

Visual Outcome and Complications after Phacoemulsification in Cataract Patients Associated with Pseudoexfoliation

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Abstract: Aim: Pseudoexfoliation is an age related syndrome characterized by the bilateral accumulation of extracellular fibrillar material in many ocular and systemic tissues. The lysosomal proteinases destroy the normal basement membrane resulting in loose zonule-lens capsule complex thus making cataract surgery to be more challenging with increased incidence of intraoperative & postoperative complications. The purpose of this study was to study the clinical profile and complications during cataract surgery in patients with cataract associated with pseudoexfoliation.

Materials and Methods: This cross-sectional descriptive study was carried out on 129 eyes with cataract and Pseudoexfoliation who underwent phacoemulsification surgery.

Results: The study comprised of 129 eyes of which 44.2% were females and 55.8% males with mean age of 67.88 ± 8.915 years and mean intraoperative pupil size of 5.987 ± 0.969 mm. The mean post-operative CDVA was 0.341 ± 0.28 log MAR. The mean pre-operative and post-operative intraocular pressure was 18.9031 ± 3.398 mmHg and 20.254 ± 2.032 mmHg respectively. Poor pupillary dilatation (43%), phacodonesis (10.1%), open angle glaucoma (22.5%) and occludable angle (8.5%) were the most common preoperative findings. Zonular dialysis (2.3%), posterior capsular rupture (3.1%), Vitreous prolapse (2.3%), striae keratopathy (20.9%), Iritis (13.95%), raised intraocular pressure (13.17%) and cystoid macular edema (4.7%) were the common intraoperative and postoperative complications observed.

Conclusion: Although cataract surgery in eyes with pseudoexfoliation is a challenge to many surgeon's, proper preoperative assessment, timely management of intraoperative complications and prompt postoperative care helps to reduce the complication rate and achieve a favourable surgical outcome in cataract patients associated with pseudoexfoliation.

Keywords: Pseudoexfoliation, Occludable angle, phacodonesis, zonular dialysis

1. Introduction

Pseudoexfoliation (PXF) is an age related syndrome characterized by the bilateral accumulation of extracellular fibrillar material in many ocular and systemic tissues [1]. Worldwide prevalence varies from 10-20% over the age of 60 years, [2] whereas in India various hospital based studies

reported prevalence from 3.01% to 18.4% over the age of 80 years due to difference in ethnic, age and sex distribution of patients examined [3], [4].

In pseudoexfoliation syndrome, lysosomal proteinases destroy the normal basement membrane resulting in loose zonule-lens capsule complex. Hence cataract surgery is generally considered to be a challenge and associated with an increased incidence of intraoperative & postoperative complications in eyes with pseudoexfoliation [5]. Common intraoperative complications include a small pupil, a shallow anterior chamber, vitreous prolapse, zonular dialysis, a posterior capsular tear, and a dropped nucleus [6].

The other factors are poorly dilating pupils, corneal endothelial changes and blood aqueous barrier breakdown also contribute to increase incidence of above intraoperative complications and also believed to increase the rate of postoperative rise in intraocular pressure (IOP), corneal edema, and fibrin reaction in the anterior chamber, posterior synechiae, cystoid macular edema, anterior capsular contraction, intraocular lens (IOL) subluxation/dislocation, and reduce postoperative visual acuity [6]-[8]. This study was undertaken to identify the risks associated with cataract surgery in the PXF patient that can be minimized with the proper preoperative, intraoperative and postoperative care.

2. Materials and methods

This prospective, non-randomized, interventional study was carried out in adherence to the tenets of the Declaration of Helsinki and approved by the Institutional Ethics Committee on 129 eyes of cataract patients associated with pseudoexfoliation who underwent phacoemulsification after obtaining written Informed consent.

Patients with cataract secondary to trauma, Secondary to glaucoma, uveitis, high myopia, and systemic diseases like diabetes, steroids were excluded.

A. Surgical technique

After obtaining written informed consent all patients

underwent a detailed preoperative evaluation which includes visual acuity assessment, detailed slit lamp examination to look for pseudoexfoliative deposits on the cornea, iris and pupillary margin and after dilatation, on the anterior capsule of the lens, dilated fundoscopy, gonioscopy (angle was graded by Shaffer's system of grading), applanation tonometry, keratometry, A-scan & intraocular lens power calculation with SRK -2 formula.

