Scleral Toricity Magnitude and Orientation Trends

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Introduction

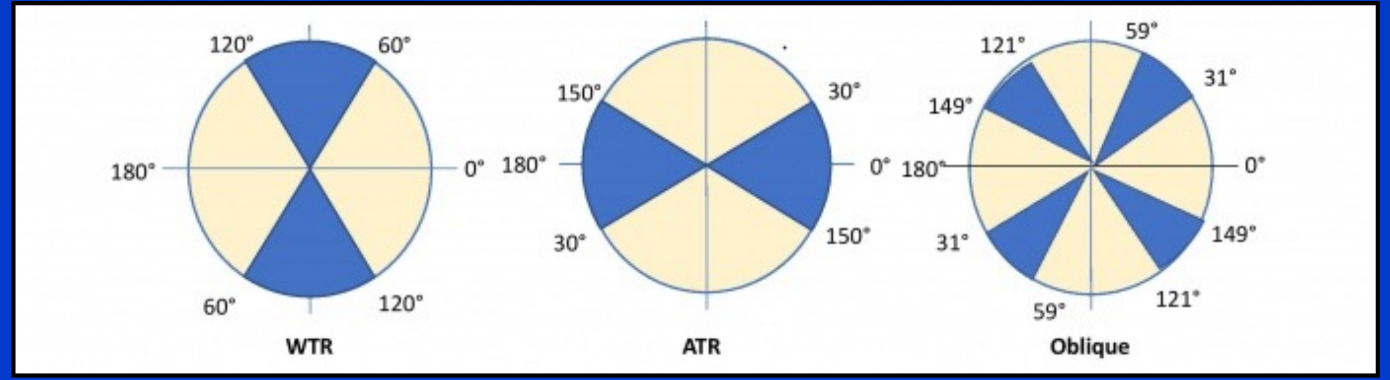
Understanding scleral toricity is a crucial component of fitting contact lenses that land on or interact with the sclera. This study aimed to show the scleral toricity trends for magnitude and orientation at various chords.

Methods

Scleral profilometry data using the sMap3D (Precision Ocular Metrology) was collected for a cohort of 53 normal eyes. Using the scleral elevation map, the magnitude and axis of scleral toricity were compiled for 11 distinct chord diameters ranging from 13.0 to 18.0mm.

Magnitude was analyzed by deriving the average, single lowest, and single highest scleral toricity at each chord, described in microns.

Orientation was examined by determining the percentage of subjects who had with-the-rule (WTR) (axis 180±30), against-the-rule (ATR) (axis 90±30), and oblique (axis 45±15 and 135±15) scleras at each chord.



