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Intra-Operative, Post-Operative Complications And Visual Outcome Of Manual Small Incision Cataract Surgery In Pseudoexfoliation Syndrome: A Retrospective Study

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Abstract
Introduction*: Pseudo-Exfoliation (Pxf) Syndrome Is An Age-Related Genetically Inherited Fibrillopathy In Which Abnormal Fibrillar Extracellular Material Is Produced And Accumulates In Many Ocular Tissues*.
Aim*: The Study Aimed To Assess The Intraoperative And Postoperative Complications Of Manual Small Incision Cataract (Msics) Surgery And Study Its Management As Well As Analyze The Visual Outcomes.*
Materials And Methods*: This Was A Retrospective Observative Study Of 152 Patients Aged Between 50-85 Years With Significant Cataracts And Pseudo-Exfoliation Syndrome Undergoing Msics From September 2022 To January 2023. The Intraoperative, Postoperative Complications And Visual Outcomes Were Recorded And Analysed.*
Results*: Out Of 152 Patients, Included In Our Study 77 (50.66%) Were Males And 75 (49.34%) Were Females. The Mean Age Was 66.03± 6.79 Years. In This Study, The Majority Of The Patients Had Immature Cataracts With Nuclear Sclerosis Grade 2 Or 3. The Mean Intraoperative Pupillary Size Was Noted To Be 6.32mm And A Majority Of The Patients Had Fair Pupillary Dilatation. All 152(100%) Patients Had Pseudo-Exfoliative Material On The Pupillary Border And Most Patients (94.73%) Had It On The Peripheral Anterior Capsule. Among The Intra-Operative Complications, There Were 9 (8.55%) Cases Of Zonular Dialysis (Zd), 6 Cases Of Posterior Capsular Rupture (Pcr), And One Case Each Of Descement Membrane Detachment (Dmd) And Iridodialysis. The Most Common Postoperative Complication Was Corneal Oedema Of Varying Degrees. Other Complications Were Mild To Moderate Iritis In 47(31.13%) Patients, Fibrinous Uveitis In 11(7.24%) Patients, Striate Keratitis In 34(22.37%) Patients, Hyphema In 6(3.95%) Patients And Cystoid Macular Edema (Cme) In Four (2.63%) Patients. Five (3.29%) Patients Had Retained Cortex. None Of The Patients Had Decentered Intraocular Lens (Iol) And Three Patients Underwent Re-Surgery. Association Between Epithelial And Stromal Corneal Edema, Less Intra-Ocular Pressure (Iop) Rise And Postoperative Complication Was Found To Be Statistically Significant. The Association Between Pupillary Size And Intraoperative Complications Was Found To Be Significant. 97.35% Of The Total Study Subjects Achieved Visual Acuity (Va) Of 6/18 Or Better At 3 Months Of Follow-Up.*
Conclusion*: This Study Showed That Despite Various Operative Difficulties And Complications, Better Visual Outcomes Can Be Achieved In Experienced Hands With Proper Pre-Operative Assessment And Operative Management.*
Keywords: *Pseudo-Exfoliation (Pxf), Manual Small Incision Cataract (Msics), Zonular Dialysis (Zd), Posterior Capsular Rupture (Pcr), Corneal Edema*

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I. INTRODUCTION

Pseudo-exfoliation (PXF) syndrome is an age-related genetically inherited fibrillopathy in which abnormal fibrillar extracellular material is produced and accumulates in many ocular tissues. Its ocular manifestations involve all of the structures of the anterior segment, as well as conjunctiva and orbital structures(1). It was first described by Lindberg in 1917, as the appearance of greyish-white fibrillo-granular material (PXF material) on the pupillary margin, anterior surface of the lens, iris surface, corneal endothelium and trabecular meshwork(2). The prevalence of PXF syndrome in the rural population of south India was 3.8%(3).

Eyes with PXF had a significantly greater prevalence of nuclear and cortical cataracts than eyes without PXF(4). PXF is a significant risk factor for intra-operative such as posterior capsular rupture(PCR), zonular dialysis(ZD) and lens dislocation, vitreous loss and post-operative complications such as corneal epithelial and stromal oedema, postoperative inflammation, hyphema, intraocular lens (IOL) decentration and dislocation, cystoid macular oedema and secondary glaucoma(5).

Insufficient pupillary dilatation secondary to atrophic changes of the iris sphincter, surgical trauma resulting from the iris vessel pathology, weakened capsule and zonular apparatus (zonulopathy) secondary to the progressive proteolytic disintegration of the suspensory ligament are the reasons for the complications during cataract surgery(5). Acquired weakened blood-aqueous barrier and Corneal endothelial morphological and functional changes (endotheliopathy) are believed to be the cause of postoperative inflammation and corneal oedema with or without permanent corneal decompensation(5).

As a result of the above-mentioned complications the visual and surgical outcome is variable and hence requires peri-operative management strategies. Despite an increased risk of complications associated with PXF, manual small incision cataract surgery(MSICS) provides a better visual outcome when performed by experienced surgeons(6).

Hence, the study aimed to assess the intra-operative and post-operative complications of manual small incision cataract surgery and study its management as well as analyze the visual outcomes.

II. MATERIALS AND METHODS

This was a retrospective observative study of the 152 patients attending the camps of Sankara eye hospital, Krishnankoil, Tamil Nādu, between September 2022 to January 2023.