Preoperatively pupillary dilatation was achieved with 0.8% tropicamide & 5% /10% phenylephrine drops along with flurbiprofen eye drops. Under peribulbar anaesthesia with 5 ml of 2% xylocaine and 5 ml of 0.5% bupivacaine with 150 units/ml of hyaluronidase phacoemulsification with 280-300 mm mercury vacuum, 20-30 cc/min aspiration flow rate and continuous ultrasound power of 50-60% was performed by horizontal and vertical chopping in all patients by all operating surgeons. A foldable IOL implantation (Aurovue-acrylic hydrophobic, biconvex with optic diameter of 6mm and A constant 118.7, Aurolab, Shah distributors, Davangere, India) was implanted and followed by thorough removal of ophthalmic viscoelastic device (2% hydroxypropylmethyl cellulose). Any intraoperative complication was noted.

Postoperatively, all patients received antibiotic steroid eye drops to be instilled hourly followed by tapering dose for 6 weeks along with flurbiprofen eye drops 0.03% TID for 4 weeks and followed regularly for visual acuity and postoperative complications.

3. Analysis and statistical methods

Data was entered into excel sheet and analysed using SPSS 22 version (IBM SPSS Statistics, Somers NY, USA). Categorical data was represented in the form of Frequencies and proportions. Continuous data was represented as mean and standard deviation. Paired t test is the test of significance for paired data such as before and after surgery for quantitative data.

p value (Probability that the result is true) of <0.05 was considered as statistically significant.

4. Results

Table 1 shows the age and sex distribution among the participants. In the study 44.2% were females and 55.8% were males, mean age of subjects was 67.88 ± 8.915 years and mean intraoperative pupil size was 5.987 ± 0.969 mm.

In the study mean pre-operative and post-operative CDVA was 1.015 ± 0.600 and 0.341 ± 0.285 respectively. There was significant improvement in the CDVA post operatively when compared to pre-operative values. [Table 2]

In our study the mean pre-operative IOP was 18.9031 ± 3.398 mmHg and post-operative IOP was 20.254 ± 2.032 mmHg. There was significant increase in IOP post-operatively.

Table 3 depicts the other ocular conditions associated with pseudoexfoliation apart from cataract. Deposition of PXF material on pupillary margin and anterior surface of the lens was seen in 79 eyes, open angle glaucoma in 29 eyes and

occludable angle in 11 eyes. Shallow anterior chamber (15.5%), poor pupillary dilatation (43%), Grade 3 (Iridodonesis with zonular dialysis) and 2 phacodonesis (easily noticeable under slit lamp with or without Iridodonesis) in 2.3% and 10.15% respectively were also observed.

Table 4 shows the fundus findings among patients that contributed to low vision in some of the cases postoperatively Glaucomatous Optic atrophy in 8.5%, Posterior vitreous detachment (PVD) in 2.3% and Age related macular degeneration (ARMD) in 3.9%

Fig. 1, shows the intraoperative complications observed, Phacodonesis in 10.1%, Zonular dialysis in 2.3%, Posterior capsular rupture (PCR) in 3.1%, Vitreous Prolapse in 2.3% and Iridodialysis in 0.8%.

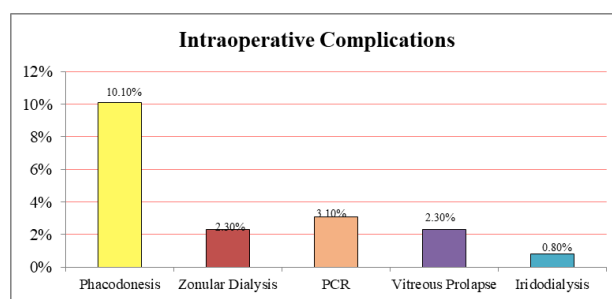


Fig. 1. Bar diagram showing Intraoperative Complications among subjects

Table 1
Age and sex distribution among the participants

Profile	Count	%	
Sex	Female	57	44.2%
	Male	72	55.8%
Age	Mean ± SD	67.88 ± 8.915	

Table 2
Mean CDVA log MAR at Pre-Operative period and Post-Operative period

CDVA	N	Mean	SD	P value
Pre-Operative	129	1.015	0.600	<0.001
Post-Operative	129	0.341	0.285	

Table 3
Conditions associated with pseudoexfoliation

Factors	N	%
Shallow AC	20	15.5
Poor pupillary dilatation	17	43
Presence of PXF material on pupillary margin and lens	79	61.2
Phacodonesis	13	10.1
Increased trabecular pigmentation	23	17.8
Ocular hypertension	12	9.3
Open angle glaucoma	21	16.3
Occludable angle	11	8.5
Subluxation	3	2.3

Table 4
Fundus findings among subjects

Fundus features	Count	%
Normal	110	85.3
Glaucomatous optic atrophy	11	8.5
ARMD	5	3.9
PVD	3	2.3

Fig. 2, depicts postoperative complications. In this study Striae Keratopathy was seen in 20.9%, Hyphema in 1.6%, Iritis in

13.95%, raised IOP in 13.17%, Retained lens matter in 3.1%, Cystoid macular edema (CME) in 4.7% and Decentred IOL in 1.6%.

