Utilizing Corneal Topography to Aid in Predicting Scleral Topography for the Purpose of Fitting Scleral Contact Lenses

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PURPOSE

Scleral topography has become a useful tool in the optimization of scleral lens fitting, particularly with regard to the landing zone of the lens, but most offices currently do not have access to this technology. Many scleral lens fitters, however, do have corneal topography at their disposal. Our purpose was to determine if corneal topography is any predictor of scleral topography, and therefore useful to anticipate scleral shape in conducting a scleral lens fit, or if the two are completely independent.

METHODS

We collected data using the sMap 3D (Precision Ocular Metrology) for scleral shape and Keratograph 5M (Oculus) for corneal topography. Using these instruments, we evaluated the amount of corneal toricity and scleral toricity present in each eye. The scleral maps looked at toricity present at corresponding points of 15, 16, and 17 millimeters in diameter on the surface of the eye. Subgroups were created based on corneal readings containing eyes with oblique astigmatism, against-the-rule (ATR) astigmatism, and with-the-rule (WTR) astigmatism. Oblique astigmatism was defined as the flattest meridian of an eye being between 31 to 59 degrees and 121 to 149 degrees. ATR astigmatism was defined as eyes with the flattest meridian landing between 60 to 120 degrees. WTR astigmatism was defined as eyes with the flattest meridian landing between 0 to 30 degrees and 150 to 180 degrees. The amount of toricity in the cornea was compared to the toricity present in the sclera looking for generalized patterns. Data from 53 eyes (27 right and 26 left) were collected, with 43 eyes with WTR corneal astigmatism, 7 eyes with oblique corneal astigmatism, and 3 eyes with ATR astigmatism.

With the Rule Corneal Topography vs. Scleral Topography

The graph to the left shows the general trends of the patients with WTR corneal toricity. Amount of WTR corneal cylinder were plotted against scleral toricity at 16mm. The black line on the chart shows what would be expected if the corneal toricity correlated directly with the scleral toricity. However, what is observed is that the sclera is more “ATR” than the cornea.

Tables to the right contain data from patients with oblique and against the rule corneal toricity. The general trend of those patients with oblique corneal topography showed to have majority against the rule scleral toricity. While those patients with against the rule corneal toricity showed to have oblique scleral toricity. More data is needed to draw any conclusions for these two subgroups.

CONCLUSIONS

Scleral shape as measured using an sMap3D in individuals with normal corneas demonstrated a tendency to be more against the rule than the cornea. Practitioners fitting scleral lenses on normal corneas should anticipate that scleral toricity is not fully consistent with corneal toricity, but tends to be somewhat less than the WTR toricity or more against the rule than the corresponding cornea.

SUMMARY

Those eyes that had WTR corneal astigmatism of greater than 1.5 D had WTR scleral topography, but less than the cornea. The group of eyes with 1.50 diopters of WTR astigmatism or less generally followed a pattern of low WTR or low ATR. Of the 43 eyes with WTR corneal astigmatism, 39 had scleral toricity that was less WTR or ATR in shape, while 4 had a more WTR sclera than the cornea. Eyes showing ATR and oblique corneal astigmatism had ATR scleral topography in the majority of cases.