Patients aged between 50-80 years with significant cataracts and pseudo-exfoliation syndrome undergoing MSICS with polymethyl methacrylate (PMMA) IOL implantation with or without glaucoma, who are willing to participate in the study were included. All the patients were followed up to 3 months after the surgery.

Patients with true exfoliation, Complicated cataracts, traumatic cataracts with or without subluxation or dislocation of the lens, Uveitic cataracts, Congenital cataracts, phacolytic glaucoma, history of miotic use, pigment dispersion syndrome, Corneal opacities, previous ocular surgeries and visually impairing retinal pathology and monocular patients were excluded from the study.

Data were collected in a standardized proforma from all the patients who meet the inclusion criteria. All patients underwent a complete ophthalmic evaluation that included detailed ocular and medical history, best corrected visual acuity using Snellens' visual acuity chart, slit lamp bio-microscopic examination with special emphasis on the status of the cornea, grading and type of cataract, distribution of pseudo-exfoliative material, presence of irido-phacodonesis, iris characteristics and maximum pupillary dilatation.

Intra-ocular pressure (IOP) was measured using a non-contact tonometer and Goldmann applanation tonometry. Gonioscopy was done using Goldmann four mirror gonioscope to look for angle status (graded using Shaffer's grading system) and distribution of PXF.

Posterior segment evaluation was done using 90 D and indirect ophthalmoscopic examination using 20 D was done in eyes with axial length >24mm in either eye. B-scan ultrasonography was done when there was no view on fundus examination. Keratometry using an automated keratometer and A-scan biometry using the contact method were done to calculate the IOL power using SRK-T formulae. Pachymetry was done in selected cases.

Patients with IOP > 21mm of hg were treated with oral acetazolamide and topical anti-glaucoma medication before posting for cataract surgery.

SURGICAL PROCEDURE

- Preoperatively, ofloxacin 0.3% used as a prophylactic antibiotic was started one day before the surgery and was continued post-operatively. On the day of the surgery, pupils were dilated adequately using tropicamide 0.8% with phenylephrine 5% and plain tropicamide 1% eye drops in cardiac, asthmatic and hypertensive patients. Flurbiprofen 0.03% was instilled on the day of the surgery to maintain pupillary dilatation.
- Patients on anti-glaucoma medications were given oral acetazolamide the previous night and one hour before the surgery and IOP was measured using non-contact tonometry before posting for cataract surgery.
- All patients underwent temporal MSICS by a single surgeon with experience of >5000 cataract surgeries.
- All surgeries were performed under peribulbar anaesthesia. After aseptic precautions and draping of the operating eye, maximum pupillary dilatation achieved was noted. A routine MSICS with a self-sealing sclero-corneal tunnel with implantation of PMMA IOL was performed. Intra cameral adrenaline (1:100000) was used when needed. An adequate dispersive ocular visco-elastic device (OVD) was used and washed thoroughly. Intra-cameral 0.5% moxifloxacin 0.1ml and sub-conjunctival dexamethasone 0.5ml(1mg) was injected at the end of the surgery.
- During the surgery presence of PXF synechiae, anterior capsular wrinkling and difficult capsulorhexis due to zonular weakness, need for intra cameral adrenaline, need for sphincterotomies, difficult nucleus prolapses and delivery, difficult IOL implantation and dialling were noted.
- In the event of any complication during the surgery (ZD or PCR), the case was appropriately managed using additional procedures such as implantation of capsular tension ring (CTR), anterior vitrectomy, and iris claw lens implantation or IOL implantation in the sulcus.

All patients were examined on the next postoperative day after measuring the uncorrected visual acuity with pinhole improvement using Snellen's visual acuity chart. Status of the wound, striate keratitis, corneal oedema (epithelial and stromal), DMD, hyphema, postoperative inflammation, fibrinous membrane, pigment dispersion, retained cortex, IOL tilting and decentration were noted.

All patients were prescribed topical dexamethasone with chloramphenicol for 4 weeks and were tapered over 6 weeks. Patients with significant striate keratitis received 5% sodium chloride drops for 2 weeks. Corneal oedema was treated using oral glycerol, oral acetazolamide and topical anti-glaucoma medications if not contraindicated. Patients with postoperative inflammation received homatropine 2% for 2 weeks and prednisolone 1% eye drops with ofloxacin 0.3% eye drops in tapering doses over 8 weeks. The fibrinous membrane was treated using sub-conjunctival mydracaine 0.5 ml and Oral prednisolone was prescribed in tapering doses if not contraindicated. Ciprofloxacin 500mg twice a day for 5 days was prescribed to all the patients in the event of intra-operative complications.

Re-surgeries for retained cortical matter, hyphema and decentered or dislocated IOL were noted.

All patients were followed up after 1 week, 1 month and 3 months.

The presence of CME was noted at the end of 3 months postoperatively.

III. RESULTS

Out of 152 patients, included in our study 77 (50.66%) were males and 75 (49.34%) were females. Most of the patients were in the age group of 60-69 years and only three patients were above 80 years. The mean age was 66.03± 6.79 years (range: 50–85 years). The age and gender distribution of this study are shown in Table 1.

Table 1- AGE AND SEX WISE DISTRIBUTION OF PATIENTS

AGE GROUP	MALE	FEMALE	TOTAL
50- 59	8 (40%)	12 (60%)	20 (100%)
60- 69	37 (50%)	37 (50%)	74 (100%)
70- 79	25 (46.3%)	28 (51.8%)	54 (100%)
80- 89	0	3 (100%)	3 (100%)
TOTAL	77 (50.66%)	75 (49.34%)	152 (100%)

TABLE 2 – FREQUENCY DISTRIBUTION OF LENS STATUS

LENS STATUS/ DIAGNOSIS	Frequency	Percentage
Black cataract	2	1.31
Brown cataract	30	19.73
Hyper-mature cataract	10	6.66
Mature cataract	29	19.07
Near mature cataract	8	5.26
NS1+ PSC	1	0.65
NS2+PSC	31	20.39
NS2 + PSC + PPC	2	1.31
NS3	38	25
NS3 + CC + PPC	1	0.65
TOTAL	152	100

In this study, 38 (25%) patients had immature cataract with nuclear sclerosis grade 3, 31(20.39%) had nuclear sclerosis grade 2, 30(19.73%) had brown cataract, 29(19.07%) had mature cataract, 10 (6.66%) had hyper mature cataract, eight (5.26%) had near mature cataract, three patients had immature cataract with posterior polar cataract (PPC), one patient had nuclear grade 1 with posterior subcapsular cataract and two (1.32%) had black cataract.

TABLE 3: DISTRIBUTION OF PSEUDOEXFOLIATIVE MATERIAL IN OCULAR STRUCTURES.

PSEUDO-EXFOLIATIVE MATERIAL DISTRIBUTION	NUMBER(PERCENTAGE)
PUPILLARY MARGIN	152(100)
ANTERIOR LENS CAPSULE	144(94.73)
ANTERIOR SURFACE OF IRIS	85(55.92)
TRABECULAR MESHWORK	47(30.92)

CORNEAL ENDOTHELIUM	65(42.76)
LENS ZONULES	38(25)
PXF SYNECHIAE	36(23.68)

All 152(100%) patients had pseudo-exfoliative material on the pupillary border, 144(94.73%) on the peripheral anterior capsule, 47(30.92%) patients had pseudo-exfoliative material on the trabecular meshwork, 65(42.76%) patients on the corneal endothelium, 85(55.92%) on the iris surface, 38(25%) on the zonules and 36(23.68%) had PXF synechiae.

TABLE 4: DISTRIBUTION OF STUDY SUBJECTS BASED ON PUPILLARY SIZE

INTRA-OPERATIVE PUPILLARY SIZE	NUMBER(PERCENTAGE)
<3mm (very poor)	3(1.97%)
3-5mm(poor)	40(26.31%)
5-7mm(fair)	74(48.68%)
>7mm(good)	36(23.68%)

The mean intraoperative pupillary size was noted to be 6.32mm (3–9 mm). Three patients had very poor pupillary dilatation requiring sphincterotomy, 74(48.68%) patients had fair dilatation, 40(26.31%) patients had poor dilatation hence required intraoperative adrenaline, 36(23.68%) had good pupillary dilatation. 36 patients had irido-phacodonesis of varying degrees, 101 patients had pupillary ruff atrophy, 31 patients were having POAG or were POAG suspects and 8 patients were PACG suspects.

TABLE 5- DISTRIBUTION OF PRE-OPERATIVE VISION

VISUAL ACUITY	PRE- OPERATIVE VISION
PL- CFCF	60(39.47%)
CF (1mt- 3/60)	52 (34.21%)
4/60- 6/60	47 (30.92%)
6/36- 6/18	4 (2.63%)
6/12- 6/6	1 (0.66%)

The distribution of pre-operative vision of the patients of this study is shown in Table 4.

Table 6- INTRAOPERATIVE DIFFICULTIES AND COMPLICATIONS

Intra Operative Complication	Frequency	Percentage
Difficult Rhexis	64	42.11
Difficult Nucleus Prolapse	65	42.76
Use of Adrenaline	86	56.58
Sphincterotomy and stretch pupilloplasty	10	6.58
Descement Membrane Detachment (DMD)	1	0.66
Posterior Capsular Rent	6	3.95
Vitreous Loss	10	6.58
Anterior Vitrectomy	10	6.58
Zonular dialysis	9	5.92
IOL in sulcus	7	4.61
Use of CTR	3	1.97
Use of Iris Claw Lens	10	8.61
Iridodialysis	1	0.66

The surgeon faced difficulties during surgery in completing the CCC in 64 cases (42.11%) and in prolapsing the nucleus in 65(42.76%) mainly due to the small and rigid pupil and synechiae. 86(56.58%) cases required intra-cameral adrenaline, and sphincterotomy was required in 8 cases (5.26%). 2 patients required stretch pupilloplasty.

Among the intraocular complications, there were 9 (8.55%) cases of ZD, 6 of which had a vitreous loss. CTR was placed in 3 cases with IOL placement in the bag and 6 required primary retro-pupillary iris-claw

implantation. 4 cases had severe irido-phacodonesis hence intracapsular cataract extraction was done with primary retro-pupillary iris claw lens implantation. Among 6 cases (3.95%) of PCR, the vitreous loss was present in 3 cases and was managed with anterior vitrectomy and iris-claw implantation, other three cases were managed with IOL in the sulcus. One case of 3-clock hour nasal irido-dialysis occurred during difficult nuclear delivery of black cataract. One case had DMD due to difficult nucleus delivery.

