

To Determine the Surgical Procedure for Cataract Removal and its Complications in Patients Diagnosed with Pseudo Exfoliation SyndromeEshwari Patel¹, Manoj Kumar², Nageshwar Sharma³¹Senior Resident, Department of Ophthalmology, Patna Medical College and Hospital, Patna, Bihar, India²Senior Resident, Department of Ophthalmology, Patna Medical College and Hospital, Patna, Bihar, India³Associate Professor and HOD, Department of Ophthalmology, Patna Medical College and Hospital, Patna, Bihar, India

Received: 14-02-2024 / Revised: 20-03-2024 / Accepted: 19-04-2024

Corresponding Author: Dr. Manoj Kumar

Conflict of interest: Nil

Abstract**Aim:** To determine the surgical procedure for cataract removal and its complications in patients diagnosed with pseudo exfoliation syndrome**Materials and Methods:** This study was conducted in the department of Ophthalmology, Patna medical college and hospital, Patna, Bihar, India for nine months. Cases of 225 eyes (80 eyes with pseudo exfoliation and 145 eyes without pseudo exfoliation as the control group) that underwent phacoemulsification cataract surgery and IOL implantation were analyzed retrospectively. All patients were given detailed information about their diagnosis and surgical procedures to be applied, and written informed consent was obtained. Patients with previous ocular surgery or trauma, uveitis, glaucoma, IOP \geq 21 mmhg or corneal pathology were excluded from the study. All cataract surgeries were performed using quick chop technique by the same surgeon. Patients' age, gender, anterior segment and fundus findings in both eyes, presence of pseudo exfoliative material, preoperative and postoperative day 1 IOP, and surgical notes were evaluated.**Results:** There were 51 (34.7%) males and 29 (38.6%) females among the PEX cataract patients, and 98 (65.3%) male and 47 (61.8%) female controls. The incidence of pseudo exfoliation was similar in women (38.2%) and men (34.7%) ($p=0.660$). There was no statistically significant effect of gender on pseudo exfoliation frequency. The mean age was 74.64 ± 6.8 in the PEX group and 68.95 ± 7.5 in the control group. Mean age was significantly higher in the PEX group compared to controls. Poor pupil dilation was observed intraoperatively in 60 (75%) of the patients with pseudo exfoliation and 17 (11.7%) of the control patients. Frequency of poor intraoperative pupillary dilation was significantly higher in the PEX group compared to controls ($p < 0.001$, Table 3). Intraoperative posterior capsule rupture occurred in 10 (12.5%) PEX patients and 5 (3.4%) controls. The incidence of intraoperative posterior capsule rupture was statistically significantly higher in the PEX group compared to the control group ($p=0.012$, Table 4). Intraoperative vitreous loss occurred in 7 (8.8%) PEX patients and 5 (3.4%) controls. Despite the fact that more PEX patients developing vitreous loss than controls, the difference was statistically insignificant.**Conclusion:** Cataract patients considering surgery should be evaluated preoperatively for pseudo exfoliation. Surgeons should be aware of the possibility of poor pupillary dilation and the complications that can arise in patients with PEX during cataract surgery. Caution should be taken during every stage of surgery to avoid these complications, and surgeons should be knowledgeable and skilled in complication management should they occur.**Keywords:** Cataract, Complications, Pseudo Exfoliation Syndrome.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Cataract surgery is one of the most commonly performed surgical procedures worldwide, with a high success rate in restoring vision in patients with cataracts. Despite advancements in surgical techniques and intraocular lens technology, certain pre-existing ocular conditions can complicate the

procedure and affect postoperative outcomes. One such condition is pseudo exfoliation syndrome (PEX), a systemic disorder characterized by the accumulation of abnormal fibrillary material in various tissues, including the anterior segment of the eye. Pseudo exfoliation syndrome is

