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Original Research Article

Outcomes and complications of cataract surgery using phacoemulsification in eyes with and without pseudo exfoliation syndrome

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ABSTRACT

Background: Cataract remains a significant cause of visual impairment globally, with pseudo exfoliation syndrome (PEX) posing additional challenges for cataract surgery. This study aimed to compare outcomes and complications in patients with and without PEX undergoing phacoemulsification for senile cataract.
Materials and Methods: A total of 70 patients were divided into two groups: PEX (Group 1) and non-PEX (Group 2). Surgical procedures were performed, and outcomes were evaluated.
Results: Group 1 exhibited smaller pupil diameter and higher rates of advanced cataracts and intraoperative complications. Despite similar postoperative parameters, Group 1 showed increased inflammatory response and poorer initial visual recovery.
Conclusion: Tailored management strategies for PEX patients undergoing cataract surgery are warranted.

1. Introduction

Cataract continues to be the predominant cause of blindness and visual impairment in the elderly population globally, even as the overall number of affected individuals declines.[1]

Age stands as the primary risk factor for cataract progression, with pseudo exfoliation syndrome (PXF) representing an additional independent risk factor for the development of nuclear sclerosis and subsequent indication for cataract surgery.[2,3]

Pseudo exfoliation (PXF) syndrome is typically identified by the presence of a greyish-white fibrillar material, known as PXF material, along the pupillary margin.[4] This material may also manifest on various ocular structures, including the lens surface, lens zonules, iris surface, corneal endothelium, trabecular meshwork, and anterior hyaloid surface.[5]

This condition represents a significant risk factor for complications during cataract surgery and is the leading cause of secondary glaucoma.[6] During cataract surgery, both intraoperative and postoperative complications can arise due to the weakening of the capsule and zonular apparatus (zonulopathy) resulting from progressive proteolytic disintegration of the suspensory ligament. This instability of the crystalline lens during surgery may lead to complications such as capsular rupture, zonular dialysis, vitreous loss, nuclear luxation, or displacement of the intraocular lens (IOL) over time. Additionally, challenges may arise from poor or inadequate pupil dilation (iridopathy) caused by atrophic changes in the iris sphincter and stroma, resulting in transillumination defects. Furthermore, PXF patients commonly experience postoperative anterior chamber inflammation and fibrinous reaction due to a weakened blood-aqueous barrier.[7]

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This study aims to compare visual outcomes and complications in patients undergoing phacoemulsification for senile cataract, with and without pseudo exfoliation syndrome.

2. Materials and Methods

This was an observational analytical prospective study conducted at the upgraded department of ophthalmology in a tertiary care centre located in North India. The study was conducted after taking due clearance from the Institutional Ethical Committee. The study spanned a duration of 6 months and involved a total of 70 patients. Written informed consent was taken from all study participants. These patients were divided into two groups: Group 1 (test group) comprised 35 individuals diagnosed with unilateral immature senile cataract along with pseudo exfoliation syndrome (PEX). None of the patients had pseudo exfoliation glaucoma. While Group 2 (the control group) consisted of 35 patients with unilateral immature senile cataract but without PEX or any other ocular pathology. All patients underwent a preoperative eye examination including a detailed clinical history and systemic examination. Ocular examination included visual acuity measurement using Snellen chart, intraocular pressure (IOP) measurement by application tonometry. Central anterior chamber depth, keratometry, axial length were measured using Optical biometer and IOL power was calculated. Detailed slit lamp examination under maximal mydriasis was performed to assess pseudoexfoliative material deposition on the anterior lens capsule, type and grade of cataract, and the presence of phacodonesis or zonulolysis. A detailed fundus examination was conducted using Indirect ophthalmoscopy and 90 D biomicroscopy. All observations including demographic data, age in years, uncorrected visual acuity, best corrected visual acuity, anterior chamber depth, axial length, intraocular pressure, grade of cataract were carefully recorded using excel sheet. Phacoemulsification procedures were performed on both groups by a single experienced surgeon utilizing the stop and chop technique. Subsequently, a thorough comparative analysis was conducted to assess incidence of intraoperative and postoperative complications, as well as the overall outcomes of the surgical intervention. Pupillary diameter was measured intraoperatively using a transparent ruler under a microscopic magnification of 10 on a flat television screen. Postoperative examination on day 1 included IOP measurement, corneal oedema, anterior chamber flare and cell response, presence of posterior synechiae, capsular changes and visual acuity. Intraocular pressure was measured using an applanation tonometer. Anterior chamber flare and cell response was evaluated according to the criteria of Hogan et al. A table was used to convert the measurements in centimeters to the actual size in millimeters.[6] The quantitative data was represented as mean and standard deviation and the qualitative as number and percentage. The data collected was compared among the test group (with PEX) and the control group using independent samples (unpaired) Student's t-test ($p<0.05$) as the data was normally distributed.[8]