Table 7- POSTOPERATIVE COMPLICATIONS

POSTOPERATIVE COMPLICATION	FREQUENCY	PERCENTAGE
Epithelial Corneal Edema	67	44.08
Stromal Corneal Edema	25	16.45
SK	34	22.37
Reaction	47	31.13
fibrinous uveitis and membrane	11	7.24
Hyphema	6	3.95
Retained cortical matter	5	3.29
Decentered IOL	0	0
More IOP spike	27	17.76
Less IOP spike	37	24.34
Re-surgery	3	1.97
CME	4	2.63

Among all the patients who underwent cataract surgery, 52 patients did not have any postoperative complications. The postoperative complications are illustrated in Table 7. While 92(60.53) patients had corneal oedema of varying degrees, significant oedema was seen in 27(17.76%). Other complications were mild to moderate iritis in 47(31.13%) patients, fibrinous uveitis in 11(7.24%) patients, striate keratitis in 34(22.37%) patients, hyphema in 6(3.95%) patients and CME in four (2.63%) patients. Five (3.29%) patients had retained cortex. None of the patients had decentered IOL. Among the subjects, three (1.97%) patients underwent re-surgery, which included anterior chamber AC wash for hyphema in one case, and cortical aspiration for retained cortex in the other two cases.

TABLE 8- POST OPERATIVE VISUAL ACUITY

	DAY 1	DAY 7	1 MONTH	3 MONTHS
6/6- 6/9	6 (3.95%)	63 (41.45%)	85 (56.29%)	90 (59.60%)
6/12- 6/24	90 (59.21%)	71 (46.71%)	62 (41.06%)	57 (37.75%)
6/36 – 6/60	29 (19.08%)	12 (7.89%)	3 (1.99%)	5 (3.31%)
5/60 – 1/60	17 (11.18%)	6 (3.95%)	2 (1.32%)	1 (0.66%)
<1/60	10 (6.58%)	0	0	0
TOTAL	152 (100%)	152 (100%)	152 (100%)	152 (100%)

Post-operative visual acuities on the first postoperative day and at the time of follow-up (Day 7, 1 month and 3 months) are illustrated in Table 8. 59.60% of the total study subjects achieved VA of 6/9 or better at 3 months of follow-up. Decreased visual acuity was noted in 5 (3.84%) eyes due to persistent corneal oedema, CME and posterior capsular opacification (PCO) and one eye (0.66%) had resistant corneal oedema with corneal decompensation and had visual acuity <5/60 at 3months follow up.

TABLE 9- ASSOCIATION OF POSTOPERATIVE COMPLICATION AND AGE

POSTOPERATIVE COMPLICATION		50- 59	60- 69	70- 79	80- 89	TOTAL	CHI SQ	P-VALUE
EPITHELIAL CORNEAL EDEMA	ABSENT	16 (18.82%)	46 (54.12%)	20 (23.53%)	3 (3.53%)	85 (100%)	14.84	0.002
	PRESENT	5 (7.46%)	28 (41.79%)	34 (50.75%)	0	67 (100%)		
STROMAL CORNEAL EDEMA	ABSENT	21 (16.54%)	63 (49.61%)	40 (31.5%)	3 (2.36%)	127 (100%)	8.38	0.03
	PRESENT	0	11 (44%)	14 (56%)	0	25 (100%)		
SK	ABSENT	18 (15.25%)	56 (47.46%)	42 (35.59%)	2 (1.69%)	118 (100%)	1.16	0.76
	PRESENT	3 (8.82%)	18 (52.94%)	12 (35.29%)	1 (2.94%)	34 (100%)		

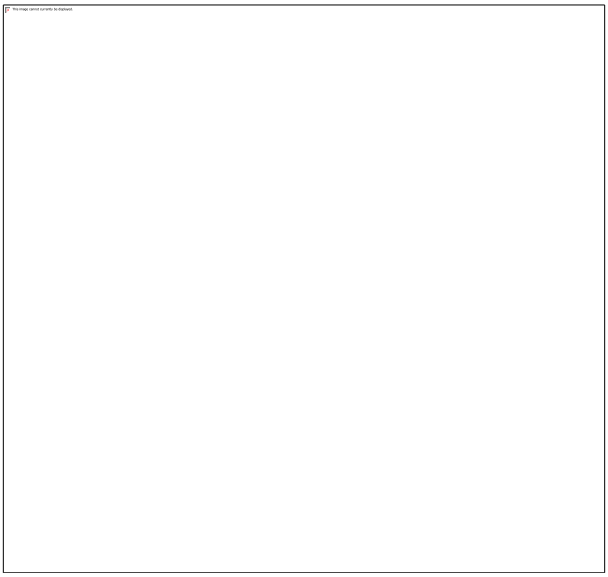
REACTION	ABSENT	16 (15.38%)	56 (53.85%)	30 (28.85%)	2 (1.92%)	104 (100%)	7.09	0.06
	PRESENT	5 (10.64%)	17 (36.17%)	24 (51.06%)	1 (2.13%)	47 (100%)		
FIBRINOUS UVEITIS AND MEMBRANE	ABSENT	21 (14.89%)	67 (47.52%)	50 (35.46%)	3 (2.13%)	141 (100%)	2.41	0.49
	PRESENT	0	7 (63.64%)	4 (36.36%)	0	11 (100%)		
HYPHAEMEA	ABSENT	21 (14.38%)	71 (48.63%)	51 (34.93%)	3 (2.05%)	146 (100%)	1.35	0.71
	PRESENT	0	3 (50%)	3 (50%)	0	6 (100%)		
RETAINED LENS MATTER	ABSENT	21 (14.29%)	71 (48.30%)	52 (35.37%)	3 (2.04%)	147 (100%)	0.98	0.80
	PRESENT	0	3 (60%)	2 (40%)	0	5 (100%)		
DECENTERED IOL	ABSENT	21 (13.82%)	74 (48.68%)	54 (35.53%)	3 (1.97%)	152 (100%)	-	-
	PRESENT	0	0			0		
More IOP SPIKE	ABSENT	20 (16%)	61 (48.80%)	41 (32.80%)	3 (2.40%)	125 (100%)	4.55	0.20
	PRESENT	1 (3.70%)	13 (48.15%)	13 (48.15%)	0	27 (100%)		
Less IOP SPIKE	ABSENT	18 (15.65%)	60 (52.17%)	34 (29.57%)	3 (2.61%)	115 (100%)	8.02	0.04
	PRESENT	21 (56.76%)	16 (43.24%)			37(100%)		
RESURGERY	ABSENT	21 (14.09%)	73 (48.99%)	52 (34.90%)	3 (2.01%)	149 (100%)	1.46	0.69
	PRESENT		1 (33.33%)	2 (66.67%)	0	3 (100%)		
CYSTOID MACULAR EDEMA	ABSENT	21 (14.19%)	73 (49.32%)	51 (34.46%)	3 (2.03%)	148 (100%)	2.92	0.40
	PRESENT	0	1 (25%)	3 (75%)		4 (100%)		

