# Cataract surgery in patients with Pseudoexfoliation syndrome: Challenges and outcomes from a tertiary healthcare center.

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## *ABSTRACT*

### Purpose:

To study intraoperative challenges and surgical outcomes in patients with pseudoexfoliation syndrome (PXF) undergoing senile cataract surgery.

### Materials and methods:

An observational, descriptive, prospective study was conducted on 30 patients diagnosed with pseudoexfoliation over a period of one year (January 2024–January 2025) at a rural tertiary healthcare centre, following ethical approval. Written informed consent was obtained in the local language. Patients aged >40 years with PXF undergoing senile cataract surgery were included, while those with other ocular diseases or a history of previous ocular surgery were excluded. Data regarding age and gender distribution, intraocular pressure (IOP), pupillary dilation, intraoperative and postoperative complications, management techniques and postoperative visual outcomes were collected and studied.

### Results:

Thirty patients were included, with the majority in 71–80 year age group 56.61% (17 patients). Intraoperatively, pupillary dilation of < 4mm was achieved in 33.3% (10 patients), 4–6 mm in 39.96% (12 patients), while ≥6 mm dilation was obtained in 26.64% (8 patients). Topical tropicamide and intracameral adrenaline were used in all cases; Visco-mydriasis was required in 86.58% (26 patients) while additional mechanical pupillary stretching using two-dialer method and using iris hooks was done in 73.26% (22 patients) and 13.32% (4 patients) respectively. Adjunctive procedure included sphincterotomy in 16.65% (5 patients). Intraoperative complications included zonular dialysis 13.32% (4 patients), posterior capsular rent 9.99% (3 patients) and vitreous loss 3.33% (1 patient). In 6.66% (2 patients) mild zonular dialysis of <4 clock hours was present. Out of which 1 patient was treated with sulcus-fixated IOL and the other patient was treated with capsular tension ring with in the bag IOL. There were 6.66% (2 patients) having zonular dialysis of >4 clock hours. One patient was treated with vitrectomy with primary SFIOL and the other patient was treated with vitrectomy with secondary SFIOL after 3 weeks postoperatively. Posterior capsular rent was seen in 9.99% (3 patients) out of which 2 patients without vitreous loss were treated with sulcus fixation IOL while 1 patient who had vitreous loss too was managed with vitrectomy and primary SFIOL.

On postoperative day one, 53.28% (16 patients) achieved visual acuity of 6/6–6/18, 39.96% (12 patients) had 6/18- finger counting (FC) 6 meters, and 6.66% (2 patients) had vision of FC at 6 meters-FC at 3 meters. Corneal edema and irregular pupil were the frequent postoperative findings in 19.98% (6 patients) and 13.23% (4 patients) respectively, whereas decentered IOL occurred in 3.33% (1 patient).

**Conclusion:**

Patients with PXF present with significant surgical challenges due to poor pupillary dilation and weak zonules, increasing the risk of intraoperative complications like zonular dialysis, posterior capsular rent and vitreous loss. Despite these challenges, alternate techniques like use of intracameral adrenaline, mechanical stretching with two-dialer method and use of iris hooks and sphincterotomy can be considered. One can expect favourable postoperative visual outcome with timely management of zonular instability and small non-dilating pupil.

## Introduction:

Pseudo-exfoliation is an age-related condition with generalized disorder of extracellular matrix (ECM) characterized by pathological accumulation of polymorphic fibrillar extracellular matrix in the anterior segment of eye. Exfoliation material appears to be attached to various intraocular tissues such as cornea, lens, iris, ciliary body. The prevalence of PXF increases with age and affects both genders. It is commonly associated with elevated intraocular pressure and secondary open-angle glaucoma. PXF is also linked to poor pupillary dilation and zonular weakness, leading to increased risk of intraoperative and postoperative complications.

**Aim: To study intraoperative challenges and surgical outcomes in patients with pseudoexfoliation syndrome (PXF) undergoing senile cataract surgery**.

## Materials and methods:

The study was conducted in a tertiary care hospital, as an observational, descriptive, prospective study over a period of one year (January 2024–January 2025). Study was commenced after receiving approval from institutional ethical committee. Written informed consent was obtained from all participants in the local language prior to enrolment. A total of 30 patients fulfilling the inclusion and exclusion selection criteria during the study period were included. The study comprised patients aged >40 years with pseudoexfoliation syndrome undergoing senile cataract surgery, while those with associated ocular diseases or a history of previous ocular surgery were excluded. Data was collected using a structured proforma through detailed patient interviews and clinical examination. All enrolled patients underwent comprehensive ocular evaluation including visual acuity assessment, torchlight examination, slit-lamp bio-microscopy, gonioscopy, tonometry, regurgitation test and direct ophthalmoscopy. Clinical diagnosis and photographic documentation were recorded.

