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**INTERNATIONAL JOURNAL OF
 ADVANCED RESEARCH (IJAR)**

Article DOI: 10.21474/IJAR01/7759
 DOI URL: <http://dx.doi.org/10.21474/IJAR01/7759>



RESEARCH ARTICLE

CORNEAL ALTERATION IN EYES WITH PSEUDOEXFOLIATION SYNDROME.

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Manuscript Info

Manuscript History

Received: 24 July 2018

Final Accepted: 30 August 2018

Published: September 2018

Keywords:-

Corneal Endothelium, Corneal
 Endothelial cell density, Central Corneal
 Thickness, Pseudoexfoliation .

Abstract

Background: Pseudoexfoliation syndrome (PXS) is an age-related systemic microfibrilopathy, caused by gradual deposition of extracellular grey and white material over various tissues .In pseudoexfoliation eyes, corneal endothelial changes are noted.Objective of Our study was to find corneal alterations among patients of Pseudoexfoliation syndrome of Kashmir region.

Material And Methods:After obtaining the ethical clearance from the institutional ethical committee,150 patients withPseudoexfoliation were included in our Descriptive(Observational)study. Thorough ocular evaluation was done and corneal changes were noted including corneal endothelial cell density and Central corneal thickness using NON CONTACT specular microscope .Appropriate statistical tests were used for analyzing data.

Results:Pseudoexfoliation was predominantly seen in males . Mean Central corneal thickness in Pseudoexfoliation with glaucoma eyes was($509.6 \pm 13.73 \mu$) which was lower when compared with mean central corneal thickness in Pseudoexfoliation without glaucoma eyes ($523.5 \pm 17.15 \mu$). The results when statistically analyzed were found to be significant. Also corneal endothelial cell density (2304 ± 303 cells / mm^2) was lower in pseudoexfoliative eyes. Percentage of Hexagonal cells was 48.0 ± 9.8 (%) and the CV was 38.3 ± 5.8 showing polymegathism and pleomorphism in these cells

Conclusion: Qualitative and Quantitative modifications in endothelial cells of eyes with PEX, particularly when IOP is high which may increase the risk of corneal decompensation after intraocular surgeries. In patients with PXG,evaluation of Corneal endothelial cell density and central corneal thickness should be done as the risk of underestimation of intra ocular pressure is high.

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Introduction:-

Pseudoexfoliation (PEX) syndrome is an age related disease characterized by the widespread deposition of an abnormal extra cellular fibrillar material on many ocular and extra ocular tissues¹. This condition was first described by a Finnish ophthalmologist named John Lindberg in 1917 in his doctoral thesis. Pseudoexfoliative

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material was first seen with the advent of slit lamp, Lindberg defined the greyish flecks and changes on the lens and pupillary margin of the iris².

Pseudoexfoliation is present worldwide in every race and ethnic group with variable prevalence's. The reported prevalence of PEX rates varies extensively from 0% to more than 40%^{3,4}. Prevalence of pseudoexfoliation are best obtained by population based studies, however useful information on the prevalence of pseudoexfoliation can be obtained from different sub groups of a population, such as patients with cataract and glaucoma^{4,5}.

Other studies⁶ done in Kashmir valley coupled with our clinical observation led us to believe that the prevalence of PEX among Kashmiri population is relatively high. Therefore in a prospective study we set out to study the prevalence of pseudoexfoliation among Kashmiri patients with age related cataract who were scheduled for cataract surgery.

Material And Methods:-

The present study entitled "Corneal Alterations in eyes with Pseudoexfoliation syndrome" was conducted in the Postgraduate Department of Ophthalmology, Govt. Medical College, Srinagar. It is a prospective study and includes 150 patients with pseudoexfoliation syndrome. The diagnosis of Pseudoexfoliation was made based on, deposition of Pseudoexfoliation material on the pupillary margin or on the anterior capsule of lens.