Association between Epithelial and Stromal Corneal Edema, less IOP rise and postoperative complication with age was found to be statistically significant. No significant association was seen between intraoperative complication and age.

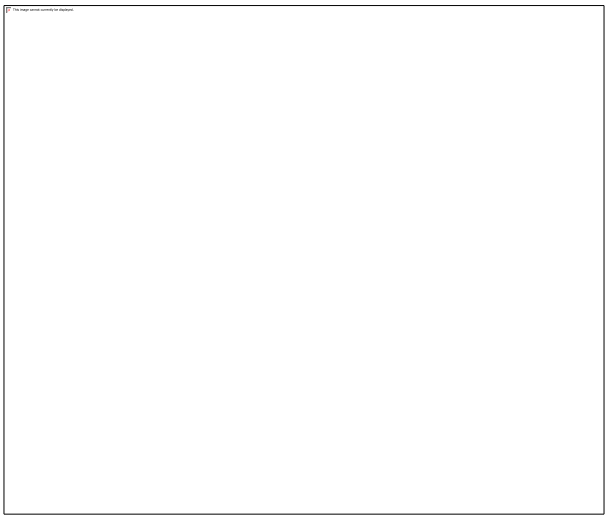
TABLE 10- ASSOCIATION OF INTRAOPERATIVE COMPLICATIONS AND PUPILLARY SIZE

INTRAOPERATIVE COMPLICATION		**1-3**	**4-6**	**7-9**	**TOTAL**	**CHI SQ**	**P- VALUE**
DIFFICULT RHEXIS	ABSENT	1 (1.14%)	28 (31.82%)	59 (67.05%)	88 (100%)	22.49	0.00
	PRESENT	2 (3.13%)	44 (68.75%)	18 (28.13%)	64 (100%)		
DIFFICULT NUCLEUS PROLAPSE	ABSENT	1 (1.15%)	30 (34.48%)	56 (64.37%)	87 (100%)	15.38	0.00
	PRESENT	2 (3.08%)	42 (64.62%)	21 (32.31%)	65 (100%)		
USE OF ADRENALINE	ABSENT	0	12 (18.18%)	54 (81.82%)	66 (100%)	45.63	0.00
	PRESENT	3 (3.49%)	60 (69.77%)	23 (26.74%)	86 (100%)		
SPHINCTEROTOMY	ABSENT	2 (1.41%)	64 (45.07%)	76 (53.52%)	142 (100%)	9.39	0.009
	PRESENT	1 (10%)	8 (80%)	1 (10%)	10 (100%)		
DESCEMENT MEMBRANE DETACHMENT	ABSENT	3 (1.99%)	72 (47.68%)	76 (50.33%)	151 (100%)	0.98	0.61
	PRESENT	0	0	1 (100%)	1 (100%)		
POST CAPSULAR RENT	ABSENT	3 (2.05%)	67 (45.89%)	76 (52.05%)	146 (100%)	3.25	0.19
	PRESENT	0	5 (83.33%)	1 (16.67%)	6 (100%)		
VITREOUS LOSS	ABSENT	2 (1.40%)	65 (45.45%)	76 (53.15%)	143 (100%)	8.86	0.01
	PRESENT	1 (11.11%)	7 (47.37%)	77 (50.66%)	9 (100%)		
ANTERIOR VITRECTOMY	ABSENT	2 (1.41%)	64 (45.07%)	76 (53.52%)	142 (100%)	9.39	0.009
	PRESENT	1 (10%)	8 (80%)	1 (10%)	10 (100%)		
ZONUALR DIALYSIS	ABSENT	2 (1.45%)	60 (43.48%)	76 (55.07%)	138 (100%)	12.63	0.002
	PRESENT	1 (7.14%)	12 (85.71%)	1 (7.14%)	14 (100%)		
IOL IN SULCUS	ABSENT	3 (2.07%)	69 (47.59%)	73 (50.34%)	145 (100%)	0.23	0.88
	PRESENT	0	3 (42.86%)	4 (57.14%)	7 (100%)		
USE OF CTR	ABSENT	3 (2.01%)	69 (46.31%)	77 (51.68%)	149 (100%)	3.40	0.18
	PRESENT	0	3 (100%)	0	3 (100%)		
USE OF IRIS CLAW LENS	ABSENT	2 (1.45%)	60 (43.48%)	76 (55.07%)	138 (100%)	11.83	0.003
	PRESENT	1 (7.69%)	11 (84.62%)	1 (7.69%)	13 (100%)		
IRIDODIALYSIS	ABSENT	3 (1.97%)	71 (47.02%)	77 (50.99%)	151 (100%)	1.11	0.57
	PRESENT	0	1 (100%)		1 (100%		

