

# Pseudoexfoliation Syndrome: Clinical Profile and Visual Outcome after Manual Small Incision Cataract Surgery

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## Abstract

**Background:** Pseudoexfoliation (PXF) is an age related, systemic, elastic fibrilopathy causes serious complications during cataract surgery such as zonular dialysis, capsular rupture and vitreous loss. **Aim:** To study the profile of eyes with pseudoexfoliation syndrome and outcome after Manual Small Incision Cataract Surgery. **Materials and Methods:** This was a hospital based, prospective study was conducted at Tertiary Care Hospital between August 2016 to September 2018. PXF was diagnosed on slit lamp examination by the presence of white dandruff like material in anterior segment. Gonioscopy was done to know the status of angles, pigmentation and presence of PXF material. **Results:** Out of 80 patients with PXF who underwent manual small incision cataract surgery (MSICS), 17 patients had complications. Zonular Dialysis alone was found in 3 eyes (17.65%) and Zonular Dialysis with Vitreous Loss was seen in 4 eyes (23.53%). Only Posterior Capsular Rent (PCR) was found in 2 eyes (11.76%) and PCR with Vitreous Loss was found in 4 eyes (23.53%). Sphincter Tear was noted in 3 eyes (17.65%) and Iridodialysis was seen in one eye (5.88%). **Conclusions:** Ophthalmologists should focus on the detection of PXF especially considering the risks for intraoperative complications related to PXF. The diagnosis of PXF may also be important in the management of cataract in these patients.

**Keywords:** Complications, Pseudoexfoliation, SICS, Vitreous Loss, Zonular Dialysis

## 1. Introduction

Pseudoexfoliation syndrome is an important ocular manifestation of a systemic disease<sup>1</sup>. It was Lindberg who while conducting his research paid attention to greyish flakes and fringes at the pupillary border and on anterior lens surface. This was found to be as common in cataract patients as in non-cataractous controls older than 55 years. The phenomenon was observed in 50% of glaucoma patients as well. It was also noticed that this was more prevalent with advancing age. Lindberg published his results as a thesis at the University of Helsinki in 1917<sup>2</sup>.

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.

One of the significant concerns for patients with pseudoexfoliation syndrome is increased incidence of intra and post-operative complications when they undergo cataract surgery.

Pseudoexfoliation causes serious complications during cataract surgery such as zonular dialysis, capsular rupture

and vitreous loss. Glaucoma is the most important sequela of PXF syndrome<sup>3</sup>.

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 this material to the iris pigment and lens epithelium cause mechanical restriction. 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<sup>4</sup>.

Various surgical techniques have been described to prevent surgical complications in patients with cataract in pseudoexfoliative eyes. The important step in reducing the surgical complication is by achieving good mechanical or pharmacological dilatation. This possibly reduce the stress on the capsular bag by creating a wider capsulorrhexis<sup>5</sup>.

Post operatively there can be increased incidence of prolonged corneal oedema, 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<sup>6</sup>.

All these complications make cataract surgery a challenge in patients with pseudoexfoliation syndrome. Manual Small Incision Cataract Surgery is safe in eyes with pseudoexfoliation syndrome.

The present study was planned to study the clinical profile of pseudoexfoliation Syndrome and visual outcome after Manual Small Incision Cataract Surgery (MSICS) in patients with pseudoexfoliation syndrome.

The increasing prevalence of pseudoexfoliation syndrome and cataract with age and its association has a major public health implication in India. This is especially so considering the burden of cataract with ageing and the association of complications in cataract surgery. Hence, we intend to do this study in tertiary care hospital to assess the profile of pseudoexfoliation syndrome and evaluate the surgical outcome of Manual Small Incision Cataract Surgery in Pseudoexfoliative eyes.

## 2. Aim

To study the profile of eyes with PXF syndrome and outcome after Manual Small Incision Cataract Surgery in pseudoexfoliative eyes.

