



Corneal Endothelium in Silicone Hydrogel and Gas Permeable Contact Lens Wearers

Jessica White, Sarah Stueder, Earlena McKee, MA, OD, FAAO

Northeastern State University Oklahoma College of Optometry



Introduction

The corneal endothelium functions primarily to maintain the clarity of the cornea. Most cells are hexagonal (70-80%). In the presence of stressors causing a disruption of the endothelial mosaic, polymegathism and pleomorphism will occur. These two factors, as well as cell density, are common markers of endothelial health used in active research. The normal cell density in a young adult is approximately 3000 cells/mm². Endothelial cell density (ECD) decreases with age. When cell density decreases to 400-700 cells/mm², corneal edema occurs and transparency is lost. The corneal endothelium has a limited capacity for regeneration and repair due to no mitotic activity after cellular loss. Research has shown the use of modern, highly oxygen-permeable lenses reduces the level of endothelial changes previously found in contact lens wearers. A healthy, normally functioning endothelial mosaic is imperative to corneal transparency and uncompromised vision. This study was designed to determine if newer silicone hydrogels have less of an effect on the endothelium than rigid gas permeable lenses.



CEM-530 Specular Microscope

Heart of America Contact Lens Society 2017, Kansas City, KS,

Methods

Using the CEM-530 Specular Microscope (Nidek Inc. Fremont, CA), we assessed the endothelial cell density, the coefficient of variation, percentage of hexagonal cells, and central corneal thickness in SiHy and RGP lens wearers. We attempted to limit our participants to subjects wearing multifocal contact lenses in order to have similar ages. Fourteen patients were silicone hydrogel wearers, and the remaining fourteen were rigid gas permeable wearers. Eligible subjects were defined as contact lens wearers wearing their particular type of lens for at least one year. Only healthy corneas absent of apparent corneal pathology were used for this study.

Results

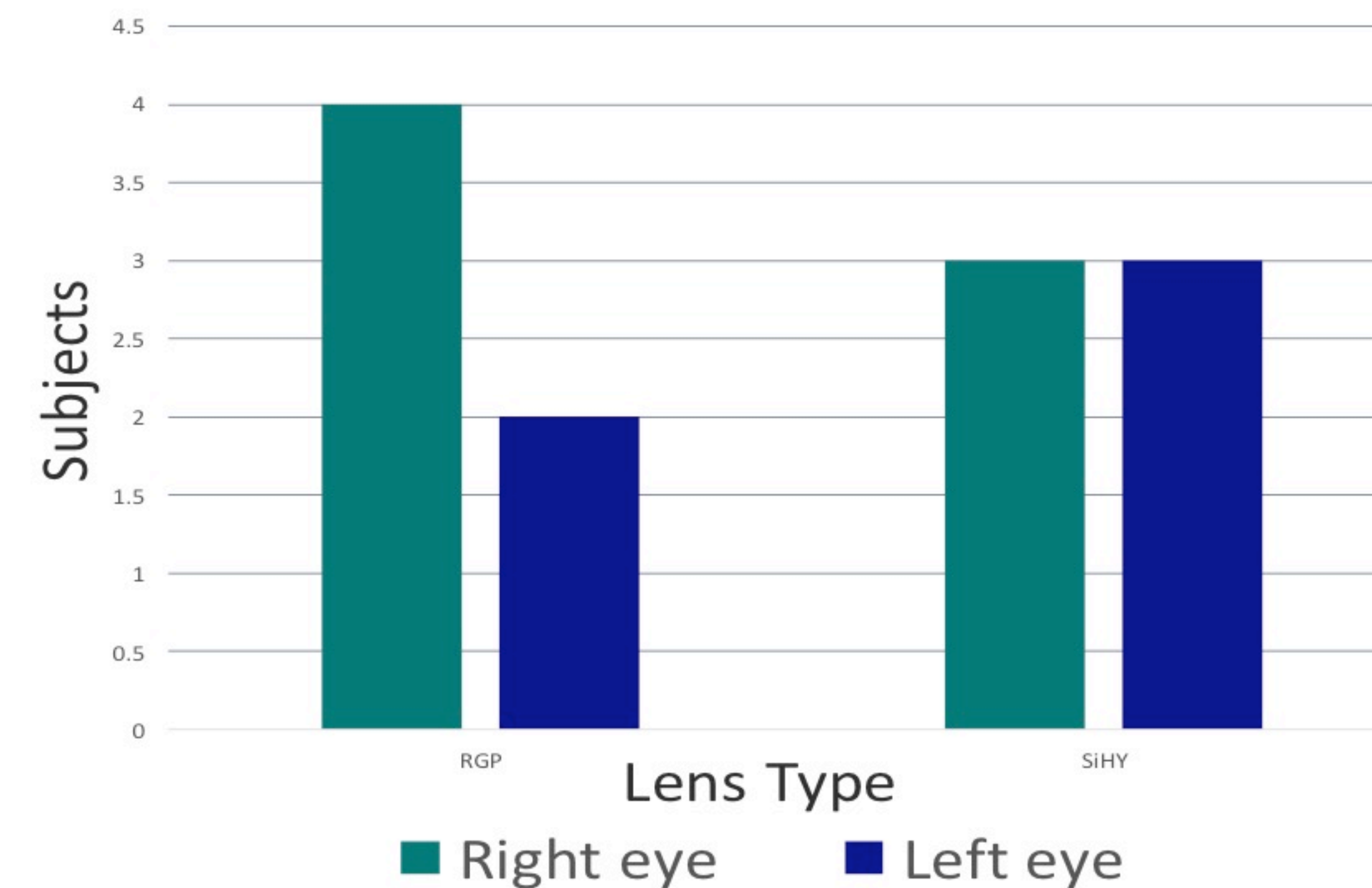
An ANOVA test was completed and a significant difference was found when comparing the percentage of hexagonal cells in rigid gas permeable wears and silicone hydrogel wearers. We then ran an unpaired t-test in order to further analyze the data. for the percentage of hexagonal cells in the two groups.

Area of Analysis	Average for SiHy Wearers	Average for RGP Wearers
ECD	2441	2488
COV	31.64	34.61
% Hexagonal Cells	68.04	64.64
CCT	549.04	554.6

Measured values for areas of ECD, COV, % hexagonal cells, CCT

Chi-squared testing failed to show a statistically significant difference in the two groups when comparing material versus ECD compared to age norms, years of wear versus ECD compared to age norms, and material versus COV.

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Number of subjects below ECD age norms for SiHy and RGP wearers

Discussion

According to our research, it appears patients fit in either type of lens would have comparable corneal endothelial health when assessing the variables contained within this study. We have several hypotheses to explain why RGP and SiHy measurable endothelial health values are comparable. First, oxygen levels transmitted by the two groups of lenses would be similar since the average Dk values for the lenses in this study were similar if lens thicknesses were similar. Due to RGP and SiHy lenses comparable Dk values, the oxygen permeability of the lenses are relatively equal as well. Secondly, SiHy lenses are a newer material and were first marketed in 2002. Therefore, the participants in our study who have worn soft contact lenses for over 14 years have more than likely worn hydrogel lenses in the past. Hydrogel contact lenses have significantly lower Dk values translating to decreased oxygen permeability to the cornea. Research has shown contact lenses have the majority of an effect on the corneal epithelium and anterior stroma as opposed to the deeper corneal structures such as the endothelium. In conclusion, according to our study, SiHy and RGP contact lenses provide comparable corneal endothelial health benefits.