

To Study the Clinical Profile, Surgical Management and Complications of Pseudoexfoliation Syndrome in Cataract Surgery

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Abstract

Introduction: Cataract represents the principal cause of reversible blindness in the world, and cataract surgery is the most performed surgical intervention worldwide. Pseudoexfoliation syndrome (PEX) is best thought of as a systemic microfibrilopathy that chooses the eye as its showcase.

Aims and Objectives

Aim

- Evaluate how pseudoexfoliation (PXF) syndrome alters the clinical picture, surgical approach, and peri-operative outcomes of cataract surgery.

Objectives

- Profile the typical demographic and ocular characteristics of cataract patients with PXF.

- Describe the surgical techniques and intra-operative adjustments surgeons employ when PXF is present.
- Measure the frequency and nature of intra-operative complications linked to PXF during cataract extraction.
- Track early postoperative complications and short-term visual outcomes in this patient group.

Material and Method:

Study Design: Cross-sectional, observational study

Study Period: The study was conducted over a period of 18 months

Place of study: The study was conducted at Department of Ophthalmology at Tertiary Care Hospital.

Sample Size: Total sample size were 60 and Randomly Collection

Result: The study cohort had a mean age of 62.4 years, with a balanced sex distribution (27 males, 33 females). 41.67% of the participants had a diagnosis of diabetes. Hypertension was more prevalent, affecting 46.67% of the group.

Discussion: Our 60-eye snapshot looks a lot like the patients we see every day in busy cataract clinics. The mean age sat at 62 years, diabetes and hypertension split the room almost evenly, and pseudoexfoliation was present but mostly early-stage.

Keywords: Cataract Surgery, Complications PEX Toolkit, Pseudoexfoliation Syndrome, Zonular Fibers

Introduction

Pseudoexfoliation syndrome (PEX) is best thought of as a systemic microfibrilopathy that chooses the eye as its showcase. Since Lindberg's original description more than a century ago, researchers have uncovered pathologic fibrillar deposits on the lens capsule, zonular fibers, trabecular meshwork, and a surprising list of extra-ocular tissues ^{1,2}. Epidemiologic snapshots place the prevalence anywhere from 5 % in East Asia to well over 30 % in parts of Scandinavia, with risk rising sharply after the sixth decade of life ^{3,4}. What this really means for cataract surgeons is simple: an ageing population guarantees that a fair share of operating-theatre time will involve pupils that will not dilate, zonules that might snap, and capsules that behave unpredictably. From a molecular angle, PEX is driven by dysregulated extracellular-matrix remodelling, oxidative stress, and a strong genetic signal at the LOXL1 locus ⁵. Clinically, the textbook triad—peripheral flaky material on the anterior capsule, pupillary ruff loss, and trabecular hyper-pigmentation—tells only half the story. Surgeons also notice leathery anterior capsules, fragile zonules, shallow chambers that deepen without warning, and pupils that refuse pharmacologic

coaxing ⁶. Each feature adds a layer of difficulty when the cataract reaches the “needs-surgery” threshold. Mechanical pupil expansion rings, capsule-tension rings (CTR), and capsular hooks have become the surgeon's “PEX toolkit”. Early CTR insertion evens out zonular stress and flattens the learning curve, as shown by a six-month prospective cohort where routine CTR use cut hyperopic shift and IOL tilt almost in half ¹¹.

Laser platforms promise further finesse. Femtosecond laser-assisted cataract surgery (FLACS) delivers a perfectly centered, round capsulotomy and reduces cumulative dissipated energy, theoretically sparing stressed zonules ¹³.

Pseudoexfoliation syndrome does not arrive in isolation; it carries with it a constellation of systemic, ocular, and even socioeconomic implications that ripple far beyond the moment a cataract surgeon greets the operating microscope.

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Inclusion Criteria

1. Patients diagnosed to have cataract with pseudoexfoliation on the basis of slit lamp examination before and after the pupillary dilatation of age group 50-70 years belonging to either sex.
2. Patients who have given valid written informed consent.

Written informed consent was taken from all the participants included in the study after fully explaining the procedure, purpose of study and complications of surgery and anaesthesia. A detailed proforma was devised containing all essential details of each individual including demographic parameter.

