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## Wave-Aberrations in Light Adjustable Intraocular Lenses

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### Abstract

**Purpose:** To evaluate the high order aberrations in the eyes of patients implanted with light adjustable intraocular lenses (LALs), their stability and their potential impact in visual quality.**Methods:** Thirty seven cataract patients were implanted with LALs (Calhoun Vision, Pasadena, USA). Two weeks after surgery they were treated with different irradiation profiles to correct the remaining refractive error. Different irradiance patterns were used to correct (adjust) myopic, hyperopic defocus and astigmatism. Following the adjustment procedures, two photo-locking treatments were performed to insure that the LAL was fixed and remained stable. The wave-aberrations of the eye were measured using a Hartmann-Shack sensor. The aberrations associated to the anterior corneal surface were estimated from Placido-based corneal topography data using a ray-tracing procedure. The aberrations of the LALs were estimated by direct subtraction of those of the whole eye and the cornea, before and after each irradiance treatment, 3 and 6 months after the surgery. In all cases, aberrations were obtained for a 4-mm pupil diameter.**Results:** After the procedures were completed, the aberrations of the LALs remained stable over time. Measurements at 3 and 6 months follow-ups showed minor changes in the higher order aberrations (changes in root-mean squared (RMS) lower than 0.03 microns). Hyperopic and myopic astigmatism adjustments induced small amount of aberrations, below 0.07 microns of RMS. Myopic adjustment produced more aberrations (0.14 microns in average) mainly due to an induction of spherical aberration. Uncorrected visual acuity after the treatment was nearly 20/20 in average, i.e., not compromised by the presence of these aberrations.*This Article**Services*

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**Conclusions:** The aberrations in the adjustable intraocular lenses remained nearly constant up to 6 months post-surgery. This indicates that the shape and optical properties of the lenses were effectively fixed by the photo-locking treatments. The adjustment profiles induced quite small amounts of high order aberrations, except for the myopic treatment. These results indicate the future potential ability of LALs to effectively control the eye's aberrations, in addition to defocus and astigmatism, after cataract surgery.

**Keywords:** aberrations • intraocular lens



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