Results

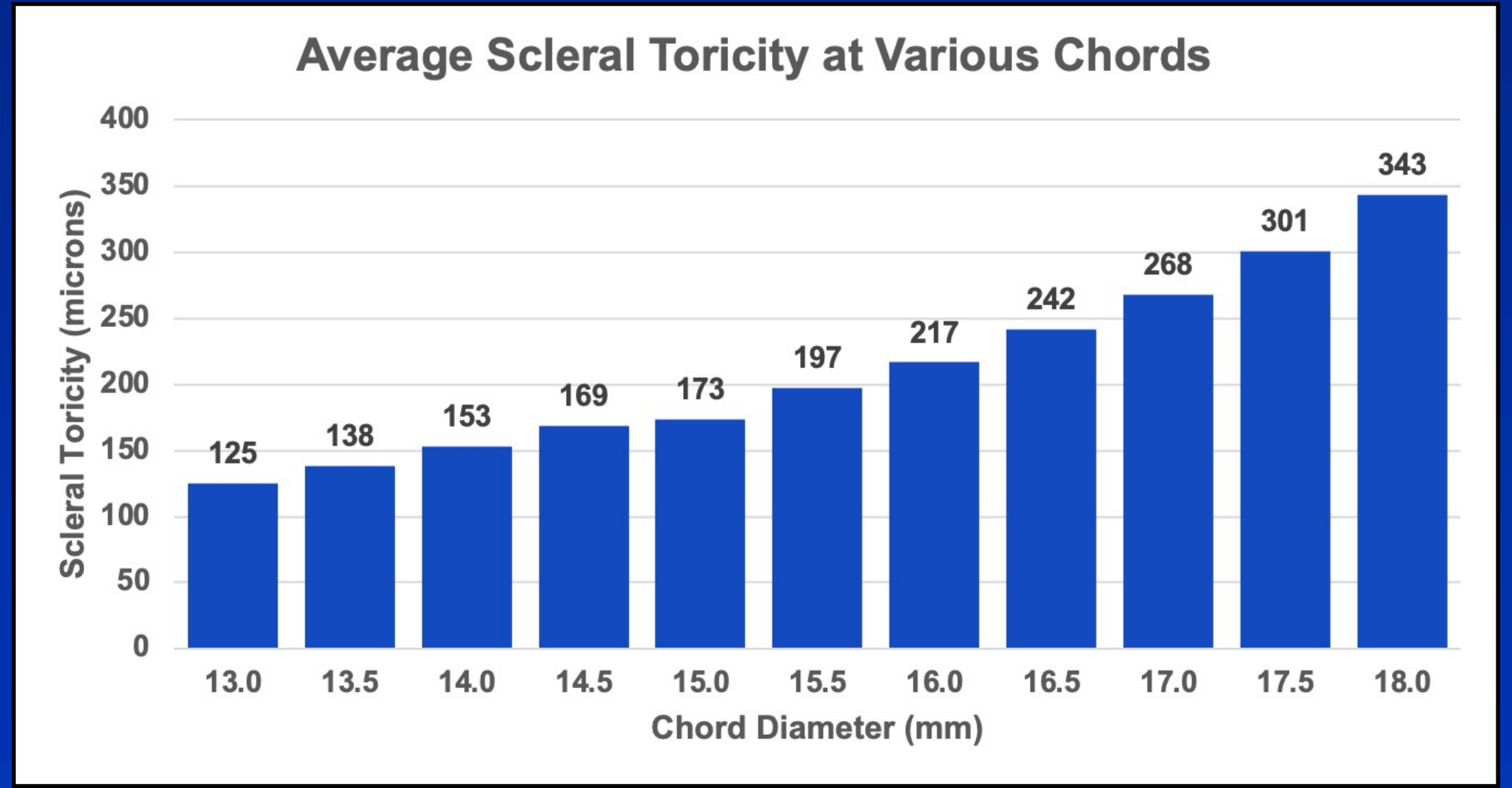


Figure 1. Average scleral toricity magnitude increased in a positive, linear pattern with increasing chord.

