Sag Distributation for 16.5 mm Scleral Lenses ?

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Introduction

Scleral lens designers must construct the diagnostic sets to accommodate a wide range of ocular shapes, conditions and applications. This means, the fitting set must include low, medium and high depth lenses for a variety of ocular conditions. Research has shown that even normal eyes exhibit a broad depth distribution with approximately 900 microns separating the lowest to highest anterior segment heights.[1] The same study showed that keratoconic eyes present with an even wider range of heights, with a differential of approximately 1,500 microns. Therefore it seems logical that our diagnostic sets require a large distribution of sagittal heights to accommodate a wide range of ocular profiles. However, how often do we use the higher depth lenses in our fitting sets? Can we fit most eyes with a smaller diagnostic set? The aim of this study was to assess which sagittal lens heights are most commonly used and better understand the lenses that need to be included in comprehensive fitting set.

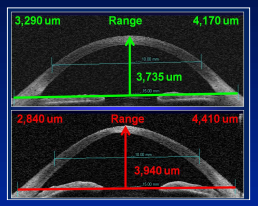

Figure 1: 55 normal eyes (green) and 55 keratoconus eyes (red) were assessed for the range of depth over a 15mm chord.

Methods

Retrospective data was collected between January and December 2018 to include every Ampleye 16.5mm diameter scleral lens manufactured and delivered by Art Optical (Grand Rapids, MI) during the sample period. The volume of lenses supplied is proprietary however, considering the size of Art Optical and its national reach in distribution, the number of patients and eyes can be considered substantial and measured in the thousands. Like many scleral lenses, Ampleye uses a reference sag to differentiate one lens from the next. The sag employed for each custom lens was recorded for the full range of available heights. From this data, the percentage usage of each individual sag could be calculated and is presented in Figure 2.

Figure 2: Distribution of 16.5mm Sags

Results

The data shows a bell-curve distribution that is skewed towards lower sagittal depths. Three lens sags make up the vast majority of lens orders:

- 4000 representing 19.9% of lenses
- 4200 representing 28.6% of lenses
- 4400 representing 23.6% of lenses

Collectively these three sags make up 72.1% of the lenses ordered.

There was a steep drop off in usage of lower sag lenses with the 3800 being used 6.4% of the time and the 3600 in only ~0.1% of cases. On the higher depth end of the spectrum, there is also a sharp decline in usage although not as acute as the low sag lenses.

Discussion

If the central concentration of usage were to include the five most dispensed lenses, the 3,800-4,600 sags would represent 88.7% of lenses ordered. This would suggest the extreme depths in the fitting set are only required in 11.3% of cases.

These findings correlate with previous work by Carracedo which showed 78% of cases could be fit with sags of 4,000-4,400 microns.[2] In this study the number of eyes in the sample size was 63 whereas this poster included thousands of cases in the calculation.

Conclusion

This research shows that we rely most heavily on a 400 micron range (4,000-4,400 microns) in our scleral lens depths. Therefore, we can conclude that eye depth is similarly concentrated over a narrow range of heights. However, our data shows that 3 in 10 patients may require a diagnostic lens of lower or higher sagittal depths so it is important that those lenses be included in a standard diagnostic set.

References

1. How Do Normal and Keratoconic Eyes Differ in Shape?, Achong-Coan et al, Poster, Global Specialty Lens Symposium, 2012, Las Vegas, NV
2. Carracedo G., Scleral Lens Findings in Spain, 2017, personal communication

Acknowledgement

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