Conclusions

Both intraocular lenses and corneal contact lenses have proven to be a significant contributor to ocular straylight (**Chapter 3-10**). Their composing material appears to be as the main factor determining their light-scattering characteristics (**Chapter 4-8**). Although the optical design is very important for the overall quality of vision, differences in terms of straylight between the studied lens designs seem to not be of much significance (**Chapter 4, 5** and **8**). The contribution of the optical design (especially in case of diffractive lenses) should, however, be further studied using a technique that could identify morphological sources of light scattering, and be able to differentiate between bulk scattering and scattering originating from the optical features.

Straylight of IOLs can be affected by the water content of lens material, as hydrophilic multifocal IOLs have shown *in vivo* to scatter less than the hydrophobic ones (**Chapter 4-5**). Increased straylight in the hydrophobic lenses might be related to the formation of glistenings. Based on the proposed model for the relationship between straylight and severity of glistenings (**Chapter 6**), the number of microvacuoles that would have an equivalent effect on light scattering could be estimated. To this end, the 0.08 log(s) difference between the hydrophobic and hydrophilic lenses must be applied to the mean straylight value (1.18 log[s]), and the difference obtained entered in the model **(Chapter 5-6**). This results in a glistenings number of 652 per mm^2. The literature review showed that such a large number can be found *in vivo*.[1] This can however not be the full explanation for the hydrophilic lenses to perform better in terms of straylight, and more study is needed.

Glistenings appear to be the most prevalent IOL degeneration/alteration, but only a large number of microvacuoles may yield a significant straylight increase (**Chapter 6-7**). A proportional relationship between straylight and the glistenings number was found (**Chapter 6**). Based on this relationship, scattering effect of clinically observed glistenings can be estimated. This finding points to the objective counting as a preferable method for assessing glistenings severity and progression. To demonstrate to what extent the presence of (*in vivo*) glistenings affects visual quality, one would need an actual range of the glistenings number. Given, however, that subjective grading has most often been used in clinics, the range of the number of glistenings is difficult to assess, and this warrants further study.

Other IOL abnormalities may be related to significant straylight elevation as well. Besides well documented cases of serious IOL opacification,[2, 3] surface deposits/snowflake degeneration may appear in a subclinical (early) form shown to affect ocular straylight (**Chapter 7**). The total incidence rate of IOL degeneration was 53%, but in some IOL groups it was 100% (**Chapter 7**). Since IOL opacification even at its early stage causes ocular straylight to increase, such a large incidence rate of lens abnormalities may (partly) explain general straylight elevation in the pseudophakic eye. This finding, however, cannot explain the high intersubject variability in ocular straylight reported in the literature (*i.e.* from 0.64 to 1.82 log[s][4]), and this remains to be elucidated.

The development of a clinical instrument for straylight assessment of the eye provided a new parameter to the existing metrics of visual quality (*e.g.* visual acuity).[5] The current thesis shows that now this instrument (the C-Quant) can also be used to *in vitro* assess straylight of IOLs (**Chapter 9-10**). The proposed C-Quant adaptation has proved effective in measuring straylight from the IOLs, but also in differentiating between large and small particles (**Chapter 9-10**). This may prove to be of clinical value as the proposed method could be used for screening new lenses or evaluation of lens explants. The latter application may improve understanding of subjective visual complaints, as now *in vivo* and *in vitro* straylight can be compared directly. The C-Quant, however, measures straylight at a fixed angle of 7.0° (average)[6] and this could be viewed as a limitation. A C-Quant adaptation that enables straylight to be measured at different angles would be advantageous and could be a step forward in intraocular lens research.

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