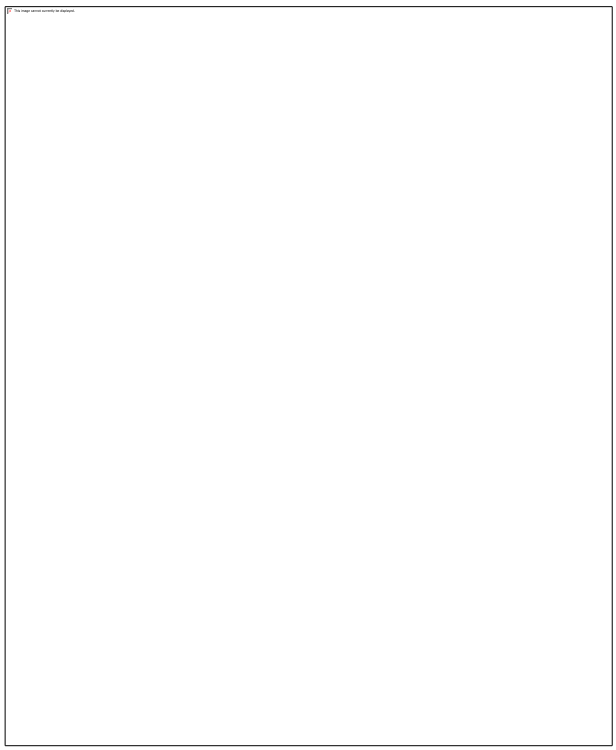
The association between pupillary size and intraoperative complications like difficult rhexis, difficult nucleus prolapses, use of adrenaline, sphincterotomy, vitreous loss, anterior vitrectomy, zonular dialysis and use of iris claw lens was found to be significant. No significant association was observed between pupillary size and postoperative complications.



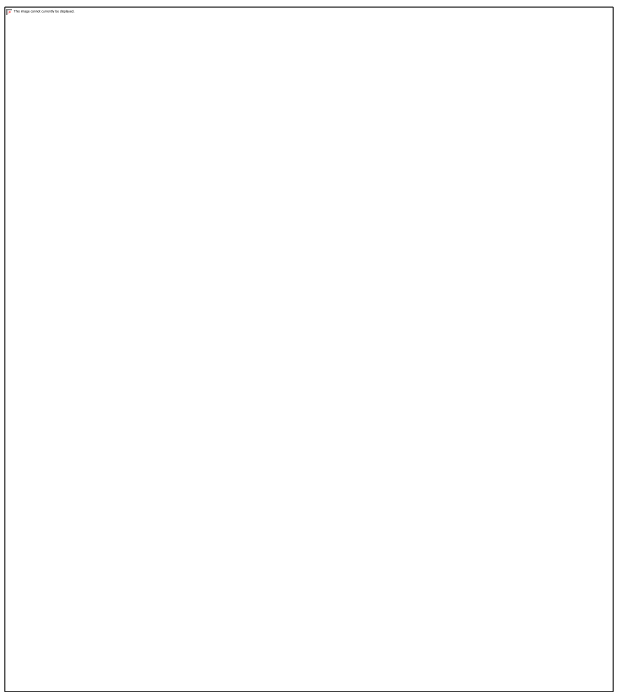
PICTURE 1: multiple sphincterotomy for management of small pupil.



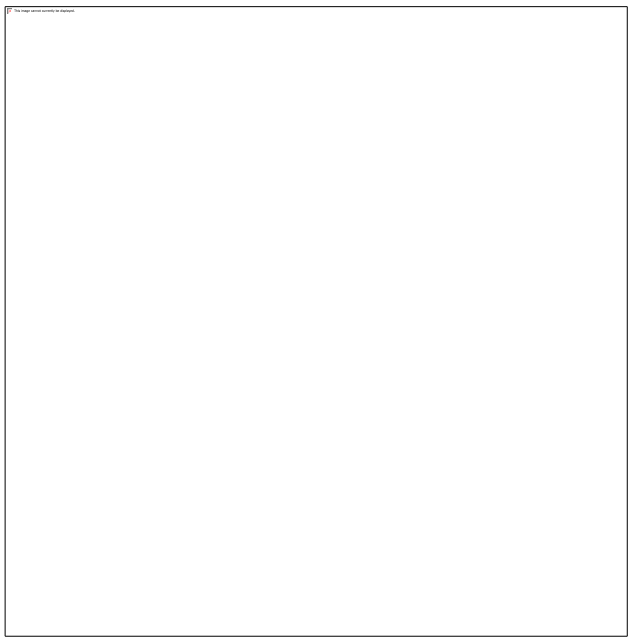
PICTURE 2: Retro pupillary iris claw lens implantation with peripheral iridectomy



