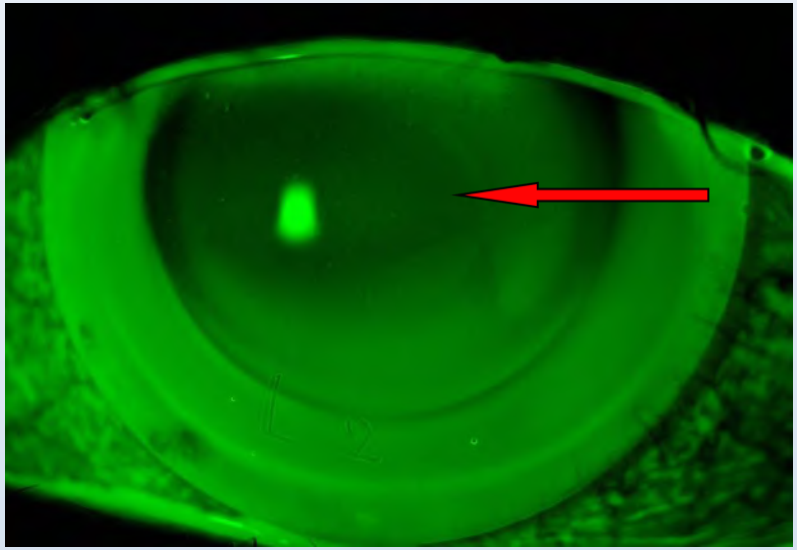
- Overall Diameter - 13.00mm
  - Non-sealed – vaults limbus and allows tear exchange, protects limbal stem cell area



Limbal Lift Design:

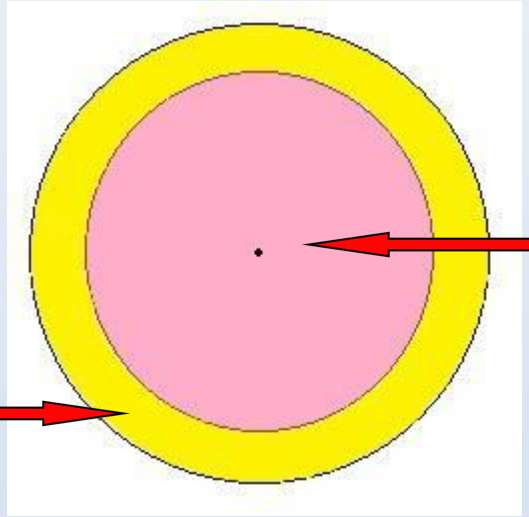
- Overall Diameter - 13.00mm
  - Larger diameter = guaranteed centration
  - Better centration gives better alignment with the optic

    = better vision, especially at night



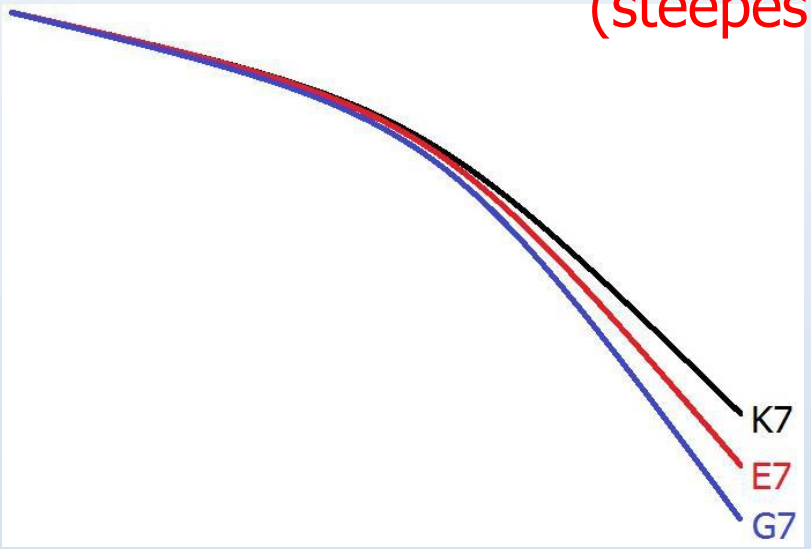
Limbal Lift Design:

- Central spherical base curve – for better VA
  - Decentration of aspheric base curve can increase distortion – reduced VA
- Aspheric periphery outside central optic zone



Limbal Lift Design:

- Aspheric periphery outside central optic zone – 3 designs
  - K series – Keratoconus (flattest periphery)
  - E series – Normal, early keratoconus & Post Graft
  - G series – Post Graft Reverse Geometry - elevated grafts (steepest periphery)

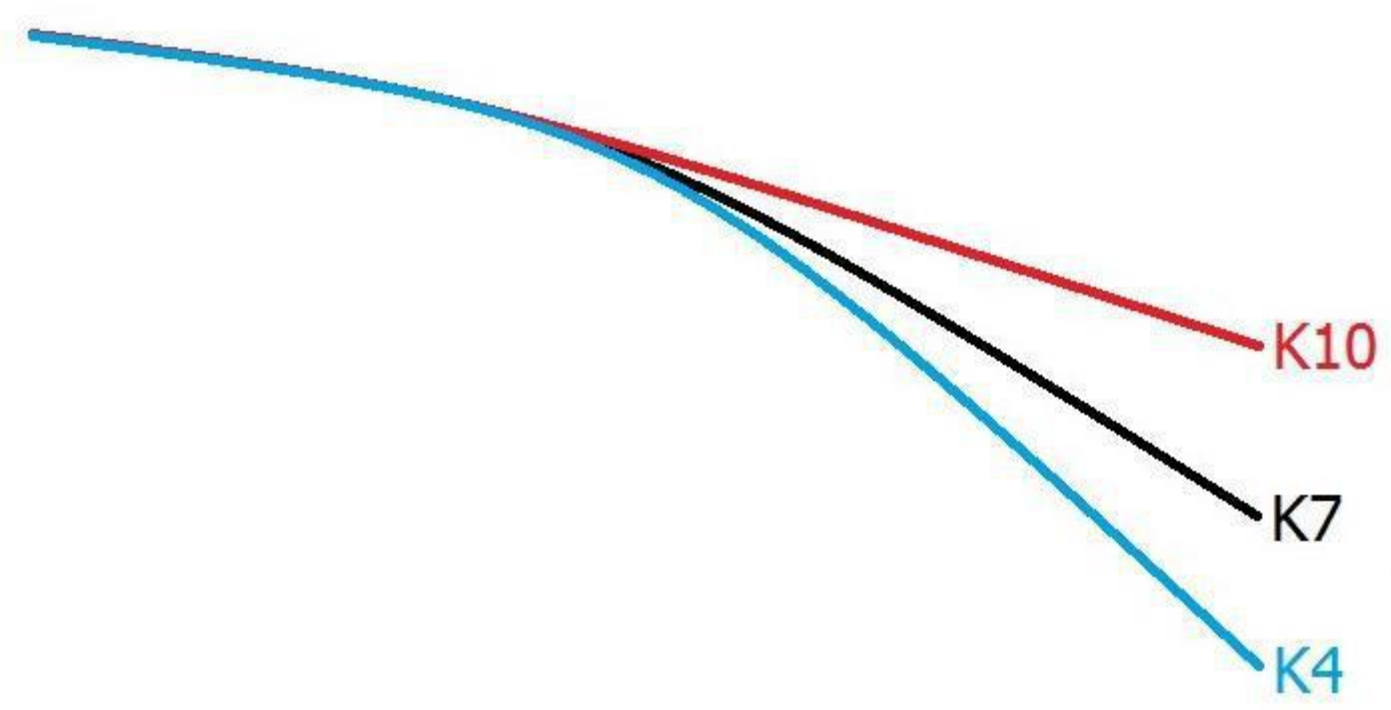


Limbal Lift Design:

- Can alter the edge clearance by changing asphericity of the periphery
  - **K series** – flattest periphery
  - K7 – standard periphery for Keratoconic design
  - Increased edge clearance - K10
    - from K7 to K10 – increased edge by **0.17mm**
  - Decreased edge clearance - K4
    - from K7 to K4 – decreased edge by **0.16mm**

Limbal Lift Design:

- K7 – standard periphery for Keratoconic design
- K 10 –> K7 –> K4

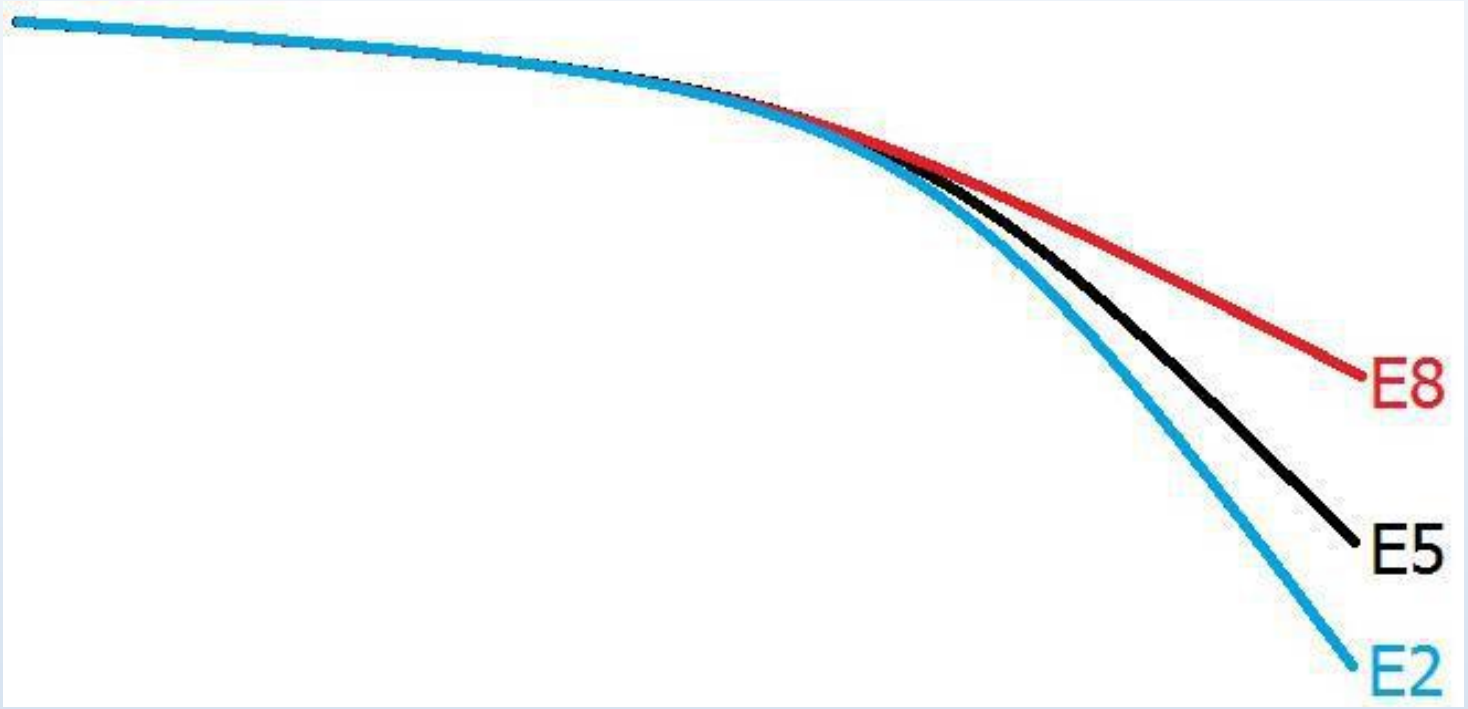


Limbal Lift Design:

- Can alter the edge clearance by changing asphericity the periphery
  - **E series**
  - E5 – standard periphery for post graft design
  - Increased edge clearance – E8
    - from E5 to E8 – increased edge by **0.15mm**
  - Decreased edge clearance – E2
    - from E5 to E2 – decreased edge by **0.11mm**

Limbal Lift Design:

- E5 – standard periphery for post graft design
- E8 –> E5 –> E2

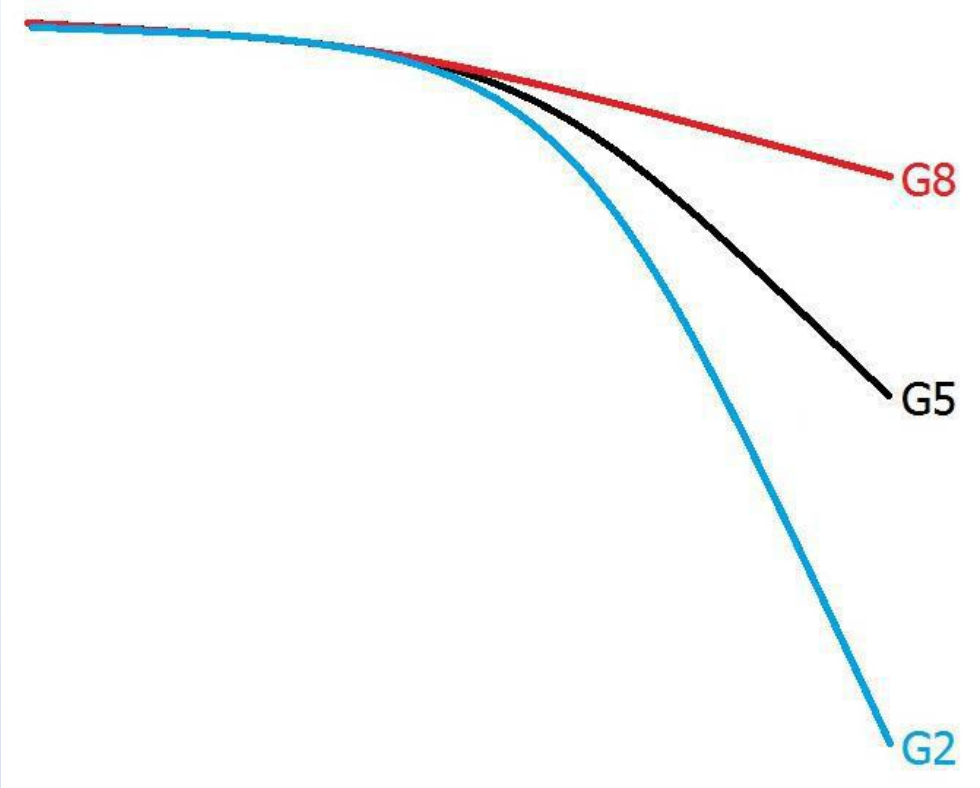


Limbal Lift Design:

- Can alter the edge clearance by changing asphericity the periphery
  - **G series** – steepest periphery
  - G5 – standard periphery for reverse geometry post graft design
  - Increased edge clearance – G8
    - from G5 to G8 – increased edge by **0.16mm**
  - Decreased edge clearance – G2
    - from G5 to G2 – decreased edge by **0.24mm**

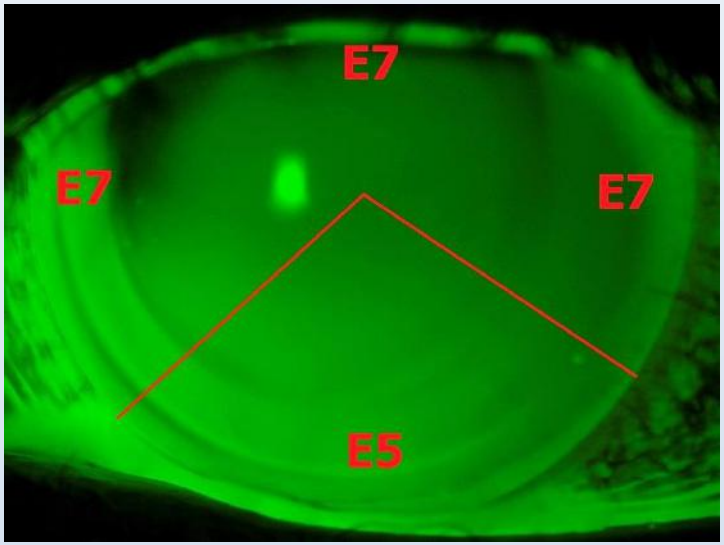
Limbal Lift Design:

- G5 – standard periphery for reverse geometry post graft design
- G8 –> G5 –> G2



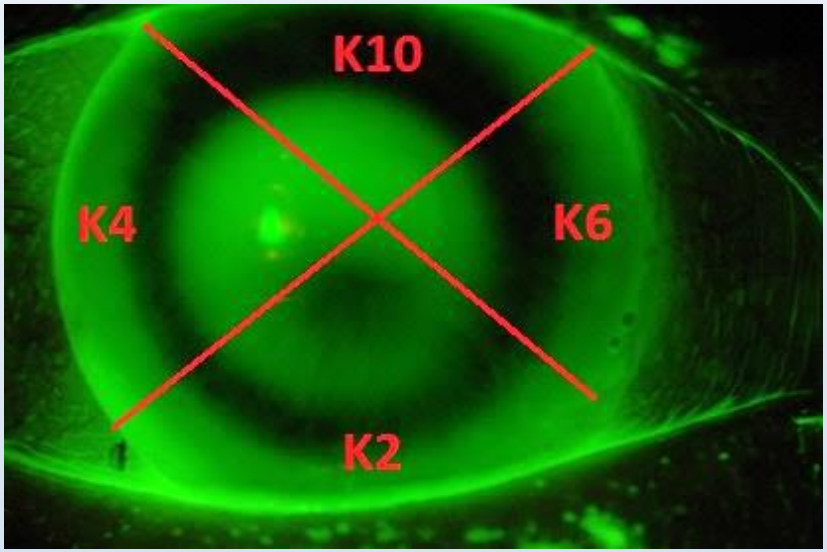
Limbal Lift Design:

- Managing edge clearance
  - Inferior tuck – inferior steepening at 6 o'clock, reduces inferior edge lift
  - 3, 12, 9 o'clock - E7, 6 o'clock – E5



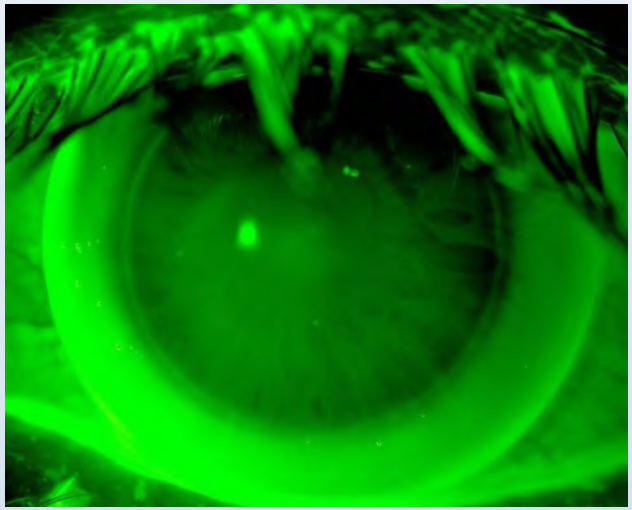
Limbal Lift Design:

- Managing edge clearance
  - Quadrant design – varying edge clearance in different quadrants, consider prism ballast for correct alignment
  - 3 o'clock – K6, 12 – K10, 9 – K4, 6 – K2



Limbal Lift Design:

- Maximum alignment – minimizes harsh bearing, maximum support
- Minimal vertical movement – rocking movement, promotes tear exchange, minimizes staining from lens movement



Limbal Lift Design:

- Standard trial sets
  - K series – K7
  - E series – E5
  - G series – G5
- Base Curve
  - Normal, Keratoconus, Corneal Graft - **Start on flattest K**
  - Or start with **Best Fit Sphere**
  - If wearing RGP lenses, start 0.2mm flatter than current base curve

Limbal Lift fitting guidelines:

- Base Curve
  - 90% - spherical, 10% - bitoric
  - Bitoric required for even bearing and edge alignment
    - > 3.0D with-the-rule corneal astigmatism
    - > 2.0D against-the-rule corneal astigmatism - to prevent lateral decentration
- Material
  - Boston XO – clear, pale blue or violet
  - Optimum Extra - clear, green or blue

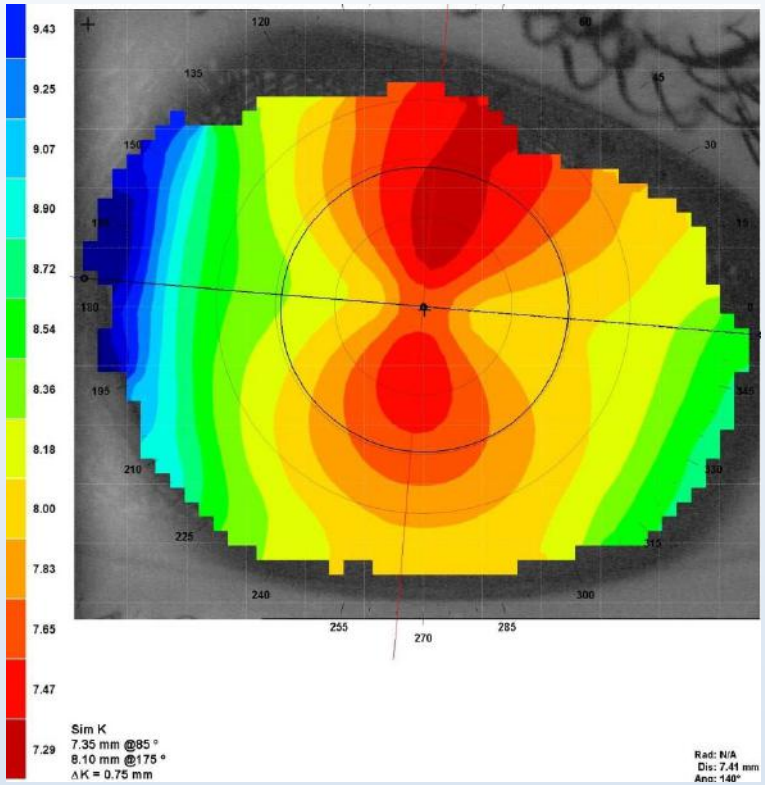
Limbal Lift Design:

- Overall diameter
  - HVID 10.5mm OD 12.5mm
  - HVID 11.0 – 11.5mm **OD 13.0mm**
  - HVID 12.0mm OD 13.5mm

    (**90% - 13.00mm**, 10% - 13.50mm)
- Back optic zone - varies with design: 6.5 – 8.0 mm
  - K series - BCOD 6.5mm
  - E series – BCOD 7.5mm
  - G series – BCOD 8.0mm

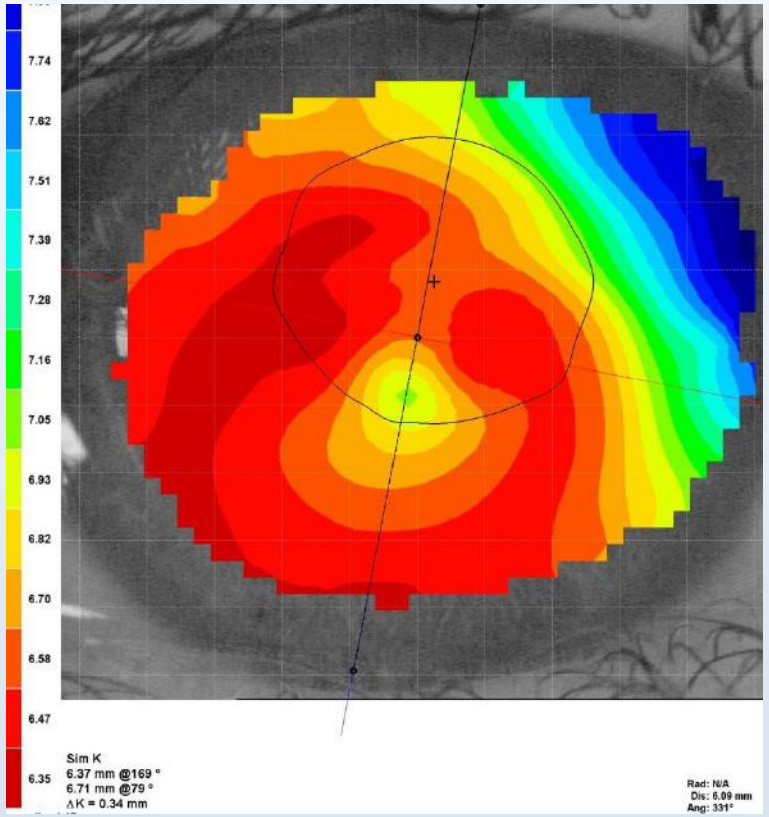
Limbal Lift fitting guidelines: Examples – 1

- Normal
  - Sim K
  - 7.35@85/8.10@175
  - Initial trial lens: 8.0 E5



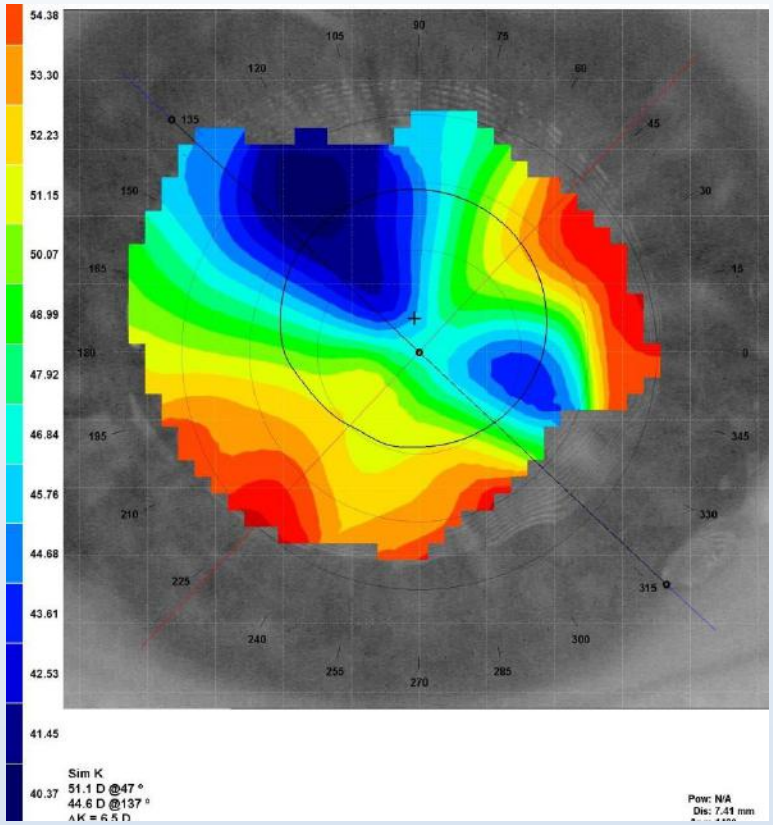
Limbal Lift fitting guidelines: Examples – 2

- Keratoconus
  - Sim K
  - 6.37@169/6.71@79
  - Initial trial lens: 6.8 K7



Limbal Lift fitting guidelines: Examples – 3

- Corneal Graft
  - Sim K
  - 6.60@47/7.56@137
  - Initial trial lens: 7.6 E5 or G5



Patient Considerations:

- Comfort – reliable wearing times
- Stability – stable even during sport
- Vision – good quality day & night
- Conjunctival hyperaemia – reduced or eliminated
- Foreign bodies - reduced or eliminated
- Ease of insertion and removal

Fitting approach: **C C E**

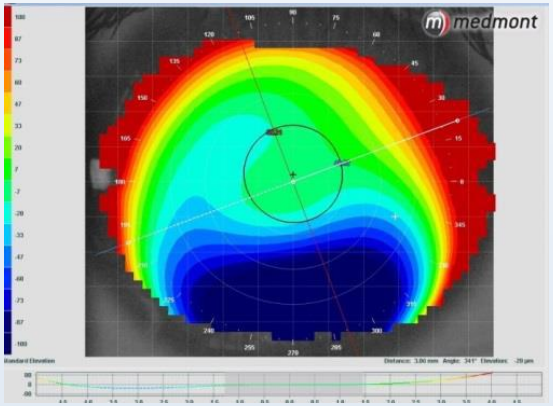
- Centre - Base curve
- Centration - Diameter
- Edge

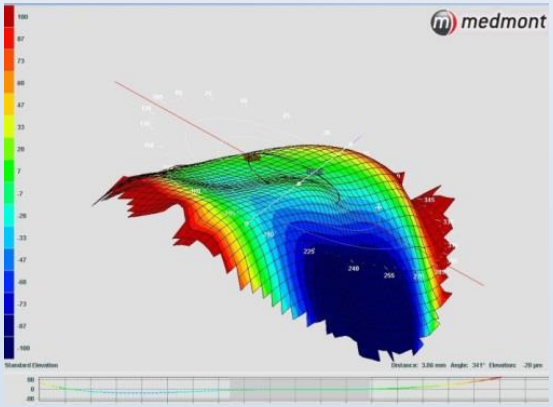
Aims:

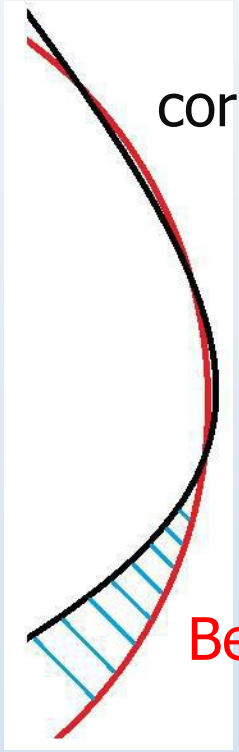
- Base curve - bearing areas distributed as evenly as possible
- Diameter – lid attachment
- Edge design
  - Rate of peripheral flattening increases with higher number
  - Moderate change 2 units, significant change 4 units
    - E7 -> E5, G6 -> G2
  - 360° even edge clearance for better comfort, adequate tear exchange and to minimise instability.

