Epithelial Barrier Function

The corneal epithelium plays an important role in maintaining the homeostasis of ocular surface. The normal human corneal epithelium is resistant to the flow of hydrophilic substances. However, a change in epithelial structure or function can allow unwanted substances to penetrate the epithelium. For example, a previous study showed a significant increase in corneal epithelial permeability to fluorescein after 8 hours of overnight-wear. The effects of longer periods of continuous wear have not been reported.

ABSTRACT

To examine the effects of 30-day continuous wear (CW) of high-Dk/t silicone lenses on epithelial barrier function by measuring the permeability of the corneal epithelium to sodium fluorescein (P<sub>dc</sub>).

METHODS

29 neophytes were adapted to silicone lenses. Baseline P<sub>dc</sub> measurements were then obtained (included afternoon (PM) followed by morning (AM) measurements, where one eye was patched overnight until the morning reading. Following baseline assessments, subjects wore their lenses continuously for 30 days. PM and AM P<sub>dc</sub> measurements were then repeated. All P<sub>dc</sub> measurements were obtained using an automated scanning fluorometer.

RESULTS

There was no significant difference between eyes for baseline PM, baseline AM, and CW PM, P<sub>dc</sub> measurements (p > 0.05). However, the 30-Day Follow-up PM P<sub>dc</sub> measurements were –2.187 (ln nm/sec) and –1.878 (ln nm/sec) for patched and unpatched eyes, respectively (p = 0.0733). This corresponds to a 13.09% and 49.86% increase in permeability from the baseline PM in the patched and unpatched eyes, respectively.

CONCLUSIONS

The results of this study show that there is a substantial decrease in epithelial barrier function during CW. Of interest and importance is the fact that a significant increase in permeability to fluorescein after 8 hours of overnight-wear.

STUDY AIM

To measure the effects of 30-day continuous-wear (CW) with silicone hydrogel lenses on epithelial permeability to fluorescein (P<sub>dc</sub>).

METHODS

Subjects

29 subjects participated in the study. All subjects had no history of contact lens wear in the previous 12 months and were free from ocular and systemic diseases with eye manifestations.

Contact Lenses

Focus Night & Day<sup>™</sup> lenses (lotraflacon A; 24% H<sub>2</sub>O; 8.4 mm or 8.6 mm; 13.8 mm; 175 Dk/t)

Instrument

A Fluorotron Master<sup>®</sup> automated scanning fluorometer was used to perform all P<sub>dc</sub> scans using single-drop fluorescein technique.

Experimental Design and Procedures

- Prospective, randomized, single-masked study design.
- After CW adaptation, all subjects discontinued lens wear for at least one week prior to baseline measurements.
- Visits:

  - Baseline
  - Visit #1: Biomicroscopic evaluation, baseline PM P<sub>dc</sub> measurement
  - Visit #2: Biomicroscopic evaluation, baseline AM P<sub>dc</sub> measurement, contact lens dispensing
  - 30-day Continuous-Wear Follow-Up
  - Visit #3: Biomicroscopic evaluation, PM P<sub>dc</sub> measurement
  - Visit #4: Biomicroscopic evaluation, AM P<sub>dc</sub> measurement

- Subjects patched one eye (randomized) on the evening prior to AM P<sub>dc</sub> visits.

RESULTS

- 29 subjects completed the study.
- 22 subject data sets were analyzed.

- Patched vs. Unpatched at each visit

Table 1

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<tr>
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<th>Patched</th>
<th>Unpatched</th>
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<tbody>
<tr>
<td>Mean In (P&lt;sub&gt;dc&lt;/sub&gt;)</td>
<td>2.32 ± 0.14</td>
<td>2.42 ± 0.13</td>
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<tr>
<td>SE (ln nm/sec)</td>
<td>2.33 ± 0.11</td>
<td>2.19 ± 0.21</td>
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<tr>
<td>p-value</td>
<td>0.882</td>
<td>0.215</td>
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Table 2

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<tr>
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<th>Unpatched</th>
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<tr>
<td>Mean In (P&lt;sub&gt;dc&lt;/sub&gt;)</td>
<td>2.32 ± 0.14</td>
</tr>
<tr>
<td>SE (ln nm/sec)</td>
<td>2.33 ± 0.11</td>
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<tr>
<td>p-value</td>
<td>0.595</td>
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DISCUSSION

The results suggest that Continuous Wear reduces normal epithelial barrier function. Several factors, including post-lens tear thickness, physical lens fit, upper lid tension during closed- and open-eye conditions, tear chemistry, tarsal plate physiology, and corneal fragility, may contribute to the variability of the corneal epithelial permeability measurement. Larger sample-size studies are needed to validate the effects of individual or combined factors on corneal epithelial permeability.

REFERENCES


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