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Original Research Article

Study of patients with Pseudoexfoliation syndrome undergoing cataract surgery

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ABSTRACT

Objectives: To analyze the visual outcome in patients with pseudoexfoliation and to know the surgical parameters to cogitate in patients with pseudoexfoliation syndrome.

Materials and Methods: An Observational study which was conducted in the Ophthalmology department in a tertiary care hospital in a rural area from June 2019 to December 2019. A total of 52 eyes of 52 patients aged 40 years and above, of either sex, clinically diagnosed with senile cataract and associated with pseudoexfoliation were enrolled in the study. After assessing best corrected visual acuity (BCVA), a detailed anterior and posterior segment examination was performed along with lacrimal sac syringing, manual keratometry, contact A-scan biometry and intraocular lens (IOL) power was calculated. All patients underwent manual small incision cataract surgery under peribulbar anaesthesia and intraocular lens was implanted. Intraoperative complications were noted during the surgery and was reported. Best corrected visual acuity was recorded on day 1, at 1st week and at 1st month of follow up.

Results: Out of 52 eyes of 52 patients, 29 were females (55.76%) and 38 eyes (73.07%) exhibited bilateral involvement. Distribution of the PXF material in various ocular structures was observed and majority of them (36.53%) had PXF material equally in iris, pupillary margin and lens. Based on the morphology of cataract associated with pseudoexfoliation, nuclear cataract was the most commonly observed in 16 eyes (30.76%) and 42 eyes (80.76%) had moderate pupillary dilatation. The intraoperative difficulties observed during cataract surgery was poor pupillary dilatation which was managed by controlled sphincterotomy during the surgery in 3 eyes (5.76%), Iridiodialysis, rhexis extension, zonular dialysis each in 1 eye and posterior capsular rent in 2 eyes. Around 92.30% of the total study population achieved post-operative BCVA of 6/12 or better at 1 month of follow up. Decreased visual acuity was noted in 2 (3.84%) eyes due to persistent corneal edema, one eye (1.92%) had posterior capsular opacification and one eye (1.92%) had cystoid macular edema.

Conclusion: This study concludes that with careful preoperative assessment and necessary intraoperative precautions, good visual outcome can be achieved in patients with cataract with pseudoexfoliation.

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1. Introduction

Pseudoexfoliation (PXF) syndrome is a condition caused by accumulation of grayish white fibrogranular extracellular pseudoexfoliative material produced by abnormal basement membranes of ageing epithelial cells in lens epithelium, iris stroma, pupillary margin, corneal endothelium, anterior hyaloid surface, zonular fibers, trabecular meshwork.¹⁻³

Pseudoexfoliation was first described by Lindberg in 1917, followed by a detailed description which was made by Alfred Vogt in 1918.⁴⁻⁶ The prevalence of PXF in South Indian population has been reported as 0.69-3.8% and in the rural population in central India as 0.95%.⁷ The exact pathogenesis of pseudoexfoliation remains unclear. Mutation in the LOXL1 gene (locus 15q22) has been attributed which is responsible for overproduction of elastic microfibrillar components such as fibrillin-1.⁸ Pseudoexfoliation is more common in the elderly, aged

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between 75 -85 years.^{9,10} Although there is no established sex predilection for PXF, a female preponderance has been reported in some studies.^{9,10} Clinically it is unilateral at the time of diagnosis in > 50% of patients, but electron microscopy evidence has shown PEX debris in the clinically unaffected fellow eye too.¹¹ Pseudoexfoliation is frequently associated with open angle glaucoma, poor pupillary dilatation and zonular weakness which has been identified as the most significant risk factors for surgical complications.¹²⁻¹⁴ Complications during cataract surgery has been reported such as posterior capsular rupture, zonular dialysis and vitreous loss during surgery which makes cataract surgery a potentially challenging one and thus surgeons must be aware of numerous intraoperative and postoperative difficulties in managing the patients with pseudoexfoliation syndrome.¹⁵

2. Materials and Methods

An Observational study after obtaining institutional ethical committee clearance which was carried out in the Ophthalmology department (OPD) in a tertiary care hospital among the rural population from June to December 2019. A written informed consent was obtained from all the patients after explaining the procedure and the risks associated with it. A total of 52 eyes of 52 patients aged 40 years and above, of either sex, clinically diagnosed with senile cataract and associated with pseudoexfoliation who visited the ophthalmology OPD were enrolled in the study. Patients with cataract due to uveitis, trauma, or systemic diseases, those with pseudoexfoliation glaucoma, retinal pathologies and high myopes or previous history of any ocular surgery were excluded from the study. Visual acuity was tested using Snellen chart and uncorrected and best corrected visual acuity was recorded. A complete anterior segment examination was performed using a slit lamp before and after pupil dilatation. Intraocular pressure (IOP) was measured by Applanation tonometry and gonioscopy was performed using a 3mirror gonioscopes. Pseudoexfoliation was confirmed by the presence of fluffy white granular material on the ocular structures. Type of cataract and pupillary dilatation was assessed using a slit lamp. Pupillary dilatation <5 mm was considered to be poor dilatation. Retinal evaluation was done by indirect ophthalmoscopy. Those found to have any optic disc or retinal pathology that was likely to confound post-operative visual outcome were excluded from the study. B scan ultrasonography was performed in patients where fundus was not visible. Other procedures included lacrimal sac syringing, manual keratometry, contact A-scan biometry and intraocular lens (IOL) power was calculated using Sanders-Retzlaff-Kraff – II (SRK –II formula). Systemic examination and investigations were performed in all patients preoperatively. A single surgeon performed the cataract surgeries. All patients underwent manual small incision cataract surgery

under peribulbar anaesthesia and intraocular lens was implanted. The involved eye was taken up for surgery with standard aseptic precautions and with sterile draping. Surgical technique is as follows. A fornix based superior conjunctival flap was made and 6mm superior sclerocorneal frown shaped incision was made with bard parker knife with 15 no. blade, 1.5-2mm behind the limbus. Sclero corneal tunnel was formed about 1.5mm in the cornea with crescent. Anterior chamber entry done with help of 3.2mm keratome. After staining the capsule with trypan blue dye, continuous curvilinear capsulorhexis done with utrata's capsulorhexis forceps. After hydrodissection, nucleus was delivered with wire vectis. Thorough cortex wash was done using Simcoe's two way irrigation and aspiration cannula. A rigid 6mm PMMA PCIOL was implanted in the capsular bag. Anterior chamber wash was given and the wound was closed with wet cautery. Postoperatively, patients were on topical antibiotics and steroids.

Intraoperative complications during surgery were noted and reported. In view of cataract with pseudoexfoliation, preventive measures like large capsulorhexis, minimum hydroprocedure and rotation of nucleus, meticulous wash and careful implantation of lens with minimum dialing were taken during cataract surgery. Best corrected visual acuity was recorded on day 1, at 1 week and at 1 month of follow up at the OPD. This study was done to know the visual outcome and to evaluate the intraoperative complications of manual SICS done in patients with pseudoexfoliation syndrome.

2.1. Statistical methods

Analysis of results was done using SPSS Software (version 22). Visual outcome was considered as the primary outcome of interest. Descriptive analysis was carried out by frequency and proportion for categorical variables. Data is represented using appropriate diagrams like bar and pie diagrams. The association between explanatory variables and categorical outcomes was assessed by cross-tabulation and comparison of percentages.

3. Results

A total of 52 eyes of 52 patients were evaluated during the study period among the rural population. All of them underwent small incision cataract surgery. The age wise distribution of patients with PXF syndrome is depicted in Table 1 and majority of them were aged above 60 years. Further, 23 patients were males (44.23%) and 29 were females (55.76%) as shown in and Table 2. Thirty eight eyes (73.07%) exhibited bilateral involvement and 14 eyes (26.92%) exhibited either right or left eye involvement (Table 3). Distribution of PXF material in various ocular structures is shown in the Table 4 and majority of them (19 eyes, 36.53%) showed equal distribution of PXF material in iris, pupillary margin and

