

Management Of Glaucoma In Pseudo Exfoliation Syndrome In Patients Attending A Tertiary Care Center

Dr. Merigala Manasa, Dr. Sasmita Panda, Dr. Sugandh Kashyap,
Dr. Chinmayee Sahoo
MBBS MS, Dept Of Ophthalmology
Residents From Mkg Medical College¹⁻⁴ Odisha

Abstract

Background:

Pseudoexfoliation syndrome (PEX) is an age-related disorder characterized by deposition of fibrillar material in ocular tissues and is a major cause of secondary glaucoma. Pseudoexfoliation glaucoma is known for its aggressive course, higher intraocular pressure (IOP), and rapid progression.

Materials and Methods:

This hospital-based observational study included patients aged ≥ 40 years diagnosed with PEX. 246 patients were evaluated, out of which 66 patients had glaucoma. Detailed ocular examination including visual acuity, slit lamp biomicroscopy, IOP measurement using Goldmann applanation tonometry, gonioscopy, fundus examination, and visual field analysis was done. Glaucoma patients were categorized and managed either medically or surgically. Medical management included Timolol 0.5% and Latanoprost 0.005%, with escalation to combination therapy or surgery based on response.

Results:

Out of 246 patients, 66 (26.83%) had glaucoma. Among them, 52 patients (78.79%) were managed medically, 14 patients (21.21%) required early surgical intervention. Among medically treated patients, equal distribution was seen between Timolol and Latanoprost groups (39.39% each). Most patients were initially managed with monotherapy (78.79%). Patients not responding to monotherapy required combination therapy or surgical intervention.

Conclusion:

Pseudoexfoliation syndrome is a significant risk factor for glaucoma, with a considerable proportion of patients developing the disease. Though most patients respond to medical therapy, a significant number require surgical intervention. Early diagnosis, regular follow-up, and timely escalation of treatment are essential to prevent disease progression and visual loss.

Keywords: Glaucoma, treatment, pseudoexfoliation syndrome, timolol, latanoprost

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I. Introduction

Pseudoexfoliation Syndrome (PEX/XFS) is an age-related, systemic microfibrilopathy characterized by the progressive accumulation of abnormal fibrillar extracellular material in various ocular and extraocular tissues. Within the eye, this material is predominantly deposited in the anterior segment structures, including the lens capsule, iris, ciliary body, zonules, and trabecular meshwork, while extraocular involvement has been demonstrated in organs such as the heart, lungs, kidneys, and blood vessels.^{1,2}

PEX is of significant clinical importance in ophthalmology as it represents one of the most common identifiable causes of secondary open-angle glaucoma worldwide. When glaucomatous optic neuropathy develops in the presence of pseudoexfoliation material, the condition is termed Pseudoexfoliation Glaucoma (XFG), which is typically more aggressive, associated with higher intraocular pressure (IOP), greater diurnal fluctuations, and faster progression compared to primary open-angle glaucoma.³

The exact etiology of pseudoexfoliation syndrome remains multifactorial, involving genetic, environmental, and oxidative stress-related mechanisms. A major genetic association has been identified with polymorphisms in the lysyl oxidase-like 1 (LOXL1) gene, which plays a crucial role in elastin metabolism and extracellular matrix stability. Defects in this pathway lead to abnormal elastin cross-linking and subsequent accumulation of pseudoexfoliative material.⁴

Histopathologically, pseudoexfoliative material consists of a complex glycoconjugate matrix surrounding a protein core. It is synthesized by various ocular cells, including non-pigmented ciliary epithelial cells, trabecular endothelial cells, and lens epithelial cells. These materials are released into the extracellular space and accumulate on the anterior lens capsule, pupillary margin, zonules, and trabecular meshwork. Obstruction of

aqueous humor outflow due to deposition within the trabecular meshwork leads to increased intraocular pressure and subsequent glaucomatous optic neuropathy.^{2,5}

Clinically, pseudoexfoliation syndrome is often an incidental finding during slit-lamp examination. Characteristic features include the presence of dandruff-like exfoliative material on the anterior lens capsule arranged in three distinct zones (central disc, intermediate clear zone, and peripheral granular zone), pigment dispersion, iris transillumination defects, Sampaolesi's line on gonioscopy, and optic disc changes in advanced stages.³

