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Research Article

Impact of Pseudoexfoliation Syndrome on Cataract Surgery Outcomes: A Clinical Perspective

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Abstract: Introduction A systemic disease's significant eye symptom is pseudo exfoliation syndrome1. It was Lindberg who while conducting his research paid attention to greyish flakes and fringes at the pupillary border and on anterior lens surface. This was found to be as common in cataract patients as in non-cataractous controls older than 55 years. The phenomenon was observed in 50% of glaucoma patients as well. It was also noticed that this was more prevalent with advancing age. Material and Methods the current study, a cross-sectional assessment of the population, was conducted in a hospital in the Hospital. Every patient 45 years of age or older who visited the OPD over a period of 6 months had an evaluation for PEX and PXG. In all, the data analysis took place for two years. Obtaining consent from the institutional ethics committee was accomplished with each participant. In cases where typical PEX was discovered at the pupil, lens surface, or other intraocular structures, it was considered that PEX was present in the eye. Results Among 80 patients, 50 (62.5%) were aged 70–79 years, 25 (31.25%) were 60–69 years, 4 (5%) were over 80, and 1 (1.25%) was 51–59 years. The mean age was 71.83±5.80 years. Males comprised 56 (70%), and females 24 (30%). Bilateral PXF was found in 60 patients (85.71%, 120 eyes), and unilateral in 20 (14.29%, 20 eyes). Lens involvement occurred in 111 (79.29%) eyes, pupillary in 109 (77.86%), iris in 56 (40%), cornea in 20 (14.29%), and angle in 6 (4.29%). Conclusion PES is an age-related, complex systemic disease and characterized by the progressive accumulation of PXM in all ocular tissue, in addition to other parts of the body such as the heart, liver, kidneys, lungs, cerebral meninges, vessel walls, and skin. Multiple epidemiological, geographic, and environmental factors play roles in its pathogenesis. Also, an association between genetic polymorphisms in the LOX1 gene and the disease is known.

Keywords: Pseudo exfoliation, Cataract surgery, Pseudo-exfoliation syndrome

INTRODUCTION

A systemic disease's significant eye symptom is pseudo exfoliation syndrome1. It was Lindberg who while conducting his research paid attention to greyish flakes and fringes at the pupillary border and on anterior lens surface. This was found to be as common in cataract patients as in non-cataractous controls older than 55 years. The phenomenon was observed in 50% of glaucoma patients as well.[1] It was also noticed that this was more prevalent with advancing age. The exfoliative material consists primarily of abnormal crosslinked fibrils that accumulate progressively in some organs such as the heart, blood vessels, lungs or meninges, and particularly in the eye's anterior structures. [2]

Although the precise pathophysiological mechanism is yet unknown, it is believed that both genetic and environmental factors contribute to the genesis and gradual extracellular accumulation of exfoliative material.[3] Therefore, higher exposure to ambient UV light or caffeine consumption, as well as polymorphisms in the LOXL1 gene, which is involved in the metabolism of elastic fibres and extracellular matrix, are linked to pseudo exfoliation syndrome.[4] The majority of patients who undergo pseudo exfoliation are elderly, typically in their late 60s and early 70s. It can be unilateral or bilaterasl, and over the course of 20 years, 50% of them turn bilateral.[5]

Clinically, tiny fibrillar extracellular material buildup and increasing generation are signs of pseudoexfoliation in the eye.[6] These dandruff-like deposits are typically observed over the anterior lens capsule and pupillary edge. In order to achieve safe surgery and a positive postoperative outcome, pseudoexfoliation syndrome offers problems that require careful preoperative preparation and intraoperative care. Therefore, the purpose of this study is to ascertain the prevalence of PXF in all patients aged 40 and above. The current study set out to determine the prevalence of pseudoexfoliation in all patients aged 40 and above, as well as the degree of pseudoexfoliation's involvement in the eyes.[7].

METHODS

The current study, a cross-sectional assessment of the population, was conducted in a hospital in the Indian state of Odisha. Every patient 45 years of age or older who visited the eye outpatient Department over a period of 6 months had an evaluation for PEX and PXG. In all, the data analysis took place for two years. Obtaining consent from the institutional ethics committee was accomplished with each participant.

Inclusion Criteria: Patients with pseudophakic eyes who had previously given written approval to participate in the trial, those whose eyes had received PEX treatment, and patients who had previously undergone cataract surgery made up the study's participants.

