Retinal straylight measurements in patients with implanted bioanalogic polyfocal lens

Kateřina Liehneová¹, Sylvie Ovesná², Eva Adamusová³, Martin Hložánek¹

¹ Ophthalmology Department, University Hospital Královské Vinohrady and 3rd Medical Faculty, Prague, Czech Republic
² GEMINI Eye Clinic, Zlín, Czech Republic
³ Medicem Institute, Kamenne Zehrovice, Czech Republic

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Study

Purpose

The purpose of the study is to compare intraocular light scattering in pseudophakic eyes of patients with implanted bioanalogic, polyfocal lens WIOL-CF and healthy eyes of corresponding age.

Materials and Methods

Twelve patients (23 eyes) from 2 centers in the Czech Republic (University Hospital Královské Vinohrady and 3rd Medical Faculty and GEMINI Zlín) were examined. Mean patient age was 65 ± 6 years. The cohort included 4 males and 8 females. The follow-up time was from 3 to 12 months. All patients underwent binocular routine cataract surgery and WIOL-CF bioanalogic IOL implantation. The patients didn't have any other ocular surgery or disease. The average postoperative UDVA was 0,92 ± 0,16 Dec. All patients were measured by straylight meter C-Quant (abbreviation for Cataract-Quantifier; Oculus). The data were analyzed using statistical software QC.Expert version 3.3 (TriloByte Statistical Software). WIOL-CF data were compared to recently published retinal straylight values in patients with monofocal and multifocal intraocular lens (IOL).
The main sources of retinal straylight are: corneal scatter, iris and sclera transparency, lens, and fundus scatter. The light scattering reduces the contrast of the retinal image, and consequently decreases the quality of image projected on the retina.

The lower the retinal straylight (straylight ratio „s“ measured by C-Quant), the better the vision.

Texts and figures on this slide are from freely accessible document „Introduction into retinal straylight“ on http://www.herseninstituut.knaw.nl/
## Comparison of measured WIOL-CF data to other published IOLs

<table>
<thead>
<tr>
<th>IOL</th>
<th>Optics</th>
<th>Material of IOL</th>
<th>Straylight value [log(s)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIOL-CF (MEDICEM)</td>
<td>Polyfocal</td>
<td>WIGEL (unique hydrogel)</td>
<td>1.09±0.25</td>
</tr>
<tr>
<td>NCL (65±8 years)</td>
<td>-</td>
<td>Natural crystalline lens</td>
<td>1.19±0.07¹</td>
</tr>
<tr>
<td>ReSTOR SN6AD1 IOL (Alcon)</td>
<td>Multifocal diffractive</td>
<td>Hydrophobic Acrylic</td>
<td>1.23±0.21²</td>
</tr>
<tr>
<td>AcrySof IQ IOL (Alcon)</td>
<td>Monofocal aspheric</td>
<td>Hydrophobic Acrylic</td>
<td>1.16±0.23²</td>
</tr>
<tr>
<td>AR40e (AMO)</td>
<td>Monofocal spherical</td>
<td>Hydrophobic Acrylic</td>
<td>1.47±0.22³</td>
</tr>
<tr>
<td>HQ201hep (Hexavision)</td>
<td>Monofocal spherical</td>
<td>Hydrophilic Acrylic</td>
<td>1.37±0.24³</td>
</tr>
<tr>
<td>PC156C55 (Henan universe IOL R&amp;M Co)</td>
<td>Monofocal spherical</td>
<td>PMMA</td>
<td>1.45±0.23³</td>
</tr>
</tbody>
</table>

¹ The value is derived from statistical curve from C-Quant software.
² Cheng Peng et al.: Optical performance after bilateral implantation of apodized aspheric diffractive multifocal intraocular lenses with +3.00-D addition power; Acta Ophthalmologica 2012
Results

The retinal straylight in eyes with WIOL-CF was statistically significantly better than healthy population standard of corresponding age (P<0.05). The mean value of retinal straylight in WIOL-CF eyes was 1.09±0.25.

Recently published retinal straylight values in pseudophakic eyes implanted with multifocal IOLs from hydrophilic acrylic were 1.23±0.21 (age: 66±8 years). The difference in retinal straylight between eyes implanted with multifocal IOLs and polyfocal IOLs (WIOL-CF) was statistically significant (P<0.01).

Recently published retinal straylight values in pseudophakic eyes implanted with monofocal IOLs made from hydrophobic acrylic (Alcon and AMO) were 1.16±0.23 (age: 67±9 years) and 1.47±0.22 (age: 67±7 years), respectively; from hydrophilic acrylic and PMMA 1.37±0.24 (age: 63±10 years) and 1.45±0.23 (age: 65±8 years), respectively. The difference in retinal straylight between eyes implanted with monofocal IOLs made from hydrophilic acrylic, PMMA and hydrophobic acrylic from AMO and polyfocal IOLs made from WIGEL (WIOL-CF) was statistically significant (P<0.01).

1. Cheng Peng et al.: Optical performance after bilateral implantation of apodized aspheric diffractive multifocal intraocular lenses with +3.00-D addition power; Acta Ophthalmologica 2012
If we assume that four of five sources of straylight were identical in pseudophakic and phakic eyes, it could be concluded that the difference would lay mainly in the lens properties and consequently, the retinal straylight induced by WIOL-CF would correspond to the straylight induced by natural crystalline lens of lower age.

This suggests that polyfocal WIOL-CF should be less susceptible to disturbing optical phenomena at low light under glare conditions than multifocal IOLs and than IOLs made from hydrophobic acrylic, hydrophilic acrylic and PMMA. This finding is consistent with better contrast sensitivity of WIOL-CF patients and could be due to the lower reflectivity and higher resistance of WIGEL (WIOL-CF material) to deposits. Moreover, smooth continuous optical surface (without transition between optical zones) may also contribute.

Conclusions

The retinal straylight in the eyes implanted with WIOL-CF was statistically significantly better compared to healthy population standard of corresponding age.

Regarding the retinal straylight WIOL-CF had better results in retinal straylight than monofocal IOLs made from hydrophobic acrylic (AMO), hydrophilic acrylic (Hexavision) and PMMA (Henan universe IOL R&M Co). Average value of straylight ratio in case of hydrophobic acrylic IOL (AcrySof IQ IOL, Alcon) is higher than WIOL-CF results, however the difference is not statistically significant.

The retinal straylight in WIOL-CF patients is substantially better than in the case of multifocal hydrophobic acrylic IOLs (ReSTOR, Alcon).