## 3. Objectives

1. To study the clinical presentation of patients with PXF Syndrome.
2. To evaluate anterior segment changes in eyes with PXF syndrome including anterior chamber depth, pupillary dilatation, status of lens and angle of anterior chamber preoperatively.
3. To evaluate visual outcome and rate of intra-operative complications in patients of PXF syndrome undergoing MSICS.

## 4. Methodology

This prospective, hospital-based study was conducted in Department of Ophthalmology at a tertiary care hospital from August 2016 to Sept. 2018. Patients recruited were informed about the nature and objective of the study and written consent was obtained before recruiting them into study. Demographic data and complaints related to diminution of vision was asked. Detailed systemic and general examination of patients was conducted.

All recruited patients underwent detailed ocular examination pre and post cataract surgery including

- Visual acuity by Snellen's chart.
- Anterior segment by slit lamp examination.
- Anterior chamber depth by Van Herick grading.
- Tonometry by Applanation.
- Gonioscopy by Goniolens.
- Posterior segment examination by IDO.
- Pupillometry by scale.

MSICS was performed by a single surgeon in all the cases.

Statistical analysis was done by using descriptive and inferential statistics using Chi Square test and software used in the analysis were SPSS 22.0 version and GraphPad Prism 7.0 version and  $p < 0.05$  is considered as level of significance.

## Eligibility Criteria

**Inclusion Criteria:** Age more than 50 years, patients with PXF getting admitted for cataract surgery, consenting for MSICS, able and willing to give informed consent were included in the study.

**Exclusion Criteria:** Patients with raised IOP, glaucomatous disc change, other causes of cataract like traumatic, metabolic, complicated, uncontrolled diabetes mellitus or other systemic or cardiovascular diseases, not consenting to MSICS, iridodonesis, phacodonesis and subluxation of the lens due to any other pathology or any other allied ocular pathology preoperatively were excluded from the study.

## 5. Results

In the present study, 50 (62.5%) patients were in the age group of 70-79 yrs, followed by 25(31.25%) in the age group of 60-69 yrs. 4(5%) patients were more than 80 yrs while 1(1.25%) patient was in the age group of 51-59 yrs of age. Mean age of patients was  $71.83 \pm 5.80$  years. 56 (70%) patients were males and 24(30%) were females. 60 patients had Bilateral PXF i.e. 120 eyes (85.71%) while 20 patients had Unilateral PXF i.e. 20 eyes (14.29%). Majority of the eyes 111(79.29%) had involvement of lens with PXF while 109(77.86%) had pupillary involvement. PXF involving Iris was seen in 56(40%) of eyes, while PXF involved 20(14.29%) of cornea and 6(4.29%) of angle.

**Table 1.** Preoperative visual status in pseudoexfoliative eyes

| Visual Acuity                               | No of eyes with Pseudoexfoliation | Percentage (%) |
|---|-----------------------------------|----------------|
| Near Normal ( $\geq 6/18$ )                 | 35                                | 25.00          |
| Visually impaired ( $< 6/18-6/60$ )         | 72                                | 51.43          |
| Severe visual impairment ( $< 6/60-FC 3m$ ) | 10                                | 7.14           |
| Social Blind (FC 3m - $\geq FC 1m$ )        | 12                                | 8.57           |
| Legal Blind (FC 1m to PL)                   | 11                                | 7.86           |
| Blind (NPL)                                 | 0                                 | 0.00           |
| Total                                       | 140                               | 100            |

The visual status was of all patients was recorded and graded according to WHO criteria (Table 1).

**Table 2.** Distribution of pupil size

The size of Undilated pupil ranged from 2 mm to 4 mm with mean Undilated pupil size of  $2.94 \pm 0.38$  mm.

| Dilated pupil size(mm) | No of eyes with Pseudoexfoliation | Percentage (%) | Mean $\pm$ SD   |
|------------------------|-----------------------------------|----------------|-----------------|
| $\leq 2$ mm            | 0                                 | 0.00           |                 |
| 2.1-3 mm               | 0                                 | 0.00           |                 |
| 3.1-4 mm               | 2                                 | 1.43           | $3.80 \pm 0$    |
| 4.1-5 mm               | 6                                 | 4.29           | $4.56 \pm 0.22$ |
| 5.1-6 mm               | 33                                | 23.57          | $5.74 \pm 0.24$ |
| 6.1-7 mm               | 99                                | 70.71          | $6.67 \pm 0.27$ |
| $> 7$ mm               | 0                                 | 0              |                 |
| Total                  | 140                               | 100            | $6.32 \pm 0.67$ |