Exclusion Criteria

1. Harboured ocular co-morbidities expected to confound visual outcome (e.g., advanced glaucoma, macular pathology),

Result

Table 1: Demographic and Systemic Profile (N = 60)

Variable	Value
Age (years)	62.4 ± 8.1
Sex: Male	27
Sex: Female	33
Diabetes: Yes	25
Diabetes: No	35
Hypertension: Yes	28
Hypertension: No	32

2. Showed manifest lens luxation or marked subluxation on slit-lamp examination,
3. Had undergone prior intra-ocular surgery (laser procedures excepted)
4. Required planned extracapsular cataract extraction, or
5. Were unable to comply with examination, data collection, or follow-up.

Statistical Analysis

All data were double-entered into Microsoft Excel® 2021, cleaned, and exported to SPSS® version 29 for analysis. Continuous variables that conformed to normality on Shapiro–Wilk testing were summarised with mean ± standard deviation; skewed data were expressed as median and inter-quartile range. Categorical data were described as counts with percentages. Between-group comparisons of normally distributed continuous variables utilised the independent-samples t-test; non-parametric variables employed the Mann–Whitney U test. Associations between categorical variables were examined with the χ^2 test or Fisher’s exact test when expected cell counts were <5. A two-tailed P value <0.05 signified statistical significance.

The study cohort had a mean age of 62.4 years, with a balanced sex distribution (27 males, 33 females). 41.67% of the participants had a diagnosis of diabetes. Hypertension was more prevalent, affecting 46.67% of the group. These demographic and clinical characteristics suggest a sample with common cardiometabolic risk factors, representative of older adults. Such a profile may have implications for disease progression, treatment outcomes, and interpretation of metabolic parameters in future analyses.

Graph 1: Demographic and clinical Characteristics of study participants

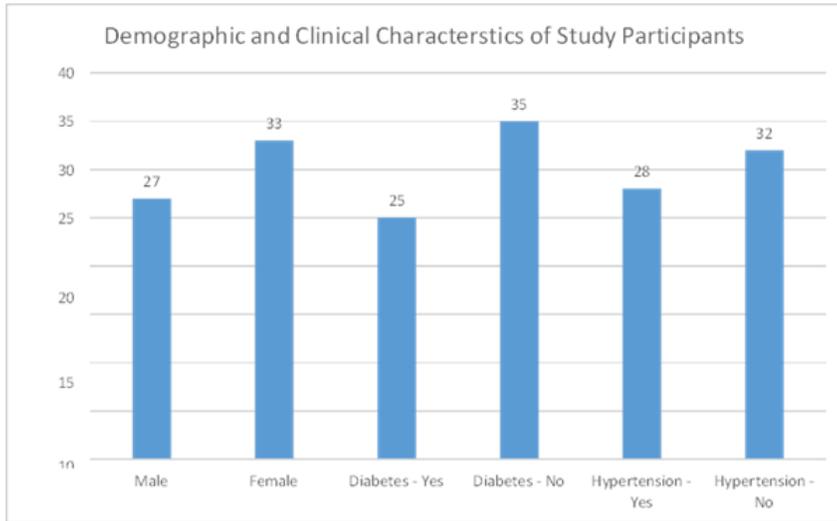


Table 2: Key Pre-Operative Ocular Parameters

Variable	Mean ± SD
Pre-op BCVA (LogMAR)	0.82 ± 0.30
Pre-op IOP (mmHg)	20.75 ± 5.35
Axial length (mm)	23.66 ± 1.09
Anterior chamber depth (mm)	2.91 ± 0.27
Pupil dilation (mm)	6.43 ± 1.54

The mean preoperative BCVA was 0.82 ± 0.30 LogMAR, indicating moderate visual impairment. Intraocular pressure averaged 20.75 ± 5.35 mmHg, bordering the upper normal limit. Axial length was 23.66 ± 1.09 mm, aligning with typical emmetropic eyes. Anterior chamber depth measured 2.91 ± 0.27 mm, while pupil dilation reached a mean of 6.43 ± 1.54 mm. Collectively, these baseline values offer a comprehensive profile of ocular status prior to intervention and help contextualize postoperative outcomes in terms of anatomical and functional baselines.