Fitting approach: Centre - Base curve – Best Fit Sphere

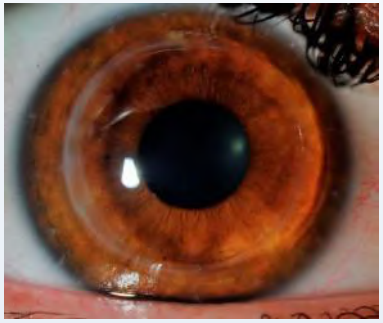
- Corneal topography - Elevation map – height (µm) in front or behind a reference sphere or best fit sphere

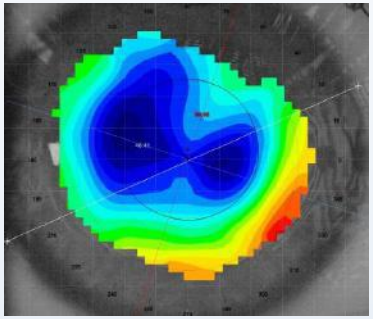




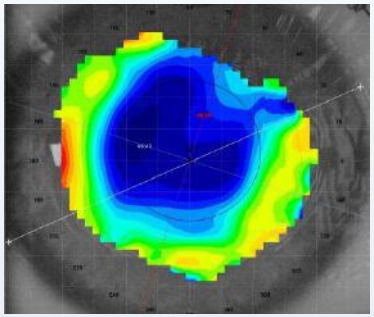


Fitting approach: Centre - Base curve

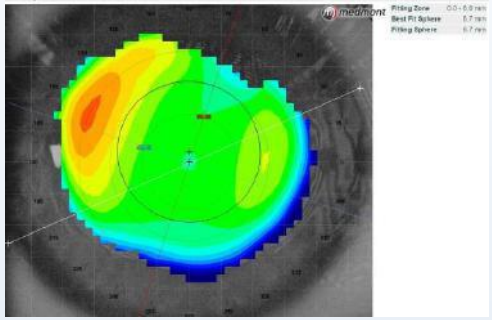




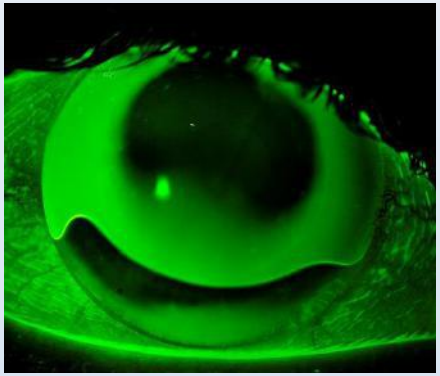
Axial
Sim K 7.25 x 6.75



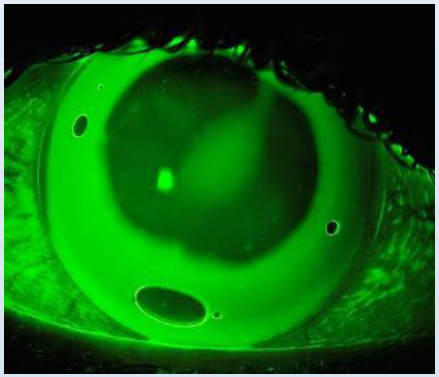
Tangential



Elevation
Best Fit Sphere 6.7



Trial lens - Limbal lift BOZR 7.0

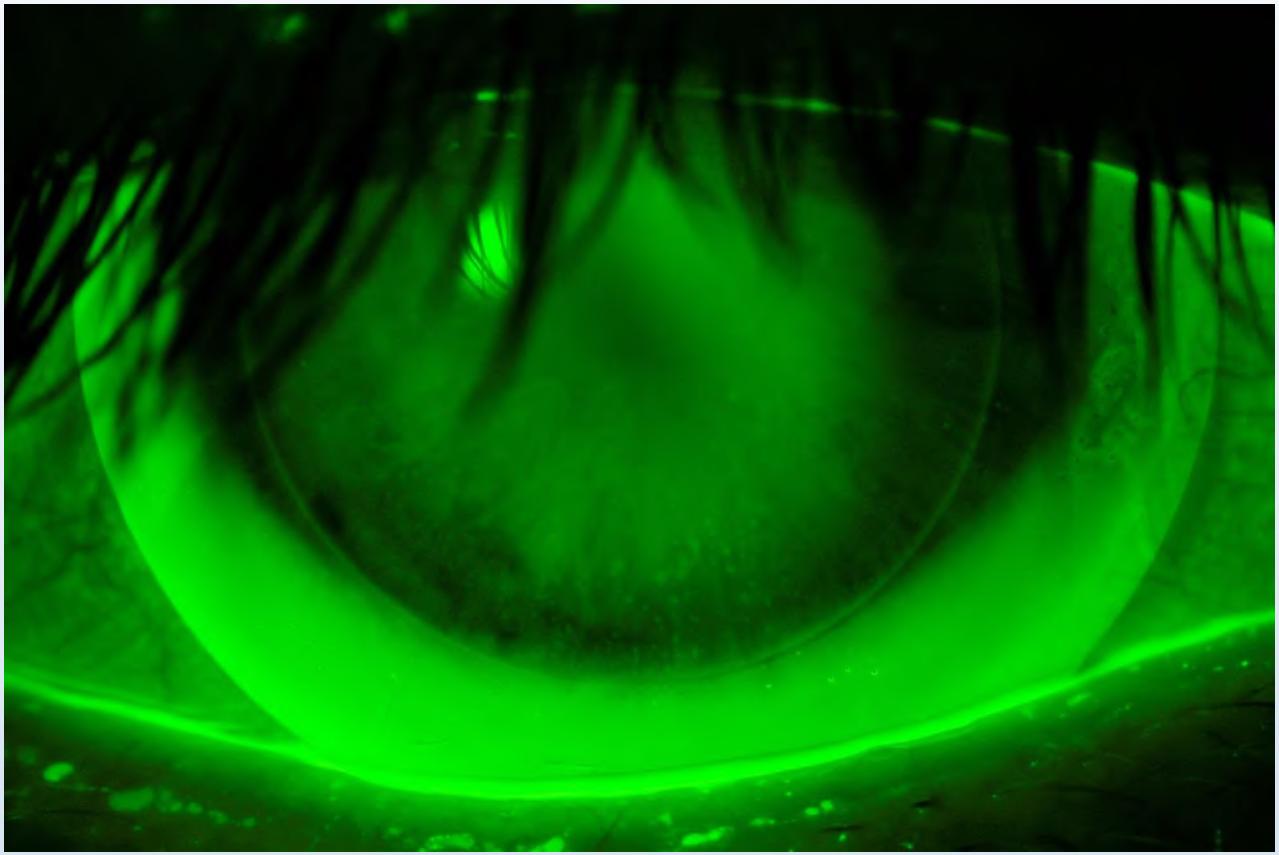


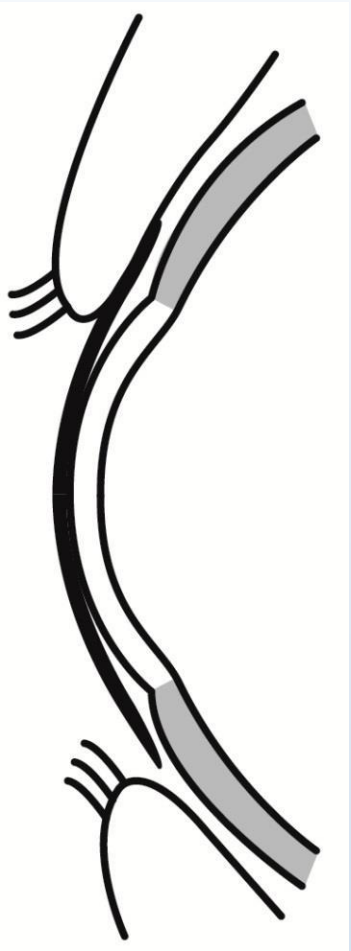
Trial lens Limbal lift BOZR 6.6 G2

Fitting Limbal Lift:

- Change in increased or decreased edge clearance by varying the asphericity - cannot be predicted from topography
- Must be assessed by a trial lens fitting
- Most common modification is peripheral steepening at 6 o'clock – Inferior tuck

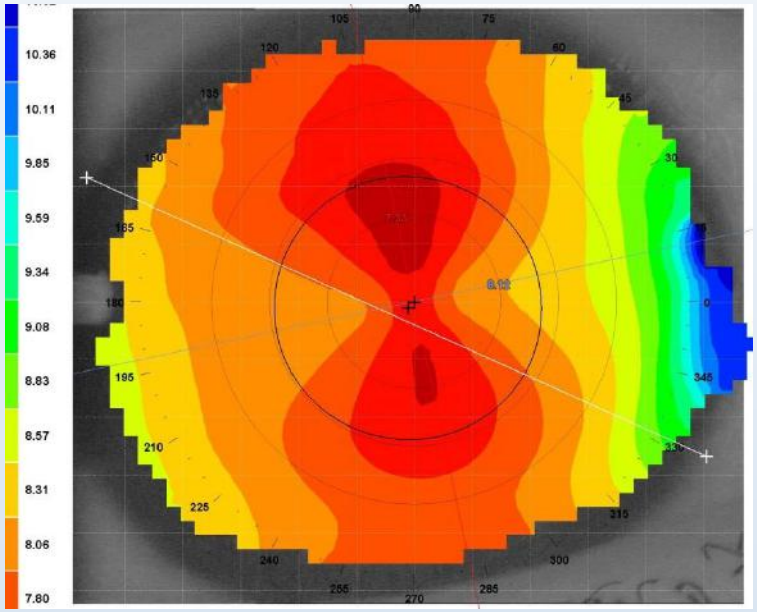
Limbal Lift Design:

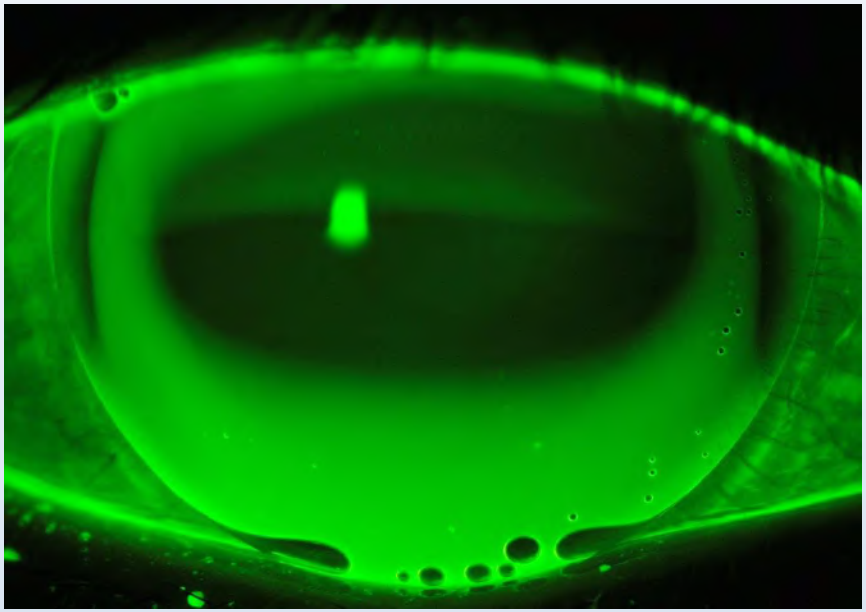




Fitting Limbal Lift:

- Regular astigmatism
  - Sim K – 8.11@12/7.33@102

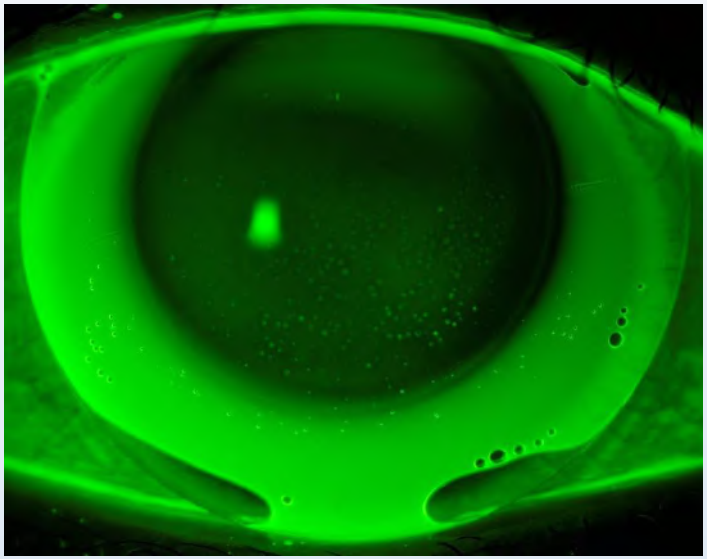




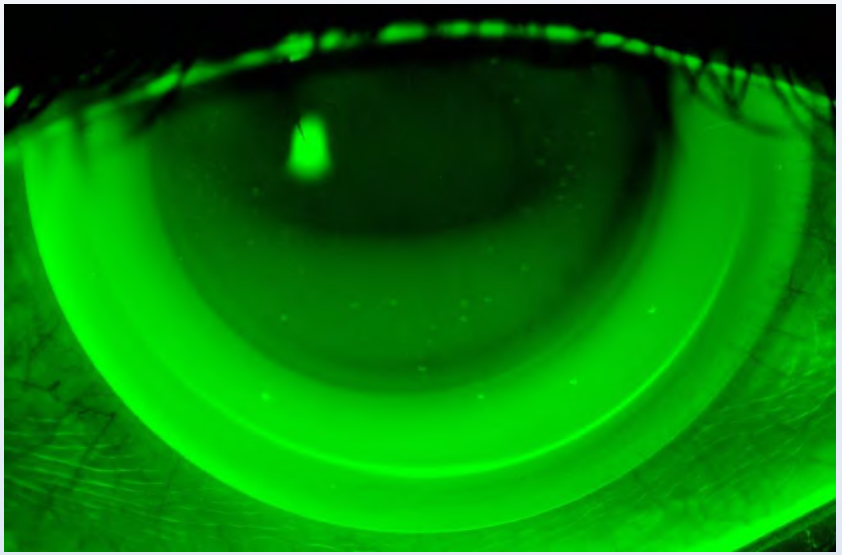
BCOR 8.2 E2

Fitting Limbal Lift:

- Regular astigmatism - Sim K – 8.11@12/7.33@102



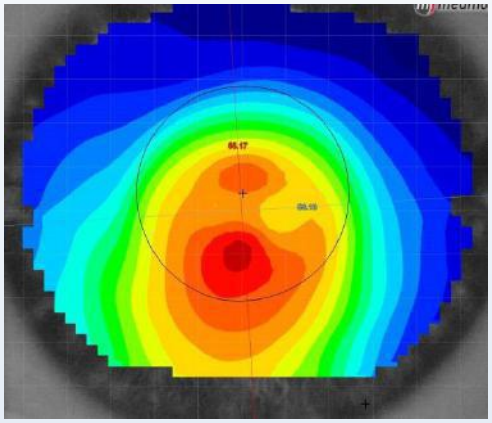
BCOR 8.2 x 7.6 E7



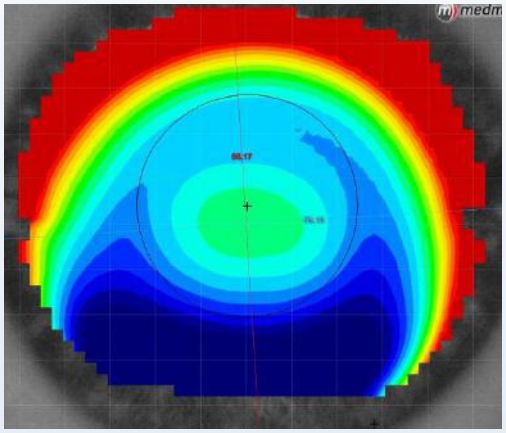
BCOR 8.3 x 7.5
3, 12, 9 o'clock E8
6 o'clock E4

Fitting Limbal Lift:

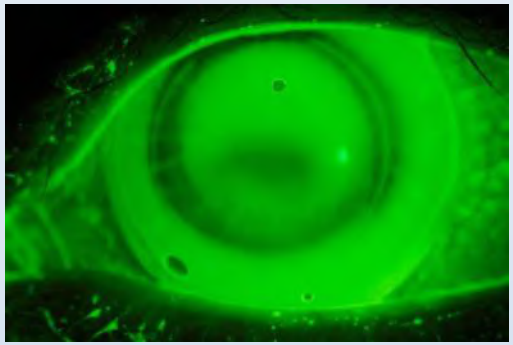
- Keratoconus - 1



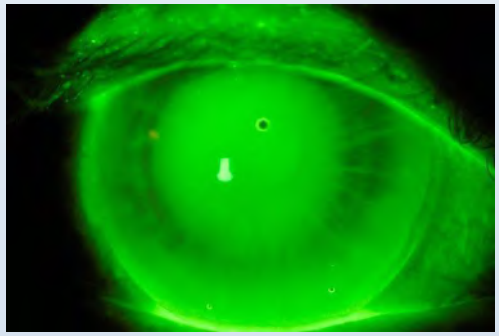
Axial 6.35/6.12



Elevation BFS 7.1mm



6.8 K7



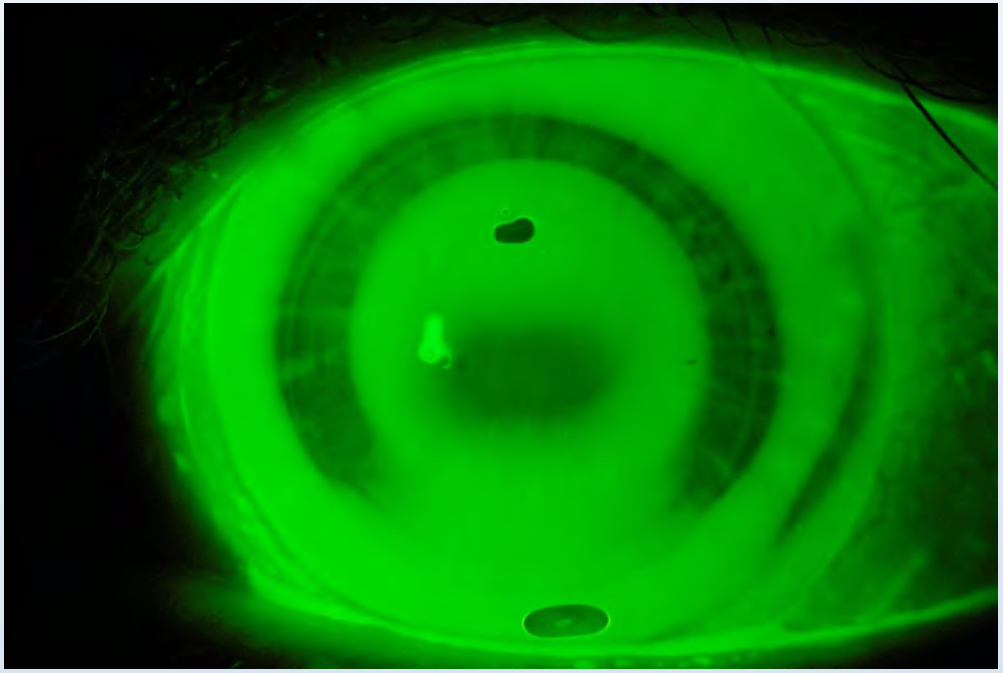
6.6 K7

Fitting Limbal Lift:

- Keratoconus - 1

Axial 6.35/6.12

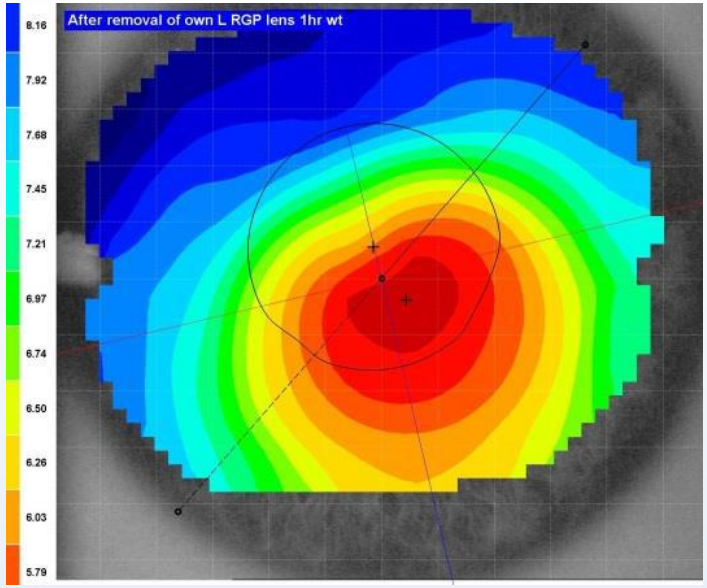
Elevation BFS 7.1mm

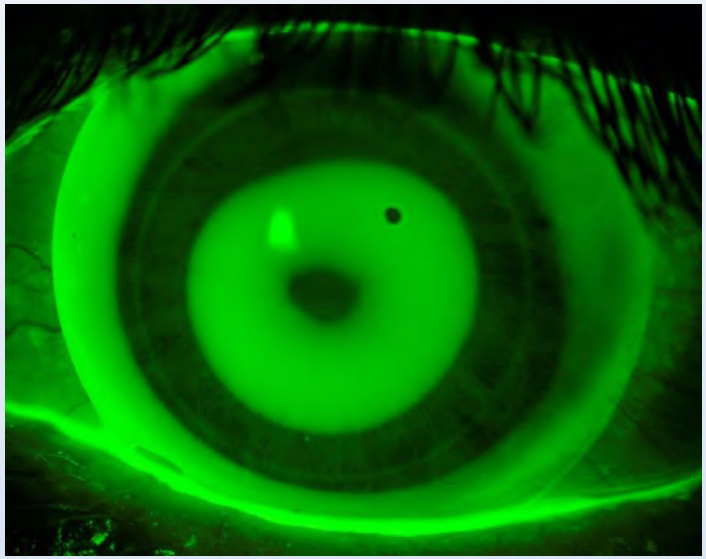


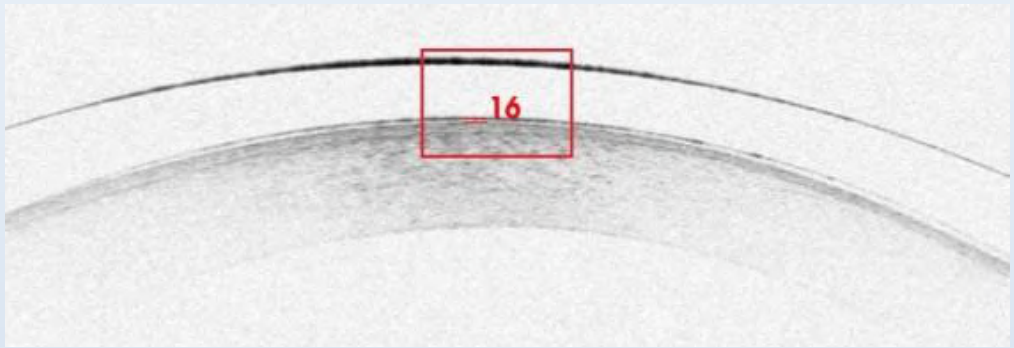
6.7 K6

Fitting Limbal Lift:

- Keratoconus - 2
  - Sim K – 5.56@13/5.96@103



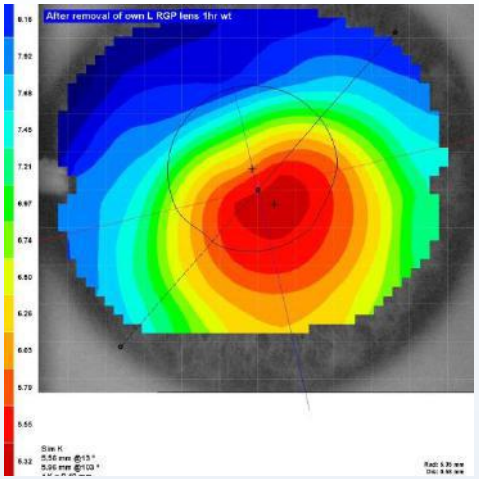


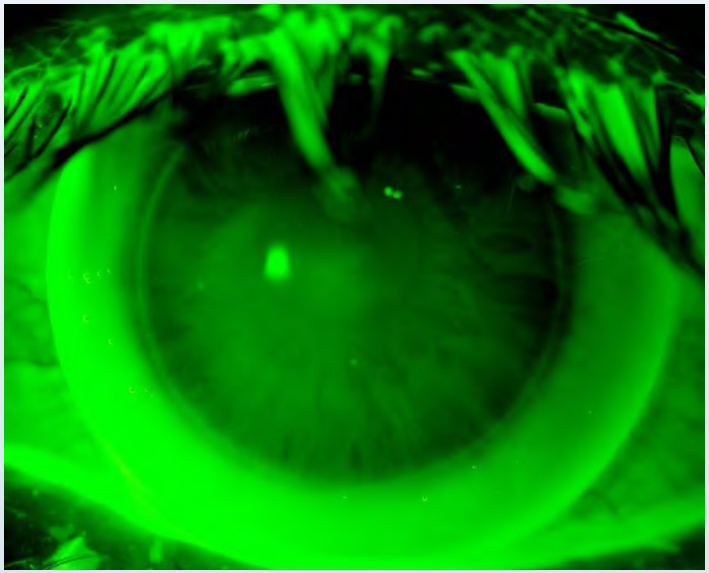


BCOR 6.0 K7

Fitting Limbal Lift:

- Keratoconus - 2
  - Sim K – 5.56@13/5.96@103



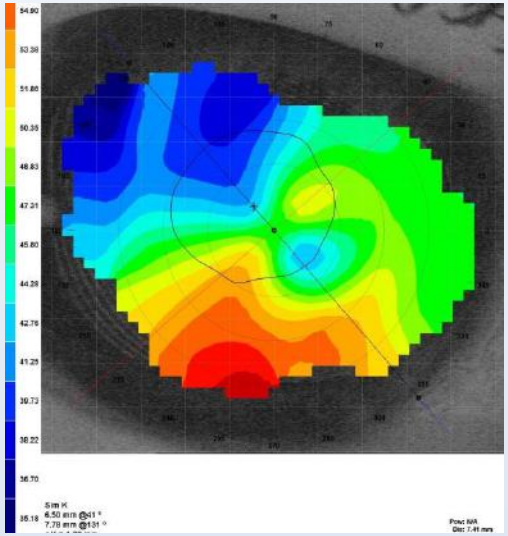


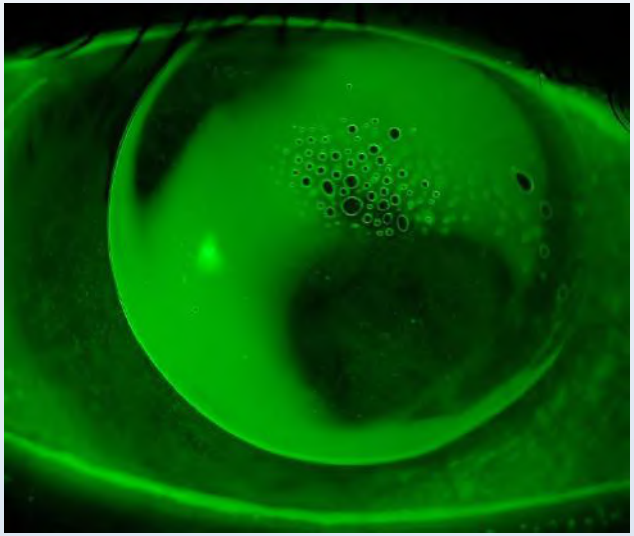
BCOR 5.85 K9

- Slightly steeper base 5.85
- Moderately flatter – K9

Fitting Limbal Lift:

- Corneal graft - 1
  - Sim K – 6.50@41/7.78@131

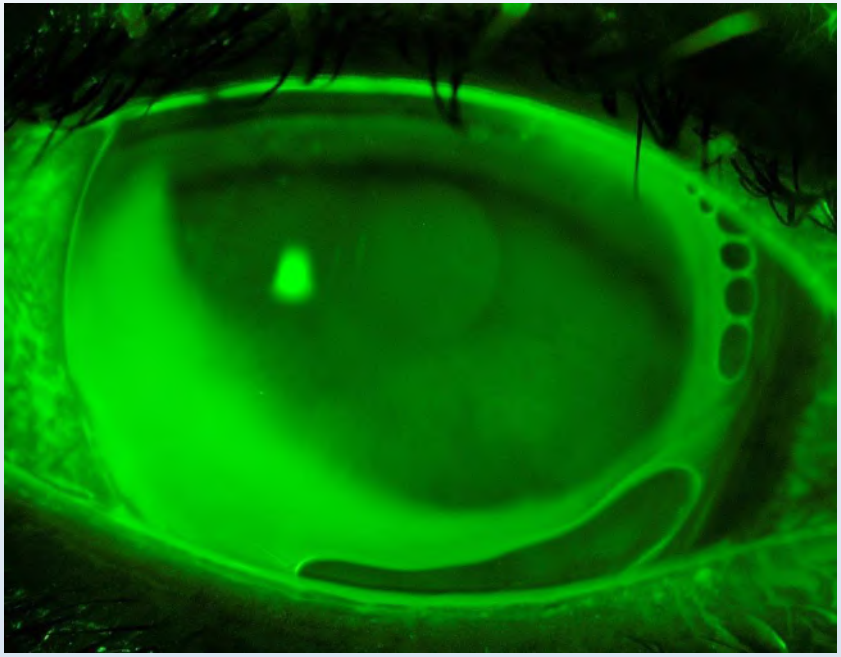




Own RGP BCOR 8.2
Unsuccessful with miniscleral

Fitting Limbal Lift:

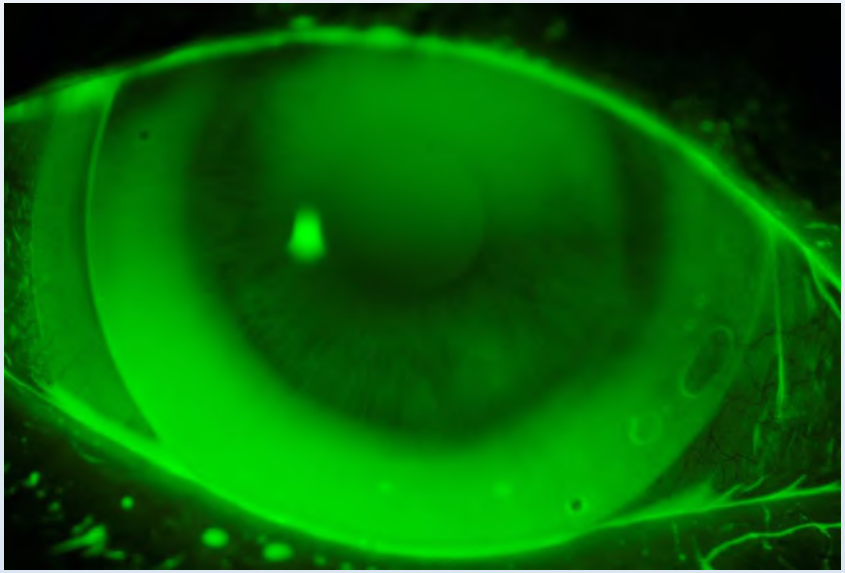
- Corneal graft - 1
  - Sim K – 6.50@41/7.78@131



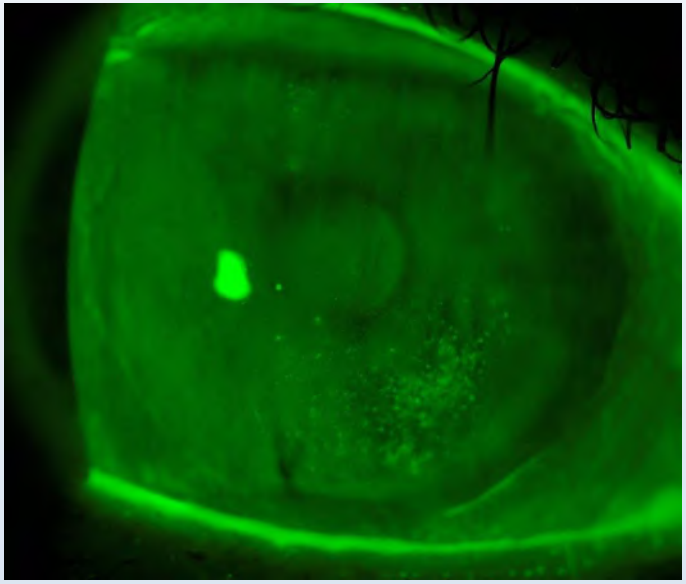
Trial lens - BCOR 7.6 E2

Fitting Limbal Lift:

- Corneal graft - 1
  - Sim K – 6.50@41/7.78@131

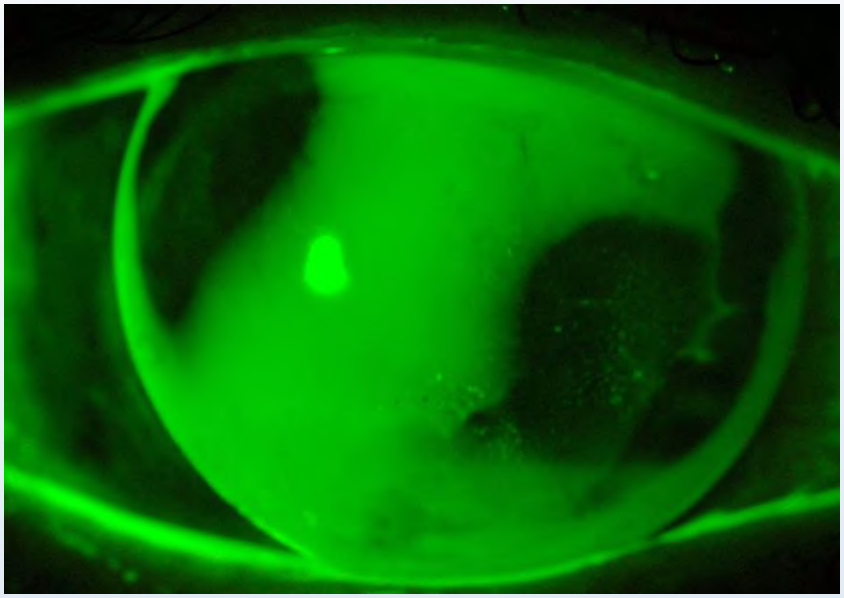


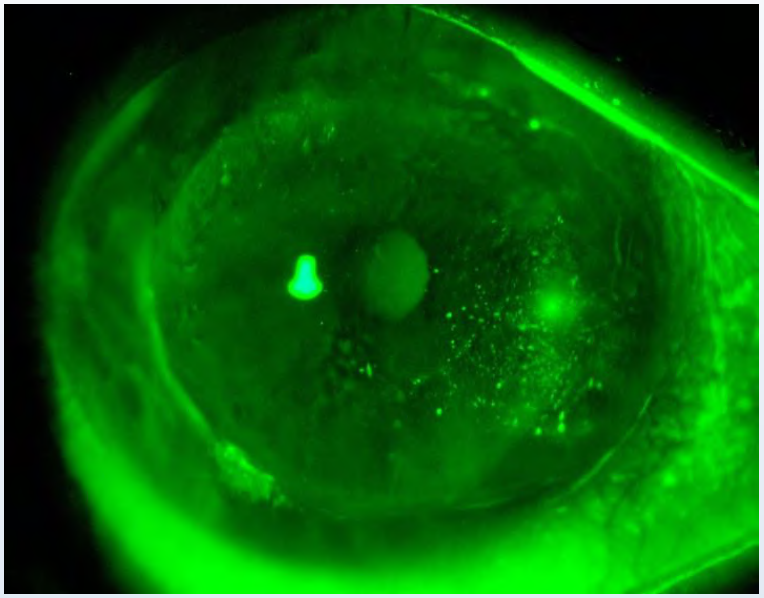
BCOR 6.8 x 7.6 E2 + Biofinity



Staining after 5hrs

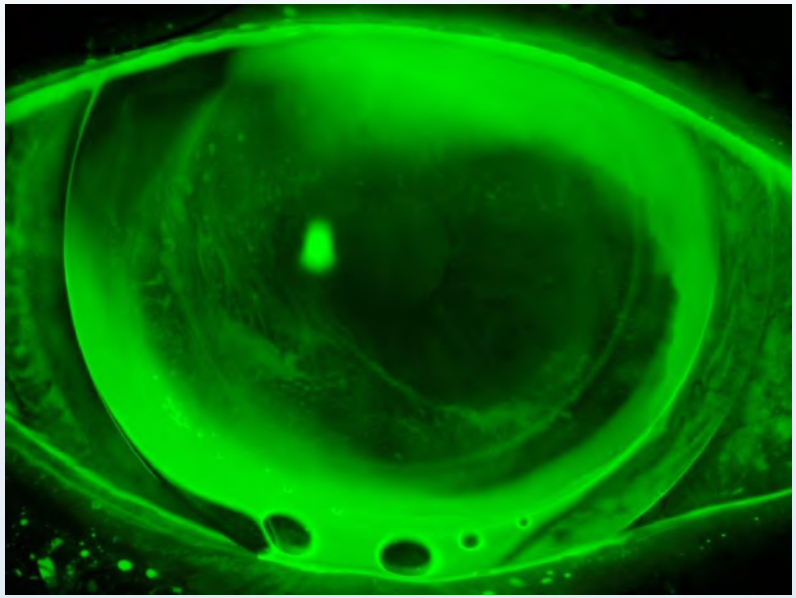
- Corneal graft – 2

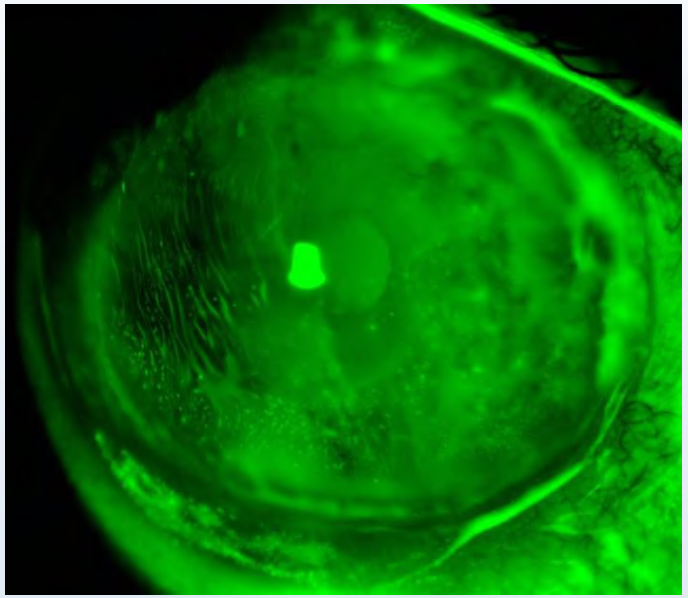




Own RGP

- Corneal graft – 2

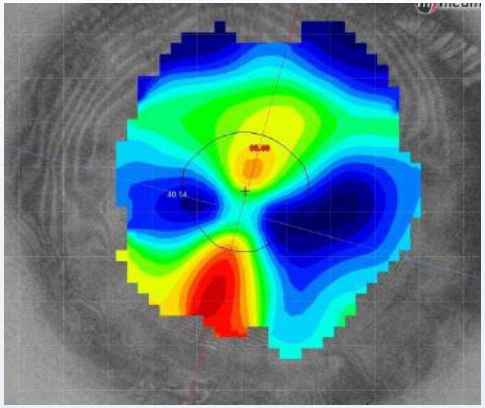




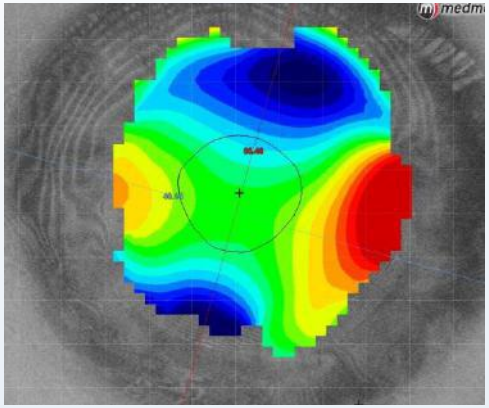
BCOR: 8.00 (13.00)

Periphery: 3/9/12 o'clock G5, 6 o'clock G3

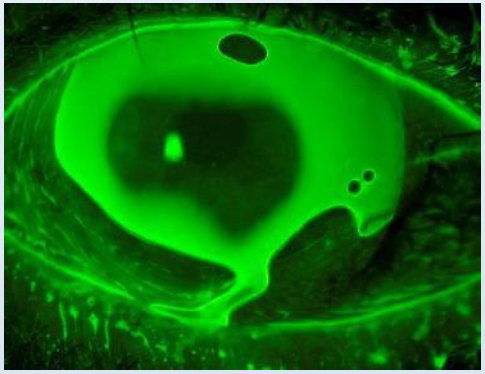
- Corneal graft – 3



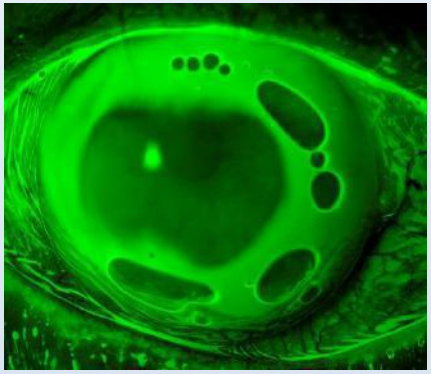
Axial – 8.41/6.09



Elevation BFS 7.4mm



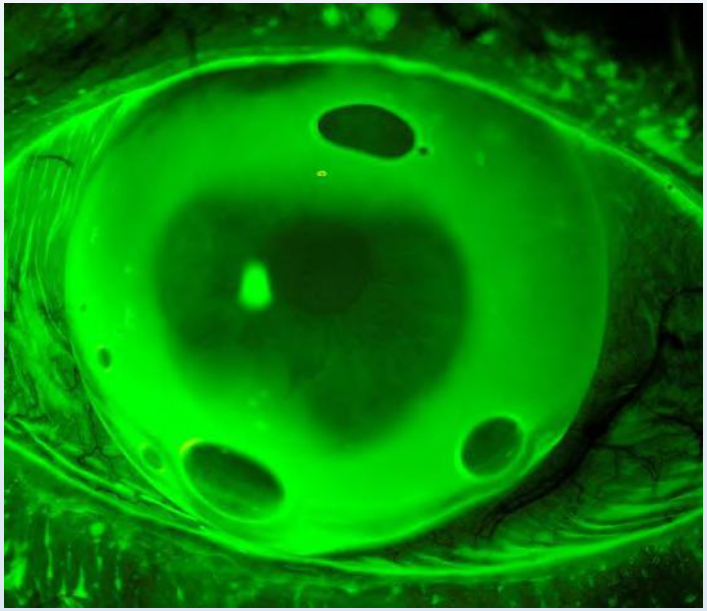
8.0 E2



7.8 G2

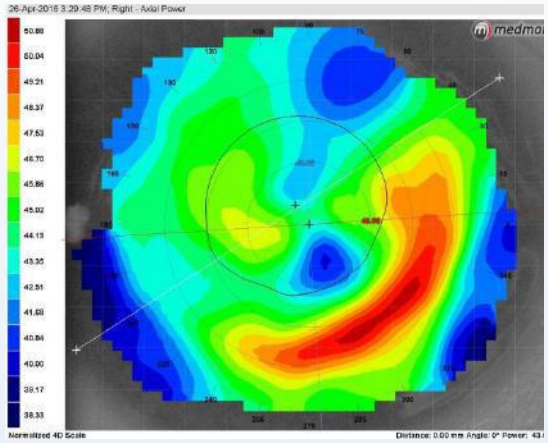
- Corneal graft – 3

Axial – 8.41/6.09

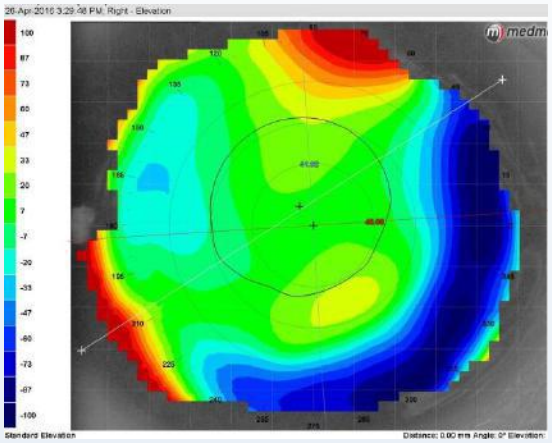


8.0 G5

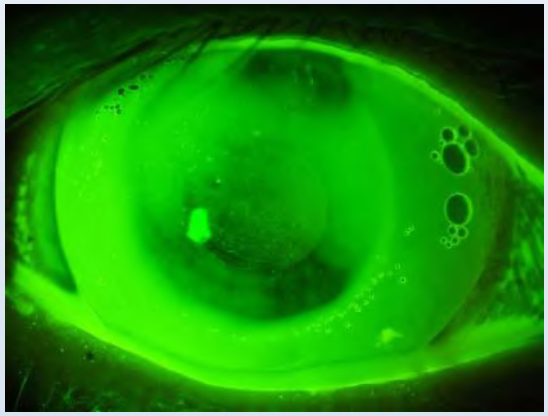
- Corneal graft – 4

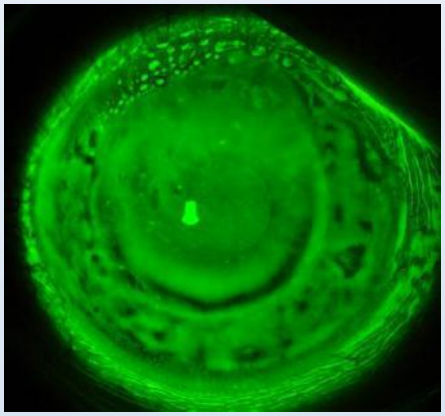


Axial – 8.05@94/7.33@4



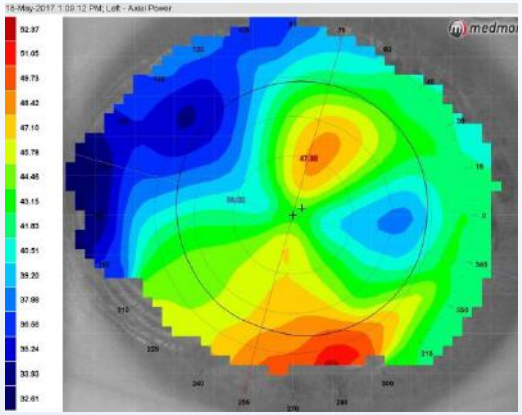
Elevation BFS 7.6mm



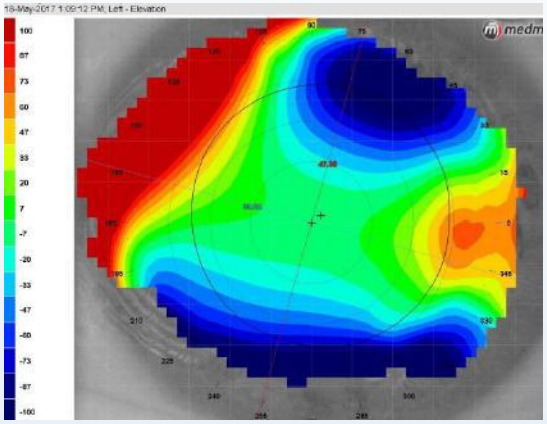


7.6 - 3, 12, 9 o’clock E5, E2 6 o’clock

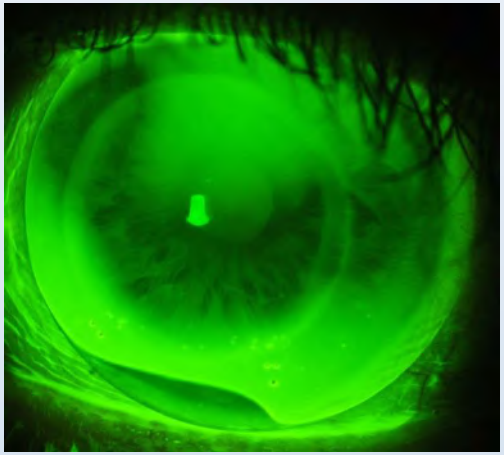
- Corneal graft – 5



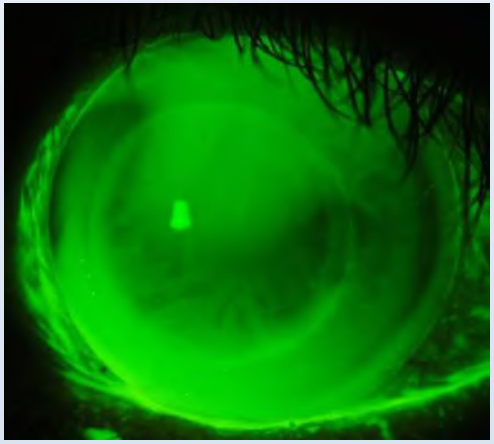
Axial – 8.52@164/7.13@74



Elevation BFS 8.0mm

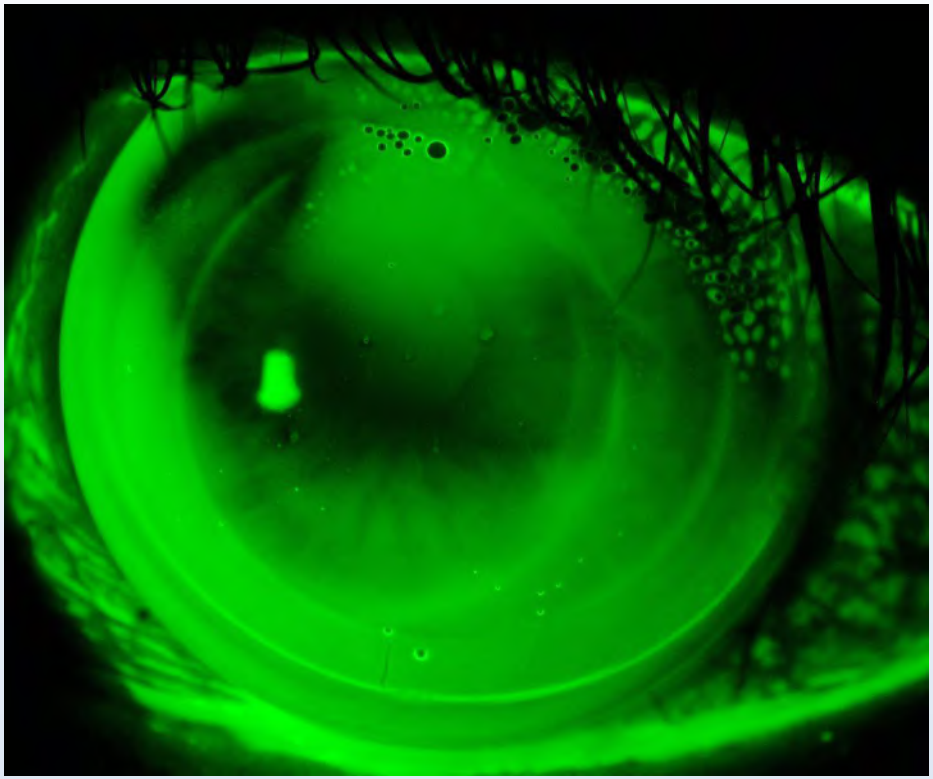


8.0 E5



8.0 E2

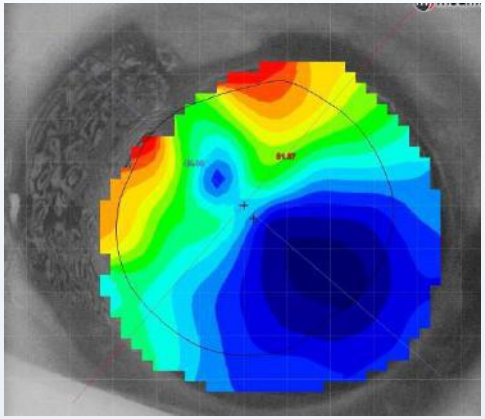
- Corneal graft – 5



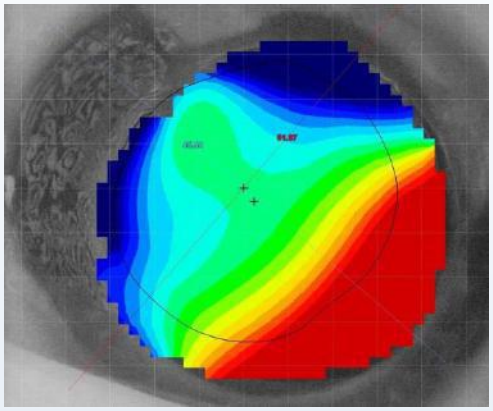
8.3x7.6 E6 – 3, 12, 9 o’clock, E3 6 o’clock,

1 prism ballast @ 6 o’clock

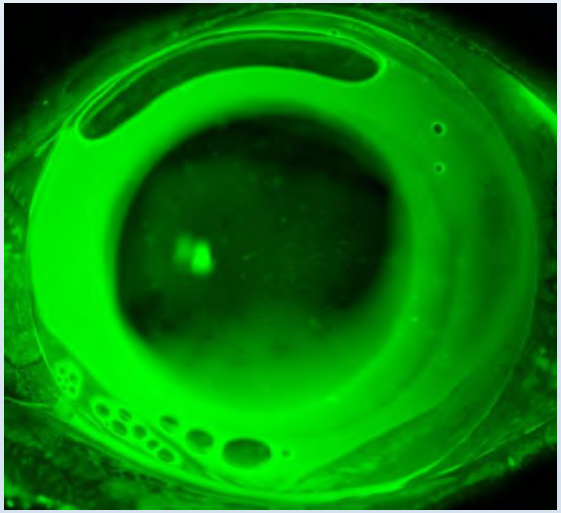
- Corneal graft – 6



Axial – 6.50/7.43

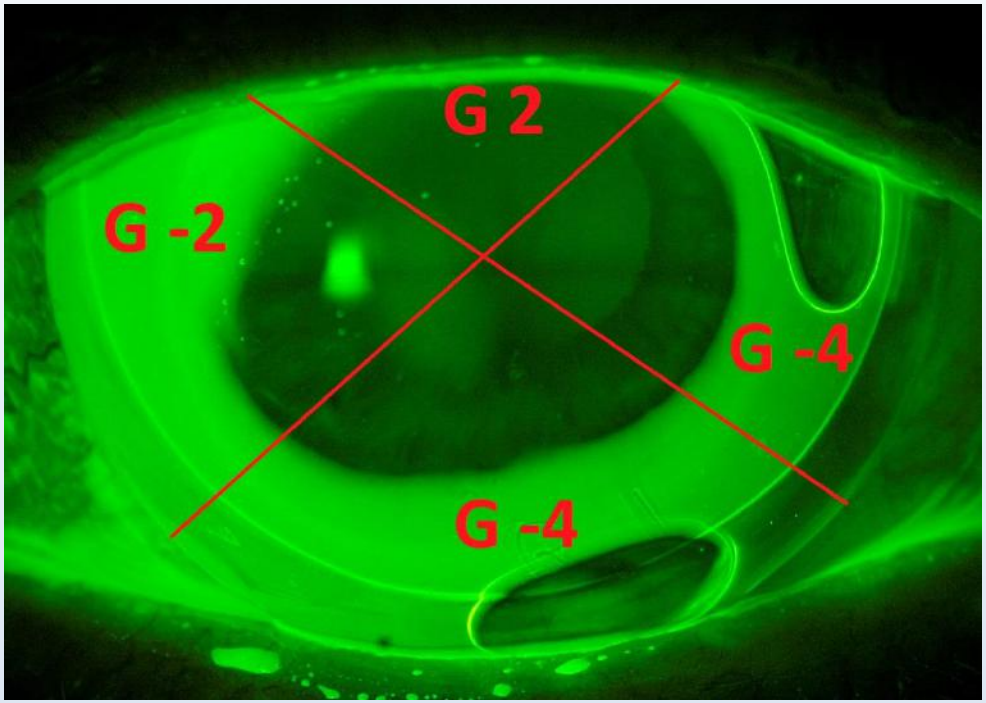


Elevation BFS 7.0mm



7.4 G 2

- Corneal graft – 7



7.1 G series

Periphery:

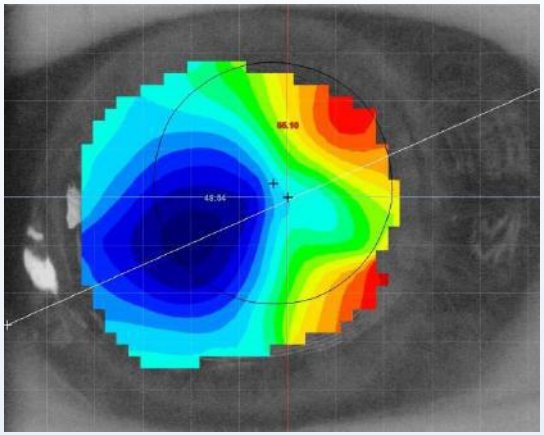
3 o'clock: G Neg 4

12 o'clock: G 2

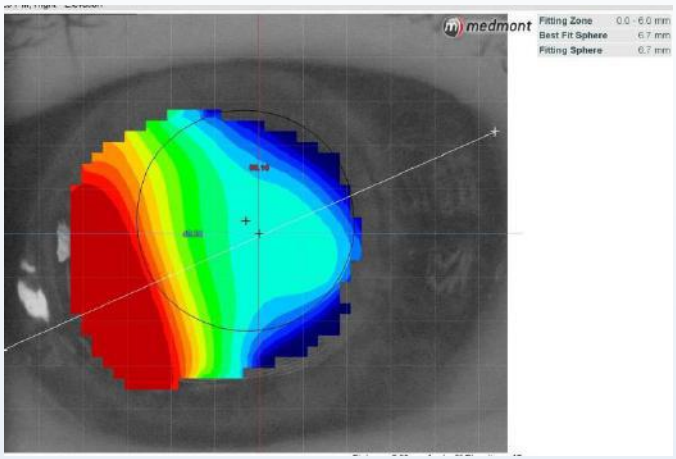
9 o'clock: G Neg 2

6 o'clock: G Neg 4

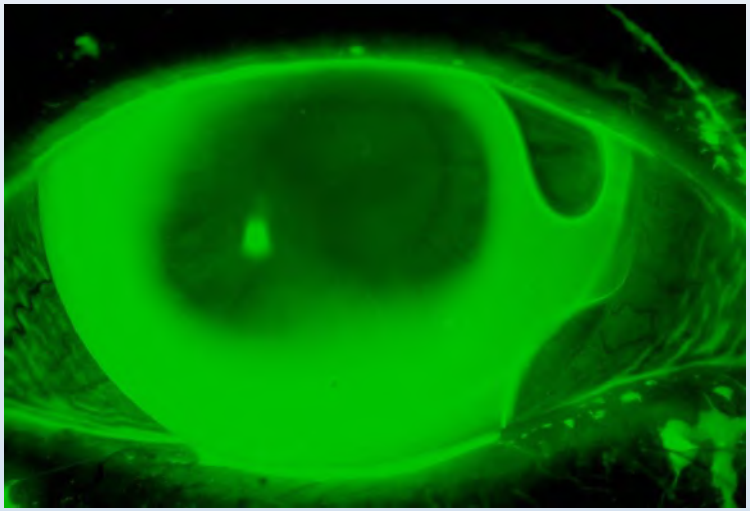
- Corneal graft – 8



Axial – 6.95/6.13



Elevation BFS 6.7mm



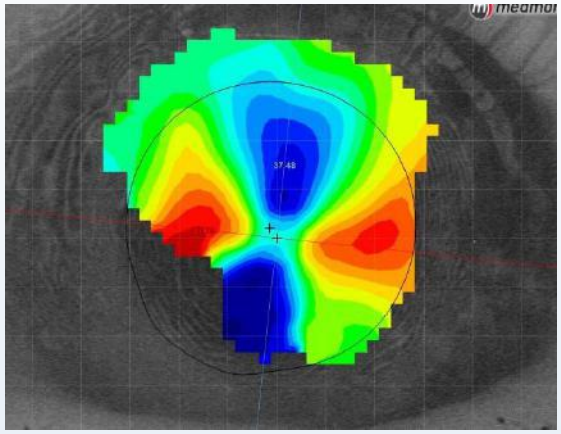
7.4 - 3 o'clock G Neg 5

12 o'clock G 2

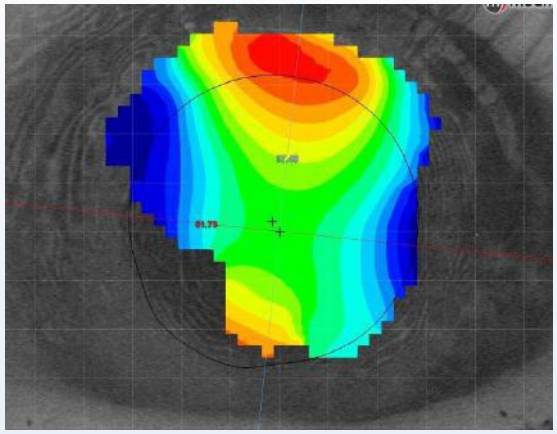
9 o'clock G Neg 2

6 o'clock G Neg 6

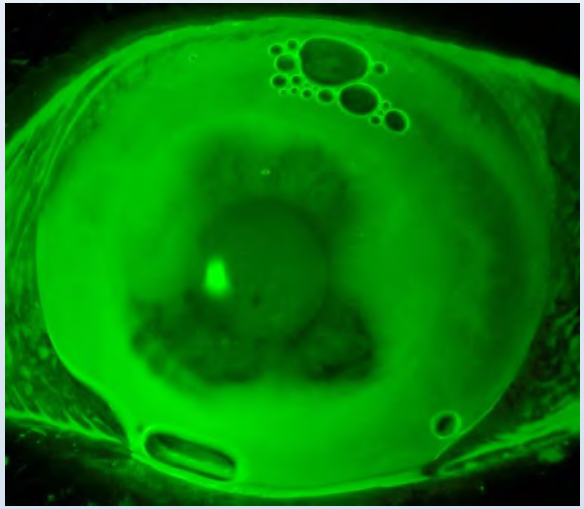
- Corneal graft – 9



Axial – 9.01/6.53



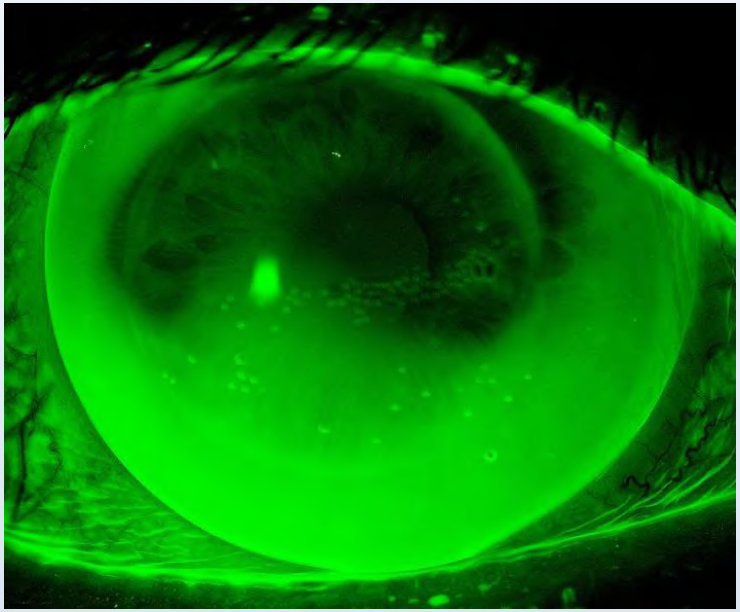
Elevation BFS 7.8mm

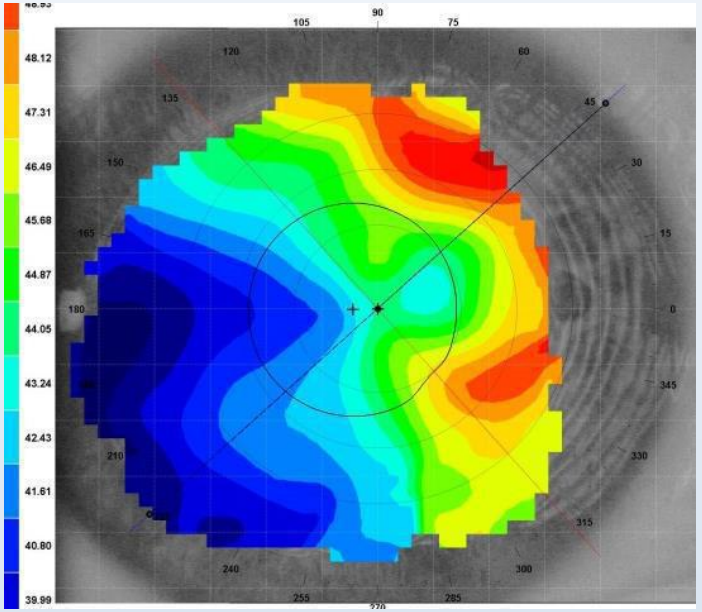


8.7x6.8 G5

- Corneal graft – 10

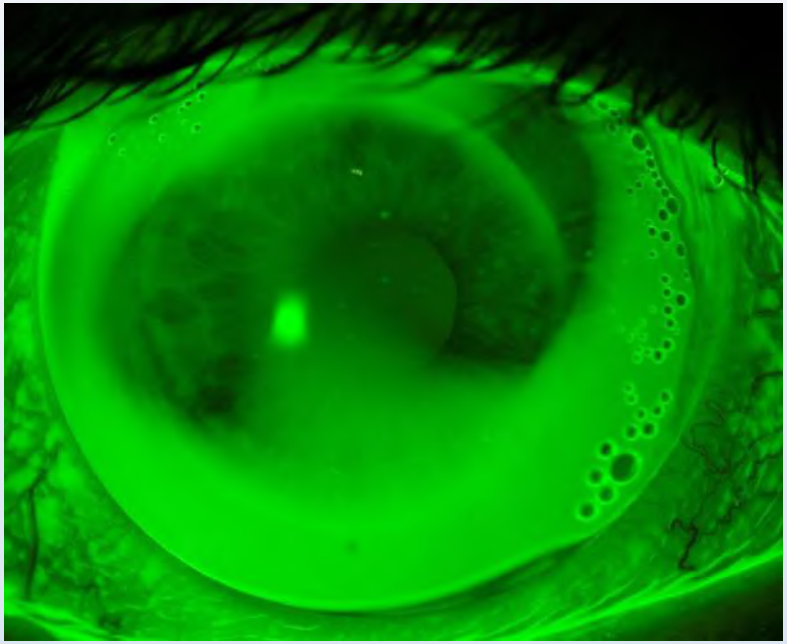
  - Sim K – 7.40@132 / 7.85@42
    2.60D astigmatism

