

Phacoemulsification in Pseudoexfoliation Syndrome

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Pseudoexfoliation (PXF) syndrome is the most common identifiable cause of open-angle glaucoma worldwide. PXF is a systemic and ocular condition in which hyaline material of unknown etiology is deposited onto structures in the anterior segment. Many studies have shown that pseudoexfoliation syndrome patients have higher rates of intraoperative complications during and after cataract surgery compared to patients without the condition. This article reviews the clinical signs of pseudoexfoliation syndrome and methods of managing complications during cataract surgery. The ophthalmologist must be aware of the subtle signs of pseudoexfoliation syndrome prior to undertaking cataract surgery. Techniques for enlarging small pupils, overcoming zonular instability, modification of phacoemulsification technique, and appropriate choice of intraocular lens implant, could minimize the likelihood of intraoperative and postoperative complications.

Clinical Signs

The patient presents with a fine, flaky material on the anterior lens capsule at the pupillary margin (Figure 1 and 2). Over time, this coalesces into a characteristic “bull’s-eye” pattern seen in pseudoexfoliation (Figure 3). There is often increased transillumination of the iris at the pupillary margin and there may

be pigment granules on the endothelium and iris surface. Within the angle, there may be observable pigment or clear flaky material. Initially, intraocular pressure is unaffected; however, elevated IOP develops in up to 80 percent of patients. In these cases, glaucomatous cupping and visual field loss may ensue.

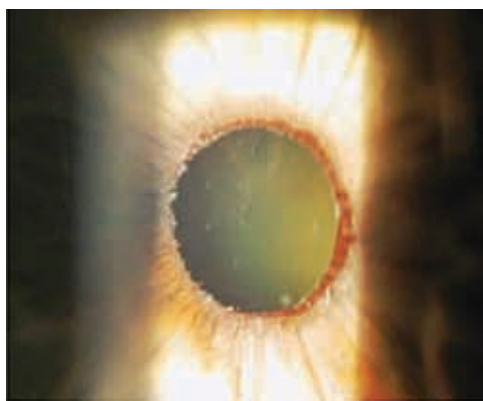


Figure 1: Undilated pupil exam in a case of PXF syndrome. Note the presence of white, fluffy material around pupil margin

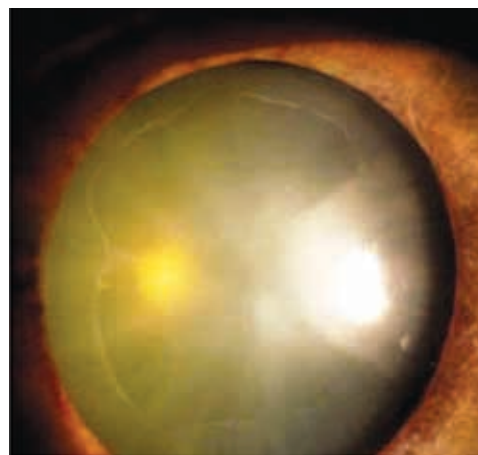


Figure 2: Dilated examination in a case of PXF syndrome. Notice the presence of ground glass appearance of anterior lens capsule

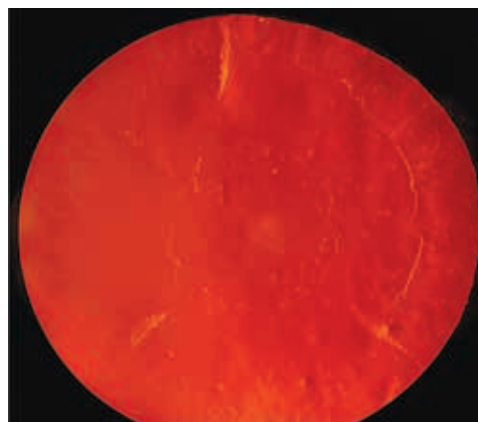


Figure 3: Retro-illumination of lens in a case of PXF syndrome. Note the 'bullseye lesion' on the anterior lens capsule

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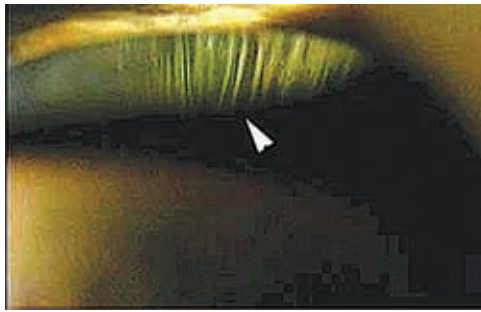


Figure 4: Gonioscopic examination in a case of PXF syndrome. Note deposition of fluffy, white material on lens zonules

Table 1: Signs suggestive of a diagnosis of Pseudoexfoliation (PXF) syndrome

- Pseudoexfoliation deposits on lens anterior capsule in pupillary area (classic pseudoexfoliation (PXF) syndrome)
- Phacodonesis/lens subluxation
- Intrastromal hemorrhage post mydriasis without rubeosis (indicative of iris vascular damage)
- Pigment dispersion post mydriasis without obvious cause
- Poor mydriasis and posterior synechiae without obvious cause
- Small anterior chamber depth without other reasons for a narrow drainage angle
- Pseudoexfoliation deposits on iris margin

Telltale signs of PXF syndrome include a classic deposition pattern on the lens, zonules (Figure 4) and pigment in the angle on gonioscopy. The most common challenges surgeons face when performing phacoemulsification on affected patients are managing small pupils and maintaining zonular stability.

Patients should undergo a slit-lamp evaluation to rule out zonular instability, phacodonesis, or subtle asymmetry in the depth of his anterior chambers. Any of these abnormalities could portend zonular problems and complicate cataract surgery. Patients with PXF syndrome can experience sudden IOP spikes after pupillary dilation, so surgeons should take steps to avoid this complication.

