Prospective study on success rates of fitting simultaneous multifocal contact lenses in relation to physiological circumstances

Introduction:
To supply elderly people with multifocal contact lenses gets more and more important. Soft simultaneous contact lenses are the most popular in this category of presbyopic contact lenses (10.7% of 62,543 Ths. Euro in the first four month of 2011 in the German market4). But a successful fitting is not guaranteed in every case. One reason of a non-successful fitting could be a individual cortical effect known as visual selectivity2. In addition to this effect, physiological structures of the anterior eye could have an influence, too. Based on studies of Parendeau et al. and Rehner4 some physiological structures were tested on a significant effect.

Purpose:
The purpose of this study was to prove influence of decentration on the eye fitted contact lens, the anterior chamber depth (ACD) and the amplitude of pupillary light reflex (APLR) on the fitting of simultaneous multifocal contact lenses with a “near-in-centre” design.

Methods:
All parameters were measured at successful wearers of simultaneous multifocal contact lenses (10x female, 10x male, (54.9±6.3) years). Both, amplitude of pupillary light reflex and the anterior chamber depth were determined with the 3D Rotating Scheimpflug Camera & Topography System SIRIUS (Bon Optic Distribution company).

The contact lens decentration was measured based on slit lamp pictures by using hourglass shaped symbols and the virtual measuring device MB Ruler (MB Softwaresolutions).

Additionally, the subjects had to evaluate the visual performance for both far and near vision, and the general comfort of the worn contact lenses by setting a dash on a variable score.

Results:
The contact lens decentration was OD (0.14±0.23)mm, OS (-0.03±0.19)mm in horizontal direction and (-0.08±0.26)mm in vertical orientation on both eyes. Comparing to related studies the contact lens decentration is significantly different (P=0.001, α=0.05).

Furthermore, an ACD of (2.67±0.35)mm was determined. The APLR was (1.96±0.49)mm.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>OD (mm)</th>
<th>SD</th>
<th>OS (mm)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupil (temp)</td>
<td>2.73 ± 0.54</td>
<td>0.55</td>
<td>3.05 ± 0.34</td>
<td>0.45</td>
</tr>
<tr>
<td>Pupil (temp)</td>
<td>2.68 ± 0.35</td>
<td>0.37</td>
<td>3.04 ± 0.18</td>
<td>0.32</td>
</tr>
<tr>
<td>ACD</td>
<td>1.93 ± 0.46</td>
<td>0.36</td>
<td>1.99 ± 0.31</td>
<td>0.33</td>
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<tr>
<td>APLR</td>
<td>1.96 ± 0.49</td>
<td>0.45</td>
<td>1.96 ± 0.49</td>
<td>0.45</td>
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</tbody>
</table>

For contact lens decentration both eyes the origin (the vertex of the cones) at the horizontal and the axis of collimated the vertical decentration.

Additionally, there is a significant relation between the far vision performance and the ACD on both eyes (OD: r=–0.465, P=0.216, ρ=0.039; OS: r=–0.474, P=0.225, ρ=0.035, α=0.05).

Concerning the near vision performance there is no significant influence detectable, but it shows an inverse trend with a monotone increasing regression.

Conclusion:
The results shows, that a minimal horizontal and vertical contact lens decentration could be an important factor on a successful fitting with simultaneous contact lenses. Concerning to the significant relation to the far vision performance, the ACD has a highly potential influence, too. Furthermore, an APLR up to 1.5mm can be beneficial, because the average amplitude exceeds the necessary amplitud of 1.1mm by 7.8%

References:
1. Sebastian Schubert, Carl-Zeiss-Promenade 2, DE-07745 Jena, mobile: 0049 162/2478113, e-mail: s.schubert@jenvis-research.com

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