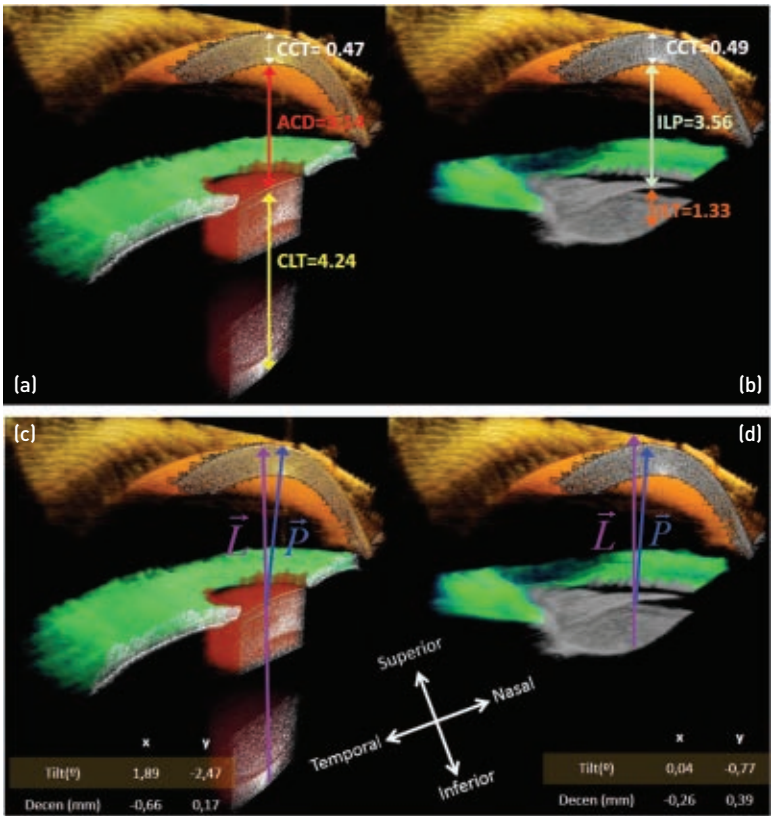
MEDICAL OPTICS

Eye Biometry Using Quantitatve 3-D OCT

Cataracts cause the crystalline lens of the eye to progressively lose its transparency, which decreases vision. It is one of the major causes of vision loss in our aging population. Modern cataract surgery involves the replacement of the cloudy lens with an intraocular lens (IOL). IOL designs are becoming more sophisticated, with benefits such as aspheric surfaces, multifocality, and the capability to change position or shape to restore accomodation. However, optical (and therefore visual) outcomes are often limited by the lack of unique measurements of anatomical ocular parameters for each individual, both pre- and post-operatively. In particular, we rely on the pre-operative ocular biometry to accurately determine the power of the IOL to be implanted in a patient. These biometric measurements could be dramatically improved by incorporating custom anterior and posterior corneal shape data and more accurate inter-ocular distances.

We used a laboratory-based spectral optical coherence tomography (SOCT) instrument with automatic custom image-processing algorithms to provide fully quantitative 3-D biometric data of the anterior segment of the eye before and after cataract surgery.[1,2] While previous studies provided biometry and IOL alignment using 1-D low coherenence interferometry, Purkinje or Scheimpflug imaging, our study allowed unbiased high-resolution measurements of interocular distances, full corneal shape and 3-D lens alignment.[3,4] This is a significant improvement in full *in vivo* anterior segment 3-D quantification with applications that will improve cataract surgery outcomes.[5] OPN



Biometry and decentration-tilt evaluation from 3-D anterior segment SOCT. (a) Pre-cataract surgery: central corneal thickness (white), anterior chamber depth (red) and central lens thickness (yellow). (b) Post-cataract surgery with IOL implantation: intraocular lens position (light green), and intraocular lens thickness (orange). (c) Pre-cataract surgery, and (d) post-cataract surgery with IOL implantation. Vector $\vec{P}$ (blue) is the pupillary axis, and $\vec{L}$ (purple) is the lens/IOL axis.

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Visit www.opnmagazine-digital.com to view the video that accompanies this article.

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