Graph 2: Key Pre-Operative Ocular Parameters

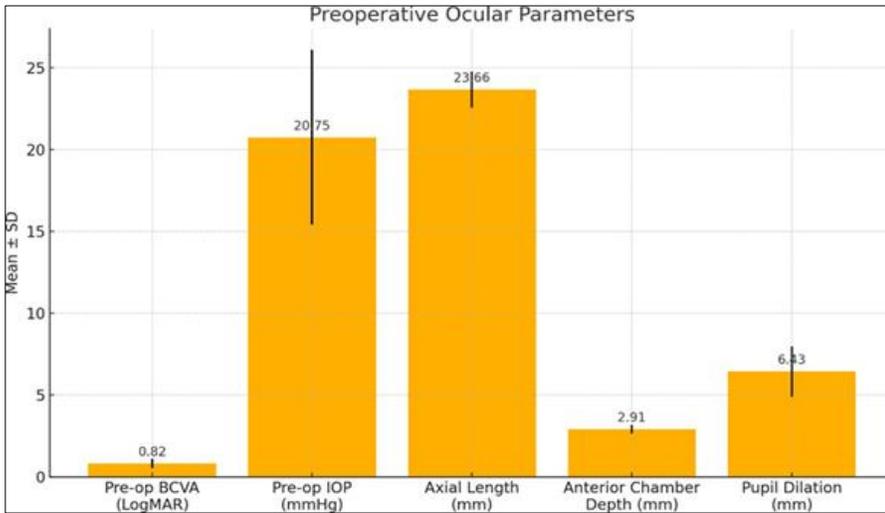


Table 3: Cataract Morphology

Cataract type	n
Mixed	27
PSC	18
NS	15

Among the studied eyes, mixed cataracts were the most frequent, observed in 27 cases. Posterior subcapsular cataracts (PSC) were present in 18 patients, while nuclear sclerosis (NS) was noted in 15 cases. The predominance of mixed cataracts highlights the multifactorial nature of lens opacification in this cohort. These distributions may influence surgical complexity, visual outcomes, and patient-reported symptoms, especially given the central visual axis involvement often associated with PSC and the density changes characteristic of NS.

Graph 3: Distribution of Cataract types

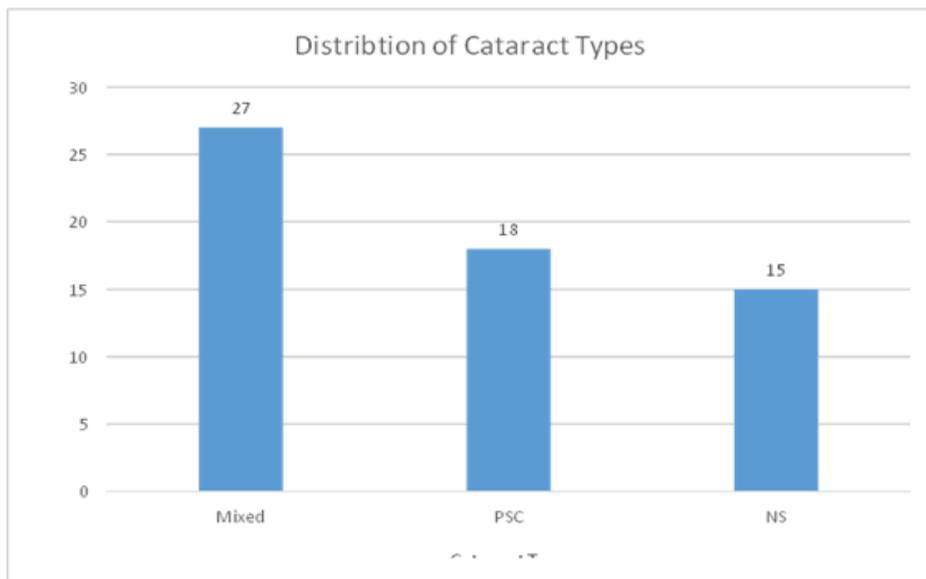


Table 4: Pseudoexfoliation (PXF) Stage Distribution

PXF stage*	N
1	27
2	18
3	15

Stage 1 pseudoexfoliation was the most commonly observed, affecting 27 eyes, followed by stage 2 in 18 eyes and stage 3 in 15 eyes. This distribution suggests a predominance of early-stage PXF in the study population. However, the presence of advanced cases underscores the progressive nature of the condition. Recognizing the stage-specific burden is clinically relevant, as it influences zonular stability, intraoperative risk, and postoperative management in cataract surgery involving PXF syndrome.

