

Study of Prognostic Indicators in Patients with Pseudoexfoliation Syndrome Undergoing Cataract Surgery

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ABSTRACT

Introduction: Pseudoexfoliation syndrome is a systemic disorder characterized by deposits on the lens and the iris. This syndrome has been reported to be associated with increased intraoperative and post operative complications during cataract surgery. In this study we have documented the complications occurring during small incision cataract surgery (SICS) in pseudoexfoliation syndrome and compared the same with prognostic indicators like pupillary dilatation.

Aim: To document and compare the complications occurring during small incision cataract surgery in pseudoexfoliation syndrome with different grades pupillary dilatation as a prognostic indicator.

Materials and Methods: The study was conducted at Shri Sathya Sai Medical College and Research Institute Hospital by including 50 eyes of 50 patients with pseudoexfoliation over a period of one years, between July 2014 and June 2015 after obtaining ethical clearance. All the patients underwent

small incision cataract surgery (SICS) and were followed up for 6 weeks post surgery.

Results: All our patients were aged more than 50 years. About 64% patients belonged to the age group of 70 – 80 years. About 20 (40%) patients had a rigid pupil which dilated not more than 3.5 mm. Zonular dialysis was seen in 8 (16%) patients and of these patients five also had vitreous loss. Four patients had subluxated PCIOL when seen on long term follow up after six weeks.

Conclusion: Poorly dilating pupil is a common accompaniment with this condition and is an important prognostic indicator of intraoperative zonular dialysis and vitreous loss, the rate of these complications being inversely proportional to the maximum pupillary dilatation. Patients with poorly dilating pupil need to be given realistic expectations regarding the complications and recovery time. Sphincterotomy can be useful when modern pupil dilating devices are not available.

Keywords: Complications, Prognostic indicators, Pupillary dilatation, SICS.

INTRODUCTION

Pseudoexfoliation syndrome is a systemic disorder with important eye manifestations, including development of open and closed angle glaucoma and cataract with zonular instability [1]. Its prevalence increases dramatically with age [2]. This condition involves both the genders [3]. Clinically the diagnosis is made by detecting the whitish powdery deposits along the pupillary margin or whitish grey flaky material on the anterior surface of the lens or both. Other parts of the eye where the material may get deposited include zonules, ciliary body, corneal endothelium, anterior vitreous and trabecular meshwork [4]. One of the significant concerns for patients with pseudoexfoliation syndrome is increased incidence of intra and post operative complications when they undergo cataract surgery. This is attributed mainly to two pathological manifestations of pseudoexfoliation

syndrome namely zonular weakness and poor pupillary dilatation. Zonular weakness occurs because of proteolytic disintegration of the zonules. Poor pupillary dilatation occurs due to both mechanical obstruction as well as mechanical restriction. Pseudoexfoliative material infiltrating the iris stroma causes an obstruction in pupillary dilatation and adhesion of the exfoliative material to the iris pigment and lens epithelium cause mechanical restriction[5]. During cataract surgery these patients have more chances of developing sphincter tear, difficult nucleus delivery due to rigid pupil and posterior synechiae and zonular dialysis with or without vitreous loss due to weak zonules [6]. Other intra operative complications can be iridodialysis and retained lens matter. Post operatively there can be increased incidence of prolonged corneal edema, severe anterior chamber reaction, and raised intra ocular pressure. Late dislocation of the intraocular lens within

the bag or dislocation of the entire bag has also been reported [7]. All these complications make cataract surgery a challenge in patients with pseudoexfoliation syndrome. In this study we have attempted to study the outcome of small incision cataract surgery (SICS) in patients with pseudoexfoliation syndrome and compare the complications encountered with prognostic indicators.

MATERIALS AND METHODS

We conducted a longitudinal cohort study at the Department of Ophthalmology, Shri Sathya Sai Medical College and Research Institute Hospital by including 50 eyes of 50 patients with pseudoexfoliation over a period of one year between July 2014 and June 2015. They visited our hospital for complaints of diminution of vision and had significant cataract which required cataract surgery. Institutional Ethics Committee Clearance was taken before conducting the study and written informed consent was obtained from all the willing subjects.

A detailed history was taken followed by a thorough anterior and posterior segment examination. A Slit lamp examination was done for the anterior segment to note down deposition of pigments or pseudoexfoliative material over the corneal endothelium and the lens. Atrophic patches in the iris and the type of cataract were also noted. Central anterior chamber depth was measured. Gonioscopy was done before pupillary dilatation to look for deposition of pigments, pseudoexfoliative material and presence of peripheral anterior synechiae in the angle. Intraocular pressure was measured using Goldmann applanation tonometer. Maximum pupillary dilatation was noted after instilling (0.8%/0.5%) tropicamide and phenylephrine eye drops and waiting for 1 hour. After dilation repeat slit lamp examination was done to look for maximum pupillary dilation, posterior synechiae, phacodonesis and subluxation of lens. Preoperatively flurbiprofen eye drops were used along with mydriatics to maintain the intraoperative mydriasis.