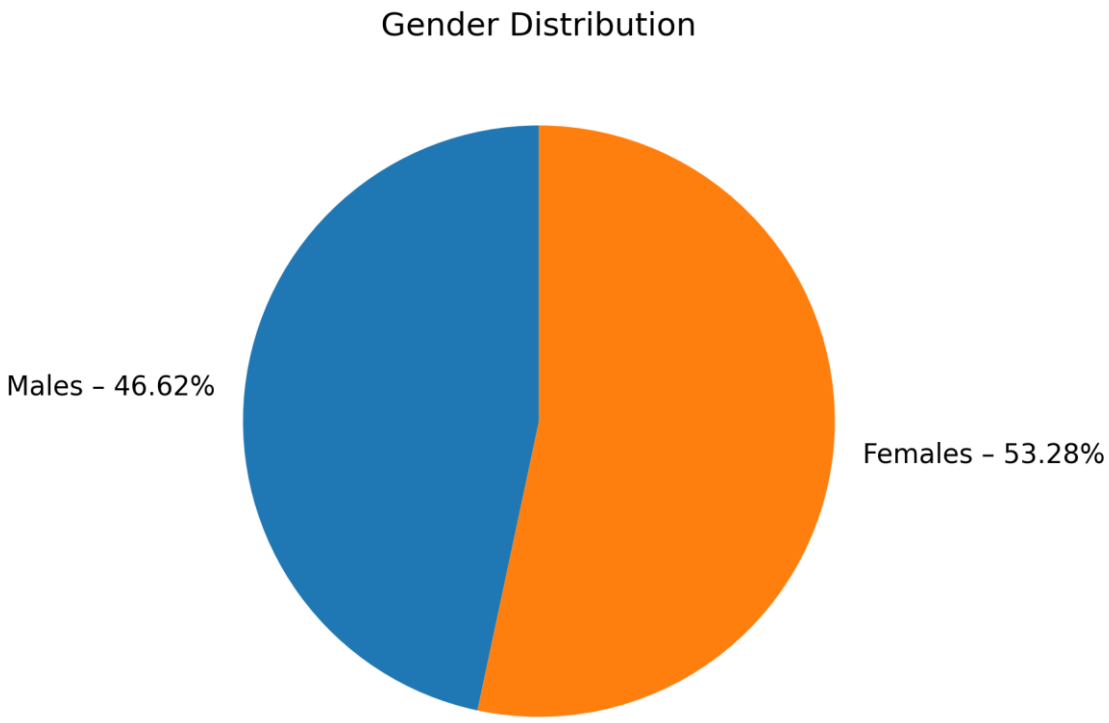
## Results:

**Table no.1 : Age and gender wise distribution of patients**

| AGE (YEARS) | MALE | FEMALE | NO. OF PTS | PERCENTAGE |
|---|---|---|---|---|
| 51-60 | 01 | 01 | 02 | 6.66% |
| 61-70 | 04 | 03 | 07 | 23.31% |
| 71-80 | 06 | 11 | 17 | 56.61% |
| >80 | 03 | 01 | 04 | 13.32% |
| TOTAL | 14 | 16 | 30 | 100% |