lens. Based on morphology of the cataract associated with pseudoexfoliation, nuclear cataract was the most commonly observed (30.76%) followed by eyes with both coexisting cortical and nuclear cataract (23.07%), (Table 5). Distribution of eyes based on pupillary dilatation (Table 6), three of them had poor pupillary dilatation (5.76%), while 42 eyes had moderate dilatation (80.76%) and 7 of them (13.46%) dilated beyond 7mm. The intraoperative difficulties observed during cataract surgery is shown in (Table 7) Poor pupillary dilation (Table 6), was managed by controlled sphincterotomy during the surgery in 3 patients, to facilitate capsulorhexis and nucleus delivery. Due to poorly constructed tunnel, one of the eyes had iridodialysis which was small and present superiorly at 12'o clock position and the patient was asymptomatic. Rhexis extension was seen in one eye, which was managed by conversion of CCC to can-opener technique Further, zonular dehiscence occurred in one eye, necessitating capsular tension ring placement to stabilize the zonular apparatus. Posterior capsular rupture occurred in two eyes, for which anterior vitrectomy was performed, and the intraocular lens was placed over the anterior capsular rim. Posterior chamber intraocular lens was implanted in 50 eyes. Immediate postoperative complications (as observed on first postoperative day) were also recorded have been illustrated in (Table 8). A comparison of preoperative and post-operative best corrected visual acuities on first post-operative day and at the time of follow-up (Day 7 and 1 month) is illustrated in Table 9 respectively. As evident, 92.30% of the total study population achieved BCVA of 6/12or better at 1month of follow up. Decreased visual acuity was noted in 2 (3.84%) eyes due to persistent corneal edema probably due to corneal decompensation, one eye (1.92%) had posterior capsular opacification and one eye (1.92%) had cystoid macular edema and they were treated accordingly (Table 10).

Table 1: Age distribution

Age group in years	No of eyes(n=52)	Percentage n (%)
41-50 years	6	11.53%
51-60 years	12	23.07%
61-70years	19	36.53%
Above 70 years	15	28.84 %

Table 2: Gender distribution

Sex	No of eyes(n=52)	Percentage n (%)
Male	23	44.23%
Female	29	55.76%

Table 3: Laterality Distribution

Eye	No of eyes (n=52)	Percentage n (%)
Unilateral	14	26.92%
Bilateral	38	73.07%

Table 4: Distribution of Pseudoexfoliative material on ocular structures

Distribution of PXF material	No of eyes (n=52)	Percentage n (%)
Corneal endothelium	4	7.69%
Pupillary margin	9	17.30%
Iris	8	15.38%
Lens	12	23.07%
Iris,Pupillary margin and lens	19	36.53%

Table 5: Morphology of cataract among the study population with pseudoexfoliation

Type of cataract	No of eyes (n=52)	Percentage n (%)
Hyperature	5	9.61%
Mature	9	17.30%
Nuclear	16	30.76%
Cortical + Nuclear	12	23.07%
Posterior subscapsular + Nuclear	7	13.46%
Posterior polar +Nuclear	3	5.76%

Table 6: Distribution of population based on pupillary dilatation

Pupillary dilatation	No of Eyes (n=52)	Percentage n (%)
< 5mm (poor)	3	5.76%
5-7mm(fair)	42	80.76%
>7mm(good)	7	13.46%

Table 7: Intraoperative complications

Complications	No of Eyes (n=52)	Percentage n (%)
Iridodialysis	1	(1.92%)
Rhexis extension	1	(1.92%)
Posterior capsular rent	2	(3.84%)
Zonular dialysis	1	(1.92%)

Table 8: Postoperative complications

Complications	No of eyes (n=52)	Percentage n (%)
Postoperative hyphema	3	5.76%
Corneal edema	4	7.69%
Anterior chamber reaction	4	7.69%
Retained lens matter	1	1.92%
Decentered IOL	1	1.92%
Irregular Pupil	4	7.69%
IOP elevation	4	7.69%

Table 9: Preoperative and postoperative best corrected visual acuity

BCVA	Preoperative BCVA	Postoperative BCVA(n=52)		
	(n=52)	Day 1	Day 7	1 Month
6/6 -6/12	0	12 (23.07%)	35 (67.30%)	48 (92.30 %)
6/18-6/36	28 (53.84 %)	33 (63.46%)	15 (28.84%)	4 (7.69 %)
6/60 or less	24 (46.15%)	7 (13.46%)	2 (3.84%)	0

Table 10: Causes for decreased postoperative visual acuity (1 Month of follow up)

Causes	No of eyes (n=52)	Percentage n (%)
Persistent corneal edema	2	3.84%
Posterior capsular opacification	1	1.92%
Cystoid macular edema	1	1.92%

