

Preventing Complications in Eyes With Pseudoexfoliation

How to prepare and deal with these complicated cataracts.

BY BRADFORD J. SHINGLETON, MD

Cataract surgeons must address four key areas in order to prevent or minimize complications in eyes with pseudoexfoliation (PXF): IOP, phaco techniques, the IOL's selection and fixation, and postoperative capsular contraction.¹ This article reviews each of these areas in sequence to provide a guide to surgery in these challenging cases (Figure 1).

IOP

PXF is the most common identifiable cause of open-angle glaucoma (OAG).² Roughly 20% of cases of this disease are associated with PXF, and approximately 30% to 50% of patients with PXF develop glaucoma. Surgeons have come to recognize that uncomplicated phacoemulsification has a beneficial effect on IOP in eyes with OAG, and this effect extends to eyes with PXF.

In a series of more than 1,000 eyes,³ my coinvestigators and I found that a long-term reduction in IOP occurs in PXF eyes without glaucoma. PXF eyes with glaucoma also experienced a significant decrease in IOP for up to 3 years postoperatively, and patients required fewer glaucoma medications after surgery for up to 7 years. Of particular importance is that high preoperative IOP is associated with a greater IOP reduction. Despite the beneficial effects of phacoemulsification on long-term IOP control, PXF eyes may have a significant increase in IOP during the early postoperative phase. We found that 4% of PXF eyes without glaucoma developed IOP spikes of greater than 30 mm Hg on the first postoperative day. Seventeen percent of eyes with PXF glaucoma had a similar elevation in IOP, which must be taken into consideration in eyes with significant cupping of the optic nerve or visual field loss.

IMPACT OF PXF

The effect of PXF on cataract surgery is well documented. Early reports⁴ showed a five- to 10-fold increase in sur-

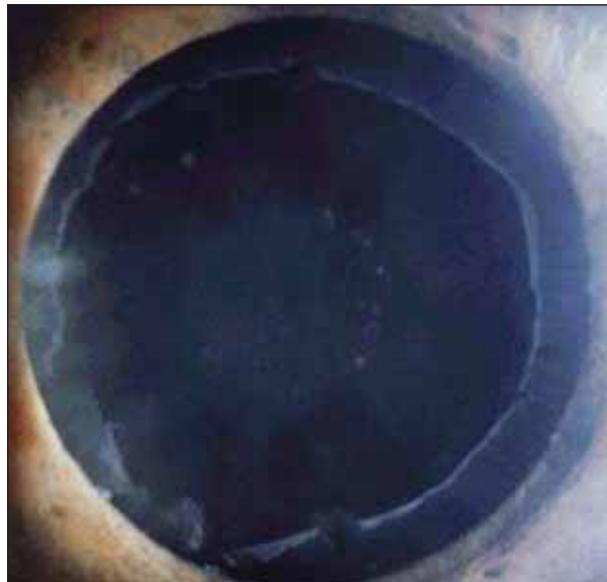


Figure 1. Prominent PXF material on the anterior capsule of the eye.

gical complications with cataract surgery in eyes that have PXF. More recent studies have found a reduction in this rate of complications, but there is no question that the PXF eye presents special challenges for the cataract surgeon. Two pathologic manifestations of PXF, poor pupillary dilation and zonular weakness, are the most important risk factors for surgical complications.¹ Other problems can occur intraoperatively, however, including a shallow anterior chamber, positive intraoperative pressure, vitreous prolapse, capsular fragility, and dropped nuclei. In addition to the IOP spike mentioned earlier, other complications are more common in eyes with PXF. These problems include corneal edema, aqueous flare, deposits on the IOL, cystoid macular edema, anterior capsular con-

traction (phimosis), posterior capsular opacification, and subluxation/dislocation of the IOL. In order to minimize intraoperative surgical complications, a careful preoperative evaluation is critical.

Ophthalmologists should carry out a detailed search for direct and indirect signs of zonular instability, which may be subtle and manifest only by minimal iridodonesis. Asymmetry in the depth of the anterior chamber is a critical sign and should be assessed within each PXF eye and between eyes. In PXF, eyes with zonular instability may have either a shallow or a hyperdeep anterior chamber compared with the contralateral eye, and they may demonstrate asymmetry in depth between quadrants within a given eye. The presence of phacodonesis confirms zonular instability, and frank subluxation is easily identified with a well-dilated pupil. In eyes with a small pupil, clinicians can occasionally observe subtle subluxation of the lens by noting an eccentric position of the central nucleus.

Increasing age, greater nuclear density, and a reduced pupillary size may be associated with zonular problems intraoperatively. It is important to note that the amount of PXF material present does not correlate with zonular instability. In a recent study on complicated surgery in PXF eyes, my colleagues and I found that 2.5% of eyes with asymmetry in anterior chamber depth required a vitrectomy in the setting of zonular weakness. Of greater importance is that a history of complicated surgery in the fellow eye or the presence of frank lens subluxation increased the rate of vitrectomy to approximately 50%.⁵

PHACO TECHNIQUES

Intraoperative problems related to weak zonules can be minimized with careful attention to surgical detail.¹ The following points deserve particular attention.

Capsulorhexis

A well-centered and appropriately sized continuous curvilinear capsulorhexis is critical for safe phacoemulsification in the presence of zonular weakness. A capsulorhexis that is too small can make phacoemulsification more difficult because of limited access to the nucleus. A capsulorhexis that is too large may compromise the use of devices to support the capsule. I recommend a capsulorhexis of 5 to 5.5 mm in diameter.

An important intraoperative sign of zonular weakness is the appearance of prominent radiating striae at the site of puncture upon initiation of the capsulorhexis (Figure 2). A very sharp needle puncture or bimanual capsular fixation may facilitate the start and completion of the capsulorhexis without extending the tear to the capsule's periphery.

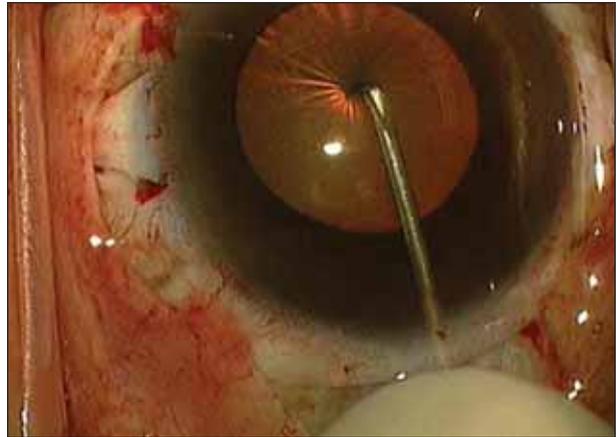


Figure 2. Radiating striae in the anterior capsule of an eye with PXF and weak zonules.

Hydrodissection and Hydrodelineation

Hydrodissection is essential to enhancing nuclear rotation. All efforts should be made to achieve free and complete rotation of the lens within the capsular bag. Free rotation minimizes transmitted stress to the zonules during phacoemulsification as well as the extension of aspiration forces to the capsular fornix. Viscodissection with an ophthalmic viscosurgical device can also facilitate cortical-capsular cleavage and subsequent epinuclear and cortical removal.

Phacoemulsification and Cortical Removal

Current-generation phaco technology using enhanced power, flow, and vacuum modulation has greatly improved surgical results in PXF eyes. It is important to keep the area of emulsification in the central pupillary zone and away from the capsular fornix. Bimanual rotation of the nucleus will also minimize the transmission of mechanical forces to the zonular platform. I favor a chopping technique in the setting of a freely rotating nucleus. This technique is also well suited to eyes with small pupils.

Capsular instability may become apparent when cortical removal from the capsular equator is difficult. Tangential stripping of cortex can often help the surgeon to remove recalcitrant cortex in this circumstance. Capsular instability may also present with radiating posterior capsular striae and significant flux in the capsule's position. During phacoemulsification and cortical removal, it is particularly important to maintain a stable anterior chamber without shallowing or excessive deepening. It may be useful to enter the eye while the height of the infusion bottle is low to minimize retrodisplacement of the lens-iris diaphragm.

Due to zonular damage, PXF eyes are at risk for intraoperative aqueous misdirection. This problem typically pres-

ents with progressive shallowing of the anterior chamber and positive pressure during the procedure. In these circumstances, the placement of a dispersive ophthalmic viscosurgical device around the capsular equator or the use of a capsular tension ring (CTR) is often helpful. Some patients may benefit from a posterior sclerotomy and vitreous tap to achieve satisfactory intraoperative deepening of the chamber.

Zonular Instability and a Small Pupil

A host of adjunctive devices may be used to manage zonular instability and a small pupil. Michael Snyder, MD, addresses several within this issue of *Cataract & Refractive Surgery Today* (see page 32). To manage a small pupil, I favor the use of iris hooks or expanding devices such as the Malyugin Ring (MicroSurgical Technology, Redmond, WA). These tectonic support systems provide an adequately sized and contoured pupil with minimal manipulation.

