The Relationship Between Corneal Sagittal Depth And Corneal Diameter

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PURPOSE

The purpose of this study was to determine if there is a correlation between corneal sagittal depth and corneal diameter, which might impact fitting of soft and scleral contact lenses in regular corneas. A previous study[1], showed no correlation between corneal sagittal depth at 14 mm and corneal diameter. This study looked at the sagittal depth of corneas at difference chord diameters to determine if there were variations in shape that might explain why contact lenses seem to fit more loosely on larger corneas than on smaller corneas, as out clinical experience seems to indicate. Specifically, we looked at the mean sagittal depth at different diameters on the cornea: 5mm, 7mm, 9mm, 11mm, 12mm, 14mm, and 15mm. This was done to determine if the relationship was consistent across the cornea or if it varied on central versus peripheral measurements, which might indicate a difference in corneal volume.

METHODS

This research looked at stored corneoscleral topographies (CSP) on the Indiana University School of Optometry Pentacam. No patient personal information was recorded during data collection. Only regular (corneas without disease) were used in the data pool. Two groups were established, larger corneas with measured HVID (horizontal visible iris diameter) greater than 12.3mm and smaller corneas with HVID less than 11.8mm. The larger cornea group has 20 eyes, and the smaller cornea group has 15 eyes. Mean corneal sag data was obtained at the various chord diameters.

Chord diameter	Small Corneas (<11.8)	Large Corneas (>12.3)
5mm	421.47	404.9
7mm	844.47	809.4
9mm	1437.27	1373.9
11mm	2212.4	2125.4
12mm	2625.6	2539.9
14mm	3022.27	2937.15
15mm	3807.27	3719.1

FIGURE 1: This table shows the average sagittal depth values for the small and large cornea groups at each chord diameter. You can appreciate the similarity between the values.

1. Dlouhy, Joselyn. *"Optimizing Soft Lens Fitting: Importance of Horizontal Visible Iris Diameter (HVID) Versus Corneal Curvature When Choosing a Best Fit Soft Contact Lens*, 2021.

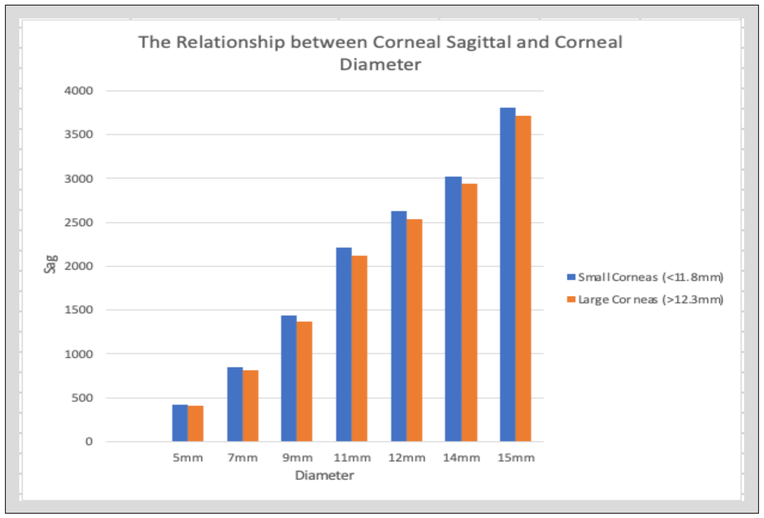

FIGURE 2: This graph compared the small cornea group directly to the large cornea group by taking the average sagittal depth at each measured point. The smaller corneas have a slightly larger sag at every point.

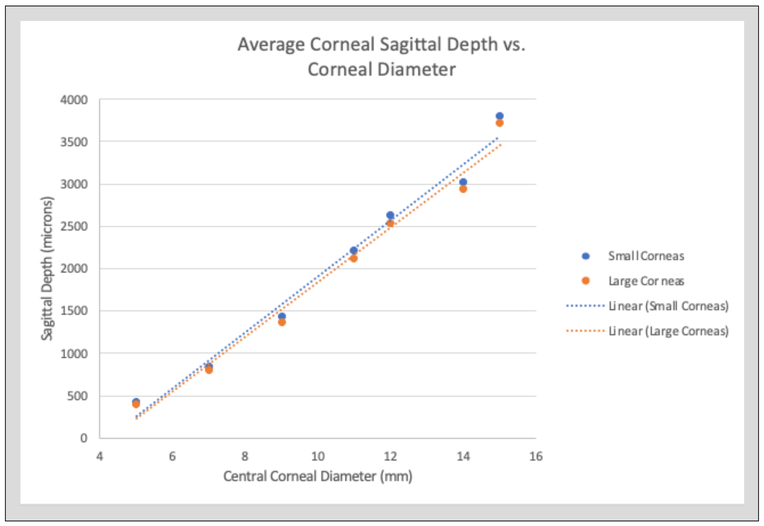

FIGURE 3: This graph compared the small cornea group directly to the large cornea group by taking the average sagittal depth at each measured point. The difference between the small and large corneas is slightly more pronounced with further out measurements.

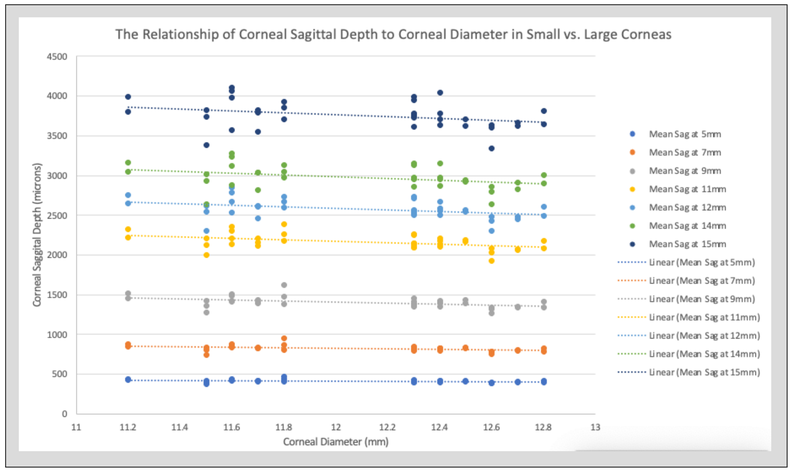

FIGURE 4: This graph plots all the data points collected from both groups. The linear regression lines show the consistent and slightly inverse relationship between sagittal depth of small and large corneas. The further out the measurement was taken, the more negative the regression line.

RESULTS

Our research suggests that there is not a significant correlation between corneal sagittal depth and corneal diameter and even a slight inverse relationship. The smaller cornea group has a deeper sag at every measured point (FIGURE 2 and FIGURE 3) compared with the larger cornea group. The sagittal depth difference was consistent at each chord diameter and did not show an increase or decrease in the peripheral cornea, limbus, or scleral zones compared to the central measurements.

CONCLUSIONS

It has been a long-held belief that corneal sagittal depth and corneal diameter had a direct relationship. This was believed to be the case because soft lenses tend to fit more tightly on smaller corneas and more loosely on larger corneas, suggesting a depth relationship with diameter. This study did not find that to be the case at any given chord diameter, even as clinical experience suggests otherwise. The reason that lenses may appear to fit more loosely on larger corneas and tightly on small corneas may be due to the sponginess of the sclera (lenses fit over smaller corneas will ride over more conjunctival tissue, which may interact differently with the lens than the cornea) which might allow for lens settling and tightening up, or differences in keratometric values between small corneas and large corneas. Further study on this topic may include obtaining a larger patient base, as well a controlling for keratometric values (ie. Ensuring the mean K values of each group are approximately the same).