

## Correlations between tear function abnormalities and pseudoexfoliation: A comparative study

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### Abstract

**Aim:** Pseudoexfoliation (PEX) could alter the tear secretion and destabilize it by modifying the cell morphology in conjunctiva. Abnormalities of tear secretion and tear film have been assessed that can occur in eyes with PEX syndrome as compared to normal eyes.

**Materials and Methods:** A prospective non-randomized study consisting of Group 1 with 60 eyes of 30 normal subjects without PEX material on lens as controls and Group 2 with 60 eyes of 30 patients with PEX material in both eyes as cases were taken. Exclusion criteria included patients with ocular surface disorders, PEX glaucoma, previous ocular surgeries, long term use of eye drops and adnexal abnormalities. Tear functions were assessed by, Schirmer's 2 test and tear break-up time (TBUT).

**Results:** The mean age in group 1 was 64 years and group 2 was 62 years. There were 14 males and 16 females in group 1 whereas 20 males and 10 females in group 2. Average of Schirmer's and TBUT in group 1 were 24.02mm and 15.65s respectively, whereas in Group 2 they were 11.6mm and 7.8s and difference was clinically significant. Among the eyes with PEX, 54.2% of cases had PEX material in both zone 1 and zone 3. 30.8% of cases had only in zone 1 and 15% had only in zone 3. Hence 69.2% of cases had PEX material in zone 3. The average mydriasis in eyes with PEX was 5.2 and in eyes without PEX was 6.5.

**Conclusion:** PEX syndrome alters tear film stability and decreases tear secretion.

**Keywords:** Dry eye, Pseudoexfoliation, Schirmer's test, Tear function.

### Introduction

Pseudoexfoliation (PEX) was first described more commonly in eyes with cataract and glaucoma<sup>1</sup> by John G. Lindberg in 1914. Ever since there has been innumerable studies to decipher its structure and pathological effects. PEX can cause corneal endotheliopathy, iris sphincter atrophy, poor mydriasis, iris neovascularisation, transillumination defects and flaky material on the lens capsule, zonular dialysis and spontaneous dislocation of the lens.<sup>2</sup> Dry eye occurs due to goblet cell loss in eyes with PEX. Cataract surgery and glaucoma medications pose the risk for dry eye in PEX.<sup>3</sup>

Tear function abnormalities in PEX and in normal eyes have been compared.

### Materials and Methods

In this prospective non randomised study, group one consisted of 60 eyes of 30 normal subjects and group 2 consisted of 60 eyes of 30 patients with PEX syndrome in both the eyes. The study was approved by institute ethics committee. Patients diagnosed to have PEX syndrome in the lens or iris were included in group 2 of the study. Patients with ocular surface disorders, PEX glaucoma, previous ocular surgeries, long standing use of eye drops and adnexal abnormalities were excluded from the study. The demographic profile, slit lamp examination for zones of pseudo exfoliation material and grading of cataract were documented. Schirmer's 2 test and tear film break up time (TBUT) were performed to note the tear film changes and evaluate tear functions.

**Schirmer's 2 Test:** After instilling a drop of 0.8% proparacaine in the eyes and waiting for 30 seconds. About 5 mm of Whatman 41 strip was bent and placed in the

inferior fornix between the medial 2/3<sup>rd</sup> and lateral 1/3<sup>rd</sup> junction and readings were measured after 5 minutes. Values of less than 10 mm was considered as abnormal and suggestive of dry eye.

**TBUT:** Tear breakup was measured after instilling 1% fluorescein dye and the patient was asked to look straight ahead. Then it was observed under a cobalt-blue filter. The TBUT is the time which elapses from the last blink to the first appearance of a dark spot in the fluorescein stained field. The TBUT of less than 10 seconds, suggested an unstable tear film.

### Statistical Analysis

Statistical analysis in this study was performed using SPSS software. The results of schirmer's test and TBUT were analyzed by applying independent t- tests.

### Results

The study included 60 eyes of 30 normal subjects and 60 eyes of 30 patients with PEX. Mean age of the patients in group 1 and group 2 was 64 and 62 years respectively. There were 14 males and 16 females in group 1 whereas 20 males and 10 females in group 2 (Table 1).

