

# Capsular Complications With an Accommodating Lens

Preventing and managing capsular contraction with the Crystalens Five-O.

BY JACK A. SINGER, MD

I believe that the Crystalens Five-O (Bausch & Lomb, Rochester, NY) has a multifactorial mechanism of action. It includes forward movement of the lens during accommodation that is secondary not only to direct anterior tilting of the ciliary muscle, but also to vitreous pressure. Accommodative arching, as described by Kevin Waltz, MD, induces negative spherical aberration and coma, which increase depth of focus.<sup>1</sup> Astigmatism increases in most cases, likely secondary to some tilting of the lens or asymmetric changes in its central anterior shape. The flipside of this accommodative movement and arching can adversely affect vision when the IOL moves, arches, and vaults in unwanted ways due to contraction of the capsular bag. The Crystalens Five-O is much more resistant (but not immune) to capsular contraction syndrome than its smaller predecessor, the AT45SE, particularly in patients under 60 years of age and those with compromised zonular integrity.

## ASYMMETRIC VAULTING WITH CONTRACTION OF THE CAPSULORHEXIS

A 36-year-old female with a history of blunt head trauma from an automobile accident developed poste-

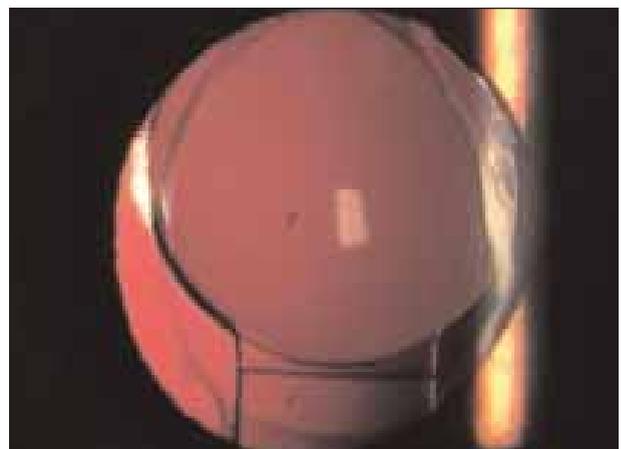
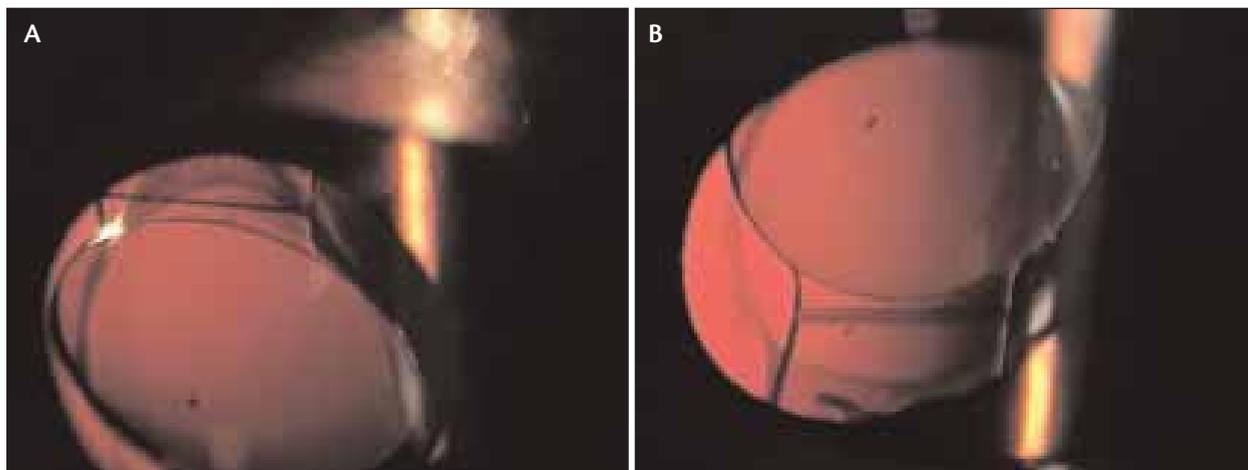


Figure 1. Crystalens Five-O with asymmetric vaulting secondary to contractile fibrosis and ovalization of the capsulorhexis.

rior subcapsular cataracts with mild zonular dehiscence. She underwent phacoemulsification in her left eye with implantation of the Crystalens Five-O. Three weeks postoperatively, she developed symptoms of blurred vision and an inferior crescent, and her surgeon implanted a capsular tension ring (CTR) without rotating



**Figure 2.** Upgaze showed excessive posterior vaulting of the superior plate haptic (A). Downgaze showed excessive anterior vaulting of the inferior plate haptic (B).



