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Ocular Profile of Patients with Pseudoexfoliation Syndrome and Pseudoexfoliation Glaucoma

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Introduction

Pseudoexfoliation syndrome (PEX) is a systemic, age related microfibrillopathy characterized clinically by the production and deposition of extracellular granular material in tissues, most notably in the anterior chamber of the eye[1]. The material is classically found on the lens capsule, pupillary border, the iris, non-pigmented ciliary epithelium, lens zonules, trabecular meshwork and corneal endothelial cells. The material has also been demonstrated along vascular endothelium, corneal epithelial basement membrane and corneal stroma. The ocular pathologies resulting from the deposition of this material include secondary open angle glaucoma, disturbances of the pre-corneal tear film, zonular weakness and dehiscence resulting in phacodonesis, angle closure glaucoma and lens dislocation, capsular rupture and vitreous release during cataract surgery, poor pupillary dilation, blood-aqueous barrier dysfunction and corneal endothelial decompensation[2]. The prevalence of PEX over the age of 60 is roughly 10-20%, increasing to 40% over the age of 80, and is highly dependent on race and ethnicity[3,4]. The rate of conversion from pseudoexfoliation syndrome to pseudoexfoliation glaucoma (PXG) is 5% in patients with PEX for 5 years, 15% at 10 years and a 15 year risk of up to 60%[5,6,7]

Compared to primary open angle glaucoma (POAG), pseudoexfoliation glaucoma (PXG) is more severe. It is associated with higher mean intraocular pressures (IOP) with higher IOP fluctuations, higher frequency and severity of optic nerve damage, more rapid visual field loss and increased glaucoma medication resistance and a greater necessity for surgical intervention[8].The purpose of current study was to document the ocular clinical profile of patients with pseudoexfoliation syndrome and pseudoexfoliation glaucoma.

Material and Methods

A cross sectional study was conducted in a tertiary eye care centre in North India for a period of one year. Five hundred patients attending outpatient department and having clinical signs of

pseudoexfoliation were included in study. All procedures performed were in accordance with the ethical standards of the institutional research committee and Helsinki declaration. Informed consent was obtained from all individual participants.

All patients underwent a comprehensive ophthalmological assessment including uncorrected and best corrected visual acuity (BCVA) testing with Snellen charts, slit-lamp biomicroscopy (to detect signs of PEX such as pseudo exfoliative material at the pupillary border, anterior lens capsule or angle, sphincteric atrophy and lens sublaxation), Goldmann applanation tonometry, dilated fundus examination, gonioscopy with Goldmann two mirror indirect gonioscope. Visual field assessment was performed using Humphrey's Field Analyzer-II (HFA-II, 24-2 SITA standard). Central corneal thickness (CCT) was measured by ultrasound pachymetry. The mean of three repeat central corneal thickness readings was used for CCT analysis. Anterior chamber depth, K1 and K2 values were measured by the one experienced surgeon with optical biometry.

PEX was defined as the presence of Pseudoexfoliation deposits on the edge of the pupil or lens capsule or angle during the biomicroscopic examination and goniscopy, an IOP less than 21 mmHg, no sign of glaucomatous optic nerve damage on fundus evaluation and normal visual field examination. PXG was diagnosed if the patient had typical characteristics of PEX as well as glaucomatous optic disc changes with corresponding visual field defects and documented IOP ≥22 mmHg. Exclusion criteria were patients with history of previous intraocular surgery in the eye with PEX, use of anti-glaucoma medications or topical/systemic steroids within the last six months, history of ocular trauma, uveitis, corneal scars and any other ocular pathology that could have led to secondary glaucoma. Eyes with hazy media due to cataract, which precluded optic disc assessment, were excluded from the analysis.

Statistical Analysis

Data was analyzed using SPSS software (version 24.0). Test of proportion (Z-test) was used to test the significant difference between two proportions. t-test was used to test the significant difference between means. $p \leq 0.05$ was considered statistically significant.

Results

The mean age of patients having PEX and PXG was 61 years with a range of 40-80 years. Majority of the patients (88%) with PEX and PXG were in the age group > 50 years which was significantly higher (p= 0.0001).

Table 1 Age Distribution of PEX

Age (Years)	Number	Percentage
40-50	60	12
51-60	170	34
61-70	162	32.2
>70	108	21.8
Total	500	100

Table 2 Age Distribution of PXG

Age (Years)	Number	Percentage
40-50	08	6.6
51-60	29	23.7
61-70	45	36.8
>70	40	32.7
Total	122	100

Proportion of males in PEX and PXG was significantly higher than females. Ratio of male:female was 1.5:1.

Table 3 Sex Distribution of PEX

Sex	Number	Percentage
Male	294	58.8
Female	206	41.2
Total	500	100
Male : Female	1.5:1	

Table 4 Sex Distribution of PXG

Sex	Number	Percentage
Male	80	65.57
Female	42	34.45
Total	122	100

Most of the patients had bilateral involvement of disease in patients having PEX and PXG.