The prevalence of pseudoexfoliation syndrome varies widely across different populations, ranging from 0.2% in Asian populations to as high as 6–10% in Scandinavian countries, with increasing incidence with advancing age. In India, studies such as the Aravind Comprehensive Eye Survey have reported a prevalence of approximately 3.8% in individuals above 40 years of age.^{6,7}

II. Materials And Methods

Inclusion criteria:

All patients aged ≥ 40 years of either sex diagnosed with pseudoexfoliation syndrome (PEX) attending the Ophthalmology outpatient department of a tertiary care center in Southern Odisha were included in the study. Patients were enrolled consecutively during the study period. Patients with primary open-angle glaucoma without PEX, secondary glaucoma due to other causes (such as uveitis, trauma, or steroid-induced), history of previous intraocular surgery (except uncomplicated cataract surgery), media opacities interfering with adequate examination, and those unwilling to participate were excluded from the study.

Methodology

Demographic details such as age, gender, and residence were recorded. Ocular history including diminution of vision, pain, redness, and duration of symptoms was noted. Relevant systemic history such as diabetes mellitus and hypertension was also documented.

All patients underwent detailed ophthalmic evaluation. Visual acuity was assessed using Snellen's chart and best corrected visual acuity (BCVA) was recorded. Slit lamp biomicroscopy was performed to identify pseudoexfoliative material over the anterior lens capsule, pupillary margin, and corneal endothelium.

Intraocular pressure (IOP) was measured using Goldmann applanation tonometry. Gonioscopy was performed using a Goldmann three-mirror lens to evaluate the anterior chamber angle structures and trabecular meshwork pigmentation. Fundus examination was carried out using direct and indirect ophthalmoscopy and slit-lamp biomicroscopy with +90D lens to assess optic disc changes such as cup-disc ratio and neuroretinal rim thinning.

Visual field analysis was done using automated perimetry (Humphrey Field Analyzer) wherever feasible to detect glaucomatous field defects. The severity of glaucoma was assessed based on optic disc changes and visual field involvement.

Glaucoma was diagnosed in patients with PEX based on elevated intraocular pressure (>21 mmHg), characteristic optic disc changes (cup-disc ratio ≥ 0.6 or asymmetry >0.2), and corresponding visual field defects. Patients were categorized into two groups: PEX with glaucoma and PEX without glaucoma.

Clinical parameters such as laterality (unilateral/bilateral), intraocular pressure levels, optic disc changes, and visual field defects were recorded and analyzed to determine the clinical profile of glaucoma in pseudoexfoliation syndrome.

Data analysis:

Statistical analysis was performed using the SPSS program for Windows, version XX (SPSS Inc., Chicago, Illinois). Data were expressed as frequencies and percentages. Categorical variables were analyzed using the Chi-square test or Fisher's exact test as appropriate. A p-value <0.05 was considered statistically significant.

Ethical aspects:

Ethical clearance was obtained from the Institutional Ethics Committee before commencement of the study. Patient confidentiality was maintained throughout the study.

III. Results

Type of Initial Management among Glaucoma Patients:

78.9% of the patients had medical therapy.

Treatment	Number of Patients	Percentage
Medical therapy	52	78.79

Treatment	Number of Patients	Percentage
Early surgical treatment	14	21.21
Total	66	100

Table 1: Type of initial management among glaucoma patients

Distribution of Initial Medical Therapy:

39.39% of the patients used timolol 0.5%

Treatment Category	Number of Patients	Percentage
Timolol 0.5% (BD)	26	39.39
Latanoprost 0.005% (OD)	26	39.39
Early surgery	14	21.21
Total	66	100

Table 2: Distribution of initial medical therapy

Treatment Modality among Glaucoma Patients:

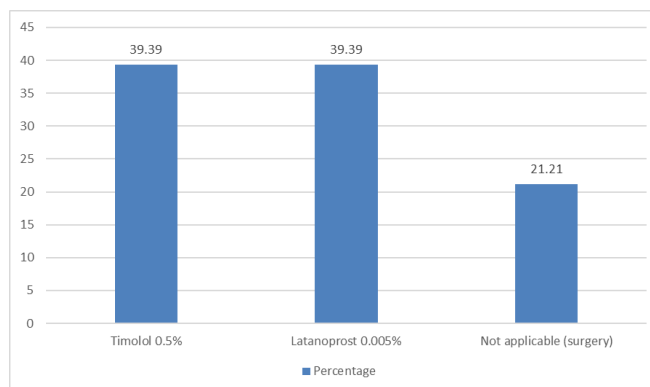
78.79% of the patients underwent monotherapy.

