

Anterior Capsular Contraction Syndrome and PXF

BY ROBERT J. ARLEO, MD; ALAN S. CRANDALL, MD; HISHAM H. ARAR, MD;
AND RICHARD S. HOFFMAN, MD

CASE PRESENTATION

A 78-year-old woman presents to your office 1 year after having cataract surgery in her left eye at another practice. She complains of worsening vision in both eyes.

Her visual acuity measures 20/50 OD and 20/30- OS. Glare testing worsens her vision to 20/200 OD and 20/400 OS. Examination reveals a significant nuclear sclerotic cataract with



Figure 1. The PCIOL is centered 1 year after implantation, but the eye exhibits anterior capsular contraction syndrome.

pseudoexfoliative material on the anterior capsule of the patient's right eye. There is a nicely centered PCIOL with anterior capsular contraction in her left (Figure 1). The fundus examination is unremarkable.

How would you manage the anterior capsular contraction syndrome in the patient's left eye? Also, would your knowledge of the outcome in that eye cause you to manage her right eye differently either intraoperatively or postoperatively?

ROBERT J. ARLEO, MD

This is a situation that I commonly encounter in my practice, because a large proportion of people in my region are of northern European descent and have pseudoexfoliation (PXF). I would try to correct this patient's difficulties with her previously operated eye before operating on the cataract in her right eye.

The immediate difficulty that the patient has in her left eye relates to a direct compromise of the visual axis from the anterior capsular contraction as well as proba-

ble anterior displacement of the IOL that is causing a myopic shift in her refraction. The most likely cause is PXF syndrome in this eye as well as the right. The long-term risks in this situation are total occlusion of the anterior capsule from continued contraction and ongoing stress on the already weakened zonules, which may lead to late dislocation of the IOL.

If the anterior capsular contraction is early, even if the patient were asymptomatic, I would make eight relaxing incisions in the anterior capsular ring in a radial fashion using the Nd:YAG laser. The relaxing incisions need to be long enough to reach the capsule beyond the thickened membrane at the rim of the capsulorhexis. If the visual axis is occluded, however, using the Nd:YAG laser to completely circumscribe the thickened area may be necessary to excise this tissue. I would use caution with this technique and keep the excision round and as central as possible.

A few precautions would be necessary in the treatment of the patient's right eye. First, because the pupil's dilation usually is poor secondary to the PXF, I would want the capsulorhexis to be at least 5 mm in order to reduce the risk of contraction. Sometimes, it will be necessary to move the iris aside with a hook as the capsule is being torn for visualization. Using a viscoelastic that stays in the eye and minimizes iris prolapse (eg, Discovisc; Alcon Laboratories, Inc., Fort Worth, TX) makes this step easier.

Next, I would perform gentle but thorough hydrodissection. The smaller capsulorhexis makes this step more dangerous, as fluid can be trapped behind the lens. There is a risk of blowing out the fragile capsule. My routine approach is to lift the edge of the anterior capsule as I perform the injection and to try to get the fluid wave about halfway around the posterior pole of the lens. I will then repeat this maneuver from the other

side and gently burp out excess fluid as I go. Having free rotation of the lens will put less traction on the zonules, and thorough hydrodissection will make cortical clean-up easier later.

To remove the nucleus, a technique that works centrally and puts little stress on the zonules is important. I use the quick chop technique. Chopping the nucleus into six to eight segments facilitates emulsification through a small pupil and makes it easier to free individual segments without putting traction on the bag. Using an adequate amount of phaco energy here would be important so as not to push around the nucleus. Sufficient vacuum at the phaco tip would permit a controlled purchase on the lens for manipulation.

After performing cortical cleanup and refilling the bag with viscoelastic, I would implant an IOL that unfolds gently and slowly (eg, the Acrysof single-piece lens, Alcon Laboratories, Inc.). In eyes with very small pupils, I often use a Lester lens manipulator (Katena Products, Inc., Denville, NJ) to gently place the trailing haptic and ensure it is in the bag. After inserting the IOL, I am in the habit of placing a capsular tension ring (CTR) in eyes with PXF to reduce the risk of late anterior capsular contraction and subsequent dislocation of the IOL.

Postoperatively, I would prescribe 500 mg of acetazolamide and IOP-lowering agents if the patient's preoperative IOP were higher than the midteens, because there is a greater risk of an IOP spike in these eyes.