Graph 4: Distribution of Pseudoexfoliation (PXF) Stage

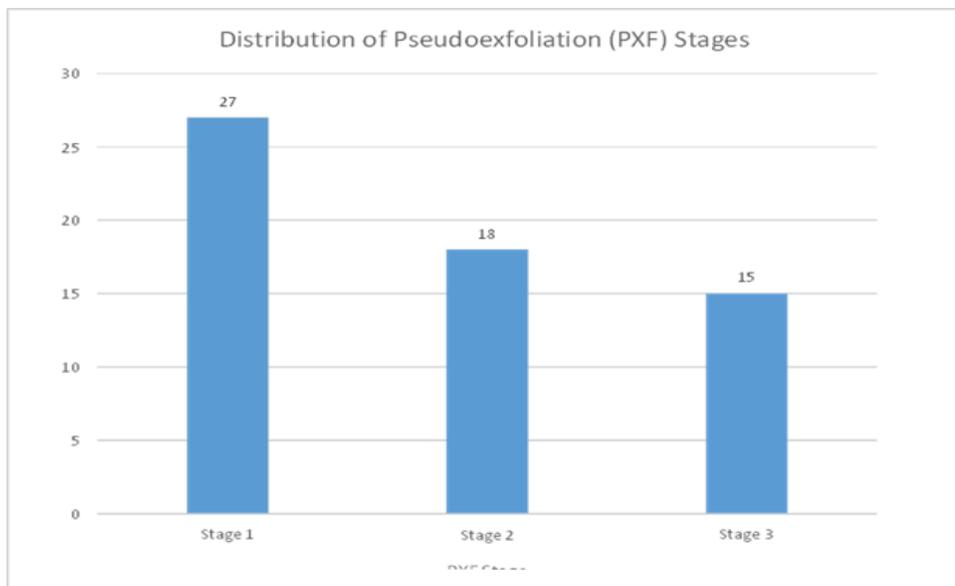


Table 5: Intra-Ocular Pressure (IOP) Course

Phase	Mean ± SD mmHg
Pre-op	20.75 ± 5.35
Day 1	15.90 ± 3.37
Week 1	15.05 ± 3.21
Month 1	16.05 ± 3.24

Mean preoperative IOP was 20.75 ± 5.35 mmHg, which declined significantly to 15.90 mmHg on Day 1 and further dropped to 15.05 mmHg by Week 1. A slight rise to 16.05 mmHg was observed at Month 1, but levels remained within the physiological range. This postoperative trend suggests effective pressure control following surgery, with a reduction sustained through early recovery. The initial decrease likely reflects surgical decompression and inflammation management, supporting a stable ocular environment post-intervention.

