

Can Corneal Toricity Be Used to Predict Scleral Toricity?

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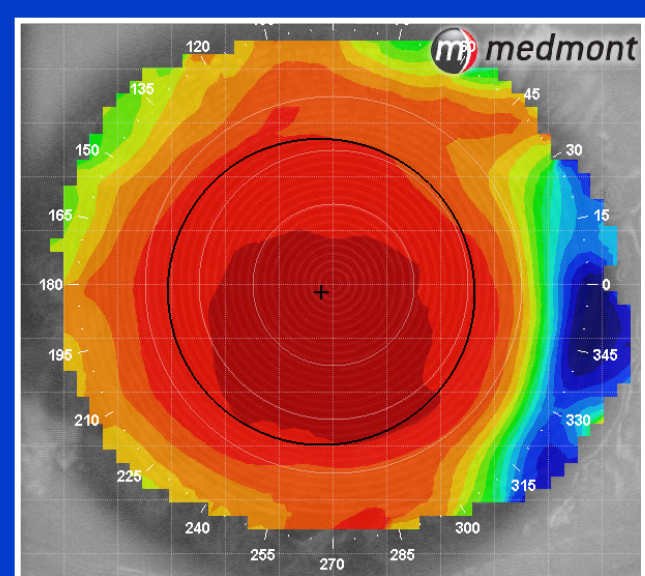
Introduction

This study aimed to examine if the amount and orientation of corneal toricity can be used to predict the amount and orientation of scleral toricity.

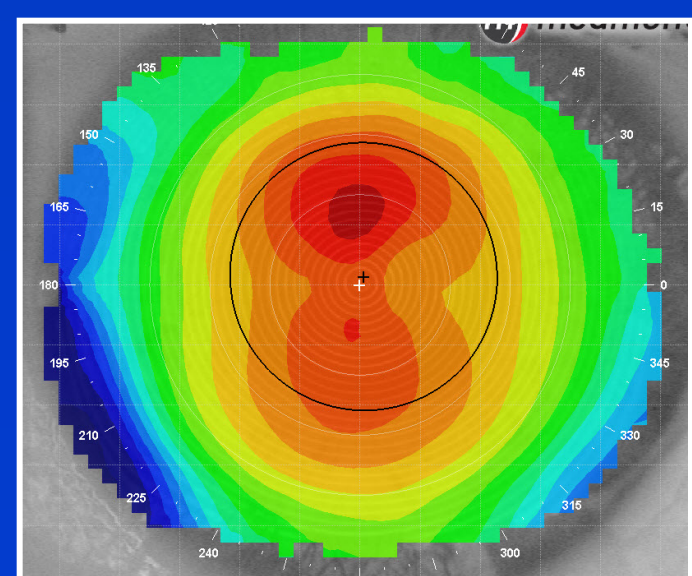
Methods

Data regarding magnitude and orientation of toricity were collected for a cohort of 53 normal eyes. Corneal toricity was determined using the elevation display map at the chords of 3.0 and 8.0mm from the Medmont Meridia (Medmont International Pty Ltd). Scleral toricity was determined using the elevation display map at the chords of 13.0, 15.0, and 17.0mm from the sMap3D (Precision Ocular Metrology).

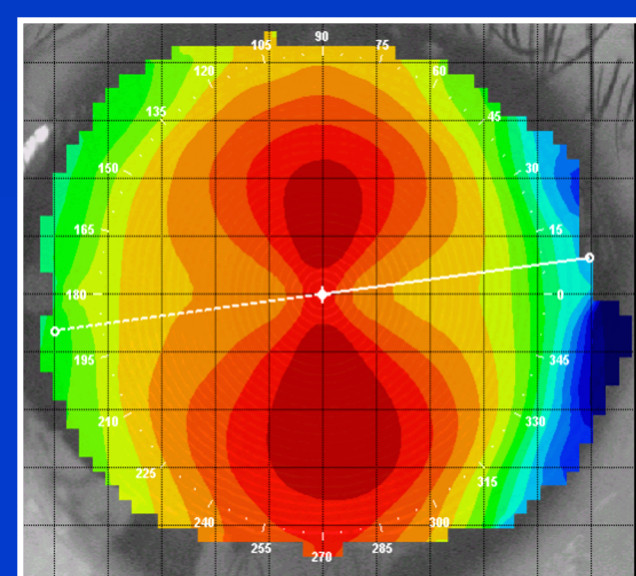
The data was further subdivided into the corneal shape categories of spherical (n=23), apical astigmatism (n=14), and limbus-to-limbus astigmatism (n=16). Spherical corneas had consistent curvature throughout. Apical astigmatism appeared as an hourglass shape confined to the center of the cornea only, which is contrasted with limbus-to-limbus astigmatism where the hourglass spanned the length of the cornea.



