

Innovations

Assessment of Angle of Anterior Chamber in Pseudoexfoliation Syndrome

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Abstract

Purpose: To assess the angle of anterior chamber in pseudoexfoliation syndrome.

Materials and methods: This cross-sectional observational study was conducted on 80 eyes who came to the department of Ophthalmology OPD. After obtaining approval from the Institutional Ethics Committee, all the patients underwent visual acuity, slitlamp examination, gonioscopy and Intra ocular pressure(IOP) estimation. Angle of anterior chamber assessed by Shaffer's grading and results were analysed. **Results:** Out of 80 eyes examined, 72 eyes (90%) have normal anterior chamber depth and remaining 8 eyes (10%) have shallow anterior chamber with high intraocular pressure. Out of 8 eyes which have shallow anterior chamber, 5 eyes (62.5%) are males and 3 eyes (37.5%) are females and 4 eyes are under age group of 60-70 (50%), 3 eyes of age group 70-80 (37.5%), 1 eye of age group 80-90 (12.5%).

Conclusion: In this study it is observed that angle of anterior chamber is open in most of the cases only few cases showed closed angle with high intra ocular pressure.

Key words: Pseudoexfoliation, Glaucoma, Gonioscopy, Intraocular pressure, angle of anterior chamber

Introduction

Pseudoexfoliation syndrome is a systemic disease mostly seen in elderly population which is characterized by increase in production and accumulation of protein which is amyloid like, which is formed by elastic fiber degeneration¹. The exfoliating material is mostly made up of aberrant cross-linked fibrils, which gradually build up in the lungs, heart, blood vessels, meninges, and anterior structures of the eye, among other organs.

PES may be an important marker for cardiovascular and cerebrovascular diseases.² There is growing evidence for systemic associations of PES with peripheral, cardiovascular, and cerebrovascular system diseases, Alzheimer's disease, hearing loss, and increased plasma homocysteine levels.^{3,4}

Though the precise pathophysiological mechanism is still unknown, genetic and environmental variables are believed to be involved in the formation and gradual extracellular accumulation of exfoliative material⁵.

Pseudoexfoliation is a complex genetic disease. Both genetic and non-genetic variables have a role in the etiopathogenesis.^{6,7,8} The lysyl oxidase like 1 (LOXL1) gene has been discovered as a significant genetic risk factor for both PES and PEG.⁹ Lysyl oxidases are essential for the synthesis and stability of elastic fibers. Increasing evidence suggests that LOXL1 is markedly dysregulated depending on the stage of fibrosis. In the early phases of pseudoexfoliation, LOXL1 is involved in the synthesis and aggregation of pseudoexfoliation fiber deposits, and in the advanced stages may affect elastin metabolism. As a result, it has been suggested that pseudoexfoliation is a type of elastosis caused by a high amount of elastic microfibrillar materials like fibrillin.¹⁹ Other candidate genes have also been reported. CACNA1A, POMP, and SEMA6A variants have been linked to extracellular matrix metabolism, ubiquitin-proteasome system, calcium signaling, and lipid biosynthesis in pseudoexfoliation pathogenesis, increasing the disease risk.¹⁰

Other non-genetic factors related to pseudoexfoliation, including oxidative stress and low-grade inflammation, can influence the expression of LOXL1.^{7,8} A detailed study of the gene maps of this complicated disease, as well as the functional effects and molecular mechanisms of these loci, will shed light on the disease's pathophysiology.

Anterior chamber: It is a chamber formed between iris and cornea. Angle of AC influences the drainage of aqueous. The ciliary band, scleral spur, trabecular meshwork, and schwalbe's line form angle structures from posterior to anterior.

Persistently increasing over time, glaucoma is an optic neuropathy that damages the optic nerve and retinal nerve fiber layer, potentially resulting in irreversible loss of central or peripheral vision. The sole modifiable risk factor that is currently recognized is intraocular pressure. Age, race (other than White), and a family history of glaucoma are additional significant risk factors¹³.