Treatment Modality	Number of Patients	Percentage
Monotherapy	52	78.79
Surgical therapy	14	21.21
Total	66	100

Table 3: Treatment Modality among Glaucoma Patients

Drug-wise Distribution in Medical Group:

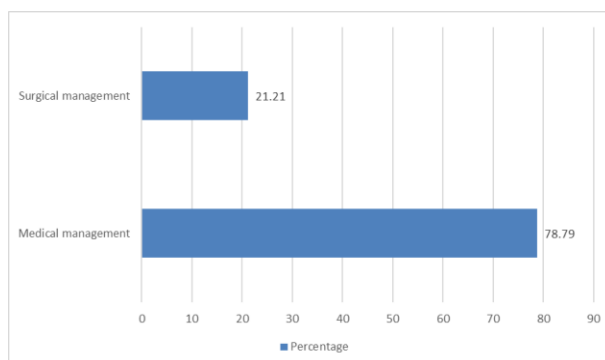
39.39% of the patients took treatment with latanoprost 0.005%.



Graph 1: Drug-wise Distribution in Medical Group

Overall Treatment Approach among Glaucoma Patients:

78.79% of the patients underwent medical management.



Graph 2: Overall Treatment Approach among Glaucoma Patients

IV. Discussion

Pseudoexfoliation syndrome (PEX) is a significant cause of secondary glaucoma and is associated with a more aggressive clinical course compared to primary open-angle glaucoma. In the present study, out of 246 patients with PEX, 66 patients (26.83%) were found to have glaucoma. This prevalence is comparable with previous studies, which have reported that approximately 20–30% of patients with PEX develop glaucoma, confirming the strong association between PEX and glaucomatous damage.⁶

In the present study, 21.21% of glaucoma patients required immediate surgical intervention due to angle closure glaucoma. This finding highlights the severe nature of glaucoma in PEX, where angle abnormalities and trabecular dysfunction contribute to rapid elevation of intraocular pressure (IOP). Similar observations have been reported by Ritch R et al., who noted that pseudoexfoliation glaucoma often presents with higher IOP and greater severity, frequently necessitating early surgical management.⁷

The majority of patients (78.79%) in the present study were initially managed with medical therapy. Patients were equally distributed between Timolol (0.5%) and Latanoprost (0.005%) groups. Prostaglandin analogues such as Latanoprost are known to be more effective in lowering IOP by increasing uveoscleral outflow, whereas beta-blockers like Timolol reduce aqueous humor production. Studies by Weinreb RN et al. have demonstrated that prostaglandin analogues are often superior as first-line therapy in glaucoma, including pseudoexfoliation glaucoma.⁸

In this study, patients were reassessed at 4 months, and those with poor response to monotherapy were shifted to combination therapy (Timolol + Latanoprost). This stepwise approach is consistent with established glaucoma management protocols. Previous studies have shown that combination therapy provides additive IOP reduction and is particularly useful in pseudoexfoliation glaucoma, which tends to be more resistant to single-drug therapy.⁹

At the end of 8 months, patients with inadequate response were advised surgical intervention. This reflects the progressive and treatment-resistant nature of pseudoexfoliation glaucoma. According to studies by Schlötzer-Schrehardt U et al., pseudoexfoliation glaucoma is associated with higher IOP levels, greater fluctuations, and faster progression, often requiring multiple medications or surgical intervention.^{10,11}

V. Conclusion

Pseudoexfoliation syndrome is an important risk factor for glaucoma, with 26.83% of patients in this study developing glaucoma. Most patients were managed initially with medical therapy, while a smaller proportion required early surgical intervention. Early diagnosis, regular follow-up, and timely treatment modification are essential to prevent disease progression and visual loss in pseudoexfoliation glaucoma.

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