particularly significant in the context of cataract surgery due to its association with various ocular complications. These complications arise primarily from the deposition of pseudo exfoliative material on the lens capsule, iris, and trabecular meshwork, leading to structural and functional alterations within the eye. The prevalence of PEX increases with age and varies geographically, being more common in certain populations. [1-3] One of the primary concerns in cataract surgery for patients with PEX is the increased risk of intraoperative and postoperative complications. The pseudo exfoliative material weakens the zonular fibres that hold the lens in place, leading to zonular instability or dialysis. This instability can complicate the surgical procedure, increasing the risk of lens subluxation or dislocation during phacoemulsification. Additionally, PEX is associated with a higher incidence of capsular rupture and vitreous loss, which can further complicate the surgical outcome and necessitate additional surgical interventions. [4,5] Another significant complication in PEX patients undergoing cataract surgery is the increased risk of postoperative inflammation and poor wound healing. The presence of pseudo exfoliative material is associated with an inflammatory response that can exacerbate postoperative inflammation, leading to complications such as cystoid macular oedema (CME) and prolonged recovery time. Furthermore, the impaired blood-aqueous barrier in PEX patients contributes to a higher incidence of postoperative intraocular pressure spikes, increasing the risk of secondary glaucoma. [6,7] Moreover, the management of intraocular lenses (IOLs) in PEX patients presents unique challenges. The weakened zonules and increased capsular fragility necessitate careful selection and positioning of the IOL to prevent postoperative decentration or dislocation. Some studies suggest using capsular tension rings (CTRs) to provide additional support to the capsular bag and reduce the risk of IOL-related complications. Despite these challenges, with careful preoperative assessment, meticulous surgical technique, and appropriate postoperative management, successful outcomes can be achieved in PEX patients undergoing cataract surgery. It is crucial for ophthalmic surgeons to be aware of the potential complications associated with PEX and to tailor

their surgical approach accordingly. This includes thorough preoperative evaluation of the extent of pseudo exfoliative material, zonular integrity, and intraocular pressure, as well as considering the use of adjunctive devices such as CTRs to enhance surgical safety and efficacy. [8]

Materials and Methods

This study was conducted in the department of Ophthalmology, Patna medical college and hospital, Patna, Bihar, India for nine months. Cases of 225 eyes (80 eyes with pseudo exfoliation and 145 eyes without pseudo exfoliation as the control group) that underwent phacoemulsification cataract surgery and IOL implantation were analyzed retrospectively. All patients were given detailed information about their diagnosis and surgical procedures to be applied, and written informed consent was obtained. Patients with previous ocular surgery or trauma, uveitis, glaucoma, IOP \geq 21 mmHg or corneal pathology were excluded from the study. All cataract surgeries were performed using quick chop technique by the same surgeon. Patients' age, gender, anterior segment and fundus findings in both eyes, presence of pseudo exfoliative material, preoperative and postoperative day 1 IOP, and surgical notes were evaluated. Intraocular pressure was measured by applanation tonometry (Haag-Streit, Switzerland) in all patients.

Statistical Analysis

Statistical Package for the Social Sciences 20 for Windows, a statistical software application (SPSS Inc.; Chicago, IL, USA) was used for statistical analysis. P values less than 0.05 were accepted as statistically significant.

Results

There were 51 (34.7%) males and 29 (38.6%) females among the PEX cataract patients, and 98 (65.3%) male and 47 (61.8%) female controls. The incidence of pseudo exfoliation was similar in women (38.2%) and men (34.7%) ($p=0.660$). There was no statistically significant effect of gender on pseudo exfoliation frequency (Table 1). The mean age was 74.64 ± 6.8 in the PEX group and 68.95 ± 7.5 in the control group. Mean age was significantly higher in the PEX group compared to controls ($p<0.001$, Table 2).