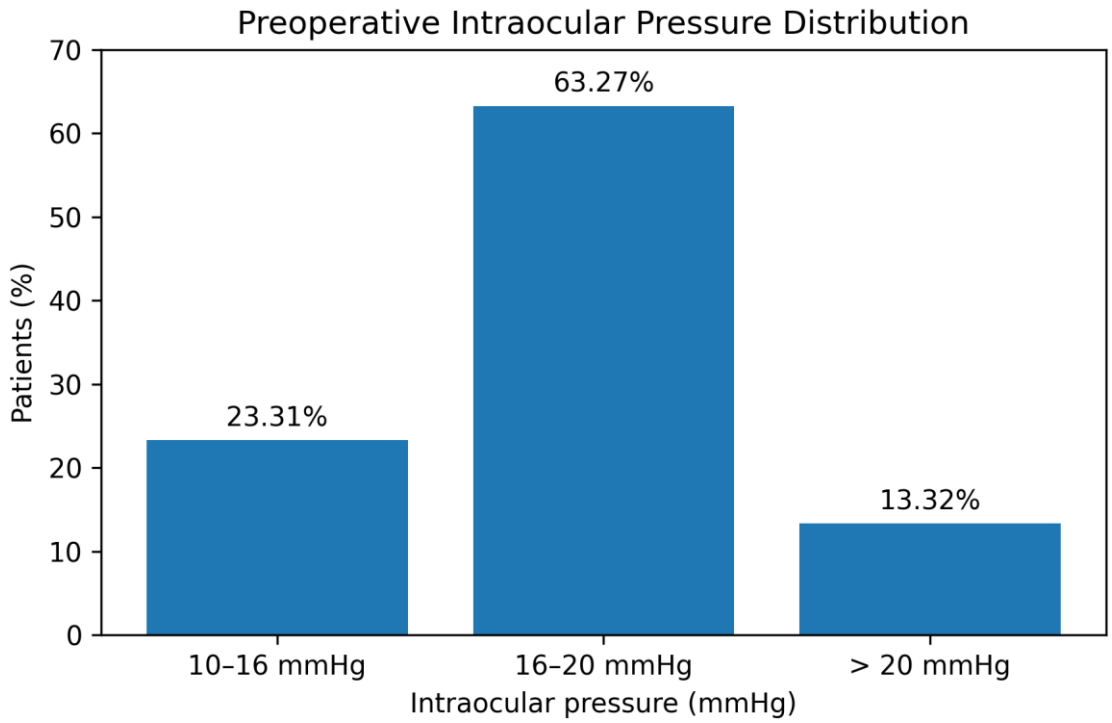
56.61% (17 patients) belonged to 71–80 years age group.

**Fig no.1 Distribution of patients based on Gender**



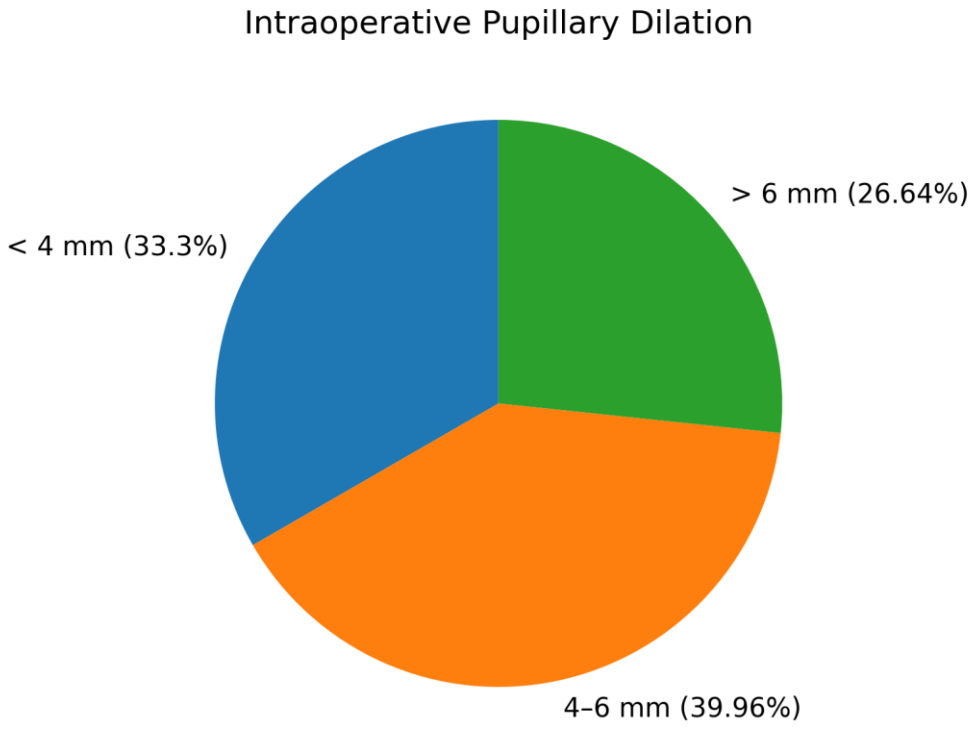

53.28% (16 patients) females and 46.62% (14 patients) males.

