

Surgical Management of Cataract in Pseudoexfoliation

G. Satyavathi¹, M. Ravi Kumar¹, A. Hema Latha²

ABSTRACT

Introduction: Cataract surgery may be more hazardous in pseudoexfoliation (PEX) due to combination of poorly dilating pupil, increased risk of zonular dialysis and vitreous loss. Postoperatively these patients require frequent follow up to monitor for complications like raised intraocular pressure, inflammation and Intra ocular lens dislocation. Aim was to study the outcome of cataract surgery in pseudoexfoliation eyes.

Material and Methods: In the current prospective, cross sectional, cost effective and out come study, 45 eyes of cataract with pseudoexfoliation of 45 target patients attending to the tertiary centre were included. Surgical procedure followed is Manual Small Incision Cataract Surgery. Adrenaline (preservative free, 0.5mg to 500 ml of infusion) has been used to get needed mydriasis during surgery. Various pre operative, intraoperative and Postoperative complications along with postoperative Best Corrected Visual Acuity and lens position are evaluated periodically from day 1 to 6 months. Exclusion Criteria: Eyes having obvious corneal pathology and obvious posterior segment pathology are excluded.

Results: 3:2 (M:F) is the gender ratio. Poor pupillary dilatation and Nuclear sclerosis are the common associations observed among cataract eyes with PEX. There is 1 case (2%) of Phacodonesis. P.C IOL could be implanted in 44 (97.7%) cases and their visual out come is between 6/12 to 6/6. Sulcus fixated IOL is kept in one case (2.2%) but with poor visual out come. Round Pupil could be achieved in 43 (95.5%) cases. Pupil is irregular in two (4.4%) cases due to sphincterotomy. Five (11.1%) cases developed PCO within 6 months of follow up and are managed by Nd YAG capsulotomy (vide table No.4)

Conclusion: The out come is good with Manual Small Incision Cataract Surgery with intraoperative preservative free adrenaline added to infusion bottle in eyes with pseudoexfoliation, risk of vision threatening problems can be minimised and it may be an option for surgical management of cataract in Pseudoexfoliation eyes. Our method does not appear to detract from the surgical out come

Keywords: out come, small pupil, preservative free, viscoelastics, hazardous.

that leads to development and precipitation of exfoliative material.¹ It is first described by Lindberg in 1917.² He believed that this material is created by earlier inflammation. The material has multifocal origin hence seen in various ocular structures. In addition to its occurrence in the eye the exfoliative fibrilopathy has been reported in skin and visceral organs suggesting that PEX is an ocular manifestation of systemic disease. It is best seen in undilated eye by seeing dandruff like deposits at pupillary margin. Peri pupillary transillumination defects are common. The classic presentation of central translucent disc surrounded by clear zone which in turn surrounded by grey white ring with scalloped edges on lens surface may not be visible in all cases due to poorly dilating nature of pupil. A polymorphism in exon 1 of the LOXL1 gene³ which is associated with extracellular matrix formation has been found to be highly associated with exfoliation.

Prevalence is closely linked with age reaching a maximum in 7th-9th decade. A study carried out in South India reported prevalence of PEX as 3.8%, while the Andhra Pradesh Eye Disease Study reported it as 3.01%^{4,5} Prevalence of glaucoma is variable in these eyes.

Well-dilated pupil with a sharp red reflex enhances the ease of cataract extraction and decreases the likelihood of complications like iris sphincter tear, zonular disruption, posterior capsule rent, vitreous prolapse and lens in vitreous in exfoliation eyes. Poor pupillary dilatation, zonular weakness, hard cataract and glaucoma are the common problems in pseudoexfoliation eyes, which alter surgical out come when attention is not paid to them. Small pupil⁶ that can impede visualization and make instrumentation into the eye more difficult. An intumescent or a brunescient cataract will cause anterior chamber shallow. It is difficult to prolapse and also express the hard nucleus.

The study object is to identify pre operative complications in PEX eyes by proper evaluation there by assessing possible intraoperative complications, and planning for preventive

¹M.S. Assistant Professor, ²Resident, Department of Ophthalmology, Guntur Medical College, Guntur.

Corresponding author: Dr. G. Satyavathi, M.S., No.12-22-17, Plot No.6, Sri Sainadh Towers, Head Post Office Road, Kothapeta, Guntur.

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INTRODUCTION

Pseudoexfoliation known by a variety of other names as senile exfoliation, exfoliation syndrome, senile uveal exfoliation, etc occurs when there is abnormal relationship between Matrix Metallo Proteinases and Tissue Metallo Proteinases

measures which ensures best visual outcome. The surgeons plan requires flexibility and resourcefulness.

