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Presentation Abstract

Program#/Poster#:	813/D961
Abstract Title:	**Interferometric Measurements of Aberrations In Isolated Human Crystalline Lenses**
Presentation Start/End Time:	Sunday, May 01, 2011, 11:15 AM - 1:00 PM
Session Number:	132
Session Title:	Crystalline Lens, Presbyopia, Accommodation and Its Restoration
Location:	Hall B/C
Reviewing Code:	262 lens: IOL and crystalline lens optics -VI
Author Block:	*Eva Acosta*[1], *Christina Schwarz*[2], *Juan M. Bueno*[2], *Jose M. Marin*[3], *Pablo Artal*[2]. [1]Applied Physics, Univ of Santiago de Compostela, Santiago de Compostela, Spain; [2]Laboratorio de Optica, Universidad de Murcia, Murcia, Spain; [3]Servicio de Oftalmologia, Hospital Virgen de la Arrixaca, Murcia, Spain.
Keywords:	627 optical properties; 623 aberrations
Abstract Body:	**Purpose:** To analyze the nature of aberrations in isolated human crystalline lenses from interferometric measurements. Deviation from a symmetric model and the contribution of significant aberrations will be specifically studied. **Methods:** A custom-built point-diffraction interferometer (PDI) has been used to measure wavefront aberrations in a number of isolated crystalline lenses from human donors (ages ranging from 35 to 45). The PDI technique is based on recording the interference between a reference spherical beam generated by diffraction from a clear pinhole in a semitransparent coated plate and the beam under test focused in the vicinities of the pinhole. Crystalline lenses were kept within the ocular globe (without corneas) in a culture medium inside an appropriate container until analysis a few hours after post-mortem. For the measurements, lenses were excised and inserted in a glass cell with plane-parallel faces filled with the same culture medium. The lens anterior surface was illuminated with a monochromatic (633 nm) plane wave and several interferograms recorded with a CCD camera. Dark fringes of the interference patterns were tracked semi-automatically for direct fitting of phase to a minimum set of significant Zernike polynomials to reconstruct the

lenses' wavefront aberrations.
Results: For all tested lenses, the 36 Zernike polynomials which sum of radial and azimuthal frequency was equal to or smaller than 10 were significant in the fit. This means that even spherical aberration of order 10th was needed to accurate fit the interferometric data. Moreover, 4th order spherical aberration had negative values for all specimens, with a mean value of -0.6 wavelengths peak-to-valley. On average the contribution to total aberration of the non-rotational aberrations was smaller than 3 wavelengths peak-to-valley, being the dominant terms the second order astigmatism (2, ±2), and (4, ±2) as well as coma (3, ±1), (5, ±1), (7, ±1) and (9,±1). Trefoil and quadrafoil terms were required for accurate fits, but had a lower impact. Conversely, pentafoil terms (5, ±5) were non significant for the fit.
Conclusions: Wavefront aberrations of isolated human crystalline lenses have been measured within a root-mean-square error better than 0.2 wavelengths with an interferometric method. These results provide a better insight into the aberration structure of the human crystalline lens.

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