ALAN S. CRANDALL, MD

There is no question that something needs to be done, first for the patient's vision and second to reduce the chance that the entire lens/bag unit will spontaneously subluxate. With a phimosis of this extent, the central area tends to be very thick and difficult to laser without damaging the lens. Most of the Nd:YAG units have mechanisms that allow the surgeon to focus anteriorly to reduce the risk of injuring the lens. I usually start in the midperipheral area and move centrally. Once a break in the capsule occurs, a separation between the lens and capsule often ensues, and the surgeon can slowly move the laser centrally. I try to create four breaks to relieve the tension and clear the visual axis. If this approach does not work, I do not hesitate to operate and use a vitrectomy unit to remove the anterior capsule.

For the patient's second eye, several approaches would be possible. The size of the original capsulorhexis is unknown, but I would try to create one of at least 5.5 mm. One could consider placing a CTR to prevent the capsulophimosis, although no studies have proven

that this device will prevent the complication. One could also perform radial incisions after the lens has been placed. The other option would be to make anterior radial cuts using the laser soon after the surgery or as soon as the capsule started to shrink. If I had performed the original surgery and were sure that the capsulorhexis was sufficiently large, I would use an Nd:YAG laser after the eye was stable.

HISHAM H. ARAR, MD

If PXF were also present in the patient's left eye, then the development of anterior capsular contraction syndrome would not be totally unexpected. PXF, with its resultant weakened or absent zonular fibers, is by far the most common setting in which anterior capsular contraction syndrome is seen. It also occurs, however, in patients of advanced age and in those with a history of uveitis, retinitis pigmentosa, and myotonic dystrophy.

The pathogenesis of anterior capsular contraction syndrome relates to the remaining lens epithelial cells underneath the anterior capsule. These cells undergo fibrous metaplasia that can result in capsular phimosis, contraction of the capsular bag, and subcapsular opacification. The centripetal forces produced by the lens epithelial cells as they undergo metaplasia are usually balanced by the centrifugal forces of the zonular apparatus. The presence of PXF and other predisposing conditions increases the likelihood of capsular contraction.

Managing the anterior capsular contraction syndrome in the patient's left eye involves radial anterior Nd:YAG capsulotomies. I would recommend using low power settings of 1.25 to 1.75 mJ to create three or four equally spaced radial cuts, each measuring around 1.0 to 1.5 mm long. In order to avoid pitting the lens, the surgeon should defocus the laser beam anteriorly. Also, I would recommend initiating the linear cuts in all four quadrants before completing them. Due to the tractional forces involved, this precaution might avoid the extension of a radial tear from the first cut. If such a tear arose and extended through the posterior capsule, the IOL might dislocate posteriorly.

Regarding the cataract in the patient's right eye and knowing what occurred in her left eye, certain precautions should be taken intra- and postoperatively. During surgery, I would start with a generous continuous curvilinear capsulorhexis. Doing so might be difficult, unfortunately, because eyes with PXF sometimes dilate poorly. I therefore would not hesitate in placing iris hooks to facilitate the creation of an adequate continuous curvilinear capsulorhexis and improve overall visualization.

Next, I would polish the undersurface of the anterior capsule using low vacuum settings to help eliminate as

many residual lens epithelial cells as possible. This step reduces the fibrotic opacification of the anterior capsule, but such polishing increases the risk of posterior capsular opacification.¹ Regarding the choice of IOL, one may use a three-piece IOL with stiff haptics, which would help stabilize the capsular bag. I would avoid silicone lenses because of the increased risk of anterior capsular opacification.² Another viable option in this case would be to use a CTR, irrespective of the presence or absence of zonular weakness, and instead implant a single-piece acrylic IOL. The use of a CTR enhances the centrifugal forces and diminishes the risk of the capsular bag's contracture. In addition, a single-piece IOL would be easier to insert than a three-piece IOL, thus minimizing the risk of further zonular compromise.

Postoperatively, I would monitor the patient closely every 4 to 6 months for anterior capsular contraction. At the first sign of this complication, I would perform anterior capsulotomies as described earlier (not sooner than 1 month if a CTR were present).

RICHARD S. HOFFMAN, MD

Phacoemulsification in the presence of PXF is fraught with numerous challenges. These patients have a higher incidence of glaucoma, poorly dilating pupils, and zonular laxity and weakness that can contribute to intraoperative zonular dehiscences and vitreous loss. Zonular weakness can also contribute to the postoperative complications of severe anterior capsular phimosis (evident in this patient) or frank IOL/capsular bag subluxation.