Challenges during Phacoemulsification

Inadequate Pupillary Dilatation

Patients' pupils must be large enough to permit the safe creation of the capsulorhexis. Surgeons may use topical mydriatics or mechanical means such as iris hooks (Katena Products, Inc.,

Table 2: Surgical tips for management of PXF

- Enlarge small pupils
- Stabilize the capsule
- Adequate size capsulorhexis
- Gentle hydrosection
- Avoid downsculpting and favor chopping the nucleus
- Clean up cortical material
- Choice of intraocular lens (foldable hydrophobic acrylic biomaterial)
- Placement of intraocular lens into the capsular bag

Denville, NJ), the Beehler pupil dilator (Moria, Antony, France), the Morcher Pupil Dilator (Morcher GmbH, Stuttgart, Germany; distributed in the US by FCI Ophthalmics, Inc., Marshfield Hills, MA), and the Perfect Pupil Injectable (PPI; Milvella Ltd, Sydney, Australia).

It is advisable to create 5.5 to 6.0 mm central capsulorhexis in eyes with PXF through a combination of iris hooks. Viscoadaptive ophthalmic viscosurgical device, such as Healon 5 (Advanced Medical Optics, Inc., Santa Ana, CA) may also help to create viscomydriasis.

Zonule-Friendly Phaco Techniques

The phaco techniques on patients with PXF syndrome are designed to place minimal stress on weak zonules. It is advisable to attempt multiquadrant hydrodissection to create a gentle wave setting to dissect the nucleus away from the capsular bag with cortical cleaving hydrodissection. After completion of hydrodissection, gently rotate the nucleus to ensure it is completely free. Divide the nucleus using stop and chop or by using a zonule-friendly vertical chopping technique.

In cases where debulking or divide-and-conquer is appropriate, it is advisable to use enough energy to prevent the nucleus from moving during the phaco passes. Choosing the proper duty cycle reduces the amount of energy delivered to the eye and can prevent corneal damage. The surgeon must use enough power to prevent nuclear movement but employ a pulse or burst mode to prevent corneal burns.

Cortical Removal

The cortical clean-up procedure using irrigation and aspiration can be tedious in eyes with PXF and, if not performed carefully, can strip away weak zonules. A bimanual irrigation and aspiration technique may be useful, especially if the patient's pupil is relatively small, because it is easier to get to the subincisional cortex through two sites.

Role of capsular tension ring (CTR)

There is some debate as to whether the device is necessary in all cases of PXF. CTRs can decrease capsulophimosis and distribute forces to the zonules more equally. Although the devices do not protect against the late dislocation of an IOL, their presence may

make it easier to suture the IOL to the sclera if necessary. The placement of these devices can exert stress on the zonules, however, and CTRs can complicate I/A if they are inserted too early. It is not advisable to use CTRs in all eyes with PXF syndrome, only in those with clear evidence of zonular weakness.

Postoperative Management

To prevent postoperative IOP spikes, it is advisable to carefully remove all lenticular fragments and viscoelastic from the eye at the end of surgery. The patient can be prescribed topical pressure lowering medication and/or oral acetazolamide for first few days and, when necessary, release pressure from their eyes through the sideport incision on the day of surgery.

A long-term complication associated with PXF is the spontaneous subluxation of implanted IOLs. This problem can arise any time between 2 months and 16 years postoperatively, with most cases occurring an average of 8.5 years after the IOLs implantation.

Several strategies can be used to correct IOL subluxation in patients with PXF. If the patient has plate IOLs, it is advisable to remove the lenses and replace them with a haptic design. For example, three-piece lenses may be sutured to the sclera or the iris. If the patient does not have glaucoma, and I have to make a large incision to remove his original lens.

Management of Late Complications

Posterior Capsular Changes

Secondary cataract (PCO) has been shown to be more frequent following cataract surgery in patients with PEX. Clinically significant PCO is treated with Nd:YAG capsulotomy.

Anterior Capsular Changes Capsule Contraction Syndrome With or Without IOL Decentration

Capsule contraction syndrome has been reported in PXF cases in which there was an exaggerated reduction in anterior capsulotomy and capsular bag diameter after extracapsular cataract surgery involving the use of a continuous curvilinear capsulorhexis. An imbalance of forces caused by zonular weakness results in an inability to resist the relatively increased strength of the centrally directed contractile forces generated by capsular fibrosis. An

autopsy study and clinical study showed a significant increase in decentration of the entire capsular bag in PXF eyes. We recommend the following preventative measures: create an optimal round anterior rhexis (just within the optic of the IOL) or a secondary capsulorhexis to enlarge the initial rhexis after completion of phacoemulsification. Performing intraoperative vacuuming of the undersurface of the anterior capsule prior to lens implantation has been shown to reduce the amount of residual lens epithelial cells and reduce capsular fibrosis. Recent publications have shown that the choice of haptic and optic material influences the likelihood of anterior capsular contraction (the rigid PMMA haptics are more resistant to contractile forces than soft polypropylene haptics). It has been suggested that patients with PXF and a small anterior capsulotomy opening should be scheduled for postoperative Nd:YAG laser capsulorhexis augmentation in the first few months following cataract surgery.

Conclusion

When operating on patients with PXF, surgeons should be aware of strategies they can use to prevent IOP spikes after phacoemulsification. Gentle nuclear disassembly, careful cortical cleanup, and the use of devices such as CTRs can reduce the risk of immediate postoperative complications. Fixating nonplate IOLs to the sclera or the iris may help prevent subluxation.

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Obituary

With profound grief we inform the sad demise of **Dr. Anil Johri** on 25.11.2008. We pray to the almighty to give courage to his family to face this loss and we stand by them in this difficult time.