Does Tear Exchange Differ Between Silicone Hydrogel Contact Lens Types?

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INTRODUCTION

- Silicone hydrogel contact lenses were developed to meet the oxygen transmissibility requirements of overnight wear.

- Thought that with increase in oxygen permeability, corneal hypoxia, infection, and inflammation would decrease.

- Even though silicone hydrogel (SHL) contact lenses have provided the corneal surface with exceptional oxygen levels, problems with corneal inflammation and infection have still been observed.

- The annualized incidence of microbial keratitis per 10,000 wearers was 1.9 for daily wear soft contact lenses and 11.9 for daily wear soft silicone hydrogel contact lenses.

- One possible explanation may be tear stagnation under the contact lens due to insufficient tear exchanges.

- Tear exchange is important for removing debris and cellular material from the corneal surface.

- Tear exchange is the measure of the difference in tear film fluorescence after the instillation of fluorescein dye.

- The purpose of this study was to determine the tear exchange rate in seven different silicone hydrogel contact lens materials using an in vivo fluorophotometer on 15 patients and compare those results to control non-silicone hydrogel contact lenses in order to determine if contact lens movement or lens modulus plays a role in tear stagnation.

MATERIALS AND METHODS

- Subject Demographics and Inclusion Criteria
  - 15 adapted soft contact lens wearers were enrolled.
  - Average age: 22.75 (22-26 years)
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- Objective and Subjective Measurements
  - Ocular surface health was assessed with biomicroscopy.
  - Corneal examination and evaluation were made using the Kipling and the Orbscan™
  - Contact lens wear was randomized and each subject wore 9 different lenses in a randomized order.
  - The first 5 minutes was excluded to allow for lens stabilization.
  - Fluorophotometry was performed every 4-5 minutes until contact lens baseline fluorescence was reached.
  - Contact lens baseline fluorescence was also measured.

- Data Analysis
  - Peak number is calculated as the raw data number minus contact lens baseline fluorescence divided by (maximum peak number minus contact lens baseline fluorescence).
  - All correlations were 2-tailed.
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RESULTS

- Table 1: Average Vertical Contact Lens Movement

<table>
<thead>
<tr>
<th>Contact Lens Type</th>
<th>Movement (mm)</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locafilcon A</td>
<td>0.62</td>
<td>0.06</td>
</tr>
<tr>
<td>Comfilcon A</td>
<td>0.29</td>
<td>0.10</td>
</tr>
<tr>
<td>CibaGold</td>
<td>0.49</td>
<td>0.39</td>
</tr>
<tr>
<td>Etafilcon A</td>
<td>0.26</td>
<td>0.05</td>
</tr>
<tr>
<td>Balafilcon A</td>
<td>0.24</td>
<td>0.09</td>
</tr>
<tr>
<td>Galyfilcon A</td>
<td>0.16</td>
<td>0.02</td>
</tr>
<tr>
<td>Galafilcon A</td>
<td>0.14</td>
<td>0.02</td>
</tr>
</tbody>
</table>

- Figure 1: Graph showing tear exchange rate vs. lens movement.

- Figure 2: Graph showing tear exchange rate vs. lens movement.

- Figure 3: Graph showing tear exchange rate vs. lens movement.

- Figure 4: Graph showing tear exchange rate vs. lens movement.

- Figure 5: Graph showing tear exchange rate vs. lens movement.

- Figure 6: Graph showing tear exchange rate vs. lens movement.

- Figure 7: Graph showing tear exchange rate vs. lens movement.

CONCLUSION

- Lens dependent tear exchange rates were not statistically different between silicone and non-silicone hydrogel contact lenses.

- The slow decay rate was different between individual silicone hydrogel contact lenses ranging from 0.02-0.024 to 0.01-0.015.

- Subjects showed a higher than normal blink rate of 16 blinks per minute with the general average blink rate being 15 blinks per minute.

- Silicone hydrogel lens slow decay rate and lens movement slow decay rate both showed a positive correlation resulting in a greater decay with increased movement and higher modulus.

- The results suggest that differences in individual silicone hydrogel lenses were related to the biophysical differences between lenses.

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REFERENCES

4. Thought that with increase in oxygen permeability, corneal hypoxia, infection, and inflammation would decrease.