

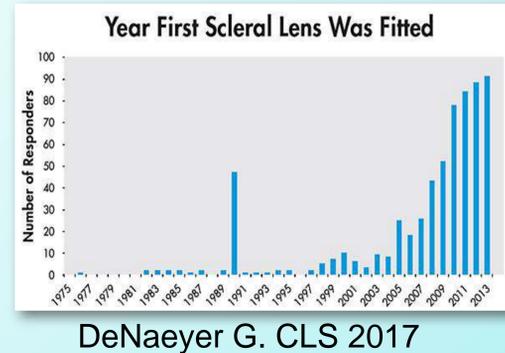
# The Effect of Scleral Contact Lens on Corneal Topography After Corneal Cross-Linking for Keratoconus

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## INTRODUCTION

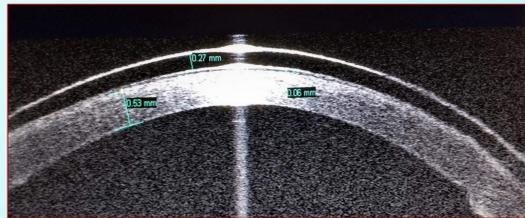
### Scleral Lenses for Irregular Cornea

- Gaining international popularity, became a mainstream in the US
- 20-25% of KC patients use Scleral Lenses (SCL)
- Often fitted as soon as 2-3 weeks after Corneal Cross-linking (CXL)
- In most CXL studies, patients who wear corneal lenses are requested to discontinue CL wear in order to avoid bias in corneal curvature determination
- For scleral lenses there is no defined consensus on this topic



### Scleral Lenses Fitting Principles

- No mechanical corneal contact - entirely sclera supported
- 13.0-15.0 mm chamber vaults the cornea and limbal region, haptics align the underlying sclera
- Total diameter 15.0 to 19.0 mm
- May settle after insertion up to 80-160µm and cause changes to the anterior corneal curvature and corneal thickness

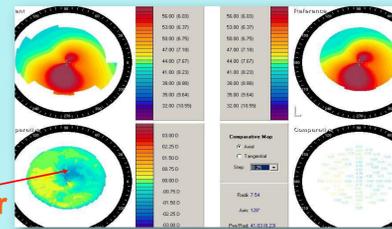


### Literature

#### Corneal Flattening post Scleral Lens Wear

- Average Sim K's and Kmax are significantly steeper 1 week after lens discontinuation (up to 1.10D). Soeters et al. CLAE, 2015
- Flattening of steep, flat and average K's after 3 hours of lens wear. Vincent et.al. CLAE, 2018

1.25 D of flattening After 5 hrs of lens wear

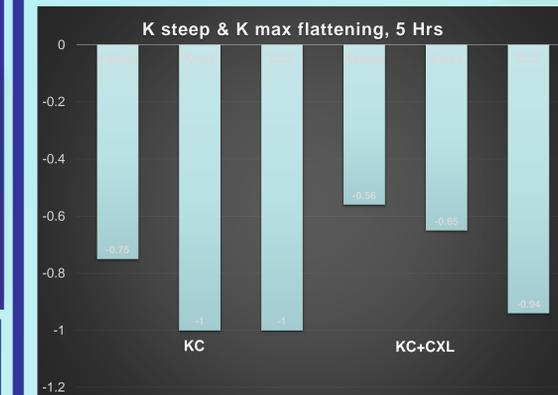
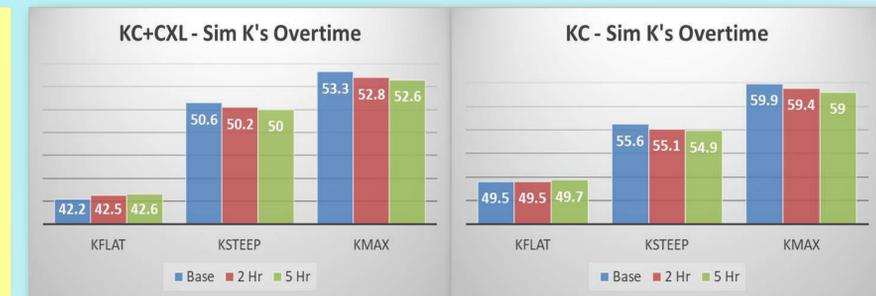


## RESULTS

- Mean age 28.5 ± 6.8 years
- KC+CXL group – mean time after CXL 2.1± 1.3 months
- Mean cl BCVA 0.77±0.12 (20/25)
- Statistically significant corneal flattening was observed in 12 (85.7%) of fitted eyes, (p<0.05)

- Ksteep flattening of 0.4±0.6 (2 hrs) and 0.7±0.6D after 5 hrs**
- Kmax flattening of 0.6±0.6 D (2 hrs) and 0.9±0.7 D after 5 hrs**

- After 5 hours of the lens wear no statistically significant difference was found in the amount of Ksteep and Kmax flattening between cross-linked (0.6 and 0.75D) and untreated (0.7 and 0.9 D) eyes



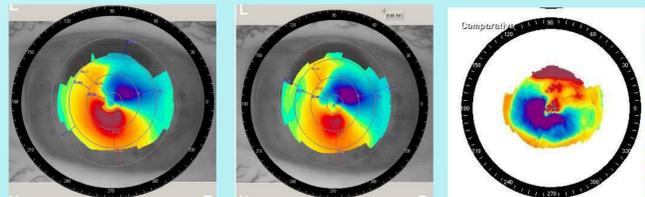
### KC+CXL vs KC group: Refractive and Corneal Dynamics

- After 5 hrs Central Corneal Astigmatism (CCA) decreased by 1.0±0.73D in post CXL and 0.94±0.85D in KC group
- CCT didn't exhibit statistically significant difference from the base line
- Corneal swelling of about 1.4% was observed in both groups

### Case #1

KC, no h/o CXL, steep cornea, Kmax 76.30  
CCT = 390 mic  
Fitted with 18.50 scleral lens  
After 5 hrs of lens wear Kmax – 74.0D!!!  
Initial clearance 250µm, clearance after 5 hours 160µm

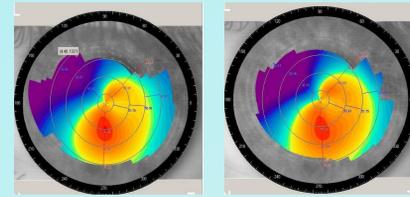
Base line, Kmax 76.30D After 5hrs, Kmax 74.0D Flattening of 2.30D



### Case #2

Mild KC, s/p SXL, spec blur after lens removal; Mini-SCL 15.60Ø, 170µm central vault  
Refitted with 18.50 lens, 250 µm clearance, stable VA  
Fluid reservoir depth beneath small-diameter scleral lenses decreases nearly 50% after 2 hrs (Nau. ECL, March 2017)

Base, Kmax 56.32 D 5 hrs Kmax 55.34D



## Corneal Flattening - Proposed Mechanisms

- Epithelial thinning - fluid forces under the lens [Vincent et.al . CLAE, 2018]
- Over time reduction in post-lens corneal clearance [Mountford J. (OSO), 2012]
- Scleral lens induced corneal swelling [Compan et. Al. Invest Ophthalmol Vis Sci 2014 ]
- Increased pachymetry associated with central corneal flattening [Am J Optom PhysOpt 1982]
- Blink forces and upper eyelid pressure cause superior corneal flattening [Vincent et. al.]

## STUDY DESIGN

- To evaluate the influence of short time full scleral lens wear on Corneal Topography
- Nine KC subjects (14 eyes); KC and CXL group – 7 eyes; KC w/o CXL – 7 eyes, control group
- Corneal Topography at the base line and after 2 and 5 hrs
- All fitted with 18.50 mm lenses, Contamac Optimum Extra (Dk=100)
- All fitted lenses had the post settling clearance of 130 to 200µm (Visante, Zeiss, inc)

## CONCLUSIONS

- Flattening of the anterior corneal surface was observed after 2 and 5 hours of lens wear
- Practitioners should be aware of these changes since SCL wear may mask the signs of KC progression or regression following CXL
- History of CXL treatment doesn't guarantee corneal shape stability following scleral wear
- Discontinuation of lens use prior to evaluation is necessary for proper follow up on the ongoing corneal changes, however further studies are required to determine its duration