The dilated pupil size in Pseudoexfoliative eyes ranged from 3 mm to 7 mm with mean dilated pupil size of  $6.32 \pm 0.67$  mm. Intraoperative use of Capsular Tension Ring and Iris Hooks was done in 4 eyes with small pupils (Table 2).

Mean anterior chamber depth in pseudoexfoliative eyes was  $2.50 \pm 0.22$  mm. Majority eyes 81(57.86 %) had ACD of 2–2.5 mm whereas 59 eyes (42.14%) were of 2.6–3 mm. None of the eyes were found to have anterior chamber depth of less than 2 mm or more than 3 mm.

It was seen that 128 eyes had angle width of III or more while 93 eyes (66.4%) had grade III angle. 35 eyes (25%) had grade IV angle whereas 12 eyes (8.6%) the angle was found to be of grade II. 74(52.9%) eyes were having IOP between 16–20 mm Hg. 61 eyes (43.6%) had IOP between 11–15 mm Hg while only 2 eyes (1.4%) had IOP more than 20 mm Hg and 3 eyes (2.1%) had IOP less than equal to 10 mmHg. Mean IOP recorded in 140 eyes with pseudoexfoliation was  $15.60 \pm 2.21$  mm Hg. Majority of eyes i.e. 69 (49.29%) had pure nuclear sclerosis grade, pure cortical grade cataract was seen in 13 eyes (9.29%), nuclear sclerosis and cortical together was found in 33 eyes (23.57%). Nuclear sclerosis and posterior subcapsular cataract was found in 6 eyes (4.29%). Mature cataract was seen in 8 eyes (5.71%) and hypermature cataract was seen in 3 eyes (2.14%). 8 eyes were found to be pseudophakic. The lens was found to be normal in position in 136 (97.4%) eyes and preoperatively subluxated in 4(2.86%) eyes.

**Table 3.** Distribution of Intraoperative complications 80 eyes of 80 patients underwent MSICS. 17(21.25%) patients developed Intraoperative Complications.

| Intraoperative Complications            | No of eyes with Pseudoexfoliation | Percentage (%) |
|---|-----------------------------------|----------------|
| Zonular Dialysis                        | 3                                 | 17.65          |
| Posterior Capsular Rent                 | 2                                 | 11.76          |
| Sphincter Tear                          | 3                                 | 17.65          |
| Iridodialysis                           | 1                                 | 5.88           |
| Posterior Capsular Rent + Vitreous loss | 4                                 | 23.53          |
| Zonular Dialysis + Vitreous Loss        | 4                                 | 23.53          |

Most common complication noted was Vitreous Loss along with PCR and ZD (Table 3).

PCIOL were put in 69 eyes (86.25%) while PCIOL in Sulcus were put in 3 eyes (3.75%). Anterior Chamber IOL were put in 5 eyes (6.25%) and Iris Claw lens were put in 3 eyes (3.75%).

**Table 4.** Postoperative visual outcome

| Visual Acuity                                 | No of eyes with Pseudoexfoliation | Percentage (%) |
|---|-----------------------------------|----------------|
| Near Normal ( $\geq 6/18$ )                   | 70                                | 87.5           |
| Visually impaired ( $< 6/18 - 6/60$ )         | 7                                 | 8.75           |
| Severe visual impairment ( $< 6/60 - FC 3m$ ) | 3                                 | 3.75           |
| Social Blind (FC 3m - $\geq FC 1m$ )          | 0                                 | 0              |
| Legal Blind (FC 1m to PL)                     | 0                                 | 0              |
| Blind (NPL)                                   | 0                                 | 0              |
| Total   | 80                                | 100            |

It was observed that there is significant improvement in the Vision after MSICS. 70 eyes (87.5%) had near Normal Vision ( $\geq 6/18$ ). Visual Impairment ( $< 6/18 - 6/60$ ) was found in 7 eyes (8.75%). Severe Visual Impairment ( $< 6/60 - FC 3m$ ) was noted in 3 eyes (3.75%) (Table 4).