Patients with POAG are often asymptomatic until significant optic nerve damage occurs unless early signs of glaucoma are identified during routine eye examinations.¹⁴ On the other hand, acute angle-closure glaucoma can develop suddenly and lead to a rapid decline in vision, accompanied by symptoms such as corneal edema, eye pain, headache, nausea, and emesis.^{15,16} Secondary glaucoma often arises due to a previous eye injury or underlying medical conditions, resulting in elevated IOP and subsequent optic neuropathy. This category encompasses

various subtypes, including congenital, pigmentary, neovascular, exfoliative, traumatic, and uveitic glaucoma.¹⁷ Normal or low-tension type of glaucoma presents as an optic neuropathy with glaucomatous visual loss despite normal or unremarkable IOP readings.¹⁸

Primary cases of exfoliation glaucoma in elderly persons are associated with exfoliation syndrome some of the causes are age related shortening of outflow channels of aqueous, accumulation of debris & extracellular material. When a person gets older, this material gets caught in their trabecular meshwork, but it is easily drained out of it in younger people. PEX syndrome is a systemic disorder affecting the extracellular matrix, with ocular manifestations such as white deposits on the pupil's margin and the anterior capsule of the lens, which can occur in one or both eyes.¹⁹ This secondary form of open-angle glaucoma poses additional risks during cataract surgery, including zonular dialysis, capsular bag rupture, and vitreous loss. These risks are attributed to eyes with unstable lens zonules and poor pupillary dilation associated with PEX syndrome.²⁰

Degradation of the tissues and additional blockage of the aqueous humor outflow routes occur when exfoliative material is adhered to cells of trabecular meshwork and Schlemm's canal. Increased intraocular pressure (IOP) and the presence of glaucoma have been positively connected with trapped material amount. Thus, we studied the angle of anterior chamber in pseudoexfoliation syndrome patients in Kolar district.

Materials and Methods

The cross sectional observational study was conducted in R L Jalappa Hospital and Research Hospital attached to Sri Devaraj Urs Medical College, located in Tamaka, Kolar, a rural part of Karnataka. All patients came to RLJH OPHTHALMOLOGY OPD having pseudoexfoliation under went visual acuity, slitlamp examination, gonioscopy, IOP estimation.

Gonioscopy -

Zeiss 3 mirror gonio lens is used for Gonioscopic examination of angle of anterior chamber.

Gonioscopic technique -

Direct observation of the ACA structures is not possible due to total internal reflection: light from the ACA strikes the tear-air interface at an angle larger than the critical angle, and thus it is reflected back into the eye. Therefore, from the instrumental point of view there are two potential approaches to perform gonioscopy, both based on an index matching-fluid:

Direct, in which light from the anterior chamber passes through the cornea and through a contact gonioscopy lens, allowing direct view of the iridocorneal angle. Indirect, the gold standard technique, in which light from the anterior chamber is reflected in a mirror allowing an inverted view of the angle ²¹.

After Briefly explaining the procedure to the patient, in semi darkened room procedures were performed. Cleaning and sterilising the front (curved) surface of the goniolens done, after instillation of topical anaesthetic eye drops (0.5% proparacine)

Under slit-lamp visualization the lens is placed directly on centre of the cornea with only gentle contact is (excessive pressure will distort angle structures). Each quadrant of the angle is visualized with the opposite mirror. Care is taken to avoid light beam to pupil. The slit light beam used skillfully by examiner which is particularly helpful in grading angle width.

-Then angle graded according to Shaffer’s grading. (table 1)

Table – 1

ACA* in degree	ACA grade	Angle status	Visible structures
0	0	Close	No structures visible
≤10	1	Extremely narrow	Schwalbe’s line
11-19	2	Narrow	Trabecular meshwork
20-34	3	Open	Scleral spur
35-45	4	Wide open	Ciliary body

ACA – anterior chamber angle

Statistical analysis: Statistical Methodology /Techniques to be employed for evaluating the results: Student t-test.

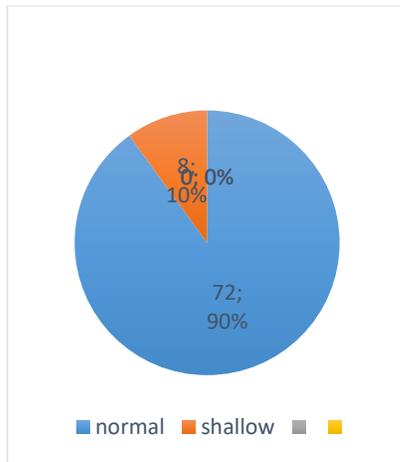
Results

Out of 80 eyes examined, 72 eyes (90%) have normal anterior chamber depth and remaining 8 eyes (10%) have shallow anterior chamber with high intraocular pressure (figure-1).

Out of 80 patients, 50(61%) were males and 30(39%) were females. (Table -2).

Out of 8 eyes which have shallow anterior chamber, 5 eyes (62.5%) are males and 3 eyes (37.5%) are females (table -4) and 4 eyes are under age group of 60-70 (50%), 3 eyes of age group 70-80 (37.5%), 1 eye of age group 80-90 (12.5%)(table -3).

Figure-1 Table 2 : Gender distribution of patients



	MALE	FEMALE
EYES	50	30
%	61	39

Table 3- Age wise distribution of open and closed angle glaucoma in the study population

Age group	Open angle	Closed angle
50-60	14	-
61-70	25	4
71-80	15	3
81-90	18	1

Table 4– Intraocular pressure distribution by gender

	Males	Males	Females	Females
	No:	of	No:	of
	eyes	%	eyes	%
High IOP	5	10%	3	10%
Normal IOP	45	90%	27	90%
Total	50	100%	30	100%

Table 5–Prevalence of open and closed angle glaucoma in males and females

	Open angle	Open angle	Closed angle	Closed angle
	No:of eyes	Percentage	No:of eyes	Percentage
Males	45	62.5%	5	62.5%
Females	27	37.5 %	3	37.5 %
Total	72	100%	8	100%

Discussion

Pseudoexfoliation syndrome is the most important risk factor for the development of secondary open-angle glaucoma. One of the main risk factors for the development of both primary angle-closure glaucoma (POAG) and Pseudoexfoliative glaucoma (PEXG) is an increased level of IOP.¹

In a study done by M. Iwanejko et al. showed that the amount of pigmentation and exfoliation material in the anterior segment significantly correlates with the level of IOP and possibly with the degree of trabecular dysfunction¹.

In studies conducted by Astrom s et al. the prevalence was higher in females (29%), but in our study prevalence was higher in male (62%)²⁰.

AC(anterior chamber) angle in patients of ES(exfoliation syndrome) is mostly open, and the AC of normal depth was reported as narrow angle in study done by Layden et al.found narrow angle in 23% of cases²².

In our study few patients (10%) with pseudoexfoliation had high IOP which was consistent with the study conducted by Wishart PK et al. (32%)²¹.

Vinita Rao et al reported proportional relation between PEXG and increasing age²³. and prevalence of PEXF among men was higher than women. Our study also has male preponderance with increasing in prevalence as patient ages, 6.28% are above 60%

The reason for this age-related increase is unknown, faulty gene expression is blamed for it.

Massood et al. studied on 102 subjects with psuedoexfoliation syndrome with (PEXG), psuedoexfoliation alone(PEX) and normal eyes were studied²⁴and found that Anterior chamber depth was significantly shallower in eyes with PEXG compared with eyes of control subjects (P < .001), but in this study percentage of shallow angle is seen in only10% of cases.

A tendency toward pupillary block and angle closure can result from various mechanisms, such as zonular weakness leading to anterior lens movement; lens thickening due to cataract formation; increased iris-to-lens adhesiveness

(sometimes with posterior synechiae) from exfoliative material, sphincter muscle degeneration, and uveitis; and iris rigidity from hypoxia.

Patients with Pseudoexfoliation syndrome should be followed up regularly and at short intervals with glaucoma screening tests or therapeutic interventions when appropriate.

Conclusion

In our study we have observed that angle of anterior chamber is open in most of the cases of PXF and only few cases showed closed angle with raised IOP.

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