**Fig no.2 Distribution of patients based on IOP**



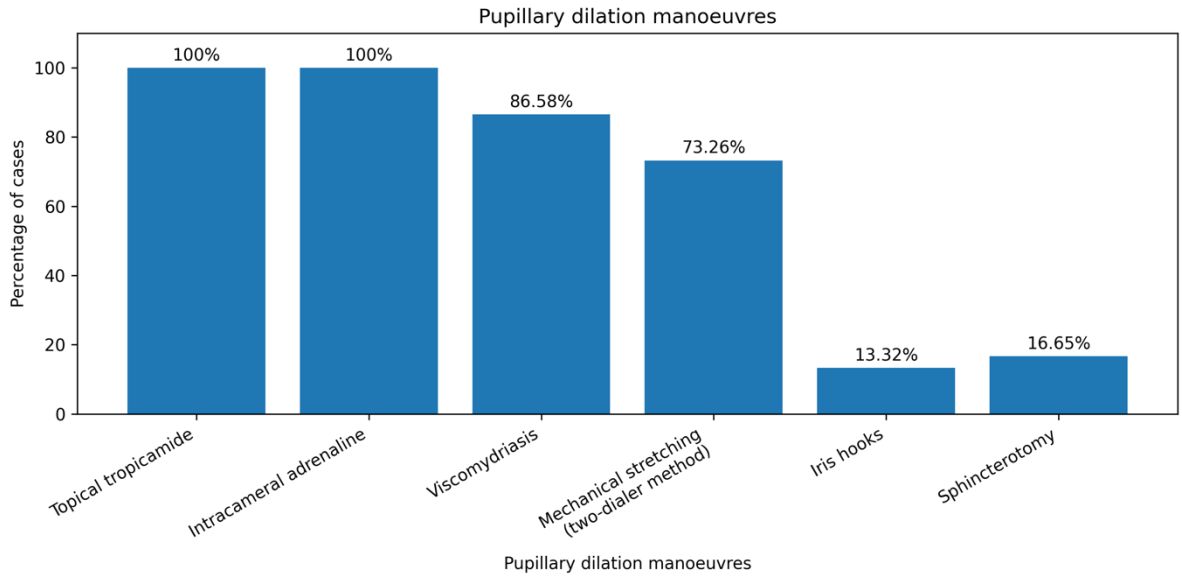

63.27% (19 patients) had IOP between 16–20 mmHg, while 13.32% (4 patients) had intraocular pressures above 20 mmHg.

**Fig no.3 Distribution of patients based on intraoperative pupillary dilation.**




Pupillary dilatation of 4–6 mm was seen 39.96% (12 patients), < 4 mm dilatation in 33.3% (10 patients), while 26.64% (8 patients) had dilatation of > 6 mm.

