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Recent Advances in Management of Cataract in Patients with Pseudoexfoliation Syndrome

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Abstract

Objectives: To reduce the risk of intraoperative complications by using currently available surgical devices. *Methods:* In a study conducted at a tertiary care hospital, 25 patients with pseudoexfoliation syndrome underwent cataract surgery. Preoperative visual acuity, refraction, slit lamp biomicroscopy, intraocular pressure measurement and fundus examination of all patients was done. From the preoperative planning, to the intraoperative management of the small pupil and phacodenesis, and to the postoperative correction of capsule phimosis and intraocular lens dislocation, a step approach to the surgical management of pseudoexfoliation patients is illustrated. *Result:* A planned approach to cataract surgery using the advanced techniques of phacoemulsification, specific ophthalmic viscosurgical devicess, and capsule support devices significantly reduces the risk of complications during cataract surgery in patients with pseudoexfoliation syndrome. *Conclusion:* Cataract surgery in settings of pseudoexfoliation syndrome carries a significant risk of complications in the form of capsule rupture, vitreous loss, nucleus luxation, and IOL dislocation. Using currently available surgical devices (ophthalmic viscosurgical device, iris retractors and ring dilators, capsular tension ring, etc.), the risk of intraoperative complications may be much reduced, allowing the surgeon to handle difficult cases with greater confidence and safety. Postoperative surveillance is required to monitor and treat postoperative intraocular pressure, anterior chamber inflammation, IOL decentration, and cystoid macular edema.

Keywords: Pseudoexfoliation syndrome; Phacoemulsification; Iris retractors; IOL dislocation.

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Introduction

Cataract is the world's leading cause of blindness and visual impairment in the elderly population.[1] Pseudoexfoliation syndrome (PXF) represents an independent additional hazard for the development of nuclear sclerosis and indication for cataract surgery.[2] In 1917, Lindberg first described exfoliation syndrome after observing the presence of whitish-gray material deposited on the pupillary border in approximately half his patients with chronic glaucoma.[3] It is a multifactorial disorder of the elastic fiber structure and is characterized by excessive production and accumulation of an elastotic material within intra- and extraocular tissues.[4] It is diagnosed by the deposition of white "dandruff-like" fluffy material, virtually in all the structures of the eye, but more importantly in the anterior segment: corneal endothelium, anterior capsule, lens zonules, iris, and trabecular meshwork. The material is composed of amyloid, laminin, elastic fibers, collagen, and basement membrane. The same material has been seen in other organs such as heart, lung, liver, kidney,

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cerebral meninges, and blood vessels, indicating that PXF is a multiorgan disease.[5]

Pseudoexfoliation syndrome is a major risk factor for complications during cataract surgery and is most frequent cause of secondary open angle glaucoma.[6] Intraoperative and postoperative complications arise from weakened capsule and zonulopathy secondary to proteolytic disintegration of suspensory ligament, resulting in instability of crystalline lens, capsular rupture, zonular dialysis, vitreous loss, nuclear luxation, decentration/dislocation of the intraocular lens (IOL). Further difficulties during surgery result from inadequate mydriasis (iridopathy), secondary to atrophic changes of iris sphincter and stroma. Using currently available surgical devices (ophthalmic viscosurgical device, iris retractors and ring dilators, capsular tension ring, etc.), the risk of intraoperative complications may be much reduced, allowing the surgeon to handle difficult cases with greater confidence and safety. Postoperative anterior chamber inflammation and fibrinous reaction occur frequently in PXF patients due to an acquired weakened blood-aqueous barrier. Endotheliopathy is seen in eyes affected with PXF, resulting in transitory, permanent corneal decompensation.

Our aim is to review the surgical approach to PXF, in light of modern surgical techniques, specifically addressing management of patients at preoperative, intraoperative, and postoperative steps.

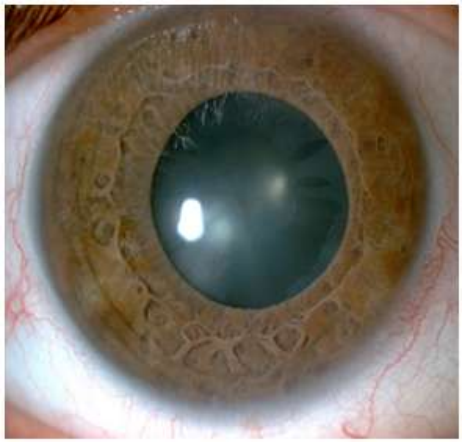


Fig. 1: Slitlamp showing signs of cataract an psuedoexfoliation.
Note: The lens surface shows signs of exfoliating fibrillar material with accumulation of whitish flakes at pupillary margin. The pupil is only moderately dilated after pharmacological mydriasis.