Exclusion Criteria Patients with a known case or family history of primary glaucoma and other causes of secondary glaucoma, as well as those who were younger than 45 years old, had abnormalities in the optic disc or nerve, and declined to give consent to participate in sthe study, were excluded from the study

Study Procedure

In cases where typical PEX was discovered at the pupil, lens surface, or other intraocular structures, it was considered that PEX was present in the eye. If a patient's pupil dilation did not disclose any symptoms of PEX in one of their eyes, then it was determined that the patient had a clinically non-PEX eye. "PXG was defined as the coexistence of peripapillary edema and clinical glaucomatous optic neuropathy. Peripapillary atrophy, focal or diffuse neuroretinal rim thinning, and retinal nerve fiber layer defects were the characteristics of PXG. Additionally, corresponding glaucomatous visual field defects or retinal nerve fiber layer defects were observed on Optical Coherence Tomography (OCT) with or without increased intraocular pressure were also present. Patients with PEX who met the following criteria and had either had glaucoma surgery in the past or were presently on topical glaucoma drugs were considered to be PXG cases.

Through the use of indirect ophthalmoscopy with a +20 D lens, gonioscopy, and slit-lamp biomicroscopic examination (both before and after mydriasis), a comprehensive assessment of the peripheral retina was carried out. In addition to a comprehensive ocular and systemic history, a Goldmann application tonometer was used to measure intraocular pressure (IOP) and bestcorrected visual acuity (BCVA). These measurements were obtained by using Snellen's chart and a comprehensive clinical history for the symptoms that were being presented. An extensive battery of systemic tests was carried out, which included an electrocardiogram, an echocardiogram, a chest X-ray, an absolute eosinophil count, a thyroid profile, a fasting blood sample, a Hb1ac level, and an electrocardiogram." Patients with missing or incomplete medical records were not included in the research.

Statistical Analysis

Immediately after the data analysis was completed, the essential descriptive statistics were given in the form of percentages and frequencies. For the purpose of determining the level of correlation that exists between qualitative variables, a chi-square test were performed. At a level of $P < 0.05$, statistical significance was determined to have been established.

RESULT

Among 80 patients, 50 (62.5%) were aged 70–79 years, 25 (31.25%) were 60–69 years, 4 (5%) were over 80, and 1 (1.25%) was 51–59 years. The mean age was 71.83±5.80 years. Males comprised 56 (70%), and females 24 (30%). Bilateral PXF was found in 60 patients (85.71%, 120 eyes), and unilateral in 20 (14.29%, 20 eyes). Lens involvement occurred in 111 (79.29%) eyes, pupillary in 109 (77.86%), iris in 56 (40%), cornea in 20 (14.29%), and angle in 6 (4.29%).

Table 1: Preoperative visual status in pseudoexfoliative eyes

Visual Acuity	No. of Eyes with Pseudoexfoliation	Percentage (%)
Near Normal (≥6/18)	20	25.00
Visually Impaired (<6/18–6/60)	41	51.25
Severe Visual Impairment (<6/60–FC 3m)	6	7.50
Social Blindness (FC 3m–≥FC 1m)	7	8.75
Legal Blindness (FC 1m–PL)	6	7.50
Blind (NPL)	0	0.00
Total	**80**	**100**

Table 2: Distribution of pupil size the size of undilated pupil ranged from 2 mm to 4 mm with mean undilated pupil size of 2.94±0.38 mm

Dilated Pupil Size (mm)	No. of Eyes with Pseudoexfoliation	Percentage (%)	Mean ± SD
≤ 2 mm	0	0.00	-
2.1–3 mm	0	0.00	-
3.1–4 mm	1	1.25	3.80 ± 0
4.1–5 mm	3	3.75	4.56 ± 0.22
5.1–6 mm	19	23.75	5.74 ± 0.24
6.1–7 mm	57	71.25	6.67 ± 0.27
>7 mm	0	0.00	-
Total	**80**	**100**	**6.32 ± 0.67**

The dilated pupil size in pseudoexfoliative eyes ranged from 3 mm to 7 mm, with a mean of 6.32 ± 0.67 mm. Capsular Tension Ring and Iris Hooks were used intraoperatively in 2 eyes with small pupils.The mean anterior chamber depth

(ACD) was 2.50 ± 0.22 mm. Most eyes (46, 57.5%) had an ACD of 2–2.5 mm, while 34 eyes (42.5%) had 2.6–3 mm. No eyes had ACD <2 mm or >3 mm.Regarding angle width, 73 eyes (91.25%) had grade III or higher: 53 eyes (66.25%) had grade III, 20 eyes (25%) had grade IV, and 7 eyes (8.75%) had grade II.