**Figure 3.** The surgeon enlarged the anterior capsulotomy by excising the contractile fibrous band with Duet intraocular forceps and scissors.

the IOL. The patients' symptoms returned 2 hours after the CTR's implantation.

Six weeks postoperatively, the patient presented to me with uncorrected distance vision of 20/30, uncorrected near vision of J8, and a BCVA of 20/20 with a refraction of  $-0.75 +1.50 \times 78$ . I found asymmetric vaulting of the Crystalens Five-O with contractile fibrosis and ovalization of the capsulorhexis<sup>2</sup> (Figure 1). The superior plate haptic had excessive posterior vaulting (Figure 2A), and the inferior plate haptic had excessive anterior vaulting (Figure 2B).

Early capsular contraction with atypical vaulting of the IOL can usually be treated with a YAG laser posterior and/or anterior capsulotomy, which relieves tension in the capsule and reduces stress on the IOL. In this case, the CTR was insufficient to withstand the force of



**Figure 4.** The surgeon piggybacked a model AQ5010V three-piece IOL in the ciliary sulcus over the repositioned Crystalens Five-O and a CTR.

the contractile anterior capsular fibrosis in the face of zonular dehiscence. The patient wanted to keep her accommodating IOL, if possible, so I attempted a surgical solution.

Viscodissection with Healon GV (Advanced Medical Optics, Inc., Santa Ana, CA) opened the capsular bag, and I used a Sinsky hook to tease out the IOL's four polyimide loops while applying counter traction on the anterior capsule with an iris retractor. I temporarily moved the Crystalens, once freed, into the anterior chamber. I instilled additional Healon GV to inflate the capsular bag and maintain the anterior chamber, while I enlarged the anterior capsulotomy by excising the contractile fibrous band with the Duet intraocular forceps and scissors (MicroSurgical Technology, Redmond, WA) (Figure 3). In order to keep it vaulted posteriorly, the

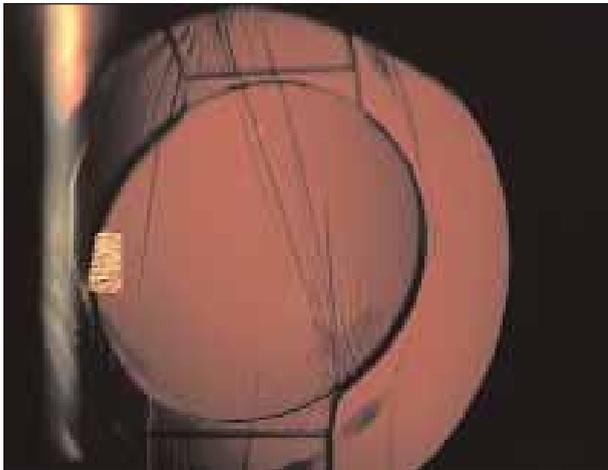


Figure 5. A Crystalens Five-O with asymmetric vaulting and retraction of the capsulorhexis. The superior plate haptic had excessive anterior vaulting with the hinge located anterior to the iris plane. The inferior plate had excessive posterior vaulting.

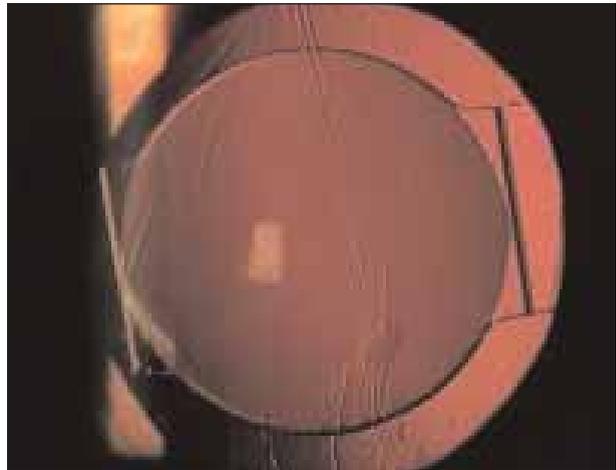


Figure 6. A repositioned Crystalens Five-O with a CTR and posterior capsular folds.

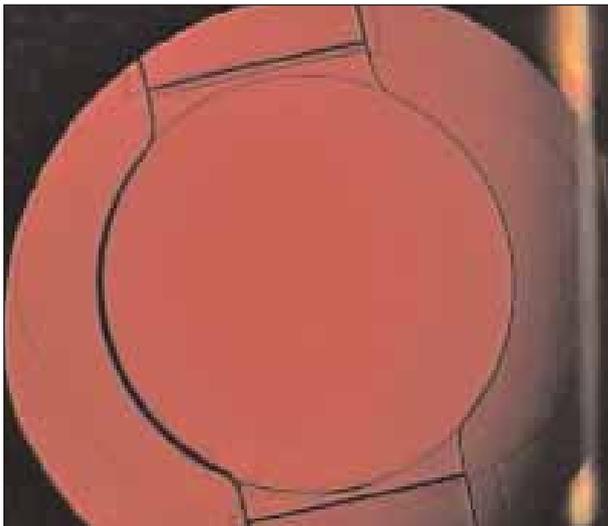


Figure 7. The surgeon created a 6 X 7-mm capsulorhexis through which to implant the Crystalens Five-O.

Crystalens was placed underneath the CTR and oriented to give maximal clearance between the sides of the optic and the anterior capsule, which happened to be perpendicular to its original position.

Proper posterior vaulting of the Crystalens was restored, but the refraction turned out to be hyperopic by +1.75 D (20/15), because the lens was located behind the CTR. I implanted a +3.00 D AQ5010V three-piece IOL (STAAR Surgical Company, Monrovia, CA) in a piggyback fashion in the ciliary sulcus (Figure 4). Fourteen months after this procedure, the Crystalens Five-O remains well positioned. The patient has uncor-



Figure 8. Shepherd Capsule Polishers.

rected distance vision of 20/20, uncorrected intermediate vision of 20/16, uncorrected near vision of J1, and a manifest refraction of -0.50 +0.25 X 57.

## ASYMMETRIC VAULTING WITH RETRACTION OF THE CAPSULORHEXIS

A 48-year-old female was referred to me by her surgeon 2 months after she underwent phacoemulsification with implantation of the Crystalens Five-O. She had experienced a myopic shift of -1.50 D sphere, and there was asymmetric vaulting of the IOL. The superior plate haptic had excessive anterior vaulting with the hinge located anterior to the iris plane, and the inferior plate had excessive posterior vaulting (Figure 5). The anterior capsulotomy was retracted superiorly, almost up to the distal end of the plate haptic, and gonioscopy showed the superior loops to be covered with a small amount of fibrotic anterior capsule. Her surgeon report-

ed that the anterior capsule had originally overlapped the plate haptic up to the hinge. The posterior capsule was intact with folds radiating from behind the superior haptic.

After opening the capsular bag via viscodissection with Healon GV, I implanted a CTR through a 1-mm sideport incision. I freed the four polyimide loops, cleaned the capsule with ultrasonic I/A using gravity-powered outflow (Surgical Design Corp., Armonk, NY), rotated the IOL horizontally, and placed it behind the CTR. The lens vaulted symmetrically posteriorly such that there was adequate anterior capsular overlap of the plate haptics and a sufficient gap between the capsulorhexis and the sides of the optic. The patient's UCVA was 20/15 at distance and J6 at near 8 days postoperatively (Figure 6). Her near vision should improve over time.

## THE PREVENTION OF CAPSULAR CONTRACTION

Capsular contraction syndrome, reported in 1993 by Davison<sup>3</sup> and by Hanson et al<sup>4</sup> is a complication of the continuous curvilinear capsulorhexis with an exaggerated reduction in the equatorial diameter of the capsular bag. Histologically, lens epithelial cells line the internal surface of the anterior capsule and capsular fornix. Pathologically, these cuboidal epithelial cells can undergo metaplasia with myofibroblastic transformation. The altered cells contain smooth muscle actin, and contraction occurs in the resultant fibrous membrane. Eradicating most of these cells will therefore help to prevent capsular contraction syndrome. This step can be accomplished in two basic ways: (1) removing a greater portion of the anterior capsule by making a large anterior capsulotomy and (2) meticulous cleaning of the anterior capsule and capsular fornix.

In a presentation at the 2008 annual meeting of the ASCRS, I demonstrated the effects of making a 6 X 7-mm capsulorhexis (Figure 7) in combination with the removal of lens epithelial cells using an ultrasonic I/A tip and Shepherd Capsule Polishers (Momentum Medical, Inc., Tampa, FL) (Figure 8). Of 100 eyes, none showed even the slightest contraction of the anterior capsulotomy (based on slit-lamp photographs), and the mean change in refraction between 1 to 3 weeks and 4 to 6 months was only 0.08 D.<sup>5</sup>

In his presentation during the 2008 ASCRS Innovators Award Session, David Apple, MD, showed postmortem specimens of three-piece AcrySof IOLs (Alcon Laboratories, Inc., Fort Worth, TX) with extensive proliferation of lens epithelial cells around the haptics and behind the optic in more than 50% of the eyes.<sup>6</sup> Earlier published reports of the rate of posterior capsular opacification

(PCO) with this IOL were as low as 3%.<sup>7</sup> Claiming that "cadavers never lie," Dr. Apple stated, "It is not a matter of if PCO will happen; it is a matter of when PCO will happen. LECs [lens epithelial cells] retained in the capsule bag continue living and proliferate, and will form a Soemmering's ring, which is a precursor to PCO." Dr. Apple showed post-mortem specimens in which proliferating lens epithelial cells were displacing the loops and/or optic of the AcrySof IOLs. He concluded, "Stable and long-term fixation of refractive IOLs in the capsular bag will require extensive cleanup or eradication of LECs from the lens capsule. This will be particularly important for accommodating IOLs."<sup>6</sup> My 5.5 years of experience with the Crystalens Five-O and AT-45SE implants along with the removal of lens epithelial cells (using a combination of ultrasonic I/A with gravity-powered outflow and Shepherd Capsule Polishers) has borne out Dr. Apple's prediction ■.

*A video of the first case presentation from this article is available at <http://www.signalz.net/singereye/Brandie-ASCRS-Singer.wmv>.*

*Jack A. Singer, MD, is in private practice at Singer Eye Center in Randolph, Vermont. He is a paid consultant to Bausch & Lomb and Surgical Design and a former shareholder of Eyeonics' stock. Dr. Singer may be reached at (802) 728-9993.*



1. Waltz K. Accommodative arching of the natural lens and the Crystalens IOL. Paper presented at: The ASCRS Symposium on Cataract, IOL and Refractive Surgery; March 19, 2006; San Francisco, CA.
2. Singer J. Asymmetric vaulting of Crystalens AT50SE following phaco of traumatic cataract and secondary CTR implantation in a 32-year old. Paper presented at: The ASCRS Symposium on Cataract, IOL and Refractive Surgery; April 7, 2008; Chicago, IL.
3. Davison JA. Capsule contraction syndrome. *J Cataract Refract Surg.* 1993;19:582-589.
4. Hanson S, Crandall A, Olson R. Progressive constriction of the anterior capsular opening following intact capsulorhexis. *J Cataract Refract Surg.* 1993;19:77-82.
5. Singer J. Stability of capsulorhexis size and refraction following Crystalens Five-O implantation with anterior capsule lens epithelial cell removal. Paper presented at: The ASCRS Symposium on Cataract, IOL and Refractive Surgery; April 6, 2008; Chicago, IL.
6. Apple DJ. Eradication and cleanup of lens substance and LECs: providing stable and long-term fixation of specialized IOLs in the capsular bag. Paper presented at: The ASCRS Symposium on Cataract, IOL and Refractive Surgery; April 7, 2008; Chicago, IL.
7. Prosdocimo G, Tassinari G, Sala M, et al. Posterior capsule opacification after phacoemulsification: silicone CeeOn Edge versus acrylate AcrySof intraocular lens. *J Cataract Refract Surg.* 2003;29(8):1551-1555.

## SHARE YOUR FEEDBACK

Would you like to comment on an author's article? Do you have an article topic to suggest? Do you wish to tell us how valuable *CRSToday* is to your practice? We would love to hear from you. Please e-mail us at [letters@bmctoday.com](mailto:letters@bmctoday.com) with any thoughts, feelings, or questions you have regarding this publication.