We found that complications occurred frequently in Anterior Chamber Depth of 2-2.5 mm. All 17 patients with complications had ACD in the range of 2-2.5 mm with mean ACD of  $2.33 \pm 0.12$  mm.

Complications occurred frequently in Dilated pupil size of 5.1-6 mm {11(64.71%)} and this was statistically

significant ( $p < 0.05$ ). (Chi square value=79.59,  $p=0.0001$ , Statistically significant)

Complications rate was maximum in patients having only Nuclear Sclerosis i.e. 6 patients out of 17 (35.29%), followed by 4 patients (17.65%) with Hypermature Cataract, 4 patients (23.53%) with combined Nuclear and Cortical Cataract and 3 patients (23.53%) with Mature Cataract had complications. (Chi square value=7.98,  $p=0.046$ , Significant)

## 6. Discussion

In our study maximum number of patients were in the age group of 70-79 years (62.50%). In a study by Gupta *et al.*<sup>7</sup>, average age of patients was 66.13 yrs and 102 (85%) of patients were above 60 years of age. In another study from India, done by Islam N *et al.*<sup>8</sup> in West Bengal, he studied 512 patients of cataract with pseudoexfoliation undergoing MSICS and found maximum of number of patients in age group of 71-80 yrs (41.11%), which is corresponding with our results. Various international studies done by Kaygisiz *et al.*<sup>9</sup>, Young *et al.*<sup>10</sup>, from Turkey and China respectively, has also shown result consistent with our study. Thus, it can be seen that there is increase prevalence of PXF with increase in age all over the globe.

Reports regarding gender distribution were similar to our study in studies done by Bairy *et al.*<sup>11</sup>, which had shown among 90 cases of pseudoexfoliation, males were 63(70%) and females, 27(30%). Ramalakshmi *et al.*<sup>12</sup> study has shown that in total of 62 cases, 39(62.90%) were males and 23(37.09%) were females.

However, various studies done in India has shown contrasting results. In a study conducted by Arvind *et al.*<sup>13</sup>, females outnumbered males in the pseudoexfoliation as well as the non-pseudoexfoliation groups. Females constituted 54.6% of subjects with pseudoexfoliation and men constituted 45.4% of them. Prachee *et al.*<sup>14</sup> studied 170 patients with pseudoexfoliation, there were 70(41.17%) males and 100(58.82%) females. Thus, there are conflicting studies regarding prevalence of PXF in males and females which can be because of ethnical and geographical differences across the world.

However, in the present study male patients has more prevalence of pseudoexfoliation. As this study is conducted in area catering patients all over in central



India, where males are exposed more to the sunlight and has reluctantly more time outdoor as compared to females. Exposures of sunlight could be considered as a major risk factor for pseudoexfoliation syndrome.

Our study is similar to study done by Ramalakshmi *et al.*<sup>12</sup> in which 23 patients (37.09%) had unilateral involvement while 39 patients (62.90%) had bilateral involvement. In another study done by Arvind *et al.*<sup>13</sup>, 108(3.8%) were found to have PXF syndrome, with unilateral disease in 53(49.1%) and bilateral in 55(50.9%) subjects.

This is expected as the disease process is invariably bilateral pathologically and literature shows the clinical bilateral involvement is evidenced after 5-10 years of unilateral clinical presence.

Majority of the patients in our study had Nuclear Sclerosis cataract which is similar to study done by Chevuturu *et al.*<sup>15</sup>, where majority of the patients has nuclear sclerosis. In a study by Thomas *et al.*<sup>16</sup>, he found that pseudoexfoliation was significantly associated with Nuclear cataract.