Table 1: Relationship between gender and PEX

			Pseudo exfoliation		Total	p
			(-)	(+)		
Gender	Female	Number	47	29	76	0.660
		%	61.8%	38.2%	100.0%	
	Male	Number	98	51	149	
		%	65.3%	34.7%	100.0%	

PEX: pseudo exfoliation syndrome

Table 2: Relationship between age and PEX

Pseudo exfoliation	n	Mean age (years)	SD	p
(-)	145	68.95	7.591	p<0.001
(+)	80	74.64	6.880	

PEX: pseudo exfoliation syndrome; SD: standard deviation

Poor pupil dilation was observed intraoperatively in 60 (75%) of the patients with pseudo exfoliation and 17 (11.7%) of the control patients. Frequency of poor intraoperative pupillary dilation was significantly higher in the PEX group compared to controls ($p<0.001$, Table 3). Intraoperative posterior capsule rupture occurred in 10 (12.5%) PEX patients and 5 (3.4%) controls. The incidence of intraoperative posterior capsule rupture was statistically significant and “vitreal loss” should be identified.

significantly higher in the PEX group compared to the control group ($p=0.012$, Table 4). Intraoperative vitreal loss occurred in 7 (8.8%) PEX patients and 5 (3.4%) controls. Despite the fact that more PEX patients developing vitreal loss than controls, the difference was statistically insignificant ($p=0.090$, Table 5). The difference between “posterior capsular rupture”.

Table 3: A comparison of PEX and poor pupillary dilation

			Poor pupillary dilation		Total	p
			(-)	(+)		
Pseudo exfoliation	(-)	Number	128	17	145	p<0.001
		%	88.3%	11.7%	100.0%	
	(+))	Number	20	60	80	
		%	25.0%	75.0%	100.0%	

PEX: pseudo exfoliation syndrome

Table 4: Relationship between PEX and posterior capsule rupture

			Posterior capsule rupture		Total	p
			(-)	(+)		
Pseudo exfoliation	(-)	Number	140	5	145	0.012
		%	96.6%	3.4%	100.0%	
	(+))	Number	70	10	80	
		%	87.5%	12.5%	100.0%	

PEX: pseudo exfoliation syndrome

Table 5: Comparison of PEX and vitreal loss

			Vitreous loss		Total	p
			(-)	(+)		
Pseudo exfoliation	(-)	Number	140	5	145	0.090
		%	96.6%	3.4%	100.0%	
	(+))	Number	73	7	80	
		%	91.2%	8.8%	100.0%	

PEX: pseudo exfoliation syndrome

Discussion

The incidence of PEX varies by population, ethnic group and age. However, studies consistently show that the frequency of PEX increases with age. [9–12] In a study conducted in the Çukurova Region of Turkey, Yalaz et al. reported a PEX frequency of 11.2% in individuals over 60 years old. [12] In their epidemiological study, Elibol et al. [13] found a PEX incidence of 13.7%. Consistent with these findings, an increase in the frequency of PEX with age was observed in the current study. The mean age of the PEX patient group was significantly higher than that of the control group ($p<0.001$). There are reports in the literature of a significant relationship between PEX and cataract development; furthermore, certain challenges of cataract

surgery in the presence of PEX and increased risk of complications have been reported. [8,14] Complications during cataract surgery occur at a higher rate in eyes with pseudo exfoliation than in standard cataract cases due to increased frequency of glaucoma and poor pupillary dilation. There is also a higher risk of zonular dialysis, capsule rupture, vitreal loss and postoperative IOL decentralization. [14] It is considerably more difficult to achieve sufficient pupillary dilation for cataract surgery in eyes with PEX than normal eyes. [8,15,16] Iris haemorrhage, corneal endothelial damage, lens dislocation, vitreal loss, posterior capsule rupture and sphincter rupture occur more frequently in eyes with insufficient intraoperative pupillary dilation during cataract extraction. [15–

