Performance of the 1CU accommodating intraocular lens in relation to capsulorhexis size

Luis G. Vargas, MD, Gerd U. Auffarth, MD, Klio A. Becker, MD, Tanja M. Rabsilber, MD, Mike P. Holzer, MD

Purpose: To assess the correlation between continuous curvilinear capsulorhexis (CCC) size and visual outcomes in patients with an accommodating intraocular lens (IOL).

Setting: Heidelberg IOL and Refractive Surgery Research Group, Department of Ophthalmology, Ruprecht-Karls-University of Heidelberg, Heidelberg, Germany.

Methods: Nineteen eyes had phacoemulsification and implantation of a 1CU accommodating IOL (HumanOptics AG). Three months after surgery, the uncorrected and best corrected distance and near visual acuities and the distance corrected near visual acuity were measured. Retroillumination photographs were taken to assess CCC size and centration and the amount of overlap between the CCC and IOL optic. The photographs were analyzed using Evaluation of Posterior Capsule Opacification system software.

Results: The mean age of the patients was 53.5 years (range 30 to 73 years). The mean uncorrected distance acuity improved from 0.05 preoperatively to 0.70 at 3 months and the best corrected near acuity, from 0.30 to 0.94. The mean postoperative distance corrected near acuity was 0.5 (range 0.1 to 1.0), which improved to 0.9 with near correction. The mean CCC size (4.3 mm) and amount of CCC decentration (0.35 mm) did not correlate with visual outcomes. However, there was a correlation between the amount of CCC–optic overlap (mean 35%; range 16% to 55%) and distance corrected near acuity ($r = 0.641$, $P = .003$). Distance corrected near acuity was better with less overlapping; that is, with a larger CCC.

Conclusions: A larger capsulorhexis with less CCC–optic overlapping gave better near visual outcomes. Results indicate that an overlap between 25% and 35%, which correlates with a CCC between 4.5 mm and 5.0 mm, provides the best capsule strength without compromising accommodation with the single-piece 1CU IOL.

J Cataract Refract Surg 2005; 31:363–368 © 2005 ASCRS and ESCRS

Accommodation is the ability of the eye to increase its refractive power to produce a clearer image at near. Helmholtz[1] showed that the classic mechanism of accommodation is achieved by contraction of the ciliary muscle. This releases the circumferential tension on the zonules, increasing the anterior–posterior lens surface curvature and thus the dioptric power. Glasser and Kaufman[2] confirmed this theory using ultrasound biomicroscopy and goniovideography. Contraction of the ciliary muscle also causes the pars plana and crystalline lens to move forward. The loss of accommodative amplitude (presbyopia) usually occurs after 40 years of age.

The development of accommodating intraocular lenses (IOLs) holds promise for the correction of presbyopia.[3,4] One theory of how these IOLs work is that the ciliary body directly causes forward vaulting of the IOL. Under this theory, the ciliary body presses on the lens or contraction of the ciliary muscle generates a pressure gradient between the aqueous and vitreous, causing anterior displacement of the lens–zonule diaphragm and steepening of anterior central lens curvature. Under these terms, we can define pseudophakic accommodation as the refractive change in the pseudophakic eye caused by interactions between the contracting ciliary muscle and the zonule–capsule–IOL

© 2005 ASCRS and ESCRS
Published by Elsevier Inc.

0886-3350/05/$-see front matter
doi:10.1016/j.jcrs.2004.02.071