Capsular Support Systems

Capsule retractors, CTRs, modified sutured CTRs, and capsular tension segments are all helpful adjuncts when stabilizing a weak zonular apparatus. I use all of these devices on a regular basis when performing cataract surgery on PXF eyes, and their use is detailed by Dr. Snyder in his article.

TECHNIQUES FOR SELECTING AND FIXATING THE IOL

I prefer to fixate a PCIOL within an intact capsular bag, but doing so requires an adequately stable capsule. When the capsule is unstable, even with adjunctive support systems, then other forms of IOL fixation are appropriate. In this situation, I may consider sulcus fixation with IOL capture. Capturing the IOL is important to minimize the chance of its displacement postoperatively through an area of zonular dehiscence. Additional options include the implantation of an ACIOL, an iris- or scleral-sutured PCIOL, and iris enclavation of an iris-sutured IOL. Even in eyes with PXF OAG, current-generation tripod or quadri-pod ACIOLs are not contraindicated.

The choice of IOL material should be based on biocompatibility and capsular compatibility. All modern IOL materials appear to have excellent uveal biocompatibility. It is possible that anterior capsular opacification may be slightly greater with silicone IOLs, but this difference is probably insignificant. I favor an IOL design with open haptics. Plate haptic IOLs should be avoided because of the risk of their subluxation and, in that situation, the greater difficulty in suture recovery and fixation postoperatively.

Because of age-related fibrosis of the ciliary muscle and an increased risk for capsular contraction syndrome or progressive zonulopathy, accommodating IOLs should probably be avoided in PXF eyes. All IOLs require precise optical centration for best optical performance. This is particularly important for multifocal and toric IOLs. Given the propensity for progressive zonular lysis, surgeons should exercise caution with regard to using such IOLs in eyes with PXF.

POSTOPERATIVE ANTERIOR CAPSULAR CONTRACTION

A preventable cause of the IOL's progressive postoperative subluxation is the treatment of anterior capsular contraction. Phimosis is more common in PXF than normal eyes⁶ and is a high risk factor for tilt and decentration of the IOL. This difference is probably due to a variety of factors, including blood-aqueous compromise, increased inflammation, retained cortex, IOL material and design, and most importantly, a compromised zonular apparatus. In PXF eyes with weak zonules, annular contraction of the capsule can occur early and relatively quickly after surgery. Centripetal contraction ensues, which can cause progressive zonulolysis. Treatment is indicated to relax the forces of anterior capsular contraction. It typically involves cruciate Nd:YAG laser incisions through the annular capsular band. I favor the release of anterior capsular contraction upon its detection to reduce the chance for later displacement of the IOL.

CONCLUSION

PXF presents a unique set of risks and challenges for cataract surgeons. They can minimize and often prevent complications by paying attention to IOP, phaco technique, IOL selection and fixation, and the postoperative status of the anterior capsule. ■

Bradford J. Shingleton, MD, is in private practice with Ophthalmic Consultants of Boston, and he is an associate clinical professor of ophthalmology at Harvard Medical School in Boston. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Shingleton may be reached at (617) 314-2614; bjshingleton@eyeboston.com.



1. Shingleton BJ, Crandall AS, Ahmed IK. Pseudoexfoliation and the cataract surgeon: preoperative, intraoperative, and postoperative issues related to intraocular pressure, cataract and intraocular lenses. *J Cataract Refract Surg.* 2009;35:1101-1120.
2. Ritch R. Exfoliation—the most common identifiable cause of open-angle glaucoma. *J Glaucoma.* 1994;3:176-178.
3. Shingleton BJ, Laul A, Nagao K, et al. Effect of phacoemulsification on intraocular pressure in eyes with pseudoexfoliation—single surgeon series. *J Cataract Refract Surg.* 2008;34:1834-1831.
4. Ritch R, Schlotzer-Schrehardt U, Kuchle M. Exfoliation syndrome. *Surv Ophthalmol.* 2001;45:265-315.
5. Shingleton BJ, Marvin AC, Heier JS, et al. Pseudoexfoliation: high risk factors for zonule weakness and concurrent vitrectomy during phacoemulsification. *J Cataract Refract Surg.* In press.
6. Davison JA. Capsule contraction syndrome. *J Cataract Refract Surg.* 1993;19:582-589.