In the patient's left eye, I would initiate treatment of the anterior capsular contraction with generous cruciate capsulotomies with the Nd:YAG laser. Four cuts would be made in the anterior capsule starting at the central edge of the fibrotic ring and extending the cut 3 to 4 mm peripherally, thus ensuring that each of the four linear cuts extended past the area of the fibrotic ring. Studies have demonstrated that this initial treatment is effective in 78% of such cases and may even be more so if the lens is well centered prior to the Nd:YAG treatment.³ If the phimosis recurred, the contraction could be treated by creating a new, larger capsulorhexis utilizing intraocular microincisional scissors while stabilizing the anterior chamber with an ophthalmic viscosurgical device.

In regard to the patient's right eye, adjusting and refining each step of the phaco procedure should reduce the complications associated with PXF. I would be careful not to place stress on the zonules by overly inflating the anterior chamber with excessive viscoelastic at the beginning of the case. A generously sized cap-

sulorhexis of at least 6 to 7 mm would leave fewer lens epithelial cells to participate in metaplasia and fibrosis of the anterior capsule, and it would allow for some phimosis to develop without obstructing the visual axis. Phacoemulsification should be performed utilizing a chopping technique in order to balance vector forces within the capsular bag and reduce zonular stress. A grooving phaco technique would place excessive traction on the subincisional zonules that could be avoided with a two-handed chopping technique.

Cortical cleanup should be performed by stripping cortex tangentially rather than centrally; tangential forces would be less likely to stress the zonules. If a zonular dialysis were present, the cortex should be stripped toward the area of zonular dehiscence, not away from it. Following cortical removal, I would gently polish the undersurface of the remaining anterior capsule in order to remove as many lens epithelial cells as possible, in the hopes of further reducing anterior capsular fibrosis and subsequent phimosis.

Although anterior capsular contraction can still occur in the presence of a CTR,^{4,5} placing the device prior to phacoemulsification may stabilize and protect the zonules from insult during the lens' removal. Moreover, by stabilizing the capsular fornices, a CTR may reduce the incidence or severity of capsular contraction postoperatively. The device also maintains the posterior capsule on stretch throughout the procedure, thereby reducing the possibility of inadvertent posterior capsular rupture. For these reasons, I would highly recommend implanting a CTR before phacoemulsification or at least following cortical removal in this case. With the growing number of reports of IOL/capsular bag subluxations in PXF eyes, the CTR may also allow additional options for the scleral fixation of subluxated IOL/bag complexes.⁶

A silicone IOL might initiate a fibrotic reaction of the anterior capsule in this patient. I would therefore select an acrylic lens with PMMA haptics in order to reduce anterior capsular fibrosis and perhaps further stabilize the capsule from progressive phimosis.⁷

Postoperatively, I would treat this patient with the same dosages of topical antibiotics, steroids, and nonsteroidals that I use for my routine cases. I would see this patient more frequently postoperatively, however, so that I could intervene earlier with an Nd:YAG laser anterior capsulotomy should progressive phimosis develop. ■

Section Editors Robert J. Cionni, MD; Michael E. Snyder, MD; and Robert H. Osher, MD, are cataract specialists at the Cincinnati Eye Institute in Ohio. They may be reached at (513) 984-5133; rcionni@cincinnatieye.com.

Hisham H. Arar, MD, is in private practice at the Cincinnati Eye Institute in Ohio with a primary focus on cataract surgery. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Arar may be reached at (513) 984-5133; harar@cincinnatieye.com.



Robert J. Arleo, MD, is Medical Director of Arleo Eye Associates in Ithaca, New York. He is a clinical investigator for Alcon Laboratories, Inc. Dr. Arleo may be reached at (607) 257-5599; rarleo@aol.com.



Alan S. Crandall, MD, is Professor and Senior Vice Chair of Ophthalmology and Visual Sciences and Director of Glaucoma and Cataract for the John A. Moran Eye Center at the University of Utah in Salt Lake City. He is a consultant and is on the speakers bureau for Alcon Laboratories, Inc. Dr. Crandall may be reached at (801) 585-3071; alan.crandall@hsc.utah.edu.



Richard S. Hoffman, MD, is Clinical Associate Professor of Ophthalmology at the Casey Eye Institute, Oregon Health & Science University, and he is in private practice at Drs. Fine, Hoffman, & Packer in Eugene, Oregon. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Hoffman may be reached at (541) 687-2110; rshoffman@finemd.com.



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