

IOL Selection for the Weakened Capsular Bag

Certain designs and materials may be preferable for pseudoexfoliation.

BY DAVID F. CHANG, MD

Devices designed to help stabilize the loosened capsular bag during phacoemulsification include (1) capsular tension rings (CTRs; Morcher GmbH, Stuttgart, Germany [distrib-

uted in the US by FCI Ophthalmics, Inc., Marshfield Hills, MA], and OPHTEC, Groningen, the Netherlands), (2) the Ahmed capsular tension segment (Morcher GmbH), and (3) capsule retractors such as the Mackool Cataract Support System (Duckworth & Kent Ltd., Hertfordshire, England, and Impex, Staten Island, NY).

Thanks to these devices and to techniques such as phaco chop, surgeons are frequently able to preserve the capsular bag despite the multiple challenges posed by weakened zonules. The surgeon, however, is then faced with a new set of decisions. Is the capsular bag suitable for the long-term support of an IOL? Which IOL should be used? Is a CTR or other implantable device, such as a Cionni modified CTR (Morcher GmbH), neces-

sary? The same questions must be considered for all eyes with pseudoexfoliation (PXF) in light of the increasing incidence of late, spontaneous dislocation of the capsular bag.¹⁻⁴

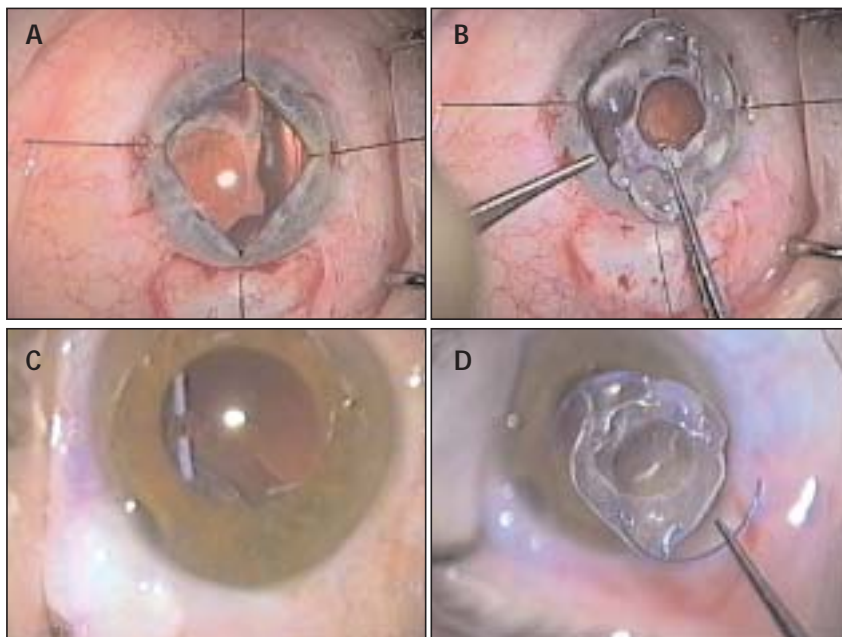


Figure 1. After late posterior dislocation of a bag with a PMMA IOL (A), the explanted bag-IOL complex showed capsulorhexis contraction and the Soemmering's ring (B). Following late posterior dislocation of a capsular bag with a silicone IOL (C), the explanted bag-IOL complex showed capsulorhexis contraction (D).