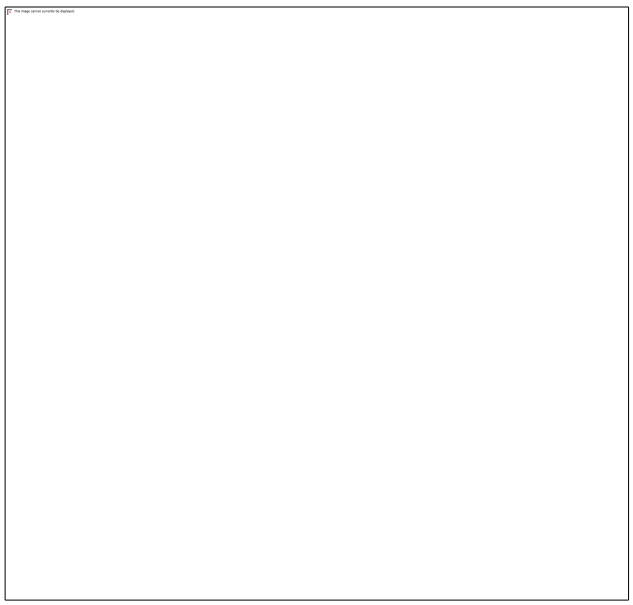
PICTURE 3: PXF distribution in pseudophakia.



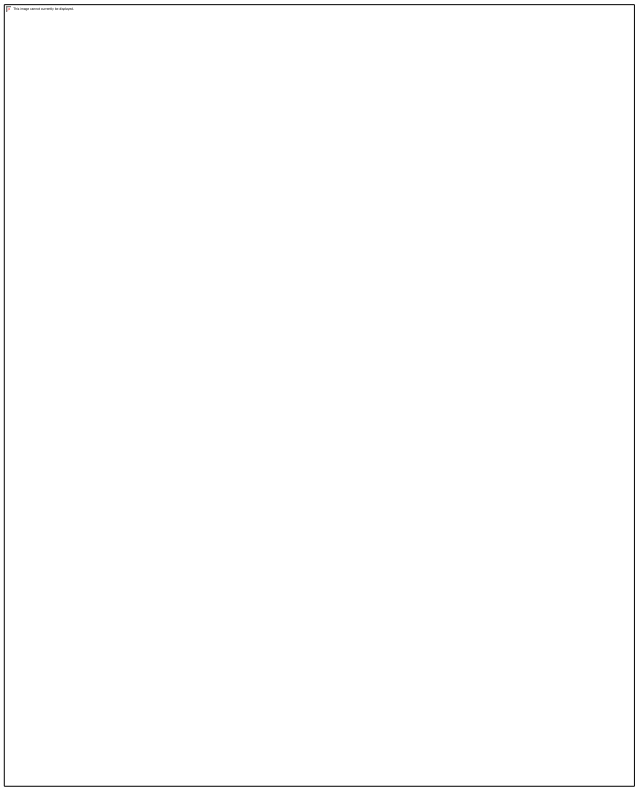
PICTURE 4: dispersion of PXF material in Aqueous Humor



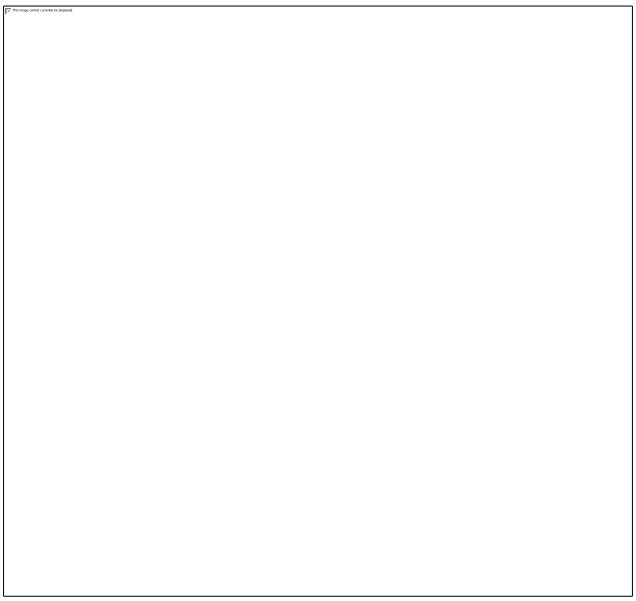
PICTURE 5: Nuclear sclerosis with PXF



PICTURE 6: Distribution of PXF material on anterior lens capsule and pupillary margin.



PICTURE 7: Immature cataract with PXF



PICTURE 8: Postoperative corneal oedema

IV. DISCUSSION

PXE syndrome is an age-related disease with prevalence directly proportional to increasing age. Andhra Pradesh eye disease study showed a prevalence of 3.01% in those 40 years of age or older, and 6.28% in those 60 years of age or older(7). PXF is rare in subjects < 50 years (8). In our study, PXF syndrome was more common (48.68%) in the age group of 60-69 years followed by the 70-79 years age group. This was comparable to a study conducted by Srinivasan et.al (9). The unilateral condition progresses to a bilateral condition with age. In bilateral PXF syndrome, previous cataract surgery provides us with pre-operatively as to the possible complications during surgery of the cataractous eye.

