It is interesting to note the significant disparity in the refractive outcome between the 2 series prior to adjusting the power of the light-adjustable IOL, which is performed 3 weeks postoperatively or later.

It is doubtful that such disparity is due to differences in surgical techniques, since both series use small-incision phacoemulsification, or difference in the timing of postoperative refraction between the 2 series. It is possible that the difference in the design of the IOLs could contribute to such disparity in the postoperative refractive outcome.

The light-adjustable IOL is a promising technology. However, it appears that there is still significant improvement to be made in attaining better refractive accuracy with this IOL, prior to adjusting the IOL power. With more accurate refractive outcome, less adjustment would be necessary.

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Reply: We appreciate Dr. Lam's comments about the promise of the light-adjustable IOL. This IOL allows the surgeon to correct residual spherical refractive error and astigmatism after cataract surgery noninvasively by shining a spatially profiled beam of ultraviolet (365 nm) light on the IOL.

In his letter, Dr. Lam expressed concern that only 52% of eyes were within ±0.50 D of emmetropia after implantation but before adjustment, less than the benchmark of 77% proposed by Hahn et al.,[1] which was published with an excellent and also critical editorial by Steinert.[2] In our study, the comparatively low percentage of eyes with ± 0.50 D of emmetrophia short term after surgery but before the necessary light adjustment/lock-in procedure was intentional. The accuracy of the refractive error adjustment is slightly better for hyperopic errors than for myopic errors, so surgeons using the light-adjustable IOL are trained to target a refractive outcome of ±0.50 D after the cataract surgery. The accuracy of the light-adjustable IOL would be more appropriately judged as the percentage of eyes between plano and ±1.00 D, but that piece of data was not analyzed in the report.

Of course, the important refractive result in assessing any IOL is not the refractive outcome 1 month after surgery but the outcome at the point of stability. At the point of stability, 96% of eyes treated with the light-adjustable IOL achieved a refraction within ±0.50 D of the intended spherical equivalent and an uncorrected distance visual acuity of 0.8,[3] an outcome superior to Dr. Lam's proposed benchmark.—*H. Burkhard Dick, MD, Ina Conrad-Hengerer, MD, Fritz Hengerer, MD, Wolfgang Haigis, PhD*

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Other factors in PCO prevention

In their recent article,[1] Kavoussi et al. hypothesized that capsular bag clarity may be due to constant irrigation of the capsular bag compartment by the aqueous humor, which may contain factors that stabilize residual lens epithelial cells (LECs). This hypothesis appears to need further consideration.

For residual LECs to proliferate, a stimulus is needed, eg, contact with the intraocular lens (IOL) or posterior capsule, whereby various cytokines (interleukin-1 [IL-1],[2] fibroblast growth factor, epidermal growth factor) that act in an autocrine and paracrine manner to stimulate proliferation are produced.

Consider 2 concepts:

1. No contact, no proliferation: In cell cultures, the LECs with anterior capsules proliferate first when they come into contact with the well bottom. They never proliferate in a floating condition in culture media. Our experience has shown that frequent culture medium exchange prevents LECs from settling on the well bottom. This contact avoidance is analogous to the open-capsule condition. With no contact, there may be no stimulation and therefore no corresponding cytokine production within LECs; ie, no proliferation.
2. Insufficient cytokine concentration: In cell cultures, when a well is too large relative to the initial LEC population used or even with a small well, when culture media are exchanged frequently, LECs hardly grow, although they have contact with the well bottom. These observations indicate that LECs require a certain concentration of cytokines

in their environment for their proliferation. Analogously, in an open capsule, the aqueous flow dilutes and removes the cytokines produced by the LECs by reducing the concentration to such a low level that the threshold for stimulating LEC proliferation is not attained.

Thus, in addition to "sharp edges," the important axiom for the prevention of anterior capsule opacification and PCO is, Do not let LECs come in contact with any intraocular tissues.

An IOL design with the capsule open, where the optic and haptic are suspended without touch to the anterior or posterior capsule, making LECs and their cytokines physiologically impotent, awaits our imaginative skills. Anticytokines such as IL-1 receptor antagonist[3] may also help prevent LEC proliferation.

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Reply: In our article, we advanced the hypothesis that IOL designs maintaining an open or expanded capsular bag are associated with bag clarity and that constant irrigation of the capsular bag inner compartment by the aqueous humor may play an important role in this finding.[A] Dr. Nishi highlights that the lack of contact between LECs and the IOL helps prevent LEC proliferation. Indeed, in cadaver eye studies, we have observed that anterior capsule opacification (ACO) and fibrosis tend to occur in areas where the anterior capsule comes in contact with the IOL optic, which accounts for large amounts of ACO developing with plate silicone IOLs.[1,2] Also, an IOL strategy to prevent ACO involves design features that prevent significant contact between the anterior capsule and the optic surface, which has been incorporated in at least 2 IOL designs: the Concept 360 (Corneal Laboratoire) and the Synchrony (Visiogen/Abbott Medical Optics, Inc.).[3,4] Dr. Nishi also highlights that constant irrigation by the aqueous humor prevents cytokines that may be involved in stimulating LEC proliferation from reaching a threshold concentration level within the bag compartment. According to previous work by Dr. Nishi and coauthors, one such cytokine is IL-1.[5,6]

We continue to evaluate modifications of the design described in our publication; the modifications include features that allow variable degrees of irrigation of the inner compartment of the capsular bag by the aqueous humor. It would also be interesting to evaluate a combination of these design features and IOL materials with the potential to release anticytokines after implantation. The concept of an expanded capsular bag certainly warrants further research.—*Liliana Werner, MD, PhD, Nick Mamalis, MD, Shaheen C. Kavoussi, MD*

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OTHER CITED MATERIAL

A. Werner L, "IOL Designs Maintaining an Open or Expanded Capsular Bag," presented at the XXVIII Congress of the European Society of Cataract and Refractive Surgeons, Paris, France, September 2010

Advantages of bevel-down technique

The study by Kim et al.[1] comparing bevel-down phacoemulsification and bevel-up phacoemulsification is seriously flawed because of the use of bevel-down sculpting. Sculpting is essentially a shaving technique and to do bevel-down shaving is the equivalent of using a snow plow with the plow attached to the vehicle backward.

Bevel-down phacoemulsification has several advantages for chopping techniques. All the energy is directed toward the cataract; none is directed toward