3. Results

A higher proportion of eyes in Group 1 (47.7%) exhibited a harder cataract of nuclear sclerosis, grade 3 or higher, compared to Group 2 (27.4%) ($p=0.015$). Intraoperative complications, such as zonular dialysis (dehiscence) were observed in only 2.9% (one case) of eyes with pseudoexfoliation syndrome (PEX) in Group 1. Similarly, posterior capsular tear (rent) with vitreous loss occurred in only 2.9% (one case) of eyes in Group 1. (Table 1) The mean pupil diameter was found to be significantly smaller in Group 1 ($p<0.001$). (Table 2)

Following surgery, the intraocular pressure (IOP) and aqueous flare response were comparable between the two groups. However, Group 1 exhibited a significantly higher inflammatory cell response compared to Group 2 ($p=0.012$). Additionally, visual acuity assessed using a Snellen chart with a pinhole on postoperative day 1 was significantly better in the control group compared to the group with PEX ($p=0.024$) (Table 2).

4. Discussion

The findings of this study shed light on the distinct challenges encountered during cataract surgery in patients with pseudoexfoliation syndrome (PEX). The significantly smaller pupil diameter observed in Group 1 underscores the difficulty in achieving adequate pupillary dilation, which is crucial for facilitating surgical manoeuvres and optimizing outcomes. This finding aligns with previous studies highlighting the association between PEX and poor or inadequate pupil dilation due to atrophic changes in the iris sphincter and stroma.[9,10] Moreover, the higher proportion of eyes in Group 1 exhibiting a harder cataract of nuclear sclerosis, grade 3 or higher, suggests that patients with PEX may present with more advanced cataracts,[11] potentially complicating surgical procedures and increasing the risk of intraoperative complications.

Intraoperative complications, such as zonular dialysis and posterior capsular tear with vitreous loss, albeit occurring in a small percentage of cases, highlight the vulnerability of the zonular apparatus in eyes with PEX. These findings are consistent with previous reports indicating a higher incidence of zonular weakness and capsular instability in PEX eyes, predisposing them to intraoperative complications.[12–14]

Following surgery, comparable intraocular pressure (IOP) and aqueous flare response between the two groups suggest that surgical intervention effectively managed these

Table 1: Preoperative demographic data and ocular observations.

Parameter	Group 1 (PEX)	Group 2 (control)	P value
Age	70±7	55±8	<0.001
ACD	3.22±0.26	2.99±0.15	<0.001
Axial length	23.09±0.65	22.80±0.77	0.146
Nuclear sclerosis	Grade 1-2 =16	Grade 1-2 =21	0.017
	Grade 3= 14	Grade 3= 11	
	Grade 4 or 5= 5	Grade 4 or 5= 3	
Posterior capsular cataract	Grade 0= 15	Grade 0= 10	0.352
	Grade 1 = 11	Grade 1=9	
	Grade 2= 8	Grade 2= 13	
	Grade 3 =1	Grade 3=3	
Cortical cataract	Grade 0= 25	Grade 0= 18	0.022
	Grade 1 = 7	Grade 1 = 13	
	Grade 2= 3	Grade 2= 4	

Table 2: Comparison of parameters Intraoperative and post operatively on Day 1

Parameter	Group 1 (PEX)	Group 2 (control)	P value
Mean pupil diameter	5.35±0.88	6.22±0.45	<0.001
BCVA	6/12 ± 2SD	6/9±2SD	0.002
IOP (Post Op day 1)	14.34±4.73	13.80±2.59	0.568
AC flare	Grade 1 = 5	Grade 1 = 3	0.110
	Grade 2 = 24	Grade 2 = 30	
	Grade 3 = 6	Grade 3 = 2	
AC cells	Grade 1 = 11	Grade 1 = 20	0.014
	Grade 2 = 22	Grade 2 = 11	
	Grade 3 = 2	Grade 3 = 4	

parameters irrespective of the presence of PEX. However, the significantly higher inflammatory cell response observed in Group 1 indicates a more pronounced inflammatory reaction in PEX eyes, potentially attributable to the generalized disorder and compromised blood-aqueous barrier in these patients. [15,16]

The significantly better best corrected visual acuity (BCVA) in the control group on postoperative day 1 highlights the potential impact of PEX on initial visual recovery following cataract surgery. This finding underscores the importance of vigilant postoperative monitoring and management strategies tailored to the unique challenges posed by PEX.

This study contributes to the current body of literature by focusing on the visual outcomes and complications among patients undergoing phacoemulsification for senile cataract, comparing those with and without pseudo exfoliation syndrome (PEX). Moreover, it assesses factors like inflammatory cell response and best corrected visual acuity, offering a thorough insight into how PEX affects postoperative outcomes. By emphasizing these factors, the study provides valuable insights for clinicians to develop customized management strategies for PEX patients undergoing cataract surgery.

5. Conclusion

In conclusion, this study highlights the challenges encountered during cataract surgery in patients with pseudo exfoliation syndrome (PEX), including smaller pupil diameter and higher incidence of intraoperative complications. Despite comparable postoperative parameters, PEX patients exhibited a heightened inflammatory response and poorer initial visual recovery. These findings emphasize the need for tailored management strategies in PEX patients undergoing cataract surgery.

6. Conflict of interest

None.

7. Source of funding

None.

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