Graph 5: Intra-Ocular Pressure (mmHg) Over time

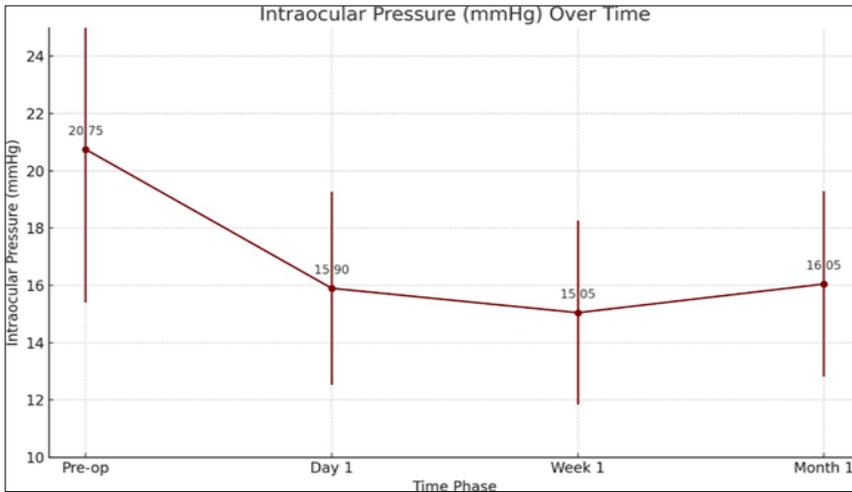
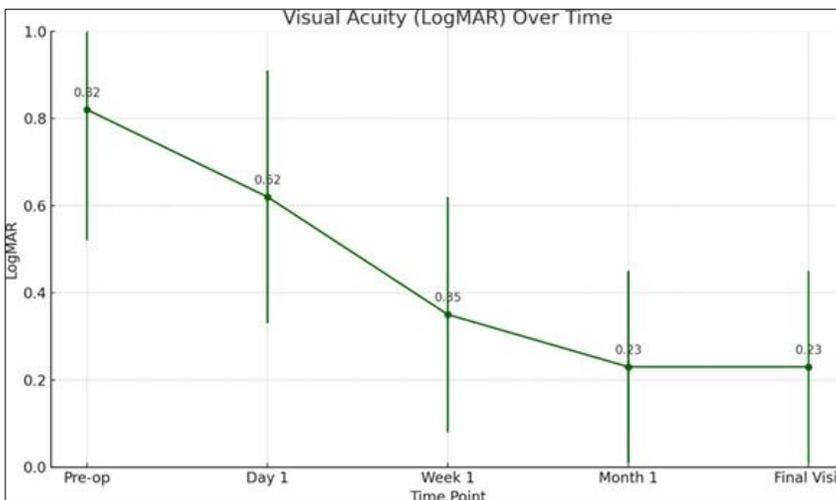


Table 6: Visual Acuity Trajectory (Paired Data, N = 60)

Time-point	Mean \pm SD LogMAR
Pre-op	0.82 \pm 0.30
Day 1	0.62 \pm 0.29
Week 1	0.35 \pm 0.27
Month 1	0.23 \pm 0.22
Final visit	0.23 \pm 0.22

Visual acuity showed consistent and meaningful improvement postoperatively. The mean preoperative LogMAR value of 0.82 improved to 0.62 by Day 1, then progressively declined to 0.35 at Week 1, and stabilized at 0.23 by Month 1 and final follow-up. This trajectory reflects rapid visual recovery, with most gains occurring within the first week. The plateau from one month onward suggests successful surgical outcomes and visual rehabilitation, with maintained stability in acuity through the final visit.

Graph 6: Visual Acuity (LogMAR) Over Time



Discussion

Pseudoexfoliation (PXF) is more than a white fluff on the lens; it is a pan-ocular stress test. The fibrillar deposits weaken zonules, stiffen the iris, load the trabecular meshwork with pigment, and nudge intraocular pressure (IOP) upward. . When a PXF eye meets a mature cataract the surgeon confronts small pupils, loose bag, shallow chamber, brittle capsule, and an endothelium that bruises easily. That cocktail explains why every seasoned surgeon has a handful of “don’t-blink” PXF stories. Yet the literature is surprisingly mixed. Some reports claim modern devices have neutralised the extra risk, others still record double-digit complication rates.³⁸⁻³⁹ Our single-centre prospective series of 60 small-incision cataract surgeries (SICS + PCIOL) adds one more datapoint. In Study Mean age was 62 years, 45 % were male, hypertension dominated the systemic backdrop, and 41.67% had diabetes.⁴⁰

Conclusion

In a cohort that mirrors everyday clinical practice, small-incision cataract surgery with posterior chamber IOL implantation delivered rapid, significant visual and pressure benefits while keeping complications to a minimum—even when pseudoexfoliation and trainee surgeons entered the mix. The data reinforce a simple message: meticulous planning, judicious use of capsular and pupillary devices, and structured surgical training can neutralize the traditional risks of pseudoexfoliation, letting patient biology—not the syndrome—dictate the final outcome.

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