Spherical



Apical Astigmatism



Limbus-to-Limbus Astigmatism

Results

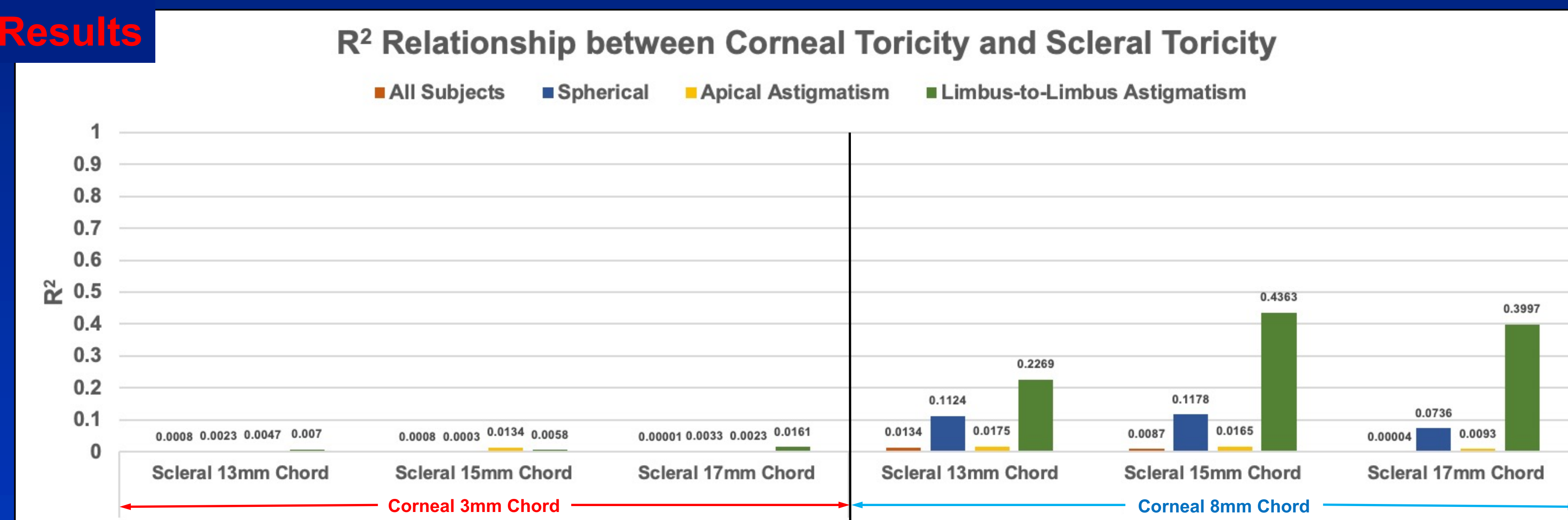


Figure 1. The R^2 value, represented by the y axis, determines the proportion of the dependent variable that can be explained by the independent variable. In other words, the R^2 value shows if corneal toricity can explain scleral toricity. R^2 values that are closer to zero represent no relationship between the two variables. R^2 values that are closer to 1.0 represent a strong correlation between the two variables, which is desirable for clinical significance. The corneal 8mm chord showed more correlation than then corneal 3mm chord. The greatest correlation was seen in the limbus-to-limbus astigmatism group.