**Fig no.4 Distribution of manoeuvres used for intraoperative pupillary dilation**



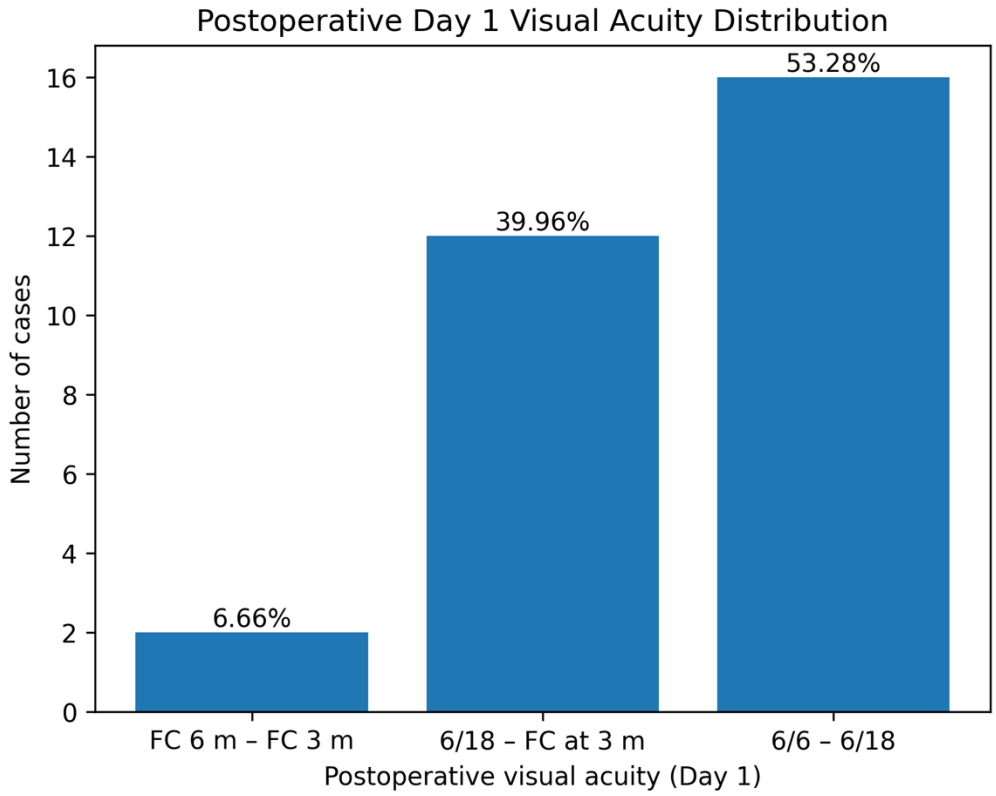

Topical tropicamide and intracameral adrenaline were used in all study cases (100%).
Visco-mydriasis was employed in 86.58%(26 patients).
Mechanical stretching with two-dialer technique in 73.26% (22 patients),
use of iris hooks in 13.32% (4 patients) and sphincterotomy in 16.65% (5 patients).

**Table no.2 Intraoperative complications in patients with pseudoexfoliation undergoing cataract surgery.**

| Intraoperative complications | No. of cases | Percentage |
|---|---|---|
| Zonular dialysis | 04 | 13.32% |
| Posterior capsular rent | 03 | 9.99% |
| Vitreous loss | 01 | 3.33% |

Zonular dialysis was seen in 13.32%,
Posterior capsular rent 9.99% and vitreous loss 3.33%.

**Fig no.5 Showing postoperative visual outcome on postoperative day 1**




On postoperative day 1, 53.28% (16 patients) attaining visual acuity between 6/6 and 6/18, 39.96% (12 patients) having vision from 6/18 to finger counting 6 meters, and only 6.66% (2 patients) showing vision finger counting at 6 meters to finger counting 3 meters.

**Table no.3 Showing Postoperative findings**

| Postoperative findings | No. of cases | Total |
|---|---|---|
| Corneal edema | 06 | 19.98% |
| Irregular pupil | 05 | 16.65% |
| Decentered IOL | 01 | 3.33% |

Corneal edema and pupil irregularity were observed in 19.98% and 16.65% respectively, while decentered intraocular lens was observed in 3.33% cases.

**Discussion:**

The present study demonstrates a predominance of pseudoexfoliation in the elderly population, with majority of patients 56.61% (17 patients) in the seventh and eighth decades of life. This age distribution is comparable to that reported by Sangal N et al.[1] who observed increasing prevalence of pseudoexfoliation with advancing age.

A slight female preponderance was noted in the present study is consistent with the findings of Kaljurand P et al.[2] although other studies such as Joshi and Singanwad SV et al.[3] have reported male predominance, indicating variable gender distribution across populations.

Pseudoexfoliation has been shown to be associated with secondary open-angle glaucoma, though elevated intraocular pressure is not universally present in all patients. In our study,

preoperative intraocular pressure was within normal physiological limits in most patients; however, raised IOP (>20 mmHg) was observed in 13.32% (4 cases), these findings are consistent with earlier studies including Fontana et al.[4]

Poor pupillary dilatation remains a hallmark intraoperative challenge in pseudoexfoliation syndrome. It results from deposition of pseudoexfoliative material on the iris, leading to sphincter muscle fibrosis, stromal atrophy and vascular insufficiency, which together reduce iris elasticity and responsiveness to mydriatics. Additionally, peri-pupillary transillumination defects, attributed to loss of the posterior iris pigment epithelium and repeated mechanical rubbing of the iris against the lens surface, are commonly observed in pseudoexfoliation eyes and signify underlying iris atrophy, thereby contributing to a small, rigid pupil with a tendency of intraoperative miosis as described by Asano et al.[5], Tekin et al.[6] In the present study, poor dilatation (<4 mm) was observed in 33.3% (10 patients) of eyes, necessitating the use of adjunctive manoeuvres such as visco-mydriasis in 86.58% (26 patients), mechanical pupillary stretching by two-dialers and use of iris hooks in 73.26% (22 patients) and 13.32% (4 patients) respectively, and sphincterotomy 16.65% (5 patients). Similar intraoperative difficulties and increased requirement for pupil expansion techniques have been reported by Aravind et al.[7] and S. Nigwekar et al.[8]