In our study 77 (50.66%) were males and 75 (49.34%) were females and hence showed no sex predilection which was comparable to the study conducted by Arvind et al. in 2003(3), however, Avramides et al. reported a female preponderance(10) and Gupta et al. reported a male preponderance(11).

All 152(100%) patients had pseudo-exfoliative material on the pupillary border and 94.73% had it on the peripheral anterior capsule in our study, this was comparable to other similar studies (6,12,13)

An association between PXF and cataract formation appears to exist and the prevalence of PXF is significantly higher in those with nuclear cataracts. In this study, the majority of the patients had immature cataract with nuclear sclerosis grade 3 (25%) and had nuclear sclerosis grade 2(20.39%) followed by brown cataracts. These findings are similar to previously reported studies(6).

Pre-operative maximum pupillary dilatation observed in our study was fair dilatation in 74(48.68%) of patients, poor dilatation in 40(26.31%) patients and hence required intraoperative adrenaline. 36(23.68%) had good pupillary dilatation. In our study, there was a strong association between intra-operative complications and poor pupillary dilatation. Degenerative alterations in the sphincter and dilator pupillae, as well as muscle cell involvement in PEX material fiber production, is the reason for poor mydriasis explained by Asano N. Poor intraoperative mydriasis can be managed with pharmacological aids such as intracameral adrenaline and visco mydriasis. Mechanical aids like iris hooks and other pupil expansion devices like Malyugin ring and B-HEX pupil expanders are kept on standby to reduce or prevent the occurrence of intraoperative complications. Stretch pupilloplasty using y hooks or Kuglen hooks or sphincterotomy, iridectomy are surgical techniques for managing small pupils. In our study 86(56.58%) cases required intra-cameral adrenaline, sphincterotomy was required in 8 cases (5.26%) and 2 patients required stretch pupilloplasty. Shiva Kumar et al. reported that nineteen cases (12.5%) required surgical intervention for small and rigid pupils. Intraoperative management was mainly by sphincterotomy in 12 cases (7.8%), stretch pupilloplasty in four cases (2.6%), superior iridectomy in two (1.3%), and iris hooks in one (0.7%)(6). Therefore, Preoperative assessment of pupillary dilation is a vital step before operating a patient of PXF.

Our study reports irido-phacodonesis of varying degrees in 36(23.68%) patients. 4 cases had severe irido-phacodonesis hence intracapsular cataract extraction (ICCE) was done with primary retro-pupillary iris claw lens implantation. Among the intraocular complications, there were 9 (8.55%) cases of ZD. ZD was noted during nuclear prolapse. Preexisting zonular weakness and hard cataracts are the reasons for difficult nucleus prolapse resulting in ZD. ZD up to 5 clock hours can be managed with CTR and in-the-bag IOL placement. Large ZD requires other measures like implantation of iris claw lens, anterior chamber IOLs or scleral fixated IOLs.

In our study PCR was seen in 6 cases (3.95%) with vitreous loss present in 3 cases. Difficult rhexis, runaway rhexis, difficult nuclear management due to poor mydriasis and hard cataracts are the reasons for PCR in PXF patients. Sivakumar et al. encountered capsule-related intraocular complications in six cases (4%), of which there were five (3.3%) cases of ZD and one case (0.7%) of PCR which was less compared to our study(6). The study by Avramides et al. had shown higher rates of capsular complications with PXF and zonulolysis in 13.09%; PCR in 10.71% and vitreous loss in 7.14%(10). Our post-operative complications were less compared to the study by Pranathi et al(14). We had one case of iridodialysis and DMD which has also been reported in the literature(11).

On postoperative day 1, 63.16% of the patients had visual acuity of 6/24 or better. 10 patients (6.58%) had visual acuity of <1/60 due to severe corneal oedema, hyphema, dense striate keratitis, and fibrinous membrane. The patients showed significant improvement in the subsequent follow-up at 1 month and 3 months with a reduction in fibrinous reaction, iritis, corneal oedema, and striate keratitis. 97.35% of the total study subjects achieved VA of 6/18 or better at 3 months of follow-up. This was comparable to the previous studies(6). The reason for low vision at the final follow-up was corneal oedema due to corneal decompensation and CME and PCO which are known complications.

Our study established a statistically significant association between postoperative complications (mainly corneal oedema) with age. This can be explained by the low endothelial count as the age increases due to which decreased endothelial function and hence the corneal oedema.

Our study also established a statistically significant association between intra-operative complications and pupillary size. We noticed, the poorer the intra-operative mydriasis, the higher the intra-operative complications. This has been well established in the literature.

Patients with PXF may have elevated IOP that may be averted by topically pressure-lowering results after surgery. In our study, 42.1% of the patient had IOP rise on poet-operative day 1 which was subsequently reduced with oral and topical anti-glaucoma medications. This was comparable to Gupta et al. study(11). 10 patients required life-long anti-glaucoma medications due to advanced glaucomatous disc changes.

Our study showed comparable intra-operative and post-operative complications and good visual outcomes in MSICS in PXF patients. Due to the short follow-up period, the long-term outcome and complications of cataract surgery in PXF could not be documented. The other limitations of the study were, no comparable normal data and no comparison between MSICS and phacoemulsification on PXF cataracts.

V. CONCLUSION

Our study showed that despite various operative difficulties and complications, better visual outcomes can be achieved in experienced hands with proper pre-operative assessment and planning, good insight into possible intraoperative and postoperative complications, standard intra-operative procedures and post-operative management.

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CONFLICT OF INTEREST
None

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