All the patients underwent small incision cataract surgery with rigid single piece posterior chamber intraocular lens implantation and all the surgeries were done by a single experienced surgeon to maintain uniformity. Post operatively all patients were treated with antibiotic steroid eye drops and those with severe anterior chamber reaction were treated with homatropine eye drops. Patients who had postoperative increase in intra ocular pressure were given oral acetazolamide for short term, sometimes along with timolol eye drops. Those who had severe corneal edema were treated additionally with hypersol eye drops. Patients were followed up to 6 weeks and in few cases further follow-up was done depending on the necessity. The longest follow-up period was about 1 year.

All the surgeries were done under peribulbar block. Detailed slit lamp examination was done on first post operative day and then every week up to 6 weeks. All the intra operative and post operative complications were noted, correlated with pre operative findings like extent of pupillary dilatation, location of pseudoexfoliation material.

INCLUSION CRITERIA

1. Patients with pseudoexfoliation getting admitted for cataract surgery.
2. Patients consenting for Small incision cataract surgery (SICS).

EXCLUSION CRITERIA

1. Patients with raised intra ocular pressure (IOP).
2. Patients with glaucomatous disc damage.
3. Patients with other causes of cataract.
4. Patients with uncontrolled diabetes mellitus or other severe systemic and cardiovascular diseases.
5. Patients not giving consent to Small incision cataract surgery.
6. Patients having iridodonesis, phacodonesis and subluxation of the lens preoperatively.

STATISTICAL ANALYSIS

The data thus collected was tabulated and analyzed for descriptive statistics using SPSS Statistical analysis Software (Version 20). The data is presented in terms of rates, ratios and frequencies of occurrences of different complications

RESULTS

A total number of 50 patients participated in the study. Among them 36 (72%) were males and 14 (28%) were females. The age group wise distribution is shown in [Table/Fig-1].

Age Group	No. of Patients	Percentage (%)
>80 years	07	14%
71-79 years	25	50%
61-70 yrs	17	34%
50-60 Years	01	0.02%
<50 years	0	0%

[Table/Fig-1]: Distribution of the subjects based on their age into different groups.

As pseudoexfoliation is common in older age groups all our patients were aged more than 50 years. About 64% patients belonged to the age group of 70 – 80 years.

MORPHOLOGY OF PSEUDOEXFOLIATION

During the initial clinical examination of the 50 subjects in the study it was noted that 28(56%) patients had pseudoexfoliation in both the eyes, 18 (36%) had unilateral pseudoexfoliation and 4 (8%) patients had pseudophakia in one eye and thus laterality couldn't be commented upon.

Depending on the site of deposition of pseudoexfoliation patients were broadly divided into 3 groups as those with pseudoexfoliation deposits on the pupillary margin, those with deposits on the lens and those having deposits on both lens

and pupillary margin. The distribution of the patients based on the location of pseudoexfoliative deposits is depicted in [Table/Fig-2].

Morphology of Pseudoexfoliation	No. of Patients	Percentage (%)
White dandruff like deposits over pupillary margin	8	16%
Deposits over the lens	4	8%
Deposits both over the pupillary margin and lens	38	76%

[Table/Fig-2]: Distribution of the patients base on the location of pseudoexfoliative deposits in the eye.

Pseudoexfoliation material over corneal endothelium was also seen in 4(8%) patients and in 2(4%) few glistening white deposits were seen over the zonules. These were visualised intraoperatively.

MAXIMUM PUPILLARY DILATATION

Maximum pupillary dilatation was noted after instilling tropicamide and phenylephrine eye drops and waiting for 1 hour. The subjects were divided into 4 different groups based on the pupil size as those with pupils 3.5mm or less, 3.4-4.5mm, 4.5-6mm and > 6mm . About 20 (40%) people had a rigid pupil which dilated not more than 3.5 mm. The distribution of subjects based on the pupil size is shown in [Table/Fig-3].

Maximum Pupillary Dilatation	No. of Cases	Percentage (%)
3.5 mm or less	20	40%
3.5 – 4.5 mm	18	36%
4.5 – 6 mm	5	10%
>6mm	7	14%

[Table/Fig-3]: Distribution of subjects based on the maximum pupil size after instilling tropicamide and phenylephrine eye drops.