The mean intraocular pressure (IOP) was 15.60 ± 2.21 mmHg. Most eyes (42, 52.5%) had IOP between 16–20 mmHg, 35 eyes (43.75%) had 11–15 mmHg, 1 eye (1.25%) had IOP >20 mmHg, and 2 eyes (2.5%) had ≤10 mmHg.In terms of cataract type, 39 eyes (48.75%) had pure nuclear sclerosis, 9 eyes (11.25%) had pure cortical cataract, 19 eyes (23.75%) had nuclear sclerosis with cortical involvement, and 4 eyes (5%) had nuclear sclerosis with posterior subcapsular cataract. 5 eyes (6.25%) had mature cataract, 2 eyes (2.5%) had hypermature cataract, and 4 eyes (5%) were pseudophakic. The lens position was normal in 78 eyes (97.5%), while 2 eyes (2.5%) had preoperative subluxation.

Table 3. Distribution of Intraoperative complications 80 eyes of 80 patients underwent MSICS. 17(21.25%) patients developed Intraoperative Complications

Intraoperative Complications	No. of Eyes	Percentage (%)
Zonular Dialysis	3	17.65
Posterior Capsular Rent	2	11.76
Sphincter Tear	3	17.65
Iridodialysis	1	5.88
Posterior Capsular Rent + Vitreous Loss	4	23.53
Zonular Dialysis + Vitreous Loss	4	23.53
Total	**17**	**21.25**

Table 4. Postoperative visual outcome

Dilated Pupil Size (mm)	No. of Eyes with Pseudoexfoliation	Percentage (%)	Mean ± SD
≤ 2 mm	0	0.00	-
2.1–3 mm	0	0.00	-
3.1–4 mm	1	1.25	3.80 ± 0
4.1–5 mm	3	3.75	4.56 ± 0.22
5.1–6 mm	19	23.75	5.74 ± 0.24
6.1–7 mm	57	71.25	6.67 ± 0.27
>7 mm	0	0.00	-
Total	**80**	**100**	**6.32 ± 0.67**

The dilated pupil size in pseudoexfoliative eyes ranged from 3 mm to 7 mm, with a mean of 6.32 ± 0.67 mm. Capsular Tension Ring and Iris Hooks were used intraoperatively in 2 eyes with small pupils.The mean anterior chamber depth (ACD) was 2.50 ± 0.22 mm. Most eyes (46, 57.5%) had an ACD of 2–2.5 mm, while 34 eyes (42.5%) had 2.6–3 mm. No eyes had ACD <2 mm or >3 mm. Regarding angle width, 73 eyes (91.25%) had grade III or higher: 53 eyes (66.25%) had grade III, 20 eyes (25%) had grade IV, and 7 eyes (8.75%) had grade II.The mean intraocular pressure (IOP) was 15.60 ± 2.21 mmHg. Most eyes (42, 52.5%) had IOP between 16–20 mmHg, 35 eyes (43.75%) had 11–15 mmHg, 1 eye (1.25%) had IOP >20 mmHg, and 2 eyes (2.5%) had ≤10 mmHg. In terms of cataract type, 39 eyes (48.75%) had pure nuclear sclerosis, 9 eyes (11.25%) had pure cortical cataract, 19 eyes (23.75%) had nuclear sclerosis with cortical involvement, and 4 eyes (5%) had nuclear sclerosis with posterior subcapsular cataract. 5 eyes (6.25%) had mature cataract, 2 eyes (2.5%) had hypermature cataract, and 4 eyes (5%) were pseudophakic. The lens position was normal in 78 eyes (97.5%), while 2 eyes (2.5%) had preoperative subluxation.