SPONTANEOUS DISLOCATION OF THE CAPSULAR BAG

At the 2000 Annual Meeting of the AAO, Mamalis et al¹ reported their initial series of nine patients with PXF who presented with late, spontaneous dislocation of the capsular bag. These dislocations occurred between 5 and 10 years after the original surgery. The investigators' case series comprised eight PMMA IOLs and one plate haptic silicone IOL, and it was published in *Ophthalmology* 1 year later.² I reported on two cases of spontaneous dislocation in PXF patients with three-piece silicone IOLs.³ At the 2002 AAO Annual Meeting Spotlight on Cataracts Symposium, Alan Crandall, MD, of Salt Lake City updated his series, which numbered 19 patients at that time.⁴

I was impressed by the contraction of the capsulorhexis in the four patients whom I have managed with this complication. I was the primary surgeon for three of them (Figure 1). Exaggerated contraction of the capsulorhexis is usually an indication of weak zonules.⁵⁻⁷ It also seems likely, however, that capsulophimosis and extensive anterior capsular fibrosis exerted excessive centripetal strain on the already weakened zonules in these eyes.

Given that the capsulorhexis technique was not widely adopted until the early 1990s, and considering the 5- to 10-year latency for this complication, it makes sense that we surgeons are seeing an increasing frequency and growing awareness of this complication during the past few years. In assessing the risk of delayed spontaneous bag dislocation in PXF, however, what is not known is the denominator. Complicating any evaluation of preventive measures is the fact that dislocation may take more than 10 years to occur. Nonetheless, I believe it is possible to make rational choices based upon our current knowledge of IOL design and materials.

CTRs AND PXF

Does every patient with PXF require a CTR? This decision is controversial, and the extent of zonular deficiency should be a determinant. Significant zonular

weakness would certainly be a reasonable indication for a CTR. Many PXF patients, however, exhibit no intraoperative evidence of zonular laxity, and I do not think that a CTR is necessary in such cases. Nevertheless, there are several surgical and IOL design objectives that make sense for any patient with PXF.

Thorough cortical cleanup is especially important in PXF eyes. Although the circumferential anterior capsular overlap of the optic edge is desirable, an excessively small-diameter capsulorhexis must be avoided in these patients. IOLs with optic diameters smaller than 6 mm should be avoided for this reason. Following IOL implantation, a small capsulorhexis can be secondarily enlarged if necessary. After obliquely cutting one edge with a long Vannas scissors, I re-tear the opening under viscoelastic.

Because hydrophobic acrylic IOLs are associated with less anterior capsular fibrosis when compared with silicone lenses,^{8,9} I believe that the former material is preferable for PXF eyes. Three-piece lens designs with broad, stiff PMMA haptics are able to exert the maximum centrifugal tension against the capsular fornices. They are preferable to the soft, floppy single-piece haptics for this reason. At the most recent AAO Annual Meeting, Da Reitz Pereira et al¹⁰ reported on a large ret-