**Table 1: Sex distribution**

Sex	Group 1	Group 2
Male	14	20
Female	16	10

Among the eyes with PEX, 54.2% of cases had PEX material in both zone 1 and zone 3. 30.8% of cases had only in zone 1 and 15% had only in zone 3. Hence 69.2% of cases had PEX material in zone 3. The average mydriasis in

eyes with PEX was 5.2mm and in eyes without PEX syndrome was 6.5mm.

Average schirmer's and TBUT in group 1 were 24.02mm and 15.65s respectively, whereas in Group 2 they

were 11.6mm and 7.8s and difference were clinically and statistically significant (Table 2).

**Table 2**

Parameter	Group 1 (controls)	Group 2 (cases)	Standard deviation	T value
Schirmer's test(mm)	24.02	11.6	0.324	0.000
TBUT(s)	15.65	7.8	0.503	0.000

## Discussion

The tear film changes in eyes with PEX were compared to age matched controls without PEX. Patients of PEX glaucoma were excluded as this condition and its treatment with antiglaucoma medications are known to affect the ocular surface and influence the results. Controls were age and gender matched to prevent the results being influenced by age related decrease in tear secretion.

The PEX syndrome is characterized by the widespread production and progressive accumulation of an abnormal extracellular fibrillar material in many ocular and extraocular tissues, including skin and connective tissue portions of various visceral organs.<sup>4</sup> The prevalence of PEX ranges from 3 to 10% in India and this increases progressively after 50 years.<sup>5</sup> Few studies have shown a greater incidence in females while others found it more common in males.<sup>6</sup>

Studies have shown 95% diagnostic value for the presence of PEX material in the pupillary ruff before dilatation.<sup>7</sup> In this study 69.2% of cases had PEX material in both zone 1 and zone 3. Out of which 30.2% had only in zone 1.

Tear is secreted from the accessory lacrimal glands of Krause and Wolfring located in the substantia propria of conjunctiva. Schirmer's 2 test (with corneal and conjunctival anesthesia) reflects mainly basic tear secretion and is more sensitive in the diagnosis of mild cases of keratoconjunctivitis sicca than schirmer's test without anesthesia.<sup>8</sup> Goblet cells secrete the mucous layer of the tear film. The TBUT evaluates the sufficiency of the mucous layer of tear film and shows that mucin secretion levels are affected by conjunctival goblet cell density.<sup>9</sup>

In the present study, there were significant differences between the mean schirmer's value and TBUT of PEX patients in comparison with the control group. A significant positive correlation between the conjunctival involvement in PEX and decreased tear secretion and tear film stability was found in a study conducted by kozobolis et al.<sup>10</sup> The mean value of TBUT and schirmer's were lower in PEX and PEX glaucoma groups than in control group, results from a study by Erdogan et al.<sup>11</sup>

Cataract surgery aggravated dry eye in a study by Cho et al.<sup>12</sup> Anti-glaucoma medications like timolol can also lead to dry eye and corneal epithelial changes.<sup>13</sup> Again using such drugs in patients with PEX syndrome increases the occurrence of symptoms of dry eye.

Main pathology that induces PEX is Defect in the zonular-elastic microfibrillar system.<sup>14,15</sup> Garner et al. took tissue from 8 patients between 75 and 88 years with PEX syndrome and subjected it to histopathological procedures which showed elastic fibers. PEX materials were cellular and eosinophilic that form tufts or delicate fibrils arranged perpendicular to the surface to which they are attached giving a characteristic carpet tuft or hoar frost appearance. In alcian blue/PAS stained section, PEX material appeared to have 2 components, magenta stained core with a coating of alcinoiphilic substance. It was also observed that zonular fibres stain identical to that of pseudo exfoliative material.<sup>16-18</sup>

The report of the present study was similar to other studies in assessing tear function in PEX, but we excluded patients of glaucoma with PEX.

Tear maintains clarity of the cornea, providing clear vision and improving defence mechanism of the eye. Hence, reduced tear function leads to xerophthalmic manifestations of PEX, which will not only reduce the corneal and lenticular clarity and efficiency but also will decrease the ophthalmic local defence mechanism. Therefore, there is a need for future studies with larger sample size to assess the impairment of local immune mechanisms in patients with PEX.

## Conclusion

PEX is one of the commonest ophthalmological problems in India, more frequently seen in males. Our study shows that PEX syndrome causes tear film abnormalities and tear film instability. Thus, the findings of our study suggests the associations between dry eye and PEX syndrome. Future studies should be warranted to see how the improvement in tear functions can help in better management of PEX.

**Conflict of Interest:** None.

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