SHORT-TERM VARIATIONS IN MACULAR THICKNESS IN SUBJECTS IMPLANTED WITH A CLEAR VS YELLOW INTRAOCULAR LENS

Chamorro E1, Bonnin-Arias C1, Aguirre Vila-Coro V1, Pérez-Carrasco MJ2, Álvarez-Rementeria L3, Armadá-Maresca F4, Sánchez-Ramos C1,2

1 Neuro-Computing and Neuro-Robotics Research Group (collaborator), Universidad Complutense de Madrid, Spain
2 Department of Optics, School of Optometry, Universidad Complutense de Madrid, Spain
3 Clínica Rementeria, Madrid, Spain
4 La Paz Hospital, Ophthalmology, Retina Department, Madrid Spain

INTRODUCTION

Following cataract surgery, the eye undergoes a drastic change in its transmittance properties. Thus, when the cataractous natural lens of a patient is removed during surgery and replaced with a clear intraocular lens (IOL), this natural transmittance barrier is also removed, and the high-energy short wavelengths of light (blue) are able to strike the retina. [1,2] The effects of yellow filters incorporated in the different IOls have been addressed in animal models and other experimental settings [3,4] The findings of these studies indicate that short-wavelength bands of light induce degenerative changes in the retina and that the use of a yellow filter is able to protect against this phototoxic damage by selecting the amount of light that reaches the retinal cells. Research so far has established that the different components of macular thickness change with age that lead to the reduced thickness of this structure with the passage of time. Using histological techniques on 55 eyes from human donors, Panda-Jonas et al [5] assessed the effect of age on retinal photoreceptor density and noted a 0.2-0.4% yearly loss of cells. In recent studies, more sophisticated techniques have been used. Thus, Aalamouit [6] examined 100 eyes of 100 subjects by OCT and reported that retinal thickness diminishes by 0.53 microns per year. Erkkson et al [7] used the StratusOCT in 134 eyes of 67 healthy subjects and detected a significant relationship between age and thickness reductions in all 9 zones of the macular thicknesses map. Depending on the macular region, these authors recorded differences of 0.26-0.46 microns per year in total retinal thickness. Despite these findings, no study has so far addressed the issue of whether this reduction in macular thickness that occurs with age could be enhanced by the phototoxic effects of light.

Purpose. To examine by optical coherence tomography (OCT) macular thickness variations produced over time in pseudophakic subjects with a clear intraocular lens (IOL) in one eye and a yellow IOL in the fellow eye.

MATERIALS AND METHODS

Methods: In each subject, macular thickness measurements were made in three separate sessions each 2 years apart (in 2006, 2008 and 2010). In sessions 1 and 2, macular thickness was determined by time-domain optical coherence tomography using the StratusOCT (Scan: Fast Macular Thickness). In session 3, we measured macular thickness by Fourier-domain optical coherence tomography using the CirrusOCT (Scan protocol: 512 x 128 Macular Cube).

The thicknesses of several macular zones (designated SO-superior outer, NO-nasal outer, IO-inferior outer, TO-temporal outer, SI-superior inner, NI-nasal inner, II-temporal inner) were automatically calculated by the OCT mapping software. From these measurements, an overall mean macular thickness (MeanMac) was calculated by an algorithm described by Paunescu in 2004 [8] (Fig. 3 and 4)

RESULTS

PHASE 1 (2006): Stratus OCT

PHASE 2 (2008): Stratus OCT

PHASE 3 (2010): Cirrus OCT

CONCLUSIONS

Our results indicate that over time, the changes in macular thickness produced in eyes implanted with a yellow IOL differ significantly from the variations that occur in eyes with a clear IOL. Although our study subjects showed similar macular thicknesses in the first examination for the two IOL types, at the end of the 4-year period, the eyes with a yellow IOL showed greater macular thicknesses than those implanted with a clear IOL.

This observation points to a protective effect of blue light-filtering intraocular lenses. Therefore, for the cataract surgery it must be selected a yellow IOL that will incorporate artificial pigmentation that simulate the protection of the lens. This will have the objective of compensating the natural barrier that has been eliminated during the cataract operation.

No public or private financial support was received

REFERENCES