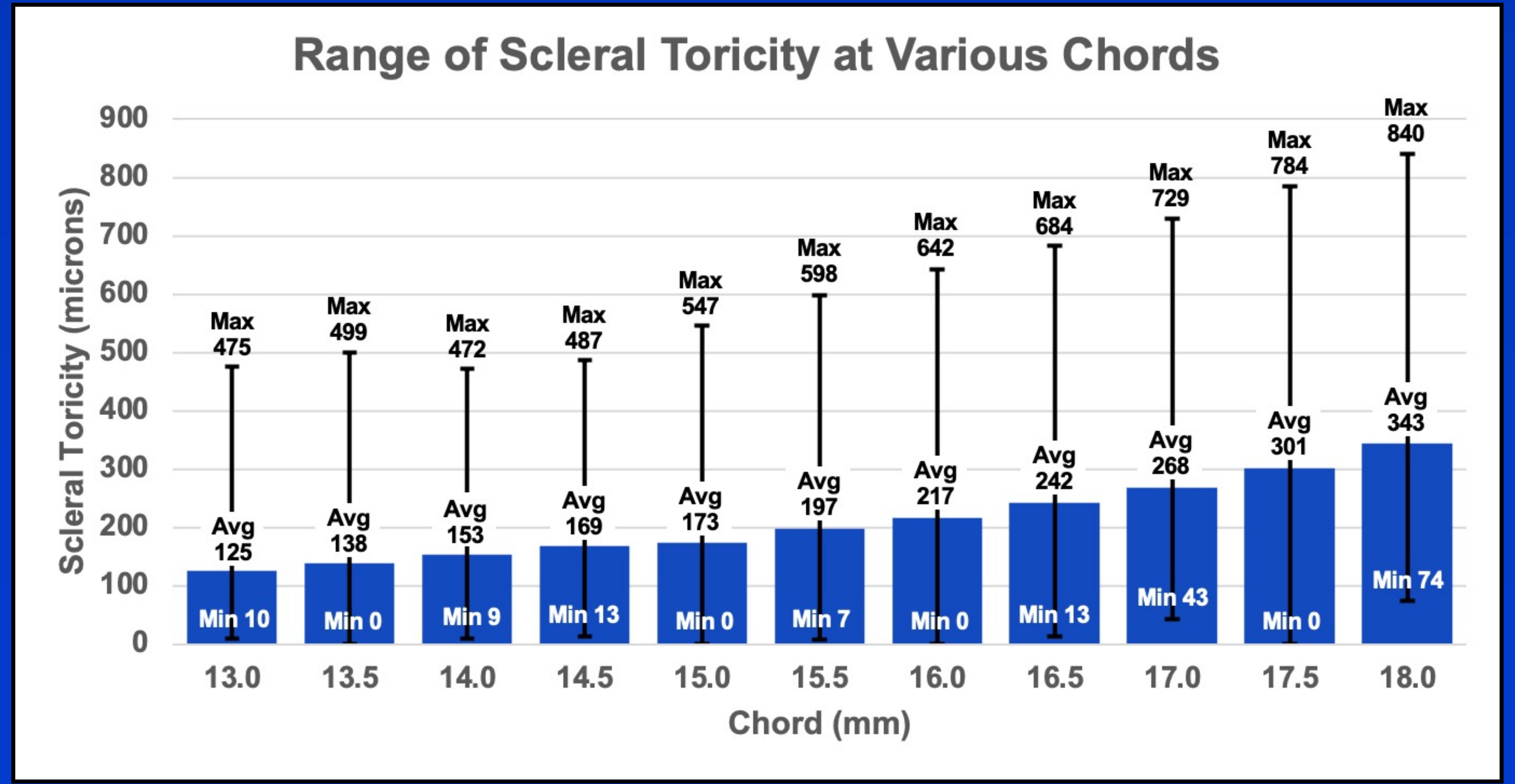
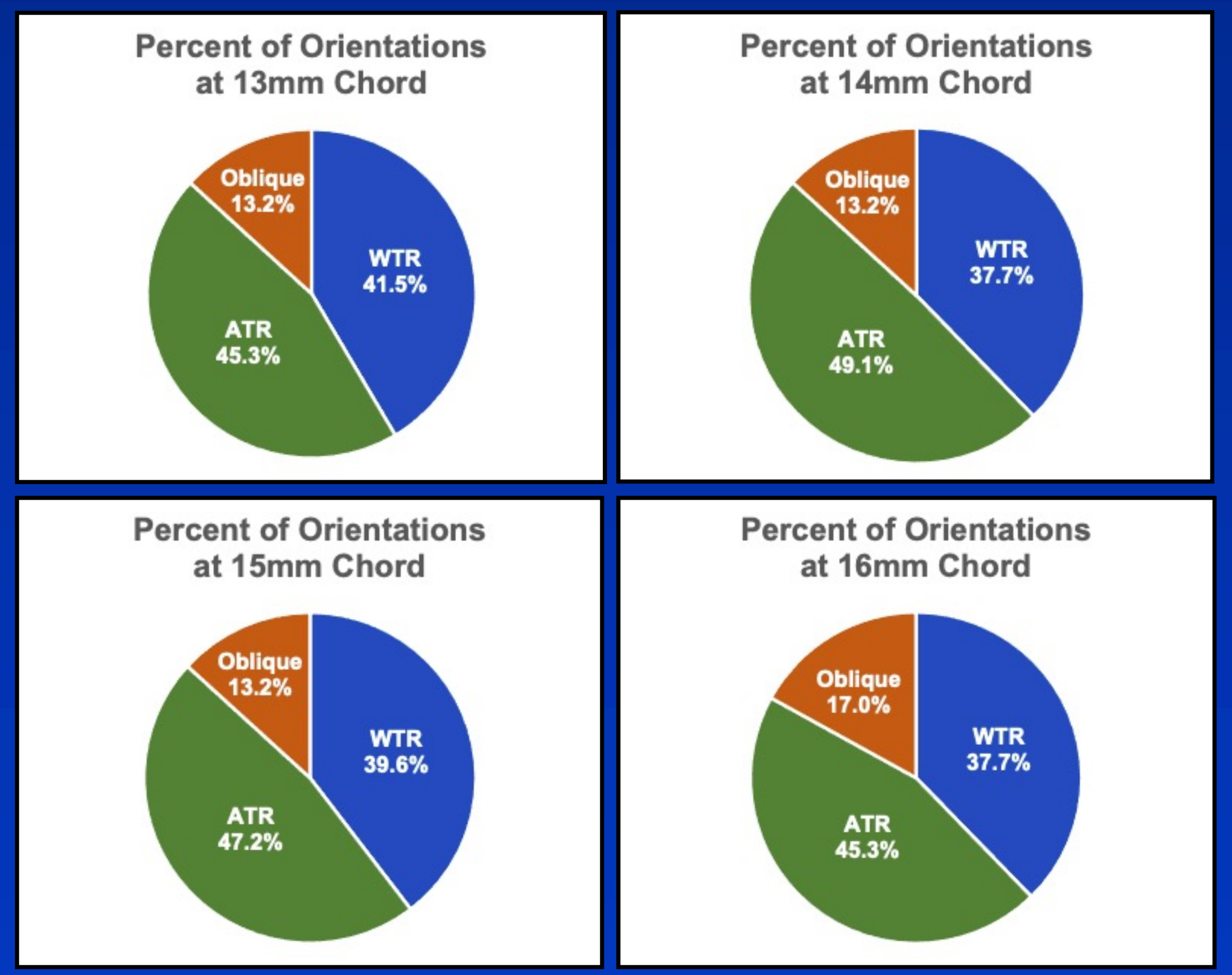


Figure 2. Though the average magnitude increased in a predictable pattern, there was a large range of scleral toricity magnitudes at each chord.