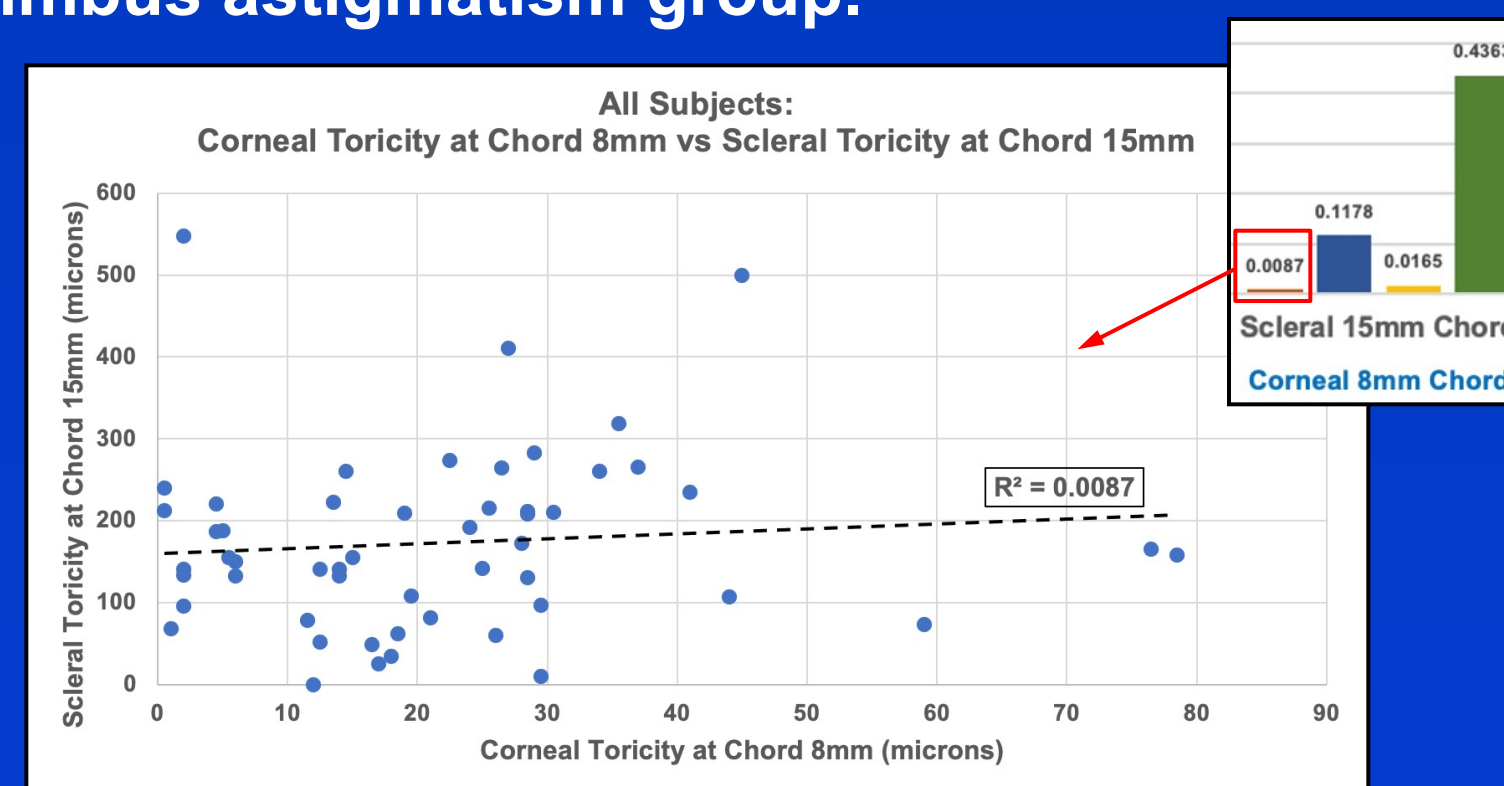


Figure 2. Example of graphical representation of data and the derivation of the R^2 values. This graph shows no correlation between corneal toricity magnitude and scleral toricity magnitude.

