Assessing the effect of wearing time on topographic corneal clearance in semi-scleral contact lens wear

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Introduction

When fitting semi-scleral contact lenses (sSCL) it is prudent to allow after insertion of the lenses some settling time as with the fitting of corneal gas permeable (GP) lenses. This time normally ranges from 20-30 minutes in order for the lens to "settle" on the eye, but the actual amount of time that is needed and the amount of settling that occurs is still not known.1,2 The question of whether it is for clinical adaptation, physiological adaptation or has clinical implications are not quiet clear. However, recent publications show that sSCL do "sink in" ("settle") over time.1,2 This appears to have more clinical implications than mere adaptation to the lenses as with corneal GPs.

The "lens sinkage" is typically attributed to the soft and compressible nature of the conjunctiva and the Tenon's tissues where the haptic part of the lens rest on the eye.

Purpose

To assess the amount of topographic corneal clearance (TCC) of three semi-scleral contact lenses (sSCL) of varying sagittal depth over a 1 hour period of wear.

Methods

Three sSCL (Jupiter 15mm, Eissilor) were fitted to 20 subjects who had previous diagnoses of keratoconus (KC) (n=18) or pellucid marginal degeneration (PMD) (n=2).

The fitting of the sSCL were based on the corneal sagittal depth (CSD) measured with the Visante™ OCT at a 15mm chord along the horizontal meridian. (Fig: 1) To select the sSCL from the diagnostic trial lens set, values of 325 (lens 1), 375 (lens 2) and 425 (lens 3) µm were randomly added in sequence to the CED and all three lenses were worn.

Immediately after the lens was inserted on the eye, a video-slit lamp camera was used to examine the sSCL on the eye using cobalt blue and enhancing Wratten #12 yellow filter. This was to ensure there were no bubbles trapped under the sSCL. Bubbles that were bigger than 3-5mm and causing any discomfort were eliminated by removing the sSCL from the eye, re-fitting the lens with non-pressured saline and then re-inserted. (Fig: 2)

The TCC (the space between the back surface of the lens and the front surface of the cornea) was measured radially using a customized ultra-long OCT every 10 minutes over a 1 hour period.

Results

There were 16 males and four females enrolled in the study. Their mean age was 33.95±7.90 (range: 23-51) years. The overall mean and SD of the central corneal clearance (CCCI) after 1 hour for all the three sSCL was 0.03±0.06mm (30±69µm). The greatest CCCI was found with Lens 3 with 0.04±0.05mm (40±50µm) at the end of 1 hour of the sSCL wear.

Table 1 shows the mean and SD of the central and 3mm locations for all the lenses at time intervals 20, 40 and 60 minutes.

<table>
<thead>
<tr>
<th>Time (minutes)</th>
<th>Lens 1</th>
<th>Lens 2</th>
<th>Lens 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.03±0.04</td>
<td>0.03±0.04</td>
<td>0.04±0.05</td>
</tr>
<tr>
<td>40</td>
<td>0.03±0.05</td>
<td>0.03±0.05</td>
<td>0.04±0.05</td>
</tr>
<tr>
<td>60</td>
<td>0.03±0.05</td>
<td>0.03±0.05</td>
<td>0.04±0.05</td>
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</table>

Discussion

Several authors have reported central corneal clearance loss after wearing lenses for some hours. Caroline et al.10 reported an average of 96 (range: 70-180) µm of apical corneal clearance (ACC) loss after 8 hours of sSCL on normal eyes.

Mountford7 reported 146 (range: 106-186) µm of ACC loss after one month of sSCL.

One question that remains unanswered is the clinical effects of the TCC on the fitting characteristics, visual acuity and comfort rate.

Irrespective of the small TCC found in this study, there were variations at the end of the 1 hour period especially with the lens showing the most central clearance.

Conclusions

1. There is a likelihood of TCCl of 30±80µm after 1 hour of sSCL wear.
2. There was no significant difference among the three lenses examined, indicating that the amount of initial lens clearance is not a factor in the eventual amount of TCC loss.
3. TCC loss will vary between wearers and partly depends on the scleral zone radius and its relationship with the scleral conjunctiva.
4. Eyelid force, design of the contact lens and unknown factors appear to play a role in sSCL compression.

References


Figures 5-7 shows the rate of topographic corneal clearance loss (TCCI) for each of the lenses from the time of insertion to the 1 hour period. It is evident from Figs 5-7 that there was gradual reduction in the TCCI though there was no significant change in TCCI at the end of the 1 hour of each of the lenses (p>0.05).

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