Table 5 Laterality of PEX

Laterality of disease	Number	Percentage
Bilateral	350	70
Unilateral	150	30
Total	500	100

Table 6 Laterality of PXG

Laterality of disease	Number	Percentage
Bilateral	98	80.3
Unilateral	24	19.6
Total	122	100

Gonioscopy of 85% of the eyes showed open angle and 15% had occludable angle.

Table 7 Gonioscopy

Gonioscopy	Number	Percentage
Open	400	85
Occludable	100	15
Total	500	100

Slit lamp biomicroscopy showed that patients detected with PXG had increased cupping at time of presentation. 32.7% of patients had cupping of 0.7 while 50.8% patients has >0.8 cupping of disc.

Table 8 CUP:Disc Ratio of Patients with PEX

C:D Ratio	Number	Percentage
0.3	106	28.04
0.4	118	31.21
0.5	154	40.74
Total	378	100

Table 9 CUP:Disc Ratio of Patients with PXG

C:D Ratio	Number	Percentage
0.6	20	16.3
0.7	40	32.7
>0.8	62	50.8
Total	122	100

Table 10 Anterior Segment Parameters

Parameter	PEX Mean ± SD	PXG Mean ± SD
CCT (µm)	530 ± 25.45	519 ± 31.25
AL (mm)	23.15 ± 0.56	23.22 ± 0.68
ACD (mm)	3.20 ± 00.25	3.26 ± 00.41
K1 (D)	43.25 ±1.50	44.00 ± 1.83
K2 (D)	44.19 ± 1.24	44.50 ± 1.50

Discussion

Pseudoexfoliation syndrome is a systemic disorder of the extracellular matrix primarily affecting the eye characterized by the deposition of fibrillar material on all anterior segment structures. In the Blue Mountains Eye study, patients with PEX in either eye had a two to threefold higher risk of open angle glaucoma[9]. PEXS is the most common cause of secondary glaucoma worldwide, and the most frequent cause of unilateral glaucoma. PXG responds poorly to medical therapy compared with other types of glaucoma and can lead to rapid progression of optic nerve damage[10]. When symptoms are present in one eye, the contralateral eye must be examined carefully and monitored, since PXG will develop in the other eye of more than 40 percent of these patients.

The prevalence of PEX increases markedly with age[11]. In our study 54% of patients with PEX were above 60 years while 69.5% with PXG were above 60 years of age. This in in accordance with other published studies which have showed PXF rate higher in patients more than 60 years age[12,13]. Most of our patients were detected with the disease at first contact. The male:female ratio having the disease was 1.5:1. There are conflicting reports of gender differences in PEX[14,15]. In our study this could be due to higher number of male patients attending the outpatient department. Most of the patients had bilateral disease (70% in PEX and 80.3% in PXG). Unilateral PEX occurs in 48-76% of patients and converts to bilateral disease in up to 50% of patients within 5 to 10 years[16].

85% of patients had open angles on gonioscopy while 15% occludable angles. Prophylactic peripheral iridectomy was done in patients with occludable angles.

PXG develops in approximately 50% of patients with PEX over time and is recognized as the most common type of secondary open angle glaucoma. Of the five hundred patients screened, 122 patients (24.4%) had glaucoma. In a study from South India, only 7.5% of the study population with PEX was glaucomatous[17].

Patients with PXG have higher IOP with greater fluctuations and marked spikes that likely cause more severe optic neuropathy compared to patients with POAG. In our study we saw 83.5% of patients who had PXG had cup:disc ratio of > 0.7 and 50 % had cup:disc ratio of >0.8. The patients in our study had higher more severity of glaucomatous optic nerve damage on presentation.

This may be due to late presentation and lack of awareness. If we detect PEX early in patients and keep patients on regular follow-up we may be able to prevent glaucomatous damage in these patients.

We also compared anterior segment parameters of patients of PEX and PXG by optical biometry. In our study, patients with PXG had significantly thinner central corneal thickness than normal subjects but there was no significant difference between the mean CCT values of PXG and PEX patients. Patients with PEX did not have thinner CCT than normal subjects. The studies of Doganay *et al*, Ozcura *et al* and Tomaszewski *et al* also found significantly thinner CCT values in PXG patients than in PEX[18,19,20].This substantiates the fact thinner central corneal thickness is a risk factor for development of PXG. We did not find any significant difference in anterior chamber depth, axial length, K1 and K2 readings between PEX and PXG patients. Bartholomew reported that no significant difference was found in anterior chamber depth in eyes with or without pseudoexfoliation in 34 eyes of patients with PEX and in 334 normal controls[21].Ozcura *et al* also found no significant difference in anterior chamber parameters between PEX and PXG patients[19].

In conclusion, our study showed higher prevalence of PEX and PXG in older population. Patients with PXG had more severity of optic nerve damage at presentation. Therefore a careful assessment for detection of PEX is warranted and regular follow-up of patients is desired to minimize the extent of optic nerve damage. In addition, CCT must be determined in order to achieve "target pressure" due to the nature of the disease.

Conflicts of interest: None

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