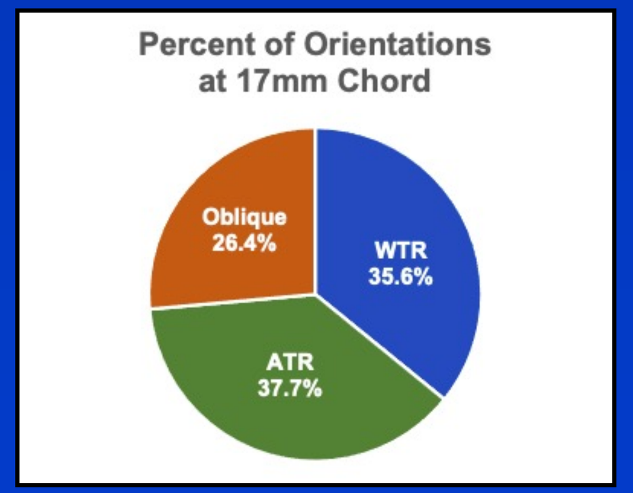


Figure 3. From the 13.0 to 16.0mm chords, the scleral toricity orientation distribution remained relatively constant. At 17.0mm, the percentage of WTR and ATR orientations slightly decreased while oblique slightly increased.

Conclusion

The analysis showed that the average magnitude of scleral toricity increased in a positive, linear pattern with increasing chord. This general trend should be taken into account in the clinical setting when fitting any diameter of scleral lens, and when changing the diameter of a lens. However, when evaluating each patient on a case-by-case basis, the high amount of variability at each chord makes the scleral shape unpredictable.

Analyzing the orientation distributions with increasing chord also yielded unpredictability.

Therefore, there were no clinically significant conclusions that may help with fitting individual patients.

Both the magnitude and orientation results suggest that utilizing an instrument that is capable of mapping the sclera may be a valuable component of scleral lens fitting. Since lenses that land on the sclera are often fitted on patients with diseased eyes, next steps include repeating this analysis on data from irregular eyes.

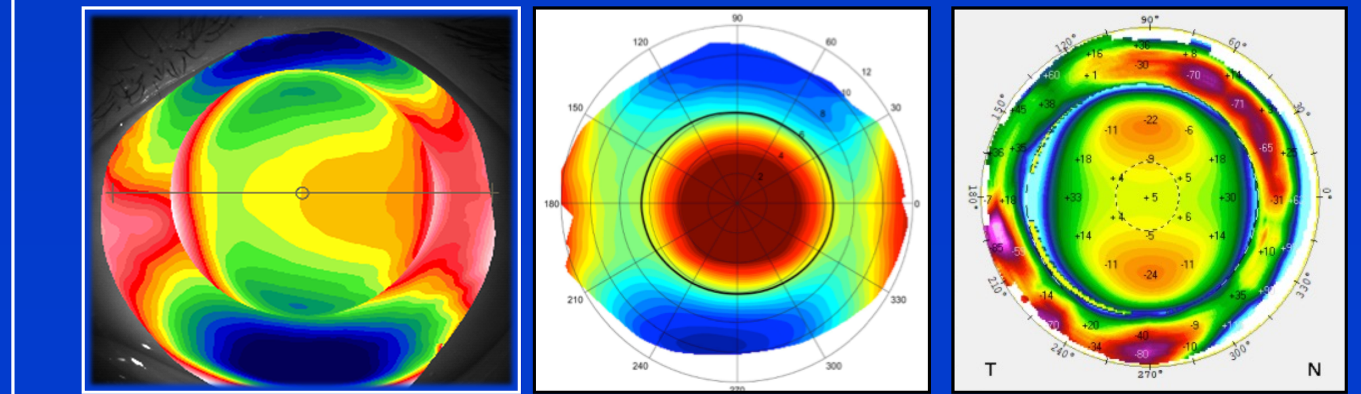


Figure 4 (left to right). Examples of scleral maps from Eaglet-Eye ESP, sMap3D, and Pentacam.