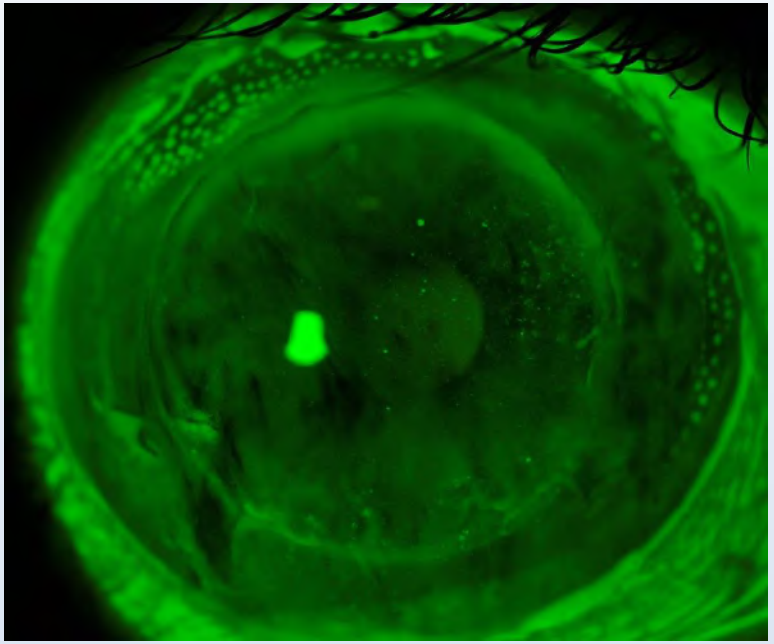




7.8 E5

- Corneal graft – 10
  - Sim K – 7.40@132 / 7.85@42

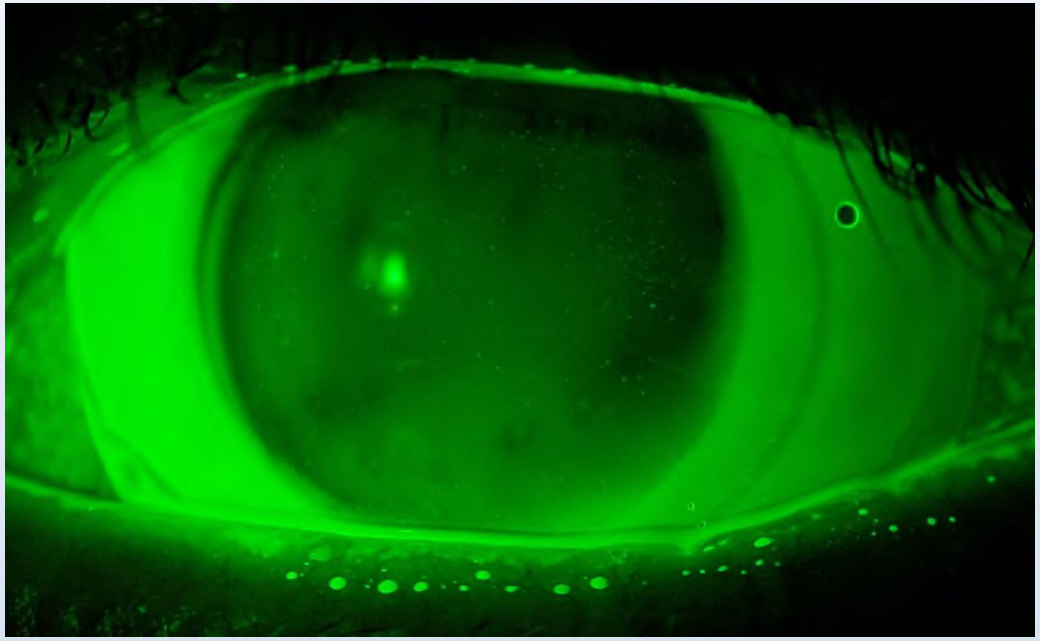




7.4x7.9 E5

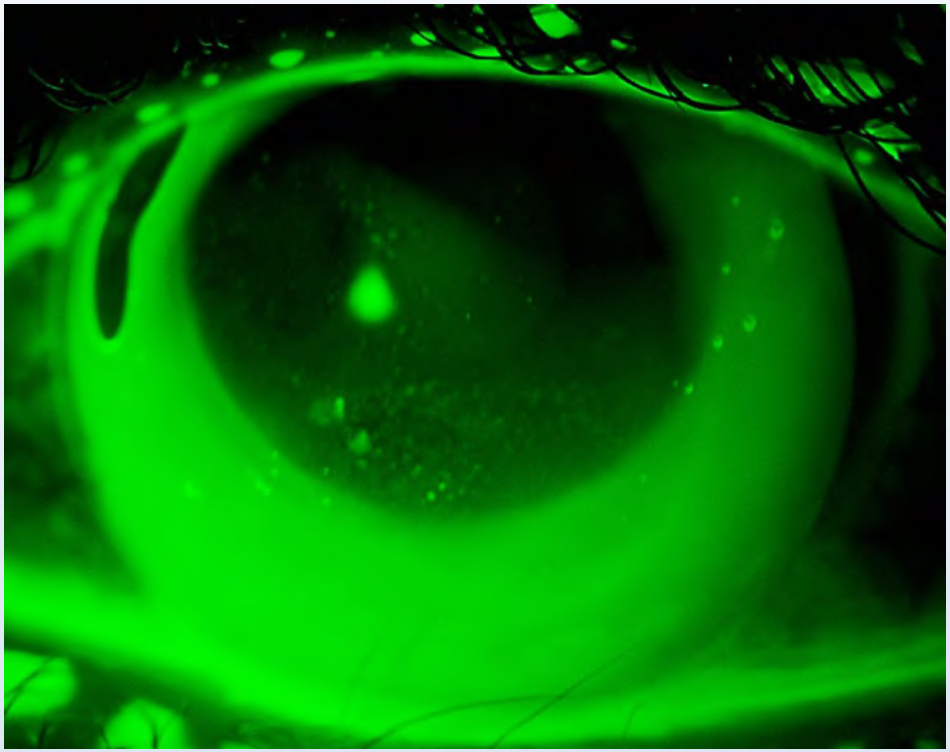
- Corneal graft – 12

  - Sim K – 6.50@49 / 7.43@139
    6.50D astigmatism



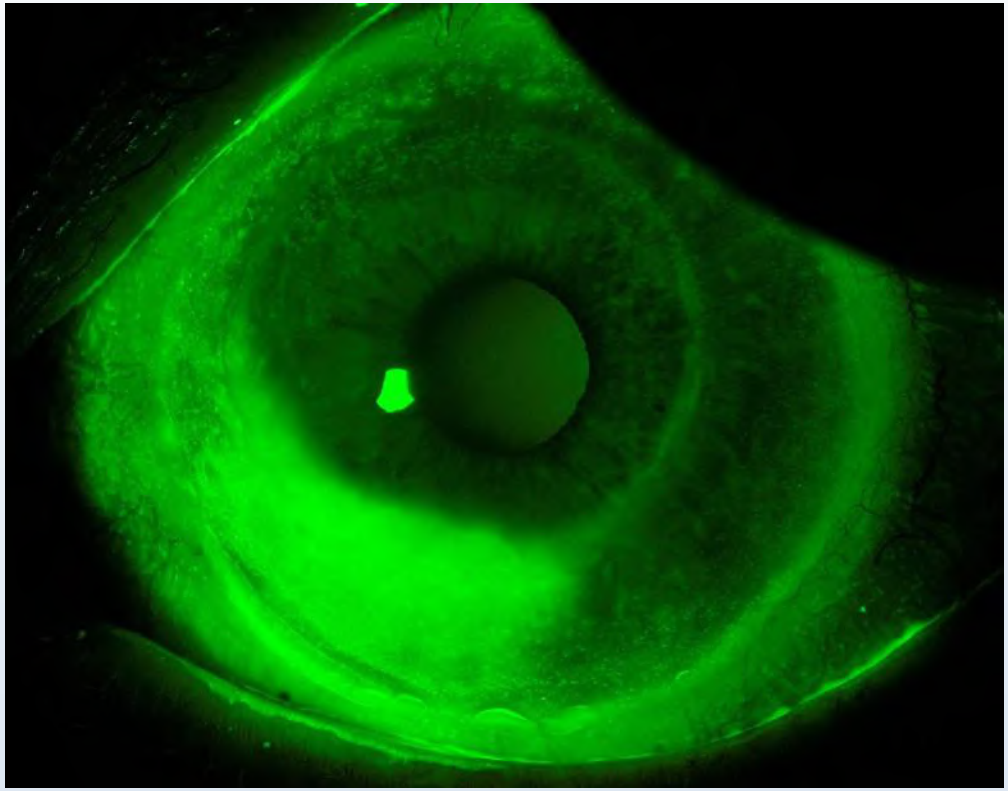
7.4 G2

- Corneal graft – 13



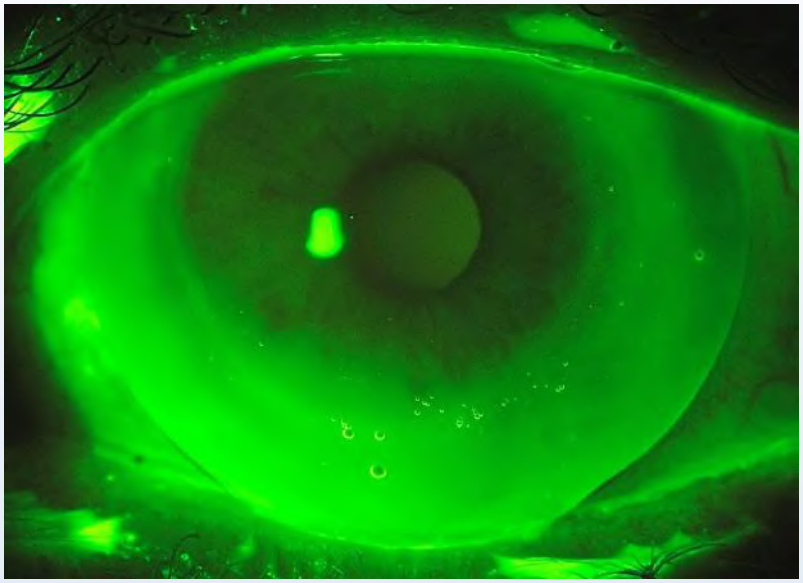
6.80 (12.0) E Neg 9

- Corneal graft – 14

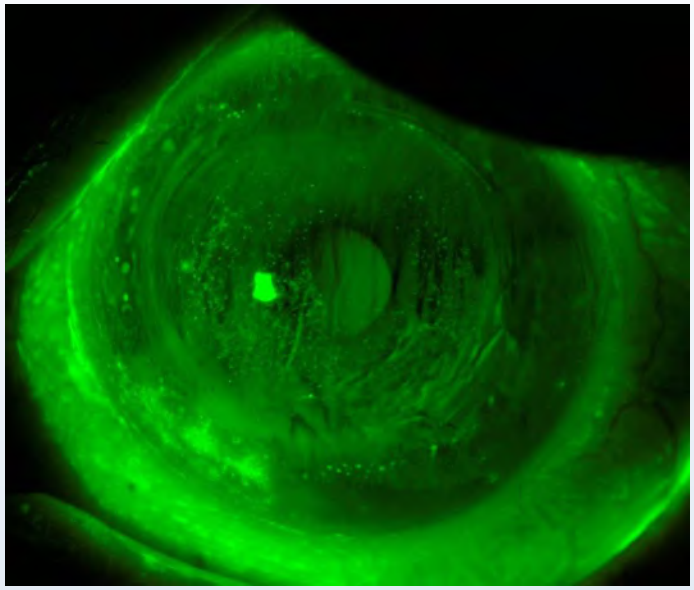


After miniscleral wear April 2016

- Corneal graft – 14

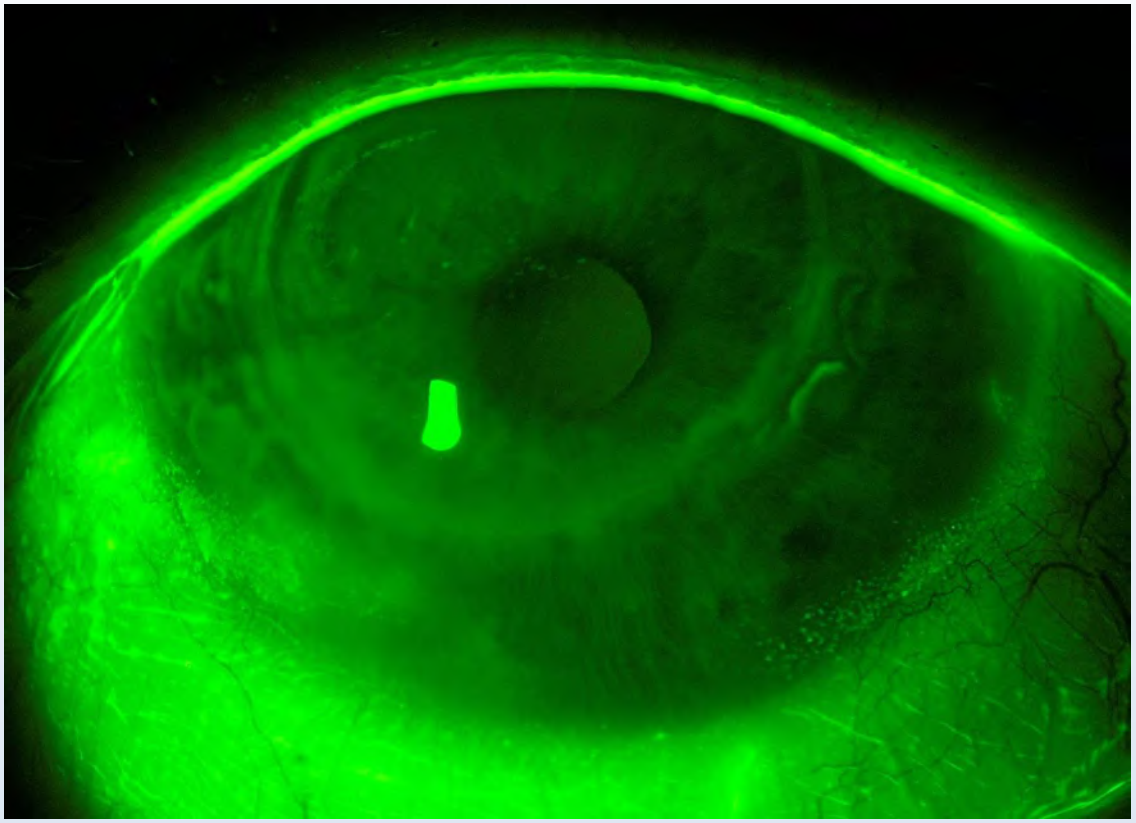


Trial lens 7.2 G5



Staining after LL wear Feb 2017

- Corneal graft – 14



Reduced staining and host oedema after LL wear August 2017

Limbal Lift Design:

- Need to be fitted with trial lenses
- May need to control edge clearance by Quadrant Edge Design and prism ballast
- Specification of peripheral asphericity – predicting change, communication with the lab - photos

Limbal Lift Lenses

Richard Vojlay

Associate Professor (The University of Melbourne)

BSc Optom LOSc FACO

Dip Oc Therapeutics Dip Humanities (Music)