Aim

- To reduce the risk of intraoperative complications by using currently available surgical devices to have better postop visual acuity.

Materials and Methods

This is a prospective interventional study in which 25 eyes of 25 patients with cataract who came to ophthalmology OPD at our tertiary care hospital were selected for 95% confidence level by simple random sampling.

Inclusion criteria

- All patients above 50 years of age having Pseudoexfoliation syndrome and diagnosed with cataract.
- Patients willing to participate in the study.
- Patients who are able to read and understand Marathi/Hindi.
- Patients ready to give written informed consent.

Exclusion criteria: patients with

- Corneal diseases (degeneration, dystrophies, peripheral thinning).
- Ocular inflammations (scleritis, uveitis.)
- Chronic angle closure glaucoma.
- Previous intraocular surgeries.
- Advanced cataracts. (mature and hypermature).

Methods

In this study, 25 patients with PXF underwent phacoemulsification.

Preop examination: A careful examination was performed for each case. Visual acuity was measured by Snellen's chart slit-lamp examination was done for diagnosis of PXF by observation of grey-white flakes at pupillary margin and fibrillary deposits over anterior lens capsule. Also, assessment of the cornea, AC depth, regularity of the pupil and nuclear hardness was examined. IOP was measured using a Goldmann applanation tonometer. A dilated fundus examinatiom was performed using a + 20D lens for indirect ophthalmoscopy and a + 90D lens for slit-lamp fundus biomicroscopy if possible to exclude any retinal pathology.

Reduced zonular integrity noted, such as phacodenesis and reduction of anterior chamber depth due to forward shift of the lens. Iridodenesis along with phacodenesis seen in 6 patients and Presence of posterior synechiae noted in 11 patients. Eight patients with raised IOP were started on IOP-lowering drugs. Maximum pupil dilation addressed to ensure adoption of appropriate surgical measures. NSAIDs given to maintain maximum achievable pupil dilation during surgery.[6]

A

Fig. 2A: Capsular retractors.

B

Fig. 2B: Capsular tension rings

Intraoperative, dispersive opthalmic viscosurgical device (OVD) placed first to coat corneal endothelium, and then cohesive OVD injected centrally to deepen anterior chamber, flatten anterior lens capsule, and maintain adequate pupil mydriasis in order to facilitate capsulorhexis creation. Posterior synechiae (present in 7 patients) lysed with blunt spatula and at the same time pupil mechanically stretched using iris hooks or iris manipulators. Continuous curvilinear capsulorhexis done. Viscodissection, prior to hydrodissection done, making cortex removal easier and safer by reducing traction on lens zonules. Depending on severity of the zonular instability, capsular tension ring (CTR, in 12 pts) and capsular retractors (in 8 pts) used to support the capsular bag during all steps of phacoemulsification, cortical cleaning, and IOL implantation. The "chop technique" of phacoemulsification, using vertical and horizontal chopping was done. A one-piece acrylic IOL was implanted in all patients (Fig. 3).

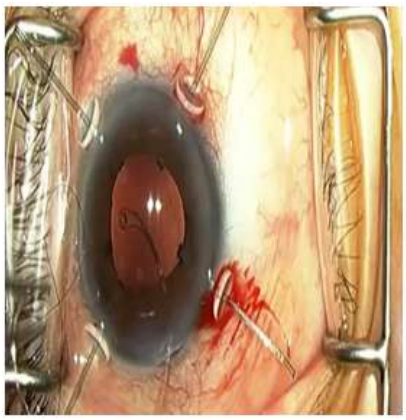


Fig. 3: Intraop photograph showing capsule retractors stenting the capsular bag during phacoemulsification.
Note: That following cortical lens aspiration, a capsular tension ring is implanted prior to intraocular lens

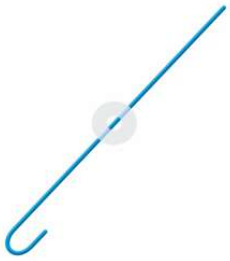
Postoperatively, prednisolone (1%), moxifloxacin (0.5%), homatropine (2%) and nepafenac (0.1%) topically were given to all patients. Patients asked to follow-up at 1 week, 4 weeks, 6 weeks and 12 weeks postoperatively.

Table 1: Methods used for intraoperative pupil dilatation

Method	No. of cases
Sphincterotomy	3
Iris hooks	5
Iris manipulators.	2

A

Fig. 4A: Iris manipulator.



B

Fig. 4B: Iris hook.