Mean IOP recorded in our study was  $15.60 \pm 2.21$  mm Hg which is consistent with study of Rao *et al.*<sup>17</sup> where baseline IOP in patients with PXF Syndrome was  $16 \pm 5.5$  mmHg. In study done by Gupta *et al.*<sup>7</sup>, out of 120 patients, the range of IOP was 11.2 mm Hg to 26.1 mm Hg with an average IOP reading of 17.38 mm Hg.

Complications rate in our study were similar to study done by Satish *et al.*<sup>18</sup>, in 500 eyes with PXF with cataract underwent MSICS with IOL implantation, PCR was seen in 50 (27.6%), vitreous loss was seen in 40 (22.09%) and Iridodialysis was seen in 4 (2.20%). Similar results were seen in study by Bangal *et al.*<sup>19</sup> intraoperative complications encountered during surgery were small nondilating pupil (26%), zonular dialysis (2%), posterior capsular rupture (6%), vitreous loss (4%), residual lens matter (10%), iridodialysis (4%), hyphema (2%).

In study of Jawad *et al.*<sup>20</sup>, most common Intraoperative complication was Vitreous loss (10.5%), PCR (9%), Damage to sphincter pupillae (8%), Retained lens material (6%) Zonular dialysis (4%) present. These results are consistent with the results of our study. Thus, it can be observed from various studies, that MSICS in PXF eyes has been associated with more frequent complications.

In a study connected by Ramalakshmi *et al.*<sup>12</sup>, out of 62 patients who underwent cataract extraction with IOL

implantation, 5 patients (8.06%) had post-operative vision of  $>3/60$ , 14 patients (22.58) had visual acuity between  $<6/18-3/60$ , 43 patients had post-operative visual acuity of  $\geq 6/18$  which is similar to our study. Another study by Prachee *et al.*<sup>14</sup>, out of 156 patients of PXF who underwent cataract surgery, the post-operative visual acuity was  $\geq 6/18$  in 126 patients (80.76%),  $6/18-6/36$  in 24 patients (15.38%) and  $\leq 6/60$  in 6 patients (3.84%) which is similar to our study.

We found that complications occurred frequently in Anterior Chamber Depth of 2-2.5 mm. All 17 patients with intraoperative complications had ACD in the range of 2-2.5 mm with mean ACD of  $2.33 \pm 0.12$  mm. Similar results were found by Kuchle *et al.*<sup>21</sup> that in eyes with PXF syndrome and anterior chamber depth of less than 2.5 mm, the risk of intraoperative complications was 13.4% compared to eyes in which the ACD was 2.5 mm or more the risk of intraoperative complications was 2.8%.

Results similar to our study were seen in study done by Gulsum *et al.*<sup>22</sup>, in patients with poor pupil dilation intraoperative complications was seen in 60(75%) of the patients with pseudoexfoliation and 17(11.7%) of the control patients. In study done by Freyler *et al.*<sup>23</sup>, he noted pupillary dilatation less than 4 mm in 19 to 32 patients with pseudoexfoliation syndrome has poor postoperative outcomes.

Reduction of stromal elasticity by accumulation of pseudoexfoliation material plays important role in poor mydriasis and poor postoperative outcomes.

In our study, rate of complications was maximum in patients having only Nuclear Sclerosis. This is similar to study done by Gupta *et al.*<sup>7</sup> He found that majority of patients who developed complications had nuclear sclerosis Similar results were noticed by Islam *et al.*<sup>8</sup> in his study.

## 7. Conclusion

- From the present study it can be concluded that there is significant association between PXF syndrome and age, male preponderance and bilateral involvement of eyes.
- Pseudoexfoliative material is most commonly seen involving lens followed by other anterior eye structures.
- MSICS provides significant improvement in visual outcome in patients with PXF syndrome with cataract.

- Detection of PXF preoperatively prepares us for the intraoperative complications and allows for prevention of these complications.
- Thus, it is recommended that each eye with PXF must be individually approached.
- Also, as the sample size was small, the findings of the present study need to be confirmed with a larger study population.

## 8. References

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