Exclusion Criteria:-

1) mechanical or chemical trauma, 2) corneal degeneration and dystrophies, inflammation, 3) history of contact lens wear, 4) previous laser treatment, 5) Previous Surgery.

After enrolment a thorough clinical examination of both eyes including visual acuity both distant (Snellen's chart) and near (Jaeger's chart), slit lamp examination of anterior segment, schirmers test, tear film break up time measurement, gonioscopy, applanation tonometry, funduscopy, computerized perimetry with Humphrey field analyzer, specular microscopy, and systemic examination was done.

Corneal endothelial morphometry and central corneal thickness were studied using the non-contact Specular Microscope. The parameters under our study included: central endothelial cell density (ECD), which is the number of cells per square millimeter, coefficient of variation (C.V.), percentage of hexagonal cells and central corneal thickness (CCT).

PXS based on the presence of typical pseudoexfoliation material at the pupil border on undilated examination, on anterior lens capsule on dilated examination, or on the trabecular meshwork on Gonioscopy, with or without Sampaolesi's line and pigment deposition in angle and/or corneal endothelium Intra ocular pressure (IOP) was measured using Goldmann Applanation Tonometry, an average of three IOP readings were obtained prior to pupillary dilatation. Gonioscopy was performed in patients who had suspicious glaucomatous findings. A diagnosis of glaucoma was recorded if the patient had raised IOP > 21mmHg along with optic nerve head cupping and corresponding visual field defects.

Statistical Methods:-

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean±SD and categorical variables were summarized as frequencies and percentages. Student's independent t-test was employed for determining differences in continuous variables.

Results:-

A total of 150 eyes with evidence of Pseudoexfoliation were enrolled in the study which included 36 eyes with glaucomatous changes and 114 eyes without glaucoma. The demographic characteristics of the patients in the study are summarized in Table 1.

Table 1:-Demographic characteristics of patients in the study

Age (years)	Male		Female		Total	
	No.	%age	No.	%age	No.	%age
40-50	3	3.4	5	8.2	8	5.3
51-60	31	34.8	24	39.3	55	36.7
61-70	42	47.2	27	44.3	69	46.0
> 70	13	14.6	5	8.2	18	12.0
Mean \pm SD	65.3 \pm 9.87		59.2 \pm 6.75		62.8 \pm 8.56	

P-value <0.001 (Statistically Significant Difference)

The mean age of the subjects in the study was 62.8 years. Mean age of males was 65.3 years whereas of females was 59.2 years. Most of the patients were seen in the 61-70 years age group. There were more Males(89) with Pseudoexfoliation than females(61) in the study. The average age at which Pseudoexfoliation was seen was higher in males than in females i.e., males developed the disease at later age than females and this was statistically significant ($p < 0.05$).

Table 2:-Tear film break up time (TBUT) in patients with Pseudoexfoliation

TBUT (Seconds)	No.	%age
≤ 10	42	28.0
11-15	68	45.3
> 15	40	26.7
Total	150	100

Fourty two eyes had abnormal tear film break up time of ≤ 10 seconds which accounts to 28% of the subjects taken in the study. Thus showing that PEX can decrease tear film stability time.

Table 3:-Corneal alterations in Pseudoexfoliation

Corneal alterations	No. of eyes	%age
Climatic Droplet Keratopathy	31	20.7
Guttiae	8	5.3
Pseudoexfoliative material on cornea	7	4.7

Climatic droplet keratopathy was seen in 31 eyes(20.7%), followed by guttae in 8 eyes(5.3%) and pseudoexfoliative material on cornea in 7 eyes.

Table 4:-Endothelial Characteristics of Pseudoexfoliative eyes

Corneal Endothelial Characteristics	Mean
Endothelial Cell Density (Cell / mm ²)	2304 \pm 303
Hexagonal (%)	48.0 \pm 9.8
Cell Variation in Cell Size	38.3 \pm 5.8

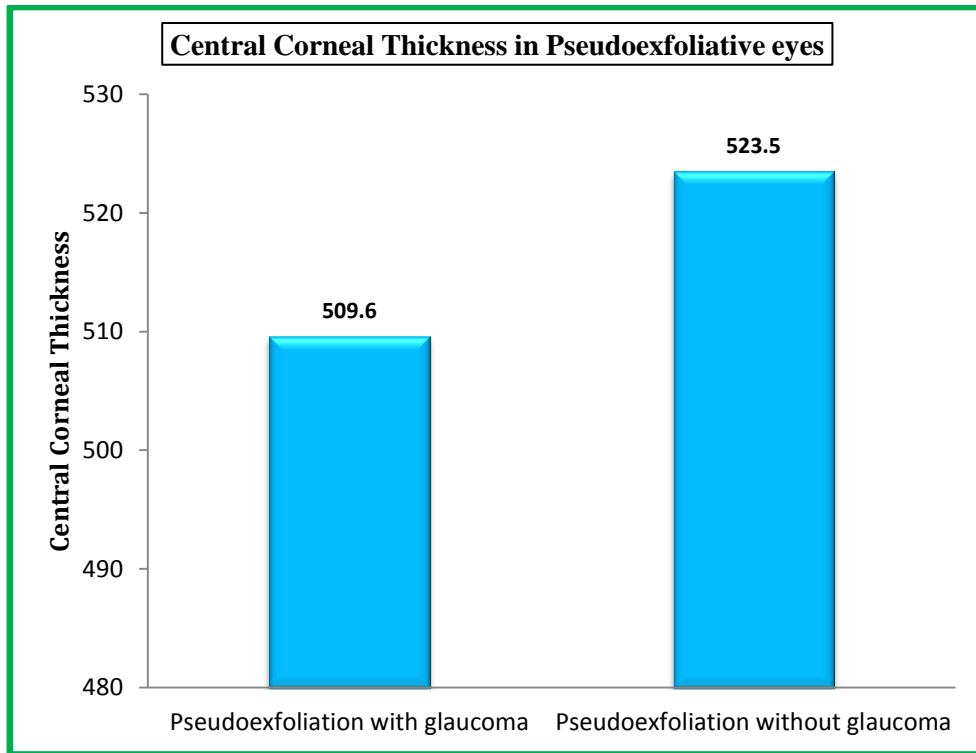
The mean Endothelial Cell Density as observed during our study in Pseudoexfoliative Eyes was 2304 \pm 303 cells / mm².

The mean of Hexagonal cells was 48.0 \pm 9.8 (%) and the CV was 38.3 \pm 5.8. Thus showing polymegathism and pleomorphism in the cells of pseudoexfoliation patients.

Table 5:-Central Corneal Thickness in Pseudoexfoliative Eyes

Central Corneal Thickness	Mean
Pseudoexfoliation with Glaucoma	509.6 \pm 13.73 μ
Pseudoexfoliation without Glaucoma	523.5 \pm 17.15 μ

Mean CCT in Pseudoexfoliation with glaucoma eyes (509.6 \pm 13.73 μ) was found to be lower when compared with Mean CCT in Pseudoexfoliation without glaucoma eyes (523.5 \pm 17.15 μ) and this was found to be statistically significant (P-value<0.001).



Discussion:-

In our study, we found that most of the Pseudoexfoliation syndrome patients enrolled were in the 61-70 age group and more males had pseudoexfoliation than females. Whereas in Saroj Sarwa et al⁷, pseudoexfoliation was seen in the age group of 55-80 years and males and females were equally involved. Forsius H, Forsman E et al⁸ however noted in their study that there was rapid increase in the incidence of Pseudoexfoliation with age, especially after 50 years. Also Dr Chandra kanth⁹ et al found that increase in age is significantly associated with pseudoexfoliation. Whereas no sex predilection was seen.

We found climatic droplet keratopathy in 31 eyes which accounts to 20.7% of the study group. Thus showing a strong association with pseudoexfoliation. Dr Chandra Kanth et al⁹ noted that out of 50 pseudoexfoliation eyes, 7 had climatic droplet keratopathy. Whereas in their control group only 2 had the same. Resnikoff S, Filiard G¹⁰ found six times as many cases of exfoliation syndrome in persons with climatic keratopathy than in people without. Whereas Forsius H Forsman E et al⁸ did not find association between the two.

Also we noted that 42 eyes had tear film break up time of ≤ 10 secs. Thus showing that pseudoexfoliation can cause decrease in tear film secretion and disturb tear film stability. M Orcun Akdemir et al¹¹ noted that tear film break up time was 11 secs in PEX group and 8 secs in PEX syndrome and PEX glaucoma group. Vassilios P. Kozobolis, Emmanouil V et al¹² noted that tear film break up time was significantly lower i.e (8.6 secs) in pseudoexfoliation patients as compared to controls in whom it was 12.3 secs. Also Kozobolis VP, Detorakis et al¹³ found that the tear film break up times were significantly lower (6.91 secs) in Pseudoexfoliation syndrome. The mean Endothelial Cell Density as observed during our study in Pseudoexfoliative Eyes was 2304 ± 303 cells / mm². Thus showing significant modification in endothelial cells of eyes with Pseudoexfoliation. Saroj Sarowa et al also showed decrease in endothelial cell density (2124 ± 116 cells/mm²) in patients with pseudoexfoliation. Whereas Upender K Wali et al¹⁴ showed that mean endothelial cell density was 2438 ± 503.4 cells/mm² in pseudoexfoliation with glaucoma patients and 2483 ± 511.2 cells/mm² in pseudoexfoliation without glaucoma patients. This difference was not found to be statistically significant.

The percentage of Hexagonal cells was 48.0 ± 9.8 (%) which is lower and the CV was 38.3 ± 5.8 which is higher than we usually see in normal population. Thus showing that PEX Eyes have more polymegathism and

pleomorphism as compared to normal population. Other studies showed similar results including Wang et al¹⁵, Seitz et al¹⁶, Quiroga et al¹⁷, Inoue et al¹⁸, Knorr in 1991¹⁹, Miyake et al²⁰ and deJuan-Marcos et al²¹.

In this study, Mean CCT in Pseudoexfoliation with glaucoma eyes was $509.6 \pm 13.73 \mu$ which was found to be lower when compared with mean CCT in Pseudoexfoliation without glaucoma eyes $523.5 \pm 17.15 \mu$. Mean CCT in Pseudoexfoliative eyes ($514.28 \pm 20.8 \mu$) as compared with CCT in age matched normal population ($511.4 \pm 33.5 \mu$) was seen in Vijaya L et al²². Similar results were given by Mohammed Ali Zare²³ et al with CCT in PEX group ($511.9 \pm 27.9 \mu$) and in control group ($531.4 \pm 32.7 \mu$). Bozydar T. Tomaszewski et al²⁴ also showed that CCT in eyes with PEXG ($508.2 \pm 32.6 \mu$) was thinner than in eyes with PEX syndrome without glaucoma ($529.7 \pm 30.3 \mu$) and control group ($527.7 \pm 29.4 \mu$). Thus showing that CCT was statistically significantly lower in PEXG group than in PEX syndrome and control group. Georgios et al²⁵ in their study found CCT in Pseudoexfoliation with glaucoma eyes (526μ) was significantly thinner compared to eyes with Pseudoexfoliation without glaucoma (547.3μ).

Thus NONCONTACT specular microscopy quickly and easily without any side effects is a useful tool for screening of corneal endothelium in pseudoexfoliation patients since PXS significantly influences cell density of corneal endothelium of people with this disease.

Conclusion:-

Our Study shows significant corneal alterations in patients of pseudoexfoliation. Therefore, all patients with pseudoexfoliative syndrome should be on regular follow up to detect glaucoma at an early stage. Patients with pseudoexfoliation are at increased risk of developing complications intraoperatively. Early diagnosis, detailed examination, knowledge of the complications and ability to manage these complications is key to success.

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