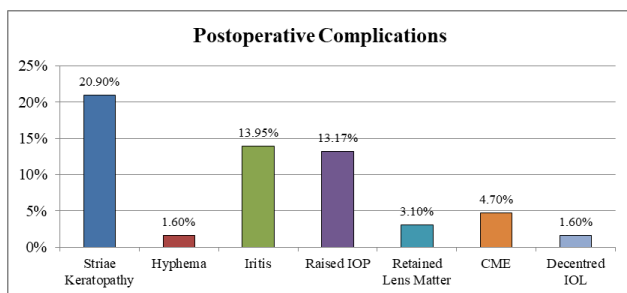


Fig. 2. Bar diagram showing Postoperative Complications among subjects

5. Discussion

The deposition of extracellular fibrillar material in many ocular tissues alters its structure, making cataract operations potentially challenging. In this regard many studies have shown pseudoexfoliation syndrome to have higher rates of complications during and after cataract surgery compared to patients without this disorder [6], [9].

In the present study involving 129 eyes of 72 (55.8%) males and 57 (44.2%) female cataract patients associated with pseudoexfoliation, the mean age of subjects was 67.88 ± 8.915 years. [Table 1]. This was in accordance with the reports of epidemiological studies on PXF that shows occurrence to be more common in patients older than 60 years and increasing prevalence with age [10], [11]. It is rarely seen before the age of 50.

Although, PXF is said to be more common in females, our study showed more prevalence among males when compared to females. There are conflicting results by other authors regarding the gender prevalence. Equal frequency of PXF among men and women reported in some studies [12], [13].

In a study by Philip et al. the male to female ratio of PEX sufferer was found to be 1:1.27 [14].

Contrary to these studies higher prevalence in male was reported in Saudi Arabia, Nepal, and Chinese population [15], [16]. Although the exact mechanism is not clear, it has been attributed to longer exposure of males to provoking climatic conditions.

In the study mean preoperative and postoperative CDVA was 1.015 ± 0.600 and 0.341 ± 0.285 log MAR respectively. There was a significant improvement in the CDVA post operatively when compared to preoperative values ($P < 0.001$). [Table 2] At the end of 6 months follow-up visit good vision was achieved in 51.94%, better in 25.58% and worst in 6.2% similar to Pranathi et al. [17]. In our study low vision was attributed to glaucomatous optic atrophy, posterior vitreous detachment (PVD) and age related macular degeneration (ARMD) whereas corneal decompensation was the cause in latter study.

In this study the mean preoperative IOP was 18.9031 ± 3.398 mmHg and at postoperative period was 20.254 ± 2.032 mmHg.

($P < 0.001$) comparable to a study by Sushil. K.K et al. [18]. There was significant increase in IOP at immediate postoperative period due to postoperative inflammation that resolved with prompt medical therapy by 2 weeks. [Table 3]

Increase in IOP was also observed in 45% of PEX patients studied by Al Saleh et al. [16] a close association between increased IOP and PEX has been reported by numerous investigators. [19] and attributed to decreased aqueous drainage due to blockage of trabecular meshwork by PXF material.

Table 4 depicts the other ocular conditions associated with pseudoexfoliation apart from cataract. Deposition of whitish grey flaky material on pupillary margin and anterior surface of the lens which is the easiest recognizable diagnostic sign of pseudoexfoliation was seen in 79 eyes and small pupil in 17 eyes for which stretch pupilloplasty and sphincterotomies in 3-4 quadrants was attempted and none of the pupil expanders were used. This prevalence was similar to a study by Sushil K. K [18] but lesser than Pranathi et al. [17] studies. Poor pupillary dilatation is an important risk factor in the manifestation of intraoperative posterior capsule rupture and vitreous loss.