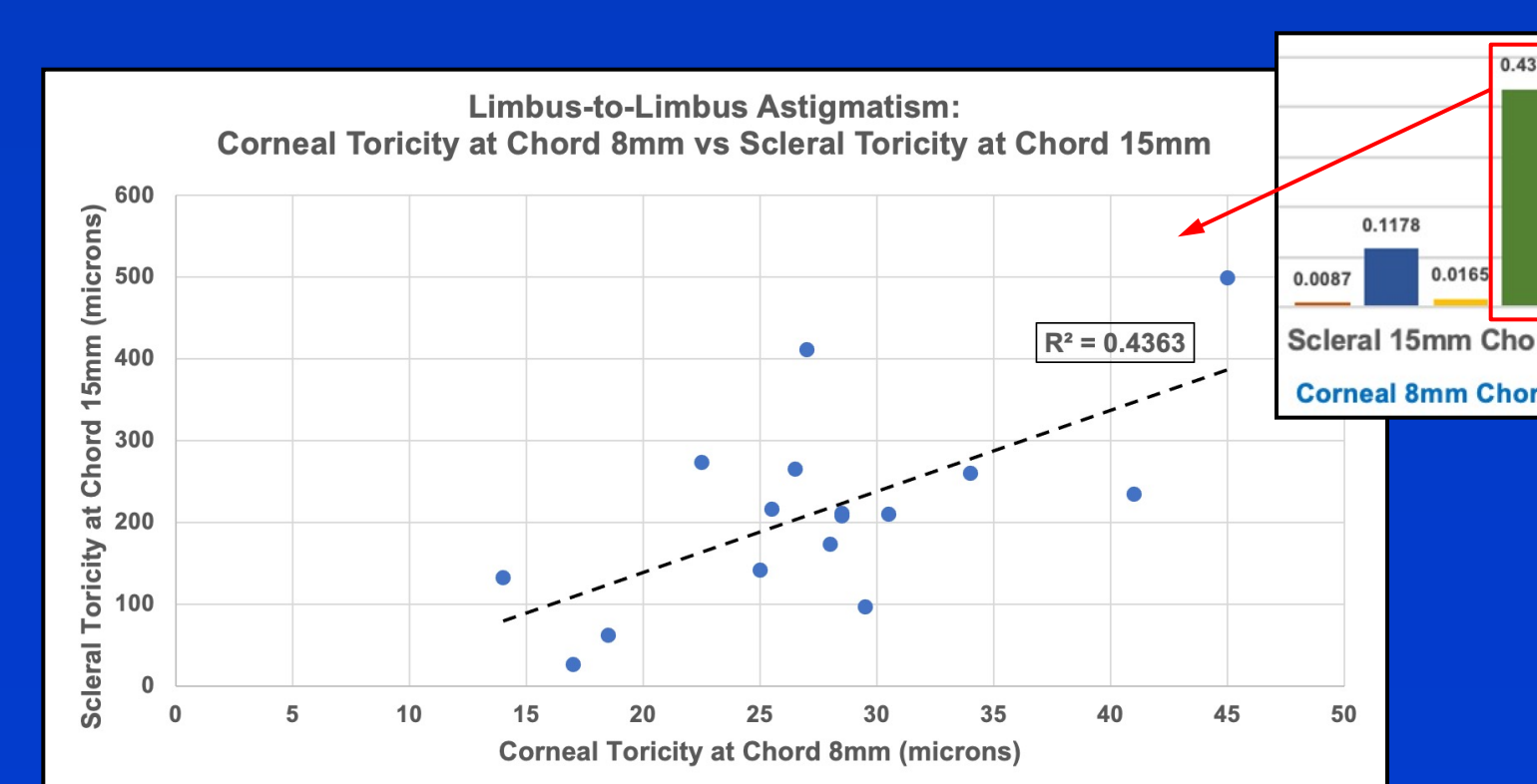


Figure 3. There was a weak, positive correlation for the limbus-to-limbus astigmatism group.