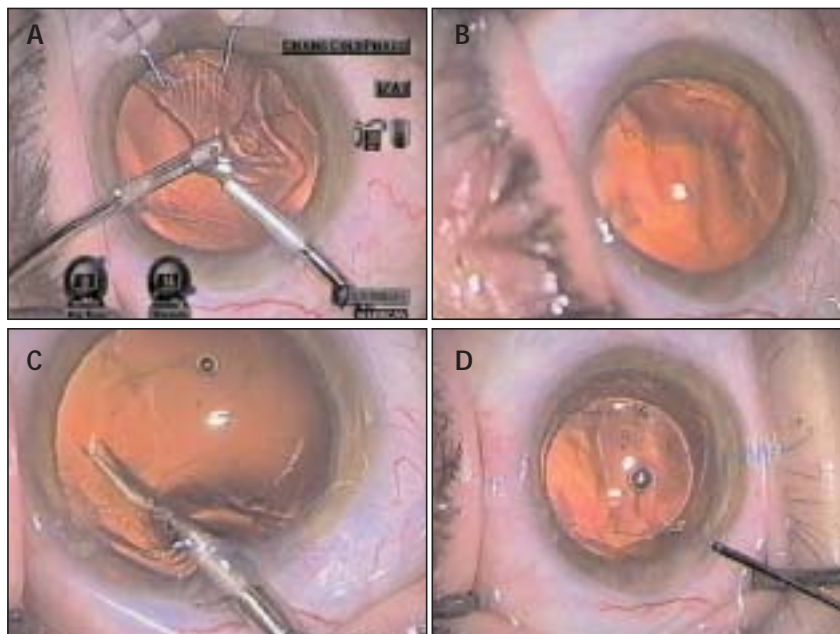


Figure 2. Mackool capsule retractors supported a nasal area of large zonular dialysis during bimanual cortical I/A (A). Despite the preservation of the capsular bag, a large nasal zonular dialysis was visible after the removal of the capsule retractors (B). The surgeon used long Vannas scissors to make multiple radial cuts in the nasal capsulorhexis edge (C). The surgeon placed a 13.5-mm-long, foldable silicone IOL in the sulcus, with the haptic axis oriented 90° from the zonular defect (D).

rospective study comparing the single-piece and three-piece AcrySof IOLs (Alcon Laboratories, Inc., Fort Worth, TX). With a single surgeon and identical capsulorhexis sizing, the single-piece AcrySof group demonstrated a significantly higher incidence of capsular contraction syndrome. Three percent of the single-piece AcrySof group required a YAG anterior capsulotomy for this condition versus none of the three-piece group. One should probably avoid silicone plate haptic IOLs in PXF eyes, because of these lenses' haptic design and higher tendency for anterior capsular fibrosis.

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Finally, one should specifically examine the anterior capsular reaction at the final 1-month postoperative visit in patients with PXF. If there already are signs of early contracture and fibrosis, prophylactic YAG relaxing cuts in the capsulorhexis edge should be considered.

In any eye in which the surgeon notes intraoperative signs of zonular laxity, the placement of a CTR is prudent. The goals would be to (1) prevent capsulophimosis, (2) reduce centripetal zonular stress by resisting capsulorhexis contraction, and (3) avoid IOL decentration caused by asymmetric capsular fibrosis. There are numerous situations, however, where a CTR alone might not afford sufficient long-term capsular support. Such cases include eyes with a large zonular dialysis or severe, diffuse circumferential weakness. It is for these eyes that the Cionni modified CTR or the Ahmed capsular tension segment were designed. Unfortunately, neither device is currently FDA-approved in the US.

If a CTR is not available, there are other options to consider. As an alternative to enlarging a small-diameter capsulorhexis, one could make relaxing incisions in the capsulorhexis edge after placing the IOL in the bag. With a temporal incision, I would orient the haptics along the horizontal axis (3- to 9-o'clock position) and make two opposing cuts in the capsulorhexis edge superiorly and inferiorly (12- and 6-o'clock positions). The cuts should not extend too far peripherally, because they merely need to prevent the sphincter-like contraction of the capsulorhexis margin.

Finally, one could place the IOL in the sulcus (Figure 2). The sulcus diameter can be estimated by adding 1.5 mm to the white-to-white horizontal corneal diameter. Thus, the typical foldable IOL of 13 mm in overall length is too

short for a corneal diameter of 12 mm or greater. STAAR Surgical Company (Monrovia, CA) makes a 13.5-mm foldable silicone IOL (model AQ 2010 V) that is my preference for sulcus placement. The IOL power should be reduced by 0.50 to 1.00 D from that calculated for capsular bag placement.¹¹ The single-piece AcrySof is not only too short for sulcus placement, but it has thicker, sharp-edged haptics that can cause pigment dispersion. If sulcus placement is elected because of a severe zonular dialysis, one should consider making multiple relaxing cuts in the capsulorhexis edge to avoid extensive and asymmetric bag contracture with avulsion of the remaining hemisphere of weak zonules.

CONCLUSION

Whereas excellent results may be obtained with a wide range of IOL materials and designs in routine cases, eyes with weak zonules are at greater risk for delayed IOL subluxation, dislocation, and capsulophimosis. Surgeons should strive to minimize anterior capsular fibrosis and capsulorhexis contraction through a combination of surgical technique and IOL selection. ■

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