Ocular hypertension (diagnosed as IOP > 21 mmHg with healthy disc and normal visual field) in 9.3%, open angle glaucoma (open angles on gonioscopy with glaucomatous optic nerve damage and visual field changes) in 16.3% eyes and occludable angle (diagnosed when pigmented trabecular meshwork was not visible in more than 180° of the angle) in 8.5%. Shallow anterior chamber in 20 eyes, poor pupillary dilatation in 17 eyes and Grade 3 and 2 phacodonesis in 2 and 10 eyes respectively. Similar features were also observed by other authors [6], [16], and [17].

A Kozart and Yanoff, [20] in a clinic based study of 100 consecutive patients with PEX, reported 15% prevalence of OHT and 7% prevalence of glaucoma. The Blue Mountains Eye Study, [21] a population based study reported 9.3% OHT and 14.2% glaucoma. Formation of posterior synechiae and anterior lens subluxation due to zonular weakness have been thought to predispose to these conditions, which are further worsened by miotic therapy [22].

Mild phacodonesis was the most frequently encountered intraoperative complication (10.15%) in our study, and considering the fact that PXF is a progressive condition a capsule tension ring (CTR) [2700 open Poly methyl methacrylate (PMMA) ring by Aurolab, Madurai India] were used in these cases. Rings were introduced before emulsifying the cataractous lens which equalizes zonular tension around the capsule and helps to recenter a mildly subluxated capsular bag. 3 eyes with grade 3 phacodonesis underwent intracapsular cataract extraction with scleral fixated intraocular lens [SC6530, PMMA, 6.5mm optic, equiconvex, modified 'C' loop & a constant 118.5 by Aurolab, Madurai, India] implantation due to trans illumination defects. In the case of mild to moderate zonular instability with small posterior capsule rupture with CTR in the bag, an IOL capture was performed with the optic in the capsular bag and the haptics placed in the sulcus after

expanding the sulcus with viscoelastic device. [Fig. 1]

It is advised to choose a CTR with a diameter larger than that of the capsular bag, as the centrifugal force expands the capsular equator and provides an equal distribution of force over the entire circumference of the capsule [23]. A 3-piece intraocular lens was implanted within the bag instead of CTR by Sushil K K et al. who observed decentration in one case. Injection of an OVD between the lens capsule and the cortex was tried to avoid trapping of cortex during CTR insertion as it creates adequate corticocapsular cleavage than hydrodissection alone.

Although careful intraoperative manoeuvres (like well centered capsulorhexis, gentle hydrodissection, zonule friendly chopping technique and tangential stripping of cortical matter) were performed Zonular dialysis was noted in 2.3%, PCR in 3.1%, vitreous prolapse in 2.3% and iridodialysis in 0.8% [Fig. 1] which was managed with prompt anterior vitrectomy and implanting a 3 piece IOL in the sulcus. Similar complications were also reported by other authors 5,17,18,24

Fig. 2 displays the postoperative complications of which Striae Keratopathy (20.9%), Hyphema (1.6%), mild iritis (13.95%) and raised IOP (13.17%) due to excessive intraoperative manipulation of small pupil and retained lens matter (3.1%), resolved within 2 weeks after prompt medical therapy and cortical wash. Similar experience was reported in other studies with same reasons. Retained OVD was the cause for raised IOP observed by Dwivedi N.R [25].

CME (4.7%) and decentred IOL (1.6%) was the late complication observed, probably due to vitreous disturbance and progressive zonular weakness respectively. IOL decentration has also been reported even when the lens is entirely in the capsular bag due to decentration of the entire bag that can be managed by repositioning or exchanging the IOL [5], [26].

However, Shingleton BJ and his colleagues have observed that the typical time frame for IOL displacement in patients with PXF requiring surgery is 8.5 years after the initial procedure. A thorough awareness of PXF syndrome and its effects on all ocular tissue is essential to understand the causes of operative complications and its outcome and thereby avoid or minimize the same.

6. Conclusion

Although cataract surgery in eyes with pseudoexfoliation is challenge to many surgeons proper preoperative assessment, intraoperative considerations like encouraging the use of Capsule tension rings, pupil expanders, a well centered capsulorhexis, gentle hydro dissection, zonule friendly horizontal chopping while emulsifying the lens and tangential cortical clean up, timely management of intraoperative complications and prompt postoperative care helps to reduce the complication rate and achieve a favourable surgical outcome in cataract patients associated with pseudoexfoliation. Since pseudoexfoliative process continue even after the surgery

patients should be monitored regularly for possible progression of glaucoma, development of capsular phimosis syndrome or decentration of IOL which require surgical intervention.

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