Zonular dehiscence in PXF syndrome occurs due to progressive degeneration and weakening of the zonular fibres, caused by direct deposition of pseudoexfoliative material and associated enzymatic and ischemic damage. This leads to thinning, fragmentation and loss of zonular fibres as described by Joshi and Singanwad et al. [3], Fontana et al.[4] In current study, zonular dialysis was the most common intraoperative complication 13.32% (4 patients), followed by posterior capsular rent 9.99% (3 patients) and vitreous loss 3.33% (1 patient). These findings were comparable to earlier Indian studies, including Pranathi K et al.[9] and SushilkumarKar et al.[10] reinforcing the higher surgical risk associated with PXF.

Intraoperative complications in pseudoexfoliation eyes were managed based on the severity of zonular and capsular involvement. In the present study, zonular dialysis involving less than 4 clock hours was present in 6.66% (2 patients) out of which 1 patient was treated with sulcus-fixated intraocular lens (IOL) implantation and other patient was treated with capsular tension ring (CTR) with in-the-bag IOL implantation. This highlights the role of capsular support devices in stabilizing mild to moderate zonular weakness. Similar recommendations have been emphasized by Belovay et al.[11] 6.66% (2 patients) had zonular dialysis exceeding 4 clock hours. Out of which 1 patient was treated with vitrectomy and primary SFIOL, while other patient was managed with vitrectomy with secondary SFIOL after 3 weeks postoperatively. This management strategy is consistent with reports from both Indian studies Aravind et al.[7]and international studies Belovay et al.[11] addressing advanced zonular compromise in PXF eyes.

Posterior capsular rent was seen in 9.99% (3 patients) out of which 6.66% (2 patients) without vitreous loss were treated with sulcus fixation IOL while 1 patient who had vitreous loss too was managed with vitrectomy and primary SFIOL. These management strategies are in accordance with those reported by Anuradha et al.[12] highlighting the importance of prompt recognition and appropriate intraoperative intervention.

On postoperative day 1, the majority of patients achieved good functional visual acuity, with 53.28% (16 patients) attaining 6/6–6/18 vision, while 39.96% (12 patients) had vision between 6/18 – finger counting 6 meters and only 6.66% (2 patients) had vision finger counting 6 meters - finger counting 3 meters, indicating satisfactory visual recovery. These results are

comparable to previous studies Joshi and Singanwad et al.[3], Asana et al.[5] who noted that despite higher complication rates in PXF eyes, good visual outcomes can be achieved with careful surgical planning and postoperative care.

Corneal edema has been commonly reported in pseudoexfoliation syndrome due to endothelial dysfunction and increased surgical manipulation as stated by Fontana et al. [4], Aravind et al.[7] Postoperative pupil irregularity is also frequent postoperative finding and is usually attributed to intraoperative iris handling and sphincterotomy noted by Anuradha et al.[12] In the present study, postoperative findings included corneal edema in 19.98% (6 patients) and irregular pupil were seen in 16.65% (5 patients).

Postoperatively, IOL decentration was observed in 3.33% (1 patient), which might be due to progressive zonular weakness with sulcus fixated IOL. Similar findings has been shown by SushilkumarKar et al.[10] who stated sulcus-fixated IOLs with progressive zonular weakness are more prone to decentration due to inadequate capsular support.

Overall, the findings of the present study are in concordance with previously published literature, reaffirming that pseudoexfoliation is associated with advanced age, poor pupillary dilatation, zonular weakness and increased intraoperative challenges. However, good visual outcomes can be achieved with meticulous surgical technique and appropriate use of adjunctive measures intraoperatively.

## Conclusion:

Cataract surgeries in patients with pseudoexfoliation are associated with increased surgical complexity due to poor pupillary dilation, zonular weakness which become hindrance during surgery and gives intraoperative challenges.
Pupillary dilation can be achieved with adjuncts such as intracameral adrenaline, visco-mydriasis, mechanical stretching of iris with two dialers, use of iris hooks and sphincterotomy. Zonular dehiscence, posterior capsular rent and vitreous disturbance can be managed by use of capsular tension rings, sulcus fixation of posterior chamber intraocular lens and vitrectomy with scleral-fixated intraocular lens respectively to expect good visual outcome post-operatively.

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