The Influence of Soft Contact Lens Materials on the Central, Para-Central and Peripheral Corneal Endothelium

Aoife Lloyd McKernan  
*Technological University Dublin*, aoifemarie.lloyd@tudublin.ie

Luisa Simo Mannion  
*Plymouth University*

Veronica O’Dwyer  
*Technological University Dublin*, veronica.odwyer@tudublin.ie

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The influence of soft contact lens materials on the central, para-central and peripheral corneal endothelium

Ardle Lloyd McKeever BSc (Hons), Optom FAIO, Lisa Simo Marron DOO EU PhD, Veronica O’Dwyer DipOpt FAIO PhD
Dublin Institute of Technology, Ireland, Plymouth University, United Kingdom

ABSTRACT

PURPOSE: To examine the influence of a variety of soft contact lens (SCL) materials on the corneal endothelium, prior to and following two weeks of cessation of SCL wear.

METHODS: Corneal endothelial cells were examined using a CEM-530 specular microscope (Nidek, Japan). Full-time SCL wearers (n = 31 eyes) were compared to a non-contact lens (NCL) control group (n = 28 eyes) of a similar age (SCL: 20.82 ± 1.69 years, NCL: 21.4 ± 2.45 years, p = 0.58). Parameters analysed included endothelial cell density (ECD; cells/mm²), mean cell area (MCA, μm²), coefficient of variation (COV) and hexagonality (%). Parameters were analysed for both the central and inferior corneal endothelium.

RESULTS: Prior to SCL cessation, two-way ANOVA testing showed significant differences between silicone hydrogel (SH) SCL materials for the COV at 0°, with generation 2 Si (G2SiH) wearers showing increased COV (27.67 ± 3.78) compared to generation 3 SH (G3SH) wearers (24.50 ± 2.75, p = 0.01). COV at the superior periphery was significantly lower in the NCL group (25.63 ± 2.79) compared to the hydrogel group (29.92 ± 6.32, p = 0.05). The MCA in the inferior periphery was also significantly higher in the NCL group (346.92 ± 36.75) compared to the hydrogel group (314.92 ± 16.57, p = 0.02)

Conclusions: SCL wear has an effect on para-central and peripheral corneal endothelial measurements in SCL wearers compared to NCL wearers; with the largest significant differences seen between NCL and hydrogel SCL wearers. Following two weeks of SCL cessation, there were no significant differences in the stability of all endothelial measurements, regardless of which SCL material was worn.

RESULTS

Figure 2: Corneal points captured by the CEM-530 specular microscope

METHODS

Inclusion criteria:
- Myopic prescriptions with low astigmatism (< -2.00 DC).
- No systemic orocular disease.
- SCL: Full-time SCL wear (>5 days per week for at least one year).
- NCL: no history of CL wear in the year prior to enrolment.

Data collection:
- Visits: baseline (SCL group: immediately following SCL removal), following SCL cessation on day 1, 2, 7, & 14. NCL control subjects were asked to attend the clinic at the same time intervals. Appointments were scheduled at the same time of day (3 hrs) to limit the possible influence of diurnal variation.
- Two-way ANOVA parametric testing was used for comparisons of groups. P < 0.05 was considered statistically significant.

Statistical analysis:
- SPSS 22 was used for statistical analysis. Normally for continuous data were assessed using the Shapiro- Wilk method. Two-way ANOVA parametric testing was used for comparisons of groups. P < 0.05 was considered statistically significant.

RESULTS

Figure 3: Endothelial cell density analysed for the SCL material groups at baseline

Table 1: Endothelial parameters for the SCL material and NCL groups at baseline

<table>
<thead>
<tr>
<th>SCL Group</th>
<th>NCL</th>
<th>G2SiH</th>
<th>G3SH</th>
<th>NCL</th>
<th>G2SiH</th>
<th>G3SH</th>
<th>NCL</th>
<th>G2SiH</th>
<th>G3SH</th>
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</thead>
<tbody>
<tr>
<td>COV (μm²)</td>
<td>24.1</td>
<td>27.3</td>
<td>25.1</td>
<td>20.5</td>
<td>23.2</td>
<td>21.8</td>
<td>21.2</td>
<td>20.6</td>
<td>21.5</td>
</tr>
<tr>
<td>MCA (μm²)</td>
<td>310</td>
<td>306</td>
<td>322</td>
<td>340</td>
<td>346</td>
<td>338</td>
<td>342</td>
<td>349</td>
<td>346</td>
</tr>
<tr>
<td>COV of MCA</td>
<td>8.5</td>
<td>7.6</td>
<td>6.5</td>
<td>7.8</td>
<td>6.3</td>
<td>8.4</td>
<td>7.9</td>
<td>7.5</td>
<td>8.2</td>
</tr>
<tr>
<td>COV of ECD</td>
<td>4.8</td>
<td>3.9</td>
<td>5.2</td>
<td>4.5</td>
<td>4.1</td>
<td>5.0</td>
<td>4.8</td>
<td>4.3</td>
<td>5.1</td>
</tr>
<tr>
<td>ECD (cells/mm²)</td>
<td>2958</td>
<td>2825</td>
<td>3096</td>
<td>3146</td>
<td>2935</td>
<td>3100</td>
<td>3075</td>
<td>3135</td>
<td>3105</td>
</tr>
</tbody>
</table>

CONCLUSIONS

- The various SCL materials examined do not have a significant effect on the central endothelial parameters compared to the NCL control group. However, SCL wear had a significant effect on peripheral corneal endothelial measurements in SCL wearers compared to NCL wearers, with the largest significant differences seen between NCL and hydrogel SCL groups.

- Results of this study are in agreement with those of Aamot et al. (2003) who found increased peripheral ECD in SCL wearers compared to NCL wearers. Aamot et al. proposed this was due to a redistribution of endothelial cells to the periphery in SCL wear. However, we found a significantly reduced MCA in SCL wearers compared to NCL wearers. This reduced MCA would also account for the higher density of cells in the periphery.

- Following two weeks of SCL cessation, there was no significant differences in the stability of all endothelial measurements, regardless of which SCL material was worn prior to SCL cessation.

References:

ACKNOWLEDGEMENTS: Arlene Betton, Naithi Caliha, Patrick Murphy, and Patrick O’Connor for their help with data and figure collection. For more information please contact ardle.mckeever@dit.ie