INTRA-OPERATIVE AND POST-OPERATIVE COMPLICATIONS

All the patients underwent Small incision cataract surgery with posterior chamber intraocular lens implantation except those patients who had intra-operative vitreous loss. [Table/Fig-4] shows the details of intra-operative complication encountered during the surgery. Zonular dialysis was seen in 8 (16%) patients and of these patients five also had vitreous loss. Stretch

Intra op Complications	No. of Patients	Percentage (%)
Sphincter tear	4	8%
Irido-dialysis	2	4%
Zonular dialysis	8	16%
Vitreous loss	5	10%
Retained cortical matter	6	12%

[Table/Fig-4]: Distribution of subjects based on intra-operative complications encountered during surgery.

pupilloplasty (10%), synechiolysis (6%), sphincterotomy (12%) were performed in few patients whenever required.

All the patients were examined on the first post operative day and then once every week for the next six weeks. Complications noted post-operatively are listed in [Table/Fig-5]. Corneal oedema was the most common complication seen post operatively followed by severe anterior chamber reaction and raised IOP. Most cases responded to conventional management. Four patients had subluxated PCIOL when seen on long term follow up after six weeks.

The complications thus, noted were compared with pre-operative maximum pupillary dilation and the results of the same are presented in [Table/Fig-6]. There was not much correlation seen between the location of pseudoexfoliation and the operative complications.

Post operative Complications	No. of Patients	Percentage (%)
Raised IOP	12	24%
Corneal edema	15	30%
Severe AC reaction	14	28%
Subluxation of PCIOL	4	8%
Pigment deposition over PCIOL on long term follow-up	10	20%

[Table/Fig-5]: Distribution of subjects based on post-operative complications encountered after surgery.

Maximum Pupillary Dilatation	Complication			
	Sphincter Tear	Iridodialysis	Zonular Dialysis	Vitreous Loss
3.5 mm or less	0	2 (4%)	6 (75%)	4 (80%)
3.5 – 4.5 mm	3 (6%)	0	2 (25%)	1 (20%)
4.5 – 6 mm	1 (2%)	0	0	0
>6mm	0	0	0	0

[Table/Fig-6]: Comparison of the complications noted with the pre-operative maximum pupillary dilation.

DISCUSSION

Pseudoexfoliation syndrome has been reported to be associated with increasing age and it is typically more common after the age of 60 years as found by various other studies [2,8-10]. One study reported that the incidence of pseudoexfoliation doubled every decade after the age of 50 years [11]. All the patients in our study were aged more than 50 years. About 50% belonged to the age group of 70 to 80 years. This is in line with majority of published studies [2,8-11]

The relation between prevalence of pseudoexfoliation and gender has not been well established. Few studies done in the past have shown a female predilection [3,8-10,12] while few studies done in India and Pakistan shows a male predilection [13-14], but majority of the reports do not show any correlation between sex and pseudoexfoliation [1]. In our study males were more commonly affected than females

(72%). Since, ours is a medical college hospital situated in the peripheral part of Chennai and most patients are from a rural background, this finding could be attributed to male patients getting more exposed to the tropical climate as they are more commonly engaged in outdoor work.

As pseudoexfoliation syndrome is an age-related systemic microfibrilopathy of the eye, there is gradual deposition of fibrillary residue from lens and iris pigment epithelium on the lens capsule, ciliary body, zonules, corneal endothelium and iris. This is clinically diagnosed mainly by the presence of white powdery / flaky material along the pupillary margin and/or over the anterior surface of the lens. In our study 76% of the subjects had deposits both on the pupillary margin and on the anterior lens surface indicating an advanced stage.

Pupillary dilatation after instilling mydriatics has been found to be poor in patients with pseudoexfoliation syndrome [10]. Poor pupillary dilation is a result of infiltration of the iris stroma with excessive extracellular matrix, causing mechanical obstruction during mydriasis [15]. In our study about 40% patients had very poorly dilating pupil i.e. < 3.5 mm and another 46% had medium dilatation of 3.5 - 6mm. Only 14% patients had pupillary dilatation of > 6mm. Poor pupillary dilatation has been suggested as an important cause for various intraoperative complications during cataract surgery in these patients [11,13,15-18]. This was true even in our study as most of the intra operative complications were seen in the poorly dilating pupil group.

The most common intra operative complication noted in our study was zonular dialysis. This was seen in 16% patients. Of these eight cases with zonular dialysis five patients also had vitreous loss (10%) and PCIOL placement was deferred. About six patients had retained cortical matter and three of them were taken for cortical wash as the lens fibres were involving the visual axis. The percentage of these complications are comparable to those listed in similar studies by various other researchers [9,15-17, 19-21].