The underlying pathophysiology should be taken into consideration when strategizing the surgical plan. The ultimate goal of surgery is to replace cataract with IOL for best visual outcome.

MATERIALS AND METHODS

This prospective, cross sectional, cost effective and outcome study comprises 45 eyes of 45 patients having cataract with PEX as basic pathology presenting over a period of 1 year (August 2014 to June 2015) under went lens removal and subsequent intraocular lens implantation performed by single surgeon in ophthalmology department of a tertiary hospital. The study was approved by Institutional Ethical Committee Board. Written and informed consent is obtained from all the patients regarding eye condition, surgical procedure and surgical risk.

PEX diagnosed clinically by the presence of typical material at the pupillary border on undilated examination, on anterior lens surface on dilated examination, on trabecular meshwork on gonioscopy, pigment deposition in angle and on corneal endothelium.

Pre operative examination

Detailed clinical history is obtained and complete ophthalmological examination is done for every patient. Clinical data of patient age, gender, presenting complaints are recorded. Relevant history such as family history of ocular and systemic diseases are noted

In all patients Best Corrected Visual Acuity is assessed by age appropriate charts. Visual Acuity ranged from CF 1-4 Mts. All cases are evaluated by Slit Lamp examination, IOP measurement, Pupillary Reaction, Gonioscopy, Fundus examination, B-Scan & A Scan Biometry, Keratometry proper management of systemic diseases like Diabetes, Hypertension, and Asthma by the concerned specialists. 3:2 (M: F) is the gender ratio. Age group selected in the study are above 40 years. Patients with pseudoexfoliation material on the anterior lens surface at and or pupillary margin in either or both eyes were labelled as having PEX.

All patients are from poor socio economic status and their basic education qualification ranged from uneducated to below 10th standard

Slit Lamp examination

Four out of 45 corneas have pigment deposition on Endothelium. Anterior Chamber Depth is normal, except in 2 cases, shallow AC where cataract is brunescence type. There is change of iris pattern which is thick & hyperpigmented in all cases. Trans illumination pupillary defects are seen in 3 cases. Pseudoexfoliation of pupillary margin is seen in 39 Cases (Table No 2) with normal Direct and Consensual light reflex action. Poor pupillary dilatation is seen in 35 cases.

Age group	No. of patients	Percentage
40 to 49 years	5	11.1%
50 to 59 years	16	35.5%
More than 60 years	24	53.3%

Table-1: Age group

Pupil size	No. of cases	Percentage
Below normal size pupil	36	80%
Normal sized pupil	10	20%
shallow ac	2	4.4%
Corneas having pigment deposition on endothelium	4	8.8%
Cataract grading cortical	10	22.2%
Nuclear: Grade I to II	12	77.7%
Grade III to IV	23	
Pupil defects	3	6.6%
Exfoliation Pupillary Margin on Lens Surface	39	86.6%
gonioscopically revealed cases	4	8.8%
Phacodonesis	2	4.4%
	1	2.2%

Table-2: Preoperative data

Lens - Exfoliative material on lens surface is observed in 4 cases. Cataract is graded by lens opacity classification system. Posterior sub capsular cataract along with cortical and nuclear cataract is in 9 out of 45 cases. Nuclear sclerosis is predominantly associated with PEX in 35(77.7%)eyes. Phacodonesis is observed in one case.

Gonioscopy revealed excess trabecular pigmentation. Two eyes having pseudoexfoliation are diagnosed gonioscopically. IOP with applanation tonometer is in normal range of 16-18 mm of Hg in all cases. Fundus is within normal limits. B-Scan performed is normal in all the cases. Dilation of pupil is measured after mydriatic drops and graded as poor (2-4mm), moderate (5-6mm) and good (>7mm).

Pre-operative preparation

Topical Antibiotic & Anti inflammatory eye drops along with systemic antibiotics are started from day before surgery. IOP kept under normal levels with oral Acetazolamide 250 mg night & 2 hours before surgery. Peribulbar block with the infiltration of Xylocaine 2% combined with Bupivacaine 0.5% Adrenaline 1 in 2,00,000 and hyaluronidase for local analgesia is achieved.

Incision and surgical strategies

The surgical procedure is Manual Small Incision Cataract Surgery by means of tunnel construction and is characterised by its greater radial length and an entry into AC to create self sealing internal corneal valve. 6 to 7 mm in cortical and Grade I & II nuclear cataracts and >7mm in Grade-III and above, tunnel is created. Intra operative mydriasis is maintained by adding Adrenaline 0.5CