Back-Surface Toric Scleral Lens Stabilization as a Fuction of the Amount of Toricity

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Introduction

The scleral surface is often irregular or asymmetric rather than symmetric in 360 degrees.[1,2] Scleral lenses can be designed with an asymmetric (toric, quadrant-specific or other) back surface to better align the sclera.[3] Until recently, the only way to identify an asymmetric sclera was to fit a scleral contact lens and observe alignment patterns such as blanching, impingement or edge lift in the 360 degrees of the haptics.[4] Lens flexure could also be attributed to an asymmetric or irregular sclera.[5] Now, profilometry can predict the shape of the sclera before the scleral lens is fitted.[4]

Asymmetric scleral designs are based on a dynamic stabilization system. Hence, once inserted, the lens rotates until the flatter and steeper meridian or quadrant of the lens matches the flatter and steeper area of the sclera respectively. The axis of the flat meridian of diagnostic lenses is often used as a reference to predict lens stabilization when a front toric, a microvault or a notch is ordered. Profilometry can also predict the flatter and steeper meridian of the ocular surface by measuring the lower and higher sagittal height meridian and differences in sagittal height between meridians or quadrants.[6]

Purpose

The aim was to analyze whether the amount of toricity applied to the back surface of scleral lenses can affect to lens stabilization and rotation.

Methods

Twenty-one scleral fittings on irregular corneas (including keratoconus, PK and post-Lasik ectasia) were retrospectively analyzed. These eyes were previously measured with the Eye Surface Profiler (ESP, Eaglet Eye, the Netherlands). Three maps of each eye were obtained. A previous study showed a higher correlation between the lowest sagittal height meridian (hereafter *min oc sag/flat* meridian) and the axis of the flattest meridian of the lens on the eye when the min oc sag/flat meridian is measured at a cord of 15 mm, instead of at 14 or 14.5 mm cords.[6] Thereby, the mean axis of the min oc sag/flat meridian for a cord of 15 mm was obtained from the three measurements *(Image 1).*

ICD Flexfit (Paragon Vision Sciences, Gilbert, AZ) and Zenlens (Bausch + Lomb's Specialty Vision Products, Rochester, NY) scleral lenses with diameters between 15.5 and 17 mm and toricities ranging from 50 to 420 microns of sagittal height difference between two principal meridians were fitted and prescribed for these eyes.

Both designs are labelled with marks at the flattest meridian. The lens marking position with diagnostic lenses was measured by lining up the slit lamp beam. An image of each prescribed lens was recorded and the axis of the flattest meridian of the lens was then measured with software to determine the angles with precision (Goniotrans, FacoElche, https://www.goniotrans.com) *(Image 2)*. This was recorded as the *lens flat axis*.

(1) The difference between the min oc sag/flat meridian and the lens flat axis was recorded as the *lens rotation*.

Regression analysis was performed to test for associations between the lens rotation and the variables (2) prescribed lens toricity and (3) prescribed lens diameter.

(4) Lens rotation for three different groups of prescribed toricity was also analyzed (50 to 100 microns, 126-200 microns and >200 microns).

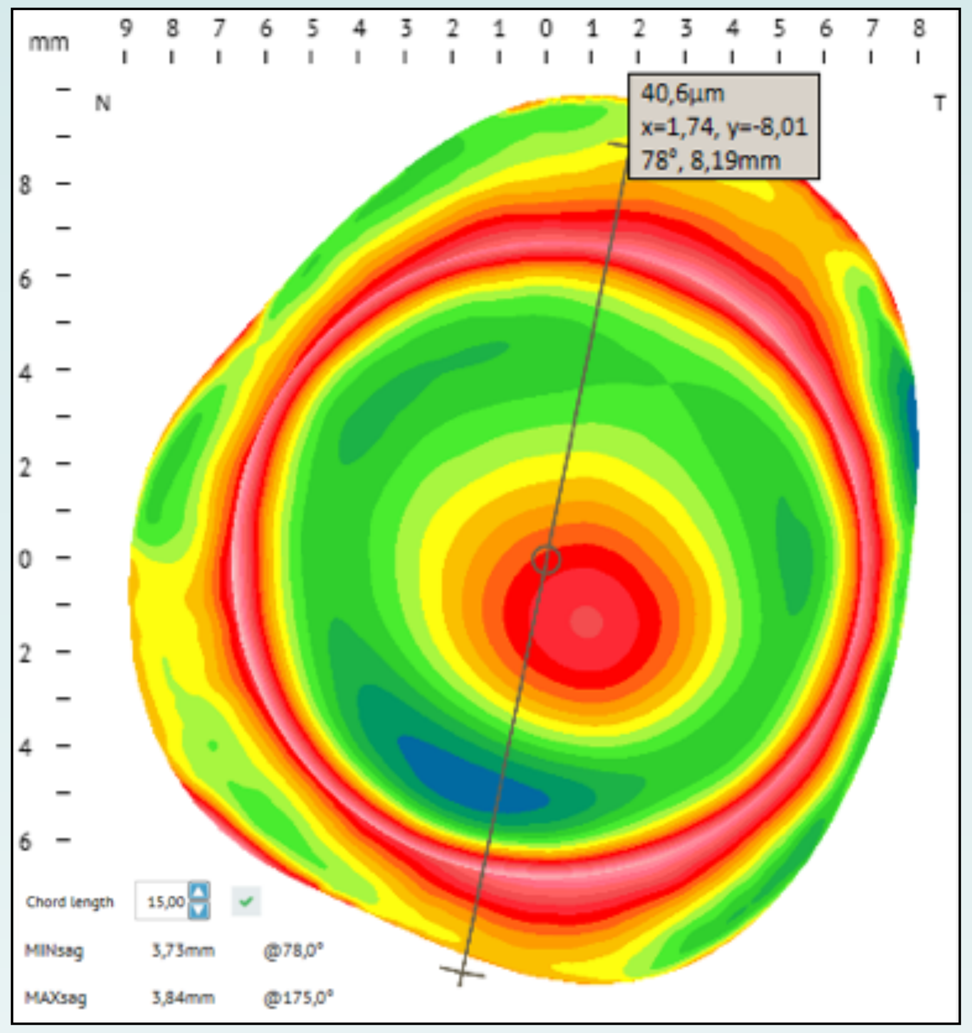

Image 1. Profilometry in a patient with an asymmetric sclera. The axis of the min sag meridian was at 78 degrees.

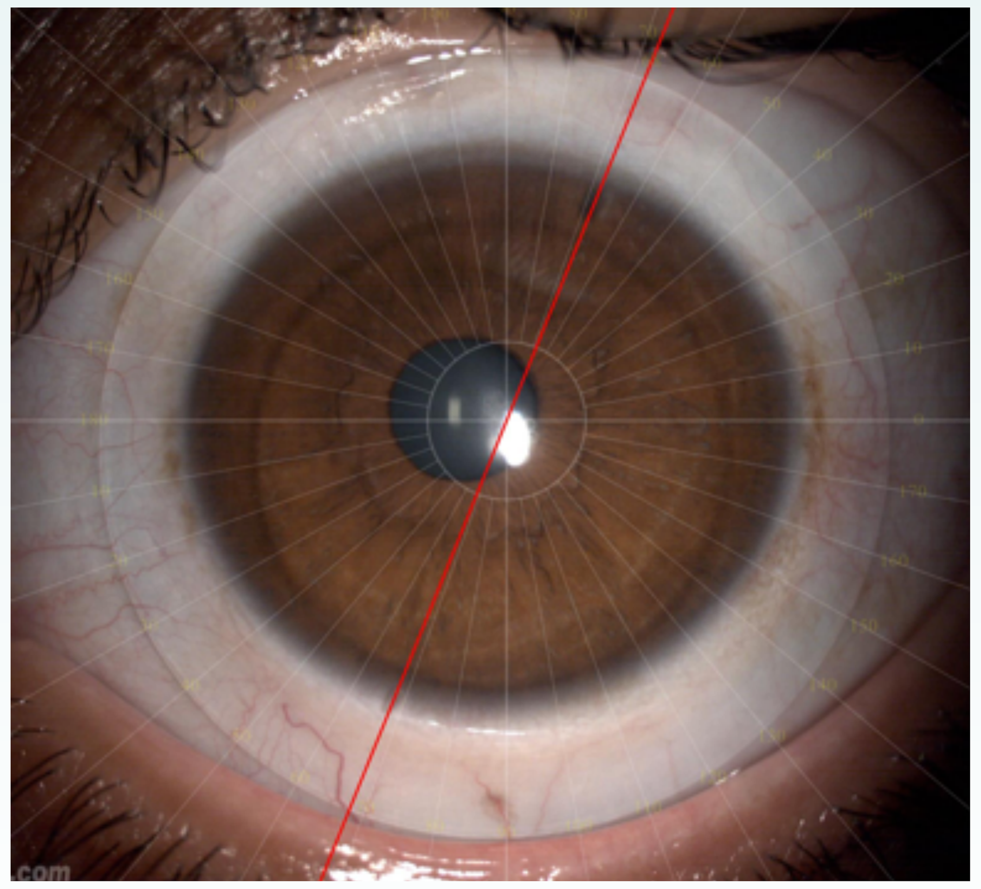

Image 2. A back-surface toric scleral lens with 90 microns of toricity fitted in the same patient as in Image 1.The axis of the marks was at 68 degrees. Rotation 10 degrees clockwise.

Disclousures:
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Results

(1) The mean overall absolute lens rotation was 16±14 degrees. The lenses rotated counterclockwise a mean of 14±13 degrees in 12 fittings and clockwise a mean of 17±16 degrees in 9 fittings. The mean absolute rotation between diagnostic and prescribed lenses was 12±16. No statistically significant differences were found when lens rotation was calculated from diagnostic lenses or from the min oc sag/flat meridian (p=0.18)

(2) A weak but significant negative correlation was found between the amount of prescribed toricity and the lens rotation (r=-0.49, p=0.02) *(Image 3)*

(3) No significant correlation was found between the variables of lens rotation and prescribed lens diameter (r=0.25, p=0.28).

(4) Mean absolute lens rotation was 23±15 degrees for the group with toricities between 50 to 125 microns, 14±13 degrees for the group with between 126 to 200 microns and 6±4 degrees for the group above 200 microns (p=0.04) *(Table 1)*

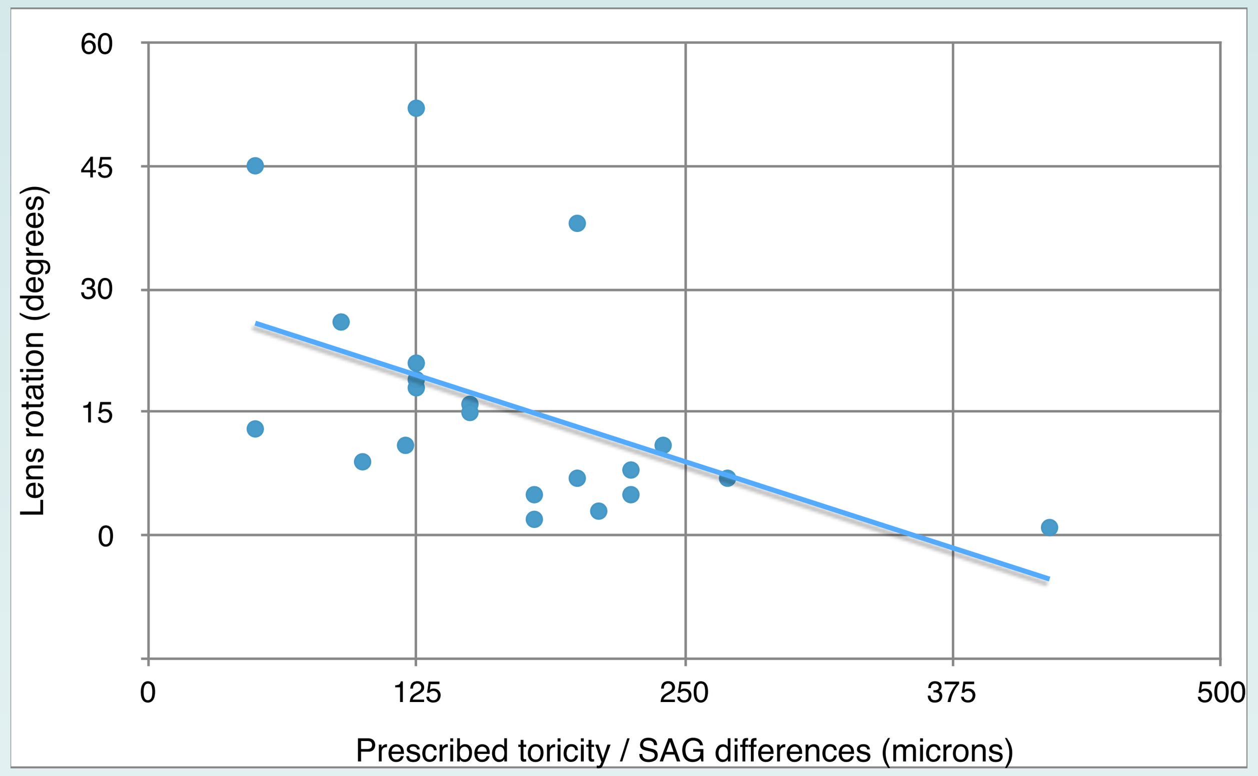

Image 3: linear regression analysis

Toricity	Mean absolute lens rotation (p=0.02)
50 ≤ 125 microns	23 ± 15
126 ≤ 200 microns	14 ± 13
> 200 microns	6 ± 4

Table 1: rotation in different groups of toricity

Discussion and Conclusions

Some lens rotation is observed, even if the axis with diagnostic lenses is taken as a reference or lens stabilization is predicted through the min oc sag/flat meridian provided by the ESP. The lens marking position with diagnostic lenses has been used preferentially to determine the final lens stabilization. However, practitioners could also use the ESP. No significant differences in final lens rotation were found between the two methods. These results have potential clinical implications particularly for the prescription of front toric surfaces, microvaults and/or notchings that relay on how the lens stabilizes. Rotation on the final lens can be expected, particularly when the prescription is for low amounts of toricity. In this case, lenses may need to be reordered to correct the axis of a front toric surface or relocate the microvault or the notch. However, considerably lower lens rotation is observed for higher sagittal height differences between two principal meridians. For back-surface toricities above 200 microns, the practitioner can be very confident about the ocular flat axis provided by the ESP to design the lenses, and there should be a lower lens reorder rate related to rotation.

References

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