Negative dysphotopsia

Summary

Although negative dysphotopsia has been extensively studied after the first report in 2000 by Davison, this phenomenon remains to be not well understood and there is no consensus about its aetiology and best treatment strategy. In this thesis, we learn more about the incidence rates of negative dysphotopsia, develop and suggest tools for psychometric and clinical evaluation and describe and try to understand the effect of supplementary implantation of a Sulcoflex IOL in the treatment of negative dysphotopsia from a clinical and optical perspective.

In **Chapter 2**, we report a great discrepancy of the incidence rates of persistent negative dysphotopsia (> 1 months) between previous studies that varied from 0 % to 20% dependent on the type of IOL used, the size of the study population and, mainly, on the method used to record complaints. In our retrospective cohort study, we found that the incidence can be markedly underestimated if patients are not actively questioned about their symptoms. Only 8% of patients reported negative dysphotopsia symptoms to their ophthalmologist, whereas 19% of patients appeared to have symptoms when they were actively being asked about it. Two patients (2%) had bothersome complaints and one of them required additional surgery. Remarkably, only one patient reported transient symptoms (<1 month) in our study population. Comparison of symptomatic and asymptomatic patients, revealed that patients with persistent complaints were significantly younger, had shorter axial eye length with corresponding higher IOL power, and had higher best corrected postoperative visual acuity. There was no difference in the dimensions of the anterior chamber, pupil diameter and corneal shape (total cornea refractive power and spherical aberration). We recommend to actively ask about the presence of negative dysphotopsia in early postoperative period, as patients may benefit from early reassurance about the benign course of this phenomenon in most cases.

Chapter 3 describes the development of a negative dysphotopsia questionnaire. Negative dysphotopsia items were constructed based on focus group interviews, literature research and our clinical data of patients with negative dysphotopsia. These items were then added to the Quality of Vision Questionnaire of McAlinden, that was translated into a Dutch version. Subsequent Rasch analysis confirmed good psychometric properties and validity of the translated original version in patients wearing contact lenses, patients with cataract and after cataract surgery. An extended version of the questionnaire, including the negative dysphotopsia items, was tested in a population of pseudophakic patients and was also

successfully validated with Rasch analysis. A moderate positive correlation was found between best corrected visual acuity and the scores of both questionnaires. Patients with negative dysphotopsia had significantly lower quality of vision compared to pseudophakic patients without negative dysphotopsia. We suggest the application of the Dutch version of the original questionnaire and its extended version for evaluation of quality of vision inclusive negative dysphotopsia on interval scale.

In **Chapter 4**, we report that extension of peripheral visual field, measured either in photopic or scotopic conditions, did not significantly change after uncomplicated cataract surgery, although a tendency for a slightly smaller temporal visual field was noted in photopic conditions. In contrary, patients with negative dysphotopsia had a tendency for a smaller visual field as compared to asymptomatic patients, with a significant difference for the inferior temporal (by 10 degrees) and inferior nasal (by 6 degrees) quadrants. Two patterns of visual field changes have been described: constriction of visual field and a relative scotoma, that matched the subjective description of symptoms. We advise to include Goldman kinetic perimetry to the standard evaluation protocol of patients with negative dysphotopsia and for assessment of visual field changes after treatment.

In **Chapter 5**, we evaluate the effectivity of supplementary implantation of a sulcus-fixated intraocular lens as a treatment modality of negative dysphotopsia in a retrospective case series. Negative dysphotopsia resolved or improved in 78% of cases and no complications, such as iris chafing, inflammation or intraocular pressure rise were detected. In one patient the treatment was not effective and the supplementary IOL was removed without complications. We noted that implantation of a supplementary IOL can cause a small movement the primary IOL not leading to significant changes in spherical refraction equivalent. Thus, supplementary implantation of sulcus IOL is a safe and effective treatment strategy in patients with bothersome negative dysphotopsia.

In **Chapter 6**, we investigate a possible relationship between biometrical data and the treatment course of negative dysphotopsia after implantation of a supplementary intraocular lens. We did not see any relationship between resolution or persistence of negative dysphotopsia and age, axial eye length, anterior and posterior chamber dimensions and photopic pupil diameter. Remarkably, two patients without resolution of negative dysphotopsia had a larger angle kappa compared to patients in whom the symptoms were effectively treated. In 5 eyes visual fields were evaluated with kinetic perimetry. Changes herein corresponded

to the clinical course after treatment and confirmed the role of kinetic perimetry in the clinical evaluation and follow up of patients with negative dysphotopsia. Patient-specific optical modelling revealed a decrease in light irradiance at the periphery (60 to 70 degrees) relative to the centre of visual field (20 to 30 degrees) that improved after a supplementary IOL implantation. There was a tendency for a higher increase of irradiance in patients with complete resolution of the symptoms compared to patients that remained symptomatic, although this was present only during simulation with extreme small pupil aperture of 1.5 mm. Ray tracing patient specific modelling might assist our investigation of mechanisms of negative dysphotopsia in the future and provide strategies for optimization of treatment and options for prevention in individual cases.