

Scleral mapping of a progressive pinguecula that required a customized scleral lens

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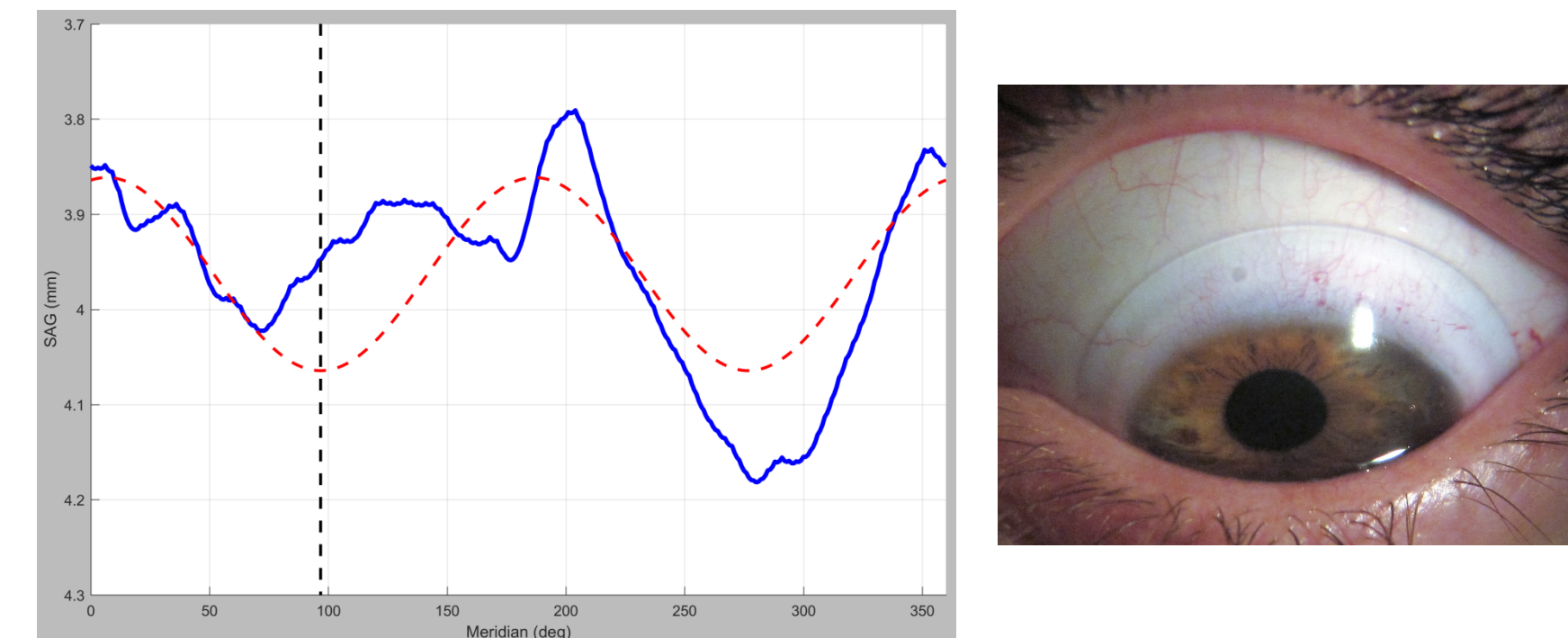
Case Description

A 24-year-old female patient with a history of severe dry eye and visual disturbance post bilateral cataract surgery with multifocal intraocular lenses was successfully fit with 16mm back surface toric Europa scleral lenses that were customized using sMap3D corneo-scleral topography in June of 2016 (**Figure 1**). **Left image** is a scleral shape plot at the 16mm diameter around the corneal center of OS in June 2016. The X-axis is the meridian in degrees 360° around. The blue line is the SAG of the ocular surface while the red line is the best fit of that surface to a toric (\sin^2) curve. Areas higher up on the graph are surface elevations and areas lower down are surface depressions. While there was some irregularity of the ocular surface, it was decided to attempt to fit this eye with a standard toric haptic Europa lens. **Right image**: Lens fit with a standard toric peripheral haptic which was comfortable and Europa scleral lens significantly mitigated her symptoms of dryness. She continued Restasis BID OU, Systane Balance PRN, and Genteal Gel QHS OU. At a two-year follow-up appointment in May of 2018, she reported recent discovery of a nasal “bump” of her left eye. She also complained of irritation of that eye while wearing her Europa scleral lens. Slit lamp examination revealed that the scleral lens was impinging on a pinguecula not observed clinically before this visit with an area of edge lift above the pinguecula (**Figure 2, top images**). Repeat corneo-scleral topography was performed prior to refitting of her left scleral lens. She was asked to leave the lens out the day of the measurement. sMap3D corneo-scleral topography revealed that, at the 16mm diameter around the corneal center, the nasal pinguecula had an approximately 200 micron elevation. (**Figure 2, red circle bottom right**). Interestingly, the early development of this pinguecula was observed on the scleral shape plot from 2016 (**Figure 2, red circle bottom left**). The data set was sent to Visionary Optics for design of a Europa scleral lens that incorporated a Precision Lift to so that the scleral lens would vault over the pinguecula, presumably eliminating impingement. Unfortunately at the dispense visit the lens rotated nasally resulting in misplacement of the Precision Lift and persistent lens impingement (**Figure 3**). Rather than trying to correct for rotation of the customized Europa scleral lens, especially given the irregular shape of the scleral shape plot (**Figure 2, bottom right**), Visionary Optics designed and manufactured a Latitude Scleral lens for the patient's left eye. The Latitude lens is a free-form completely customized lens that exactly matches the anterior ocular surface designed directly from the measurements of the sMap3D corneo-scleral topographer. The dispensed Latitude lens aligned perfectly to the patient's uneven scleral surface with rotational stability (**Figure 4**). The patient's vision was 20/25 and immediately returned her to comfortable scleral lens wear. The post settled lens vault was 116 microns. During the same 2 year period where progression of the pinguecula in the left eye occurred, there were virtually no changes in the scleral shape plots in the right eye (see **Figure 5**) and the fit of the lens ordered in 2016 was unchanged.

Conclusion

This case presents a number of insights into the value of corneal-scleral topography in the scleral lens fitting process. Firstly, it demonstrates the value of scleral topography in detecting and following a pinguecula from its subclinical origins to its clinical presentation interfering with the fit of a previously comfortable scleral lens. Secondly, the irregular scleral shape plots generated by the technology partially explained why, in this case, a simple lift over the newly developed scleral elevation did not resolve the fit difficulty. Thirdly, the perfect alignment of the free form Latitude lens reinforces the value of measuring scleral shape to optimally fit challenging scleral lens patients. In this case, a relatively straightforward fit with a standard toric haptic became a challenging fit because of the progression of conjunctival/scleral pathology over time. Finally, this case demonstrates the accuracy and precision of corneal scleral topography. In the eye that developed the pinguecula, serial scleral topography demonstrated the progression of the pinguecula and how measurement can result in an excellent fit in spite of the irregularity. It is also telling that the contralateral eye had virtually no change in scleral shape over time which again correlated with the actual clinical findings.

Figure 1

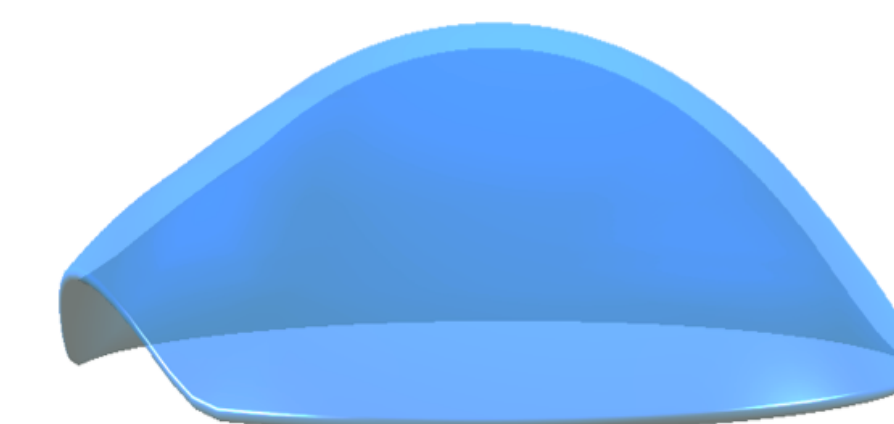


Left: Scleral shape plot at the 16mm diameter around the corneal center of OS in June 2016. The X-axis is the meridian in degrees 360° around. The blue line is the SAG of the ocular surface while the red line is the best fit of that surface to a toric (\sin^2) curve. Areas higher up on the graph are surface elevations and areas lower down are surface depressions. While there was some irregularity of the ocular surface, it was decided to attempt to fit this eye with a standard toric haptic Europa lens.

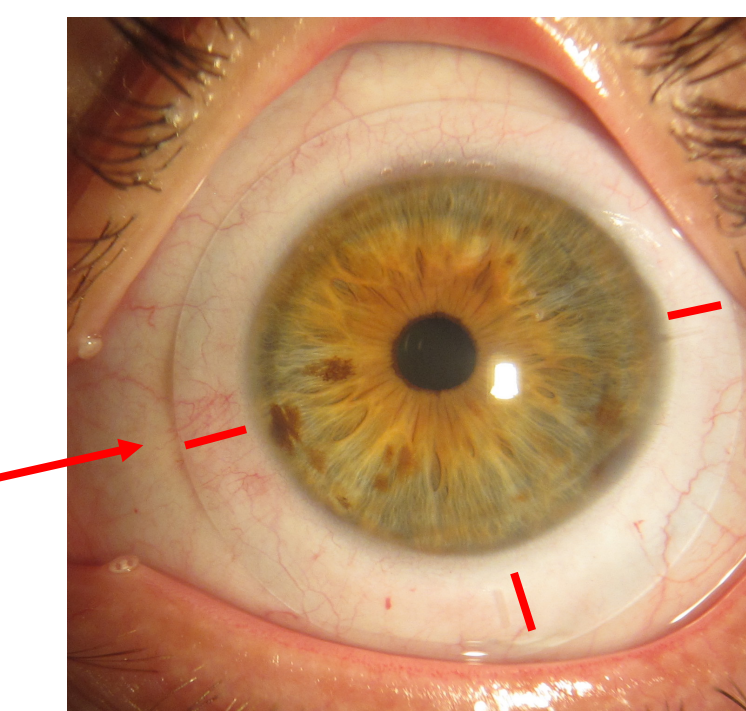
Right: Lens fit with a standard toric peripheral haptic

Figure 3

Europa w/ Precision Lift Elevation



The patient was fit with a Precision Lift but the lens rotated Counterclockwise which resulted in persistent impingement

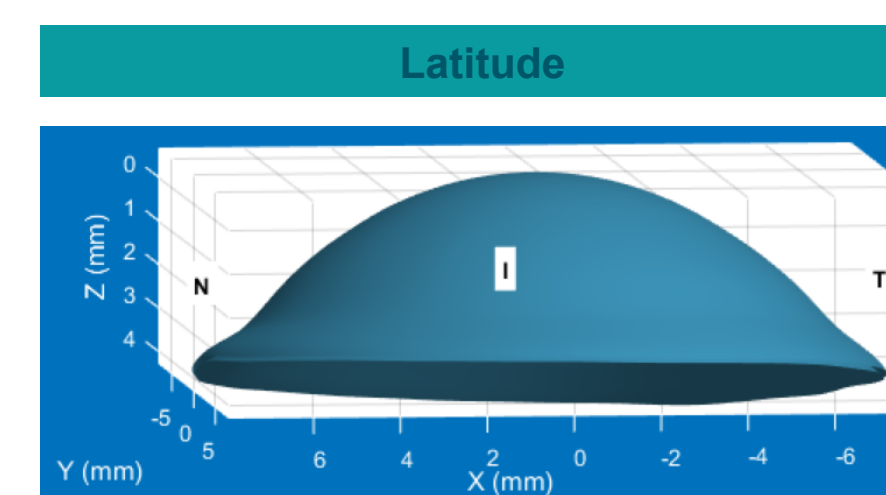


The patient was fit with a Precision Lift (**left**) intended to vault over the pinguecula. The **red lines** mark the areas of the lens intended to align to the eye at 3, 6 and 9 o'clock.

Clearly, the lens had rotated counterclockwise which resulted in persistent impingement (**right**).

Given the irregularity of the scleral shape plots and the inability to fix this with a simple lift over the pinguecula, a totally customized Latitude scleral lens was ordered for this patient.

Figure 4

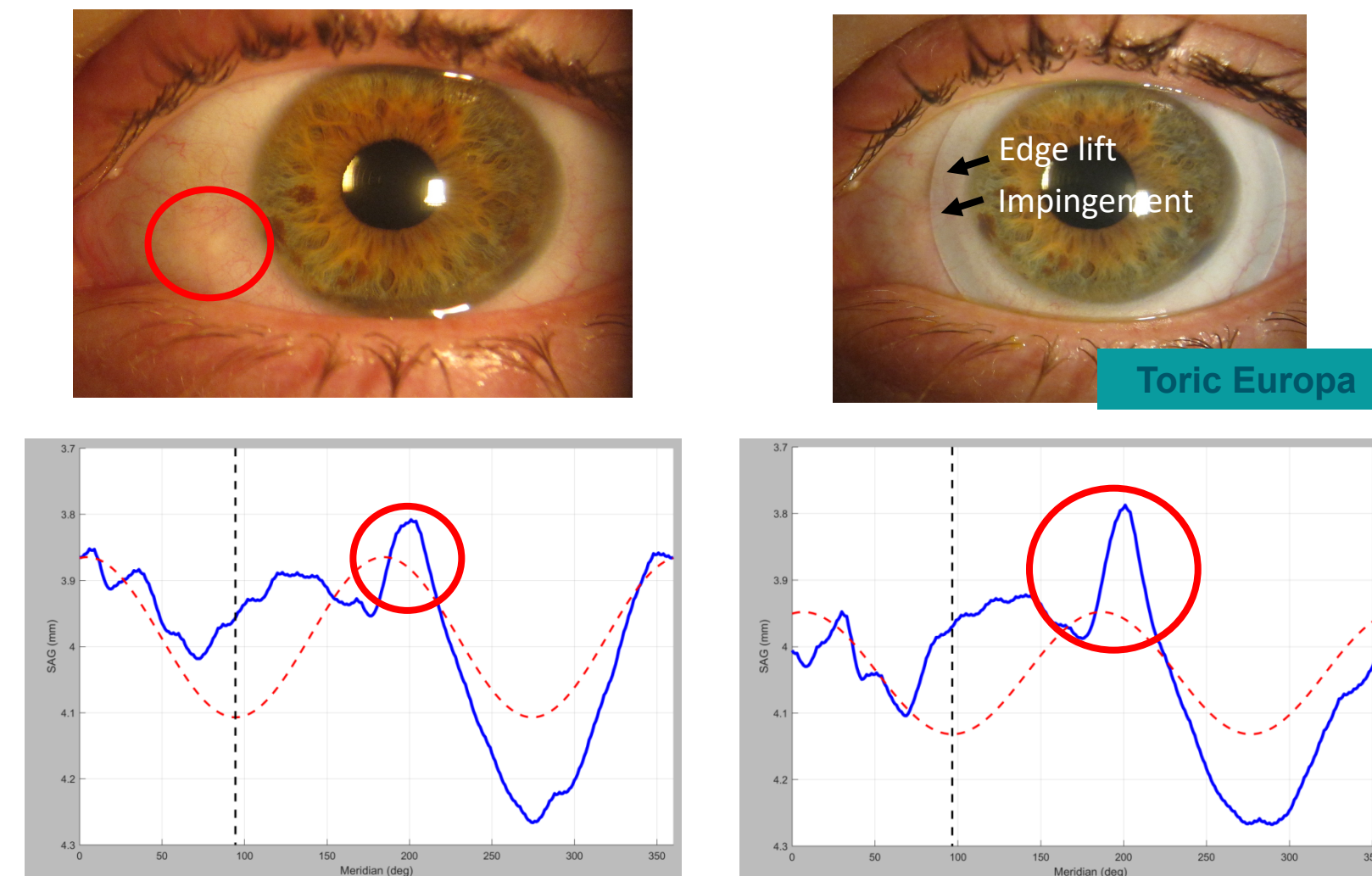


The Latitude free form customized lens was designed for this patient.

Left: Computer aided design imaging.

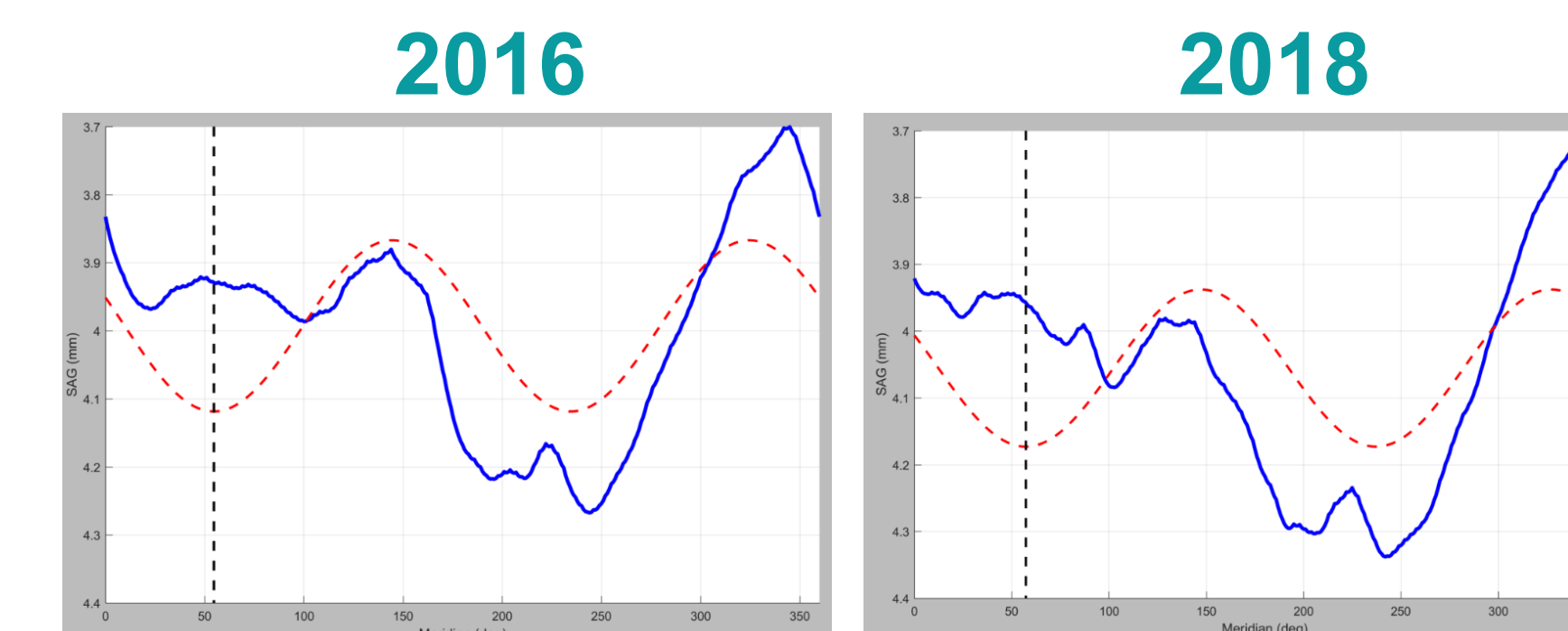
Right: Fit of the Latitude on the eye demonstrating excellent centration and fit.

Figure 2



Top photos: At 2 years post initial scleral lens fit, the patient presented with a pinguecula in the left eye (red circle) nasally and slightly inferior to midline with lens impingement in the axis of the pinguecula and edge lift superior to it. **Bottom photos:** Show the scleral shape plots at 16mm diameter around the corneal center. Left, examination from June 2016 and right from May of 2018 demonstrating progression of the pinguecula which explained the fit issues. Both scleral shape plots also demonstrated an inferior depression at 270° relative to the scleral surface 180° away at the 90° axis.

Figure 5: Contralateral Eye



During the same 2 year period, there were virtually no changes in the scleral shape plots in the right eye and the fit of the lens ordered in 2016 was unchanged.

Disclosure: Drs. DeNaeyer and Sanders are shareholders in Precision Ocular Metrology, the manufacturer of the sMap3D® instrument. Dr. Sanders is a shareholder of and Dr. DeNaeyer is a consultant to Visionary Optics, distributor of the sMap3D and manufacturer of the Europa and Latitude Scleral Lenses.