Results

- Zonular dehiscence was noted intra-operatively in about 52% cases (13 pts) and were managed accordingly with the help of CTR and capsular retractors wherever required.
- Postop visual acuity was 6/18 and above in almost 64% patients (16 cases) with minimal corneal edema and AC reaction.
- Anterior chamber inflammation was recorded on day 1 postoperatively and was found to be present in 40% eyes (in 10 patients).
- Severe postoperative fibrinous uveitis seen in 36% eyes (9 patients).
- IOP was assessed by digital tonometry and found to be high in around 32% eyes (8 patients). IOP lowering drugs were started in these patients.
- IOL decentration was seen in 24% cases (6 patients) and late in-the-bag IOL dislocation in 20% cases (5 pts) at 4 weeks follow-up mostly due to capsular phimosis.
- Radial anterior relaxing Nd:YAG laser capsulotomy was done in such cases allowing release of capsular traction over peripheral zonules, potentially avoiding dislocation of IOL in vitreous cavity.
- Vitreous loss occurred in about 32% cases (8 patients), out of which 2 patients were kept surgically aphakic and were posted for secondary IOL 1 month later.

Table 2: Preoperative risk factors and intraoperative and postoperative complications in PXF patients with cataract surgery.

Preoperative	Intraoperative	Postoperative
• Small pupil (54%) • Pupillary synechiae (28%) • Zonular laxity/dialysis (12%) • Capsule fragility (40%) • Vitreous prolapse (4%) • Shallow anterior chamber (22%) • Glaucoma (36%)	• Iris damage (16%) • Posterior capsule tear (16%) • Capsular bag dislocation (14%) • Vitreous loss (12%)	• Fibrinous uveitis (64%) • Posterior synechiae (28%) • Capsular phimosis (28%) • IOP spike (32%) • IOL in the bag dislocation (20%) • Cystoid macular edema (14%)

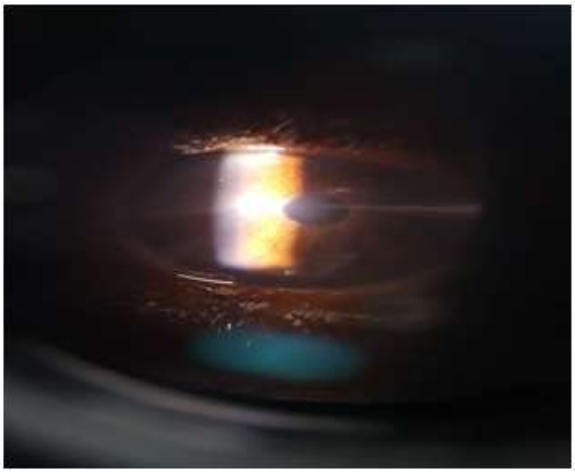


Fig. 5: Slit lamp showing pseudophakia with PXF in two weeks postop patient.

Discussion

Slit-lamp Biomicroscopy is both sensitive and specific for recognizing PXF. Degree of zonular laxity correlates with age of patient in cases of PXF. Incidence of phacodenesis/lens subluxation is reported between 8.4 and 10% in PXF whereas iridodenesis is less remarkable due to increased rigidity of ischemic atrophic iris. Poor pupil dilation is expected due to extracellular infiltration and degeneration of iris muscles with atrophic pigment epithelium and stroma.

PXF is the cause of secondary glaucoma due to increased outflow resistance and chronic deposition of pigmented material freed from iris and of exfoliative material throughout aqueous outflow system. Intraoperative, over-inflating of the anterior chamber causes damage to zonules. Use of trypan blue helps recognize anterior capsule when PXF is mistaken for anterior capsule layer, with the difference that these are typically fragile and tear abnormally. CTR and/or capsular retractors may be used to support the capsular bag.

Higher degree of postoperative anterior chamber inflammation is expected in PXF. At preoperative, patients with PXF show a baseline level of aqueous protein concentration several times greater than what is measured in cataractous eyes without PXF.[7] Capsular phimosis with IOL decentration and late in-the-bag IOL dislocation are dreaded complications postoperatively. Capsular shrinkage determines centripetal traction on weakened lens zonules, inducing tilt and decentration of IOL with dislocation of entire IOL-bag complex.

Conclusion

- Cataract surgery in PXF carries risk of complications of capsule rupture, vitreous loss, nucleus luxation and IOL dislocation; however, planned approach to surgery using advanced techniques of phacoemulsification, specific OVDs and capsule supporting devices reduces risk of complications.
- Postoperative surveillance is required to monitor and treat postoperative intraocular pressure, anterior chamber inflammation, IOL decentration and macular edema.
- Employing these measures, cataract surgery can yield satisfactory visual outcomes in PXF patients.

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