4. Discussion

PXF syndrome is an age related disorder. PXF syndrome uncommonly presents before the age of 60 years and increases with age. In our study, the frequency of PXF syndrome was more in the age group of 61-70 years which was 36.53% followed by 28.84% in the age group above 70 years, 23.07% in the age group between 51-60 years. In a hospital based study conducted by Govetto et al., PXF syndrome was not observed in patients aged < 50 years. According to the study among study population, 6.1% of them were between 50 and 60 years old, 7.3% between 60 and 70 years, 19.1% between 70 and 80 years old, 31.7% were above 80 years of age.¹⁶ In our study, among 52 patients, 23 (44.23%) were males and 29 (55.76%) were females. Reports regarding sex predilection in PXF are conflicting as Arvind et al. in 2003 showed no sex predilection⁷ while Avramides et al. reported a female preponderance.¹⁷ Bilateral involvement was observed in 38 eyes (73.07%), whereas right or left eye involvement was observed in 14 eyes (26.92%). Many studies have reported bilateral involvement rather than unilateral involvement.¹⁶⁻¹⁹ In our study, PXF material was distributed equally on the iris, pupil, and lens in 19 eyes (36.53%), only on the lens in 12 eyes (23.07%), followed by 9 eyes (17.30%) on pupillary margin. In a study conducted by Idakwo et al. in which all patients in the study had PXF material on the peripheral zones of the lens and 8 patients had on the pupillary margin.²⁰ Furthermore, Al Salehet al. reported PXF material on the iris margin in 62.3% patients and on the pupillary margin in 0.11% patients.²¹ Based on the morphology of cataract associated with pseudoexfoliation, in our study majority of them, i.e., 16 eyes (30.76%) had nuclear cataract followed by coexisting cortical and nuclear cataract in 12 eyes (23.07%). Joshi et al. in his study noticed 25% patients had nuclear cataract, 98% of them with hypermature and 50% with mature cataract.²² Pre-operative maximum pupillary dilatation observed in our study was poor in 5.76% eyes, fair in 80.76% eyes and good in 13.46% eyes. Naik et al. in their study noted 13% cases with poor pupillary dilatation, 67%

with fair and 30% cases had good preoperative pupillary dilatation.²³ Intraoperative difficulties in cataract surgery in patients with PXF syndrome have been reported in various studies.²³⁻²⁶ In our study, intraoperative difficulties occurred in 5 eyes (9.61%) while performing cataract surgery by SICS. Naik et al. and Gadewar et al. in their study reported intraoperative complications in 26% (13/n=50) and 42% (21/n=50) patients during phacoemulsification and small incision cataract surgery, respectively.²³ The common intraoperative complication observed in our study was PCR, in accordance with the findings in several studies.²³⁻²⁶ Other complications that we encountered in our study were iridodialysis, rhexis extension and zonular dialysis. Post-operatively, patients with pseudoexfoliation are at a greater risk of developing an immediate elevation of IOP, as in our study 7.6% had raised IOP in immediate postoperative period. Other most commonly observed postoperative complications were corneal edema, anterior chamber reaction and irregular pupil which are consistent with other studies too.²³⁻²⁶ At 1 month of follow-up in our study, around 92.30% had a significant improvement of visual acuity with BCVA between 6/12 to 6/6 and 7.69% had BCVA between 6/18 to 6/36, which is similar to the findings noted in various studies.²³⁻²⁷

5. Conclusion

Our study demonstrated an increased incidence of intraoperative and postoperative complications following cataract surgery in patients with pseudoexfoliation. With proper preoperative assessment combined with adequate surgical precautions like large capsulorhexis, minimum hydroprocedure and rotation of nucleus, meticulous wash and careful implantation of lens with minimum dialing helps the surgeon to overcome the challenges in the management of cataract with PXF.

6. Further scope of the study

Further studies should be done for a longer duration to determine a strategic framework for cataract surgery in

patients with PXF syndrome.

7. Limitation of the study

The major limitation of the study was small sample size and shorter duration of the study.

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9. Author's contribution

Dr. Deepa. R: Data collection, Designed the study, Protocol writing and Manuscript preparation

Dr. Srinivasan. G: Data collection, Manuscript Review and guided the research work.

10. Source of Funding

None.

11. Conflicts of Interest

All contributing authors declare no conflict of interest.

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