INTRODUCTION

• During myopic orthokeratology (OK), the central cornea is flattened and the paracentral cornea is steepened by the overnight use of rigid contact lenses of reverse geometry design. The central flattened zone is often referred to as the treatment zone (TZ).
• In order to provide good vision to the patient, the TZ must not only be large enough to encompass the pupillary area but also be well-centered, as a decentered TZ during myopic OK has been shown to increase higher order aberrations and decrease contrast sensitivity.¹
• The TZ is calculated from corneal topographic maps by subtracting the pre-OK treatment from the post treatment topography. Previous studies determined TZ parameters from different types of maps including axial², tangential³ or refractive power maps.¹ However, the type of map chosen to display the difference maps may influence measured TZ parameters.

PURPOSE

• To compare TZ parameters following OK treatment derived from axial, tangential and refractive power maps.

METHODS

SUBJECTS

• 19 subjects (6M, 13F; 28 ± 7 years) aged between 20 and 41 years were enrolled in this prospective study.
• Inclusion criteria: - Myopia between 1.00 and 4.00 D and astigmatism ≤ 1.50D.
  - non-rigid contact lens wearers.
• Soft contact lens wearers were instructed to cease lens wear for 24 hours before study.

STUDY DESIGN

• Subjects were fitted with BE OK lenses (Capricornia Contact Lens, Australia) according to manufacturer’s guidelines in both eyes.
• Lens specifications: Boston X0 (B+L Boston, USA; Dk 141 ISO/Fatt); with optic zone diameter of 6.00 mm and total lens diameter of 11.00 mm.
• Study measurements were taken at baseline before lens wear, and after 14 nights of OK treatment. Results from the right eye only are reported.

STUDY MEASUREMENTS

• Corneal topography was captured using the Medmont E300 corneal topographer (Melbourne, Australia).

RESULTS

• Baseline and post OK central refraction and corneal topographic parameters are given in Table 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Baseline</th>
<th>Post OK</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (D)</td>
<td>-1.54 ± 0.77</td>
<td>+0.23 ± 0.63</td>
<td>p = 0.020*</td>
</tr>
<tr>
<td>J1445 (D)</td>
<td>-0.11 ± 0.17</td>
<td>+0.08 ± 0.22</td>
<td>p = 0.157</td>
</tr>
<tr>
<td>J1490 (D)</td>
<td>0.00 ± 0.12</td>
<td>+0.03 ± 0.19</td>
<td>p &gt; 0.999</td>
</tr>
<tr>
<td>r2 (mm)</td>
<td>7.80 ± 0.22</td>
<td>8.18 ± 0.24</td>
<td>p &gt; 0.999</td>
</tr>
<tr>
<td>Flat K (D)</td>
<td>43.10 ± 1.18</td>
<td>41.53 ± 0.96</td>
<td>p &gt; 0.999</td>
</tr>
<tr>
<td>Steep K (D)</td>
<td>43.78 ± 1.22</td>
<td>42.37 ± 1.01</td>
<td>p &gt; 0.999</td>
</tr>
</tbody>
</table>

Table 1. Refraction and topographic parameters at baseline and after 14 days of OK treatment. Asterisks indicate statistically significant change over time.

• TZ parameters derived from three types of maps are given in Table 2.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Axial Power Map</th>
<th>Tangential Power Map</th>
<th>Refractive Power Map</th>
<th>Significance (ANOVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TZ decentration (mm)</td>
<td>0.79 ± 0.29</td>
<td>0.54 ± 0.23</td>
<td>0.77 ± 0.28</td>
<td>p = 0.013*</td>
</tr>
<tr>
<td>Horizontal TZ diameter (mm)</td>
<td>5.58 ± 0.67</td>
<td>3.67 ± 0.39</td>
<td>5.45 ± 0.57</td>
<td>p = 0.001*</td>
</tr>
<tr>
<td>Vertical TZ diameter (mm)</td>
<td>5.67 ± 0.60</td>
<td>3.67 ± 0.39</td>
<td>5.48 ± 0.46</td>
<td>p = 0.001*</td>
</tr>
</tbody>
</table>

Table 2. TZ parameters derived from axial, tangential and refractive power maps. Asterisks indicate statistically significant difference between maps.

• The horizontal TZ diameter was largest for the axial power map and smallest in the tangential power map. Post hoc pairwise comparisons showed a significant difference in the horizontal TZ diameter between axial and tangential power maps (1.91 ± 0.47 mm, p < 0.001) but no significant difference between axial and refractive power maps (0.13 ± 0.45 mm, p > 0.999).
• The vertical TZ diameter was largest for the axial power map and smallest for the tangential power map. Post hoc pairwise comparisons showed a significant difference in the vertical TZ diameter between axial and tangential power maps (1.99 ± 0.51 mm, p < 0.001) but no significant difference between axial and refractive power maps (0.19 ± 0.50 mm, p > 0.999).
• An example to compare TZ from the three types of difference maps obtained from the same subject is given in Figure 1.

DISCUSSION AND CONCLUSIONS

• This study shows that the type of corneal topographic map chosen to analyze TZ parameters after OK significantly affects the dimensions of the TZ.
• TZ centration and TZ diameter are significantly less if tangential power maps are used as opposed to axial or refractive power maps.
• TZ decentration and horizontal TZ diameter reported in this study are consistent with previous studies.² 4
• Clinicians must be cautious when comparing TZ parameters derived from different types of topographic maps.

REFERENCES


ACKNOWLEDGEMENTS

• This research was funded through the Australian Research Council Linkage Project Scheme with support from industry partners Bausch + Lomb Boston (Wilmingtom, WA), BE Enterprises Pty Ltd (Brisbane, Australia) and Capricornia Contact Lens Pty Ltd (Brisbane, Australia).
• Contact lens solutions used in the study were kindly donated by Bausch + Lomb (Australia).
• The authors thank the UNSW ROK Group for project support.

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