Zonular weakness found in pseudoexfoliation syndrome is attributed to the deposits on zonular fibers and ciliary process which result in proteolysis of the zonules. However, the degree of zonular weakness cannot be predicted by the extent of deposits present [15].

Due to the nature of the disease and inherent zonular weakness in pseudoexfoliation, complications like zonular dialysis and delayed spontaneous dislocation of the intraocular lens and capsule are more commonly noted.

Among the eight cases of zonular dialysis noted in our study, six occurred in patients with pupillary dilatation of < 3.5mm and remaining two in patients with pupillary dilatation < 4.5 mm. Also four cases of vitreous loss occurred in the former group with maximum pupillary dilatation < 3.5mm and 1 in the latter group with maximum pupillary dilatation < 4.5mm. This shows that poor pupillary dilatation is the most important prognostic indicator for serious intra operative complications. Sphincter tear was seen in four cases and none of these

patients belonged to very poorly dilating pupil group. This could be due to the fact that procedures to increase the pupillary diameter were more commonly performed in the groups with poor pupillary dilatation. These included Stretch pupilloplasty (5 cases) and Sphincterotomy (6 cases). These simple procedures need minimal instrumentation and are easy to perform and can be of great aid in patients with pseudoexfoliation with minimally dilating pupil during cataract surgery. Iridodialysis was seen in two patients and both these patients had very poorly dilating pupil. About six patients had retained cortical matter and three of them were taken for cortical wash as the lens fibres were involving the visual axis.

Whole of the iris is said to be involved in production and deposition of pseudoexfoliative material. The iris in pseudoexfoliation syndrome is rigid and has less dilating ability. Posterior synechiae are also reported to be common in pseudoexfoliation syndrome due to adherence of the posterior pigment epithelium to the lens capsule. This combination of the deposits in the stroma and iris muscle along with tissue degeneration and vascular damage leads to defective dilating ability of the iris [17]. This small size of the pupil limits the size of capsulorhexis which in turn causes increased force on the zonules during surgery leading to capsular tear, difficulty in extracting lens matter and post operative capsule phimosis [17].

Post operatively corneal edema (30%), severe AC reaction (28%) and raised intra ocular pressure (24%) were seen more commonly than usual in our study. The corneal endothelium in pseudoexfoliation syndrome shows focal degeneration. Phagocytosis of melanin granules and pseudoexfoliation fibre products has also been found in the endothelium. This dysfunctional nature of the endothelium leads to increased risk of decompensation of the cornea post surgery [17].

On long term follow-up four (8%) of our patients had subluxation of PCIOL. This could again be due to zonular weakness. About 20% had deposition of pigments over the IOL surface. These findings are very consistent with most of the other reported studies [15-21].

In this study we have tried to divide patients depending on the extent of maximum pupillary dilatation and the results show that it's the group of patients with pupillary dilatation <3.5 mm who have high chances of developing severe intra operative complications. In our knowledge this is the first study where extent of pupillary dilatation and the intra and post operative complications are compared.

LIMITATIONS

As the study was done over a one years period in our tertiary care hospital in rural suburbs of Chennai we had a small sample size. No long term follow-up of post operative cases was conducted except in few cases hence, we could not comment upon the long term complications like posterior capsular opacification. Lens Opacities classification system(LOCS) and its correlation with complications could have been done.

CONCLUSION

Poorly dilating pupil is a common accompaniment with this condition and is an important prognostic indicator of intraoperative zonular dialysis and vitreous loss. The present study shows that the rate of complication is highest in patients having maximum pupillary dilation of 3.5 mm or less. The amount and site of deposition of pseudoexfoliative material does not have a bearing on the rate of complications. A detailed slit lamp examination before and after dilatation and a careful planning before surgery become very important in these patients. Patients with minimal pupillary dilatation need to be given realistic expectations regarding the complications and recovery time. Sphincterotomy is a simple procedure which can be useful when modern pupil dilating devices are not available.

REFERENCES

- [1] Allingham RR, Damji KF, Moroi SE, Freedman SF et al. Shield's textbook of glaucoma. 6th ed. Lippincott Williams and Wilkins; 2010. 300-45.
- [2] Thomas R, Nirmalan PK, Krishnaiah S. Pseudoexfoliation in south India: the Andra Pradesh eye disease study. *Investigative ophthalmology and Visual science*. 2005; 46: 1170-76.
- [3] Forsius H, Forsman E, Fellman J, Eriksson AK. Exfoliation syndrome: Frequency, gender distribution and association with climatically induced alterations of the cornea and conjunctiva. *Acta Ophthalmol Scand*. 2002; 80: 478-84.
- [4] Schlötzer-Schrehardt U, Naumann GO. Ocular and systemic pseudoexfoliation syndrome. *Am J Ophthalmol*. 2006; 141(5): 921-37.
- [5] Kaštelan s, Tomic M, Kordic R, Kalauz M, Jasminka .Cataract surgery in eyes with pseudoexfoliation (PEX) syndrome. *J Clinic Experiment Ophthalmol*. 2013; 9: 01-05.
- [6] Scorolli L, Campos EC, Bassein L, Meduri RA. Pseudoexfoliation syndrome: A cohort study on intraoperative complications in cataract surgery. *Ophthalmologica* 1998; 212: 278- 80.
- [7] Jehan FS, Mamalis N, Crandall AS. Spontaneous late dislocation of intraocular lens within the capsular bag in pseudoexfoliation patients. *Ophthalmology*. 2001; 108: 1727-31.
- [8] Lee JKS, Wong EPY, Ho SL. Pseudoexfoliation syndrome at a Singapore eye clinic. *Clinical Ophthalmology*. 2015;9:1619-24.
- [9] Sulaiman A, Najwa M, Saad M, Nusrat M, Misbahul A, Mohammad T, et al. Prevalence of ocular pseudoexfoliation syndrome and associated complications in Riyadh, Saudi Arabia. *Saudi Med J*. 2015; 36 (1): 108-12.
- [10] Setha SP, Sheeja SJ, Arathi RS, Smitha J, Andrew DB. Ocular clinical profile of patients with pseudoexfoliation syndrome in a tertiary eye care center in South India. *Middle East Afr J Ophthalmol*. 2012; 19(2): 231-36.
- [11] Sushil K, Bhuyan L, Nanda AK. Pseudoexfoliation - a dreaded nightmare in cataract surgery. *Int J of Biomedical and Advance Research*. 2015; 6(02): 159-62
- [12] Kozart DM, Yanoff M. Intraocular pressure status in 100 consecutive patients with exfoliation syndrome. *Ophthalmology*. 1982; 89: 214-18.
- [13] Naseem A. Cataract surgery in patients with pseudoexfoliation. *Pak J Ophthalmol*. 2007; 23(3): 155-59.
- [14] Hridya M, Rajini KC. A study of ascorbic acid concentration in the aqueous humor and intra operative challenges during cataract surgery in patients with pseudo exfoliation as compared to normal. *J Evid based Med and Healthcare*. 2015; 2(31): 4540-47. doi: 10.18410/jebmh/2015/640.
- [15] Calafati J, Tam DY, Ahmed IK, Pseudoexfoliation Syndrome in cataract surgery. *Cataract. Ophthalmic Pearls*. EyeNet Magazine. 2009; 37-39. Available from: URL: <http://www.aao.org/SearchResults.aspx?q=Pseudoexfoliation%20Syndrome%20in%20Cataract%20Surgery&c=1>
- [16] Zetterstrom C, Olivestedt G, Lundvall A. Exfoliation syndrome and extracapsular cataract extraction with implantation of posterior chamber lens. *Acta Ophthalmol*. 1992; 70(1): 85-90.
- [17] Andrikopoulos GK, Gartaganis PS. Pseudoexfoliation and Cataract. *Cataract Surgery. Greece*; 353-70. Available from: URL: <http://www.intechopen.com/download/pdf/42724>
- [18] Watson NJ, Winder S, Green FD. Pupil dilatation in the pseudoexfoliation syndrome. *Eye*. 1995; 9: 341-43.
- [19] Sangal N, Chen TC. Cataract surgery in pseudoexfoliation syndrome. *Semin Ophthalmol*. 2014;29(56):403-08. doi: 10.3109/08820538.2014.959189.
- [20] Jawad M, Nadeem A, Khan A, Aftab M. Complications of cataract surgery in patients with pseudoexfoliation syndrome. *J Ayub Med Coll Abbottabad*. 2009; 21(2): 33-38.
- [21] Pranathi K, Magdum RM, Maheshgauri R, Patel K, Patra S. A study of complications during cataract surgery in patients with pseudoexfoliation syndrome. *J Clin Ophthalmol Res*. 2014; 2: 07-11.

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FINANCIAL OR OTHER COMPETING INTERESTS:

None.

Date of Online Ahead of Print: **Apr 27, 2016**

Date of Publishing: **Jul 01, 2016**