DISCUSSION

Pseudoexfolation syndrome may present unilaterally or bilaterally and is associated with open and closed angle glaucoma as well as cataract formation. It is thought that changes in the vasculature of the iris and the blood-water barrier may affect the composition of the aqueous solution, which in turn may affect the metabolism of the lens, leading to early cataract formation. PXFs have a higher risk of developing complications during and even after cataract surgery. [8]

Complications associated with cataract surgery in PXF may arise from poor pupil dilation, zonular weakness leading to intraoperative or postoperative complications such as lens dislocation, vitreous loss and post-operative IOP spikes and corneal decompensation. The increasing

accumulation of fibrous extracellular matrix in the trabecular meshwork

reduces aqueous outflow and thereby increases IOP. When IOP rises suddenly, glaucoma optic neuropathy develops. Several studies have reported that IOP is markedly increased within 24 hours after cataract surgery in eyes with PXF syndrome.[9]

Levkovich-Verbin et al. showed that elevation of IOP occurred several hours after surgery. Alternatively, shortterm elevation of IOP can be reduced by topical timolol maleate or bimatoprost.PXF material accumulates in corneal endothelial cells, leading to progressive endothelial transformation. Studies have shown decreased corneal endothelial cell density (ECD) and increased central corneal thickness (CCT) in eyes with PXF.Since the corneal endothelium in eyes with PXF is vulnerable to cataract surgery, careful surgical procedures are necessary. 4 Possible intraoperative complications in the eye with PXF

include vitreous loss and vitreous displacement, while postoperative complications include glaucoma (IOP), persistent corneal edema, lens decentration and increased incidence of PCO Kuchle et al. showed that shallower anterior chamber depth in PXF patients had a higher risk of complications with cataract surgery.[10]

Large incision extracapsular cataract surgery was associated with significant complications during cataract surgery in patients with PXF. In these cases incidence of postoperative pupillary fibrin membranes were more common. 2 When comparing complication rates between extracapsular cataract extraction and phacoemulsification in PXF eyes, several studies showed a lower complication rate in patients who underwent phacoemulsification. [11,12]

However, phacoemulsification was associated with increased rates of vitreous loss and capsule and granular tears in PXF eyes compared with non-PXF eyes. In general, PXF cataracts tend to be more difficult and require more emulsion time. Major risk factors for surgical complications during emulsification in PXF include weak zonular and poor pupil dilation. These risk factors can lead to intraoperative or postoperative vitreous displacement, vitreous loss, iridodonesis, and phacodonesis. Other postoperative complications include intraocular pressure spikes causing irreversible glaucomatous damage, corneal decompensation, anterior capsular phimosis, posterior capsular opacification, and late lens subluxation. [13]

Intraoperative mydriasis may be limited in PXF by a number of mechanisms. The PXF material in the iris stroma can cause iris atrophy, deposition in the iris blood vessels, or leak into the iris stroma, resulting in a mechanical obstruction that prevents pupil dilation. In addition, adhesion of desquamating material to the pigmented epithelium of the iris and anterior capsule of the vitreous can lead to mechanical limitation of pupillary movement.[14] Adding a preoperative topical non-steroidal anti-inflammatory drug to mydriatics topical may help minimize intraoperative miosis. Bimanual dilation with Yhook, iris retractor hook, and pupillary dilation ring can also be used to maintain adequate pupillary dilation during.[15]

Phacoemulsification. Viscomydriasis is another technique to increase pupil diameter during cataract surgery. However, whatever technique is used, care should be taken to not overstretch the pupil, as this may lead to an irregular atonic pupil postoperatively. 2 Other postoperative complications include intraocular IOP spikes, corneal decompensation, anterior capsule phimosis, posterior capsule opacification and occasionally late lens subluxation.[16]

CONCLUSION

PES is an age-related, complex systemic disease and characterized by the progressive accumulation of PXM in all ocular tissue, in addition to other parts of the body such as the heart, liver, kidneys, lungs, cerebral meninges, vessel walls, and skin. Multiple epidemiological, geographic, and environmental factors play roles in its pathogenesis. Also, an association between genetic polymorphisms in the LOX1 gene and the disease is known. There are many

clinical findings related to PES, such as PEG, cataract, zonular instability, phacodonesis, impaired blood–aqueous barrier, melanin dispersion, posterior synechiae, and keratopathy. Cataract surgery is more difficult in cases with PES, with higher risk of intraoperative and postoperative complications. PEG is known to be more progressive than POAG with higher IOP levels and greater diurnal fluctuations. Cases with PEG usually need more aggressive antiglaucoma treatment, and glaucoma surgeries are frequently performed for these patients.

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