The Impact of Scleral Lenses on Lipid Layer Thickness

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Introduction

As more practitioners fit scleral contact lenses, more research is necessary to understand the long-term implications of scleral lens wear, including how it affects the tear film. Understanding this interaction may be important to monitoring the health of the ocular surface long-term to support contact lens wear, as most patients in scleral lenses have limited lens options due to their irregular corneal shapes.

Our study sought out to learn specifically about the interaction of scleral lenses with the top layer of the tears, the lipid layer. TearScience’s LipiView imaging device uses specular (interferometric) observations of the tear film to measure the absolute thickness of the lipid layer (1). To the best of our knowledge, this is the first study to measure lipid layer thickness (LLT) over scleral lenses.

Methods & Materials

Fourteen habitual scleral lens wearers participated in the study, with ages ranging from 25 to 49 (average age 40) and 85% male subjects.

Average history of scleral lens wear was 2.1 years OU. All subjects except one were wearing Valley Contax Custom Stable scleral lenses. All subjects had a history of keratoconus OU. One subject had bilateral PKP and one had unilateral PKP.

Results

Using the LipiView II device on all subjects, average LLT over scleral lenses OD was 76.9um, OS 87.4um. In complementary research published at GSLS 2016, we found the average LLT over soft contact lenses was about 34% thinner than over scleral lenses: OD 52.2um, OS 56.4um.

Discussion

Researchers from a 2013 study applied a cut-off value of 60 nm LLT for meibomian gland dysfunction (MGD) and found a sensitivity of 47.9% and specificity of 90.2% for interferometry (2). The average LLT OU of 82.1um measured over scleral lenses during this study was above this threshold to classify patients as MGD. Only three patients had LLT under 60 nm.

Average Lipid Layer Thickness over scleral lenses measured 82.1 um

The main caveat of this study is that the LipiView II device hasn’t been calibrated for use over scleral lenses, so the reliability of these measurements can not be confirmed. We hypothesized that scleral lens wearers would have thin LLT due to increased surface tension from a larger surface area or from mechanical changes to the meibomian glands. The thick LLT over scleral lenses could be due to improved stability over the tear film due to lens material or that this small subset of patients did not have meibomian gland dysfunction. Direct measurement of the meibomian gland secretions through expression would help support this theory, as well as enrolling more subjects.

Another study limitation was obtaining baseline LLT with a day off of scleral lenses, as contact lenses are the primary (if not only) mode of corrective wear for keratoconic patients. Comparison of these measurements would have enabled better assessment of the accuracy of LLT over the lenses or possible impact of lenses on LLT.

Conclusion

Lipid layer thickness over scleral contact lenses was thicker than expected. More dry eye research related to scleral lens wear needs to be done, including evaluating gland expression, to improve our understanding about their long-term effects.

References


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