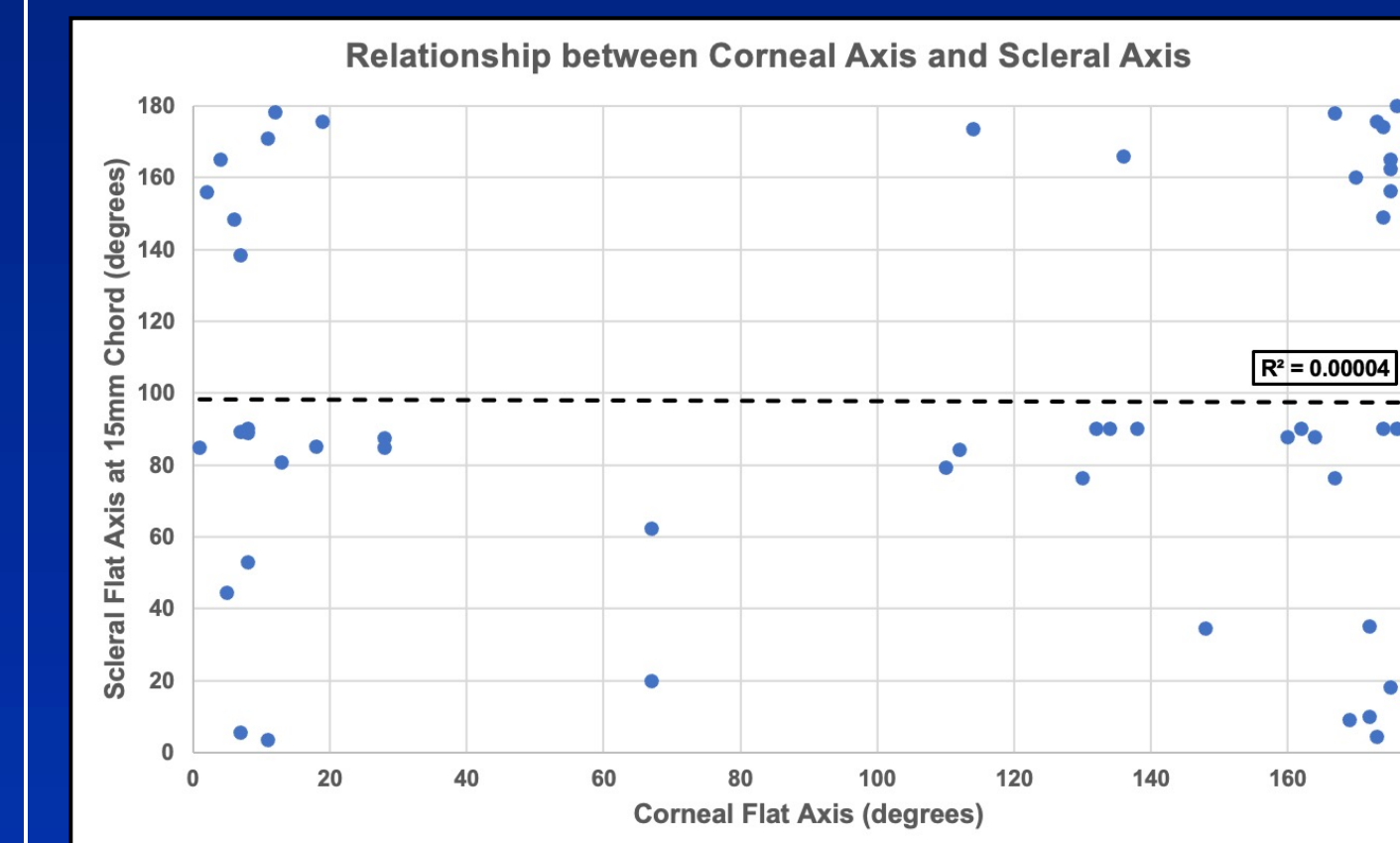


Figure 4. Example of graphical representation of orientation data, illustrating no correlation between corneal flat axis and scleral flat axis at the 15mm chord. Comparing corneal axis to scleral axes at other chords and the various corneal shape categories yielded similar results.

Conclusion

The results of this study showed no or weak correlation between corneal toricity and scleral toricity for both magnitude and orientation.

These data suggest that corneal toricity cannot be utilized to predict the magnitude and orientation of scleral toricity.

Therefore, using an instrument that is capable of mapping the sclera may be a valuable component of fitting lenses that interact with the sclera. Scleral profilometry may benefit the clinician in describing:

1. Amount of scleral toricity
2. Orientation of scleral toricity
3. Symmetry of scleral shape

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.