18] Drolsum et al. [19] also reported a higher rate of posterior capsule rupture without vitreous loss in PEX eyes compared to controls, although there was no difference in the incidence of vitreous loss. There are many studies in the literature about intraoperative complications of cataract surgery in PEX patients. In a study of phacoemulsification in PEX eyes conducted by Drolsum et al. [20], intraoperative complications occurred in 9.6% of the eyes with pseudo exfoliation, compared to 3.7% of the eyes without pseudo exfoliation. Lumme et al. [7] found significantly higher rates of intraoperative complications including zonular rupture, posterior capsule rupture, and vitreous loss (14.8%, 10.2%, and 7.4%, respectively) during cataract surgery on eyes with PEX, and suggested that zonular and posterior capsule rupture are important risk factors for vitreous loss. Scrolli et al. [16] also found higher intraoperative incidences of zonular dialysis, posterior capsule rupture and vitreous loss in PEX patients undergoing phacoemulsification than in patients without pseudo exfoliation. Avramides et al. [21] found that 61.9% of the patients with PEX had a pupil diameter of less than 5 mm, and the incidence of intraoperative complications in these patients was as follows: zonulolysis, 13.09%; posterior capsule tear, 10.71%; and vitreous loss, 7.14%. [21] In the current study, poor pupillary dilation occurred in 75% of the patients in PEX group, compared to 11.7% in the non-PEX group. Intraoperative posterior capsule rupture occurred in 12.5% of PEX patients and 3.4% of the patients without pseudo exfoliation. Vitreous loss was observed in 8.8% of the patients in PEX group and 3.4% of non-PEX group; despite the fact that more patients in the PEX group had vitreous loss, the intergroup difference was not statistically significant. However, the rates of poor pupillary dilation and posterior capsule rupture were significantly higher in the PEX group when compared to the non-PEX controls. Our results support the observation that pseudo exfoliation increases the incidence of poor pupillary dilation and is a factor that increases the risk of complications such as posterior capsule rupture during cataract surgery.

Conclusion

Cataract patients considering surgery should be evaluated preoperatively for pseudo exfoliation. Surgeons should be aware of the possibility of poor pupillary dilation and the complications that can arise in patients with PEX during cataract surgery. Caution should be taken during every stage of surgery to avoid these complications, and surgeons should be knowledgeable and skilled in complication management should they occur.

References

1. Schlötzer-Schrehardt U, Naumann GO. Ocular and systemic pseudoexfoliation syndrome. *Am J Ophthalmol.* 2006 May;141(5):921-937. doi: 10.1016/j.ajo.2006.01.047.
2. Puska P, Vesti E, Tomita G, Ishida K, Raitta C. Surgical and visual outcome of cataract surgery in eyes with exfoliation syndrome. *Acta Ophthalmol Scand.* 1996 Dec;74(6):610-614. doi: 10.1111/j.1600-0420.1996.tb00774.x.
3. Kozobolis VP, Siganos CS, Konstas AG, Ginis H, Gioulekas E, Georgiadis N. Cataract surgery in exfoliation syndrome performed by residents. *J Cataract Refract Surg.* 1997 Jul;23(6):1020-1024. doi:10.1016/S0886-3350(97)80016-2.
4. Konstas AG, Hollo G, Astin MP, Lallo N, Jenkins JN, Stewart WC. Comparison of the response to latanoprost between exfoliative glaucoma and primary open-angle glaucoma eyes with matched visual field loss. *Eur J Ophthalmol.* 1999 Oct-Dec;9(4):257-263.
5. Kühle M, Vinos SA, Mahlow J, Green WR, Kühle C, Naumann GO. Blood-aqueous barrier in pseudoexfoliation syndrome: evaluation by immunohistochemical staining of endogenous albumin. *Graefes Arch Clin Exp Ophthalmol.* 1999 May;237(5):377-381. doi:10.1007/s004170050252.
6. Hirnschall N, Crnej A, Gangwani V, Norrby S, Findl O. Correction of intraocular lens power for effective lens position using optical coherence tomography. *J Cataract Refract Surg.* 2014 Jul;40(7):1070-1074. doi:10.1016/j.jcrs.2013.12.020.
7. Lumme P, Laatikainen L. Exfoliation syndrome and cataract extraction. *Am J Ophthalmol.* 1993; 116:51. [https://doi.org/10.1016/S0002-9394\(14\)71743-X](https://doi.org/10.1016/S0002-9394(14)71743-X).
8. Sunay F, Şentürk A, Borataç N, Şendilek B, Erbil H. Katarakt hastalarında eksfoliasyon sıklığı ve cerrahi sonuçlar. *T Klin Oftalmoloji.* 1997; 6:31-5.
9. Sandinha T, Weir C, Holding D. A delayed complication of cataract surgery in a patient with pseudoexfoliation: dislocation of the intraocular lens. *Eye.* 2003; 17:272-3. <https://doi.org/10.1038/sj.eye.6700319>.
10. Kozobolis VP, Papatzanaki M, Vlachonikolis IG, Pallikaris IG, Tsambarlakis IG. Epidemiology of pseudoexfoliation in the island of Crete (Greece) *Acta Ophthalmol Scand.* 1997; 75:726-9. <https://doi.org/10.1111/j.1600-0420.1997.tb00640.x>.
11. McCarty CA, Taylor HR. Pseudoexfoliation syndrome in Australian adults. *Am J Ophthalmol.* 2000; 129:629-33. [https://doi.org/10.1016/S0002-9394\(99\)00466-3](https://doi.org/10.1016/S0002-9394(99)00466-3).
12. Yalaz M, Othman I, Nas K, et al. The frequency of pseudoexfoliation syndrome in the eastern Mediterranean area of Turkey. *Acta Oph-*

- thalmol (Copenh) 1992; 70:209–13. <https://doi.org/10.1111/j.1755-3768.1992.tb04125.x>.
13. Elibol O, Güler C, Alçelik T, Erdoğan T. Eksfoliasyon sendromunun PEKKE ve arka kamara göz içi lens implantasyonuna etkisi. MN Oftalmoloji. 1995; 2:342–45.
 14. Bayraktar Ş, Altan T, Küçüksümer Y, Yılmaz ÖF. Psödoeksfoliasyon sendromu ile birlikte olan kataraktların fakoemülsifikasyonu sırasında kapsüloreksisi takiben kapsül germe halkası uygulaması MN Oftalmoloji. 2001;8: 117–21.
 15. Aigbe N, Madzou M, Fihi A, et al. Pseudoexfoliation syndrome and phacoemulsification: a comparative study with a control population. J Fr Ophtalmol. 2014; 37:91–5. <https://doi.org/10.1016/j.jfo.2013.09.010>.
 16. Scrolli L, Campo EC, Bassein L, Meduri RA. Pseudoexfoliation syndrome: A cohort study on intraoperative complications in cataract surgery. Ophthalmologica. 1998; 212:278–80. <https://doi.org/10.1159/000027307>.
 17. McKellar MJ, Elder MJ. The early complications of cataract surgery: is routine review of patients 1 week after cataract extraction necessary? Ophthalmology. 2001; 108:930–5. [https://doi.org/10.1016/S0161-6420\(00\)00431-0](https://doi.org/10.1016/S0161-6420(00)00431-0).
 18. Jehan FS, Mamalis N, Crandall AS. Spontaneous late dislocation of intraocular lens within the capsular bag in pseudoexfoliation patients. Ophthalmology. 2001; 108:1727–31. [https://doi.org/10.1016/S0161-6420\(01\)00710-2](https://doi.org/10.1016/S0161-6420(01)00710-2).
 19. Drolsum L, Haaskjold E. Pseudoexfoliation syndrome and extracapsular cataract extraction. Acta Ophtalmol. 1993; 71:765. <https://doi.org/10.1111/j.1755-3768.1993.tb08597.x>.
 20. Drolsum L, Haaskjold E, Sandvig K. Phacoemulsification in eyes with pseudoexfoliation. J Cataract Refract Surg. 1998; 24:787–92. [https://doi.org/10.1016/S0886-3350\(98\)80132-6](https://doi.org/10.1016/S0886-3350(98)80132-6).
 21. Avramides S, Traianidis P, Sakkias G. Cataract surgery and lens implantation in eyes with exfoliation syndrome. J Cataract Refract Surg. 1997; 23:583–7. [https://doi.org/10.1016/S0886-3350\(97\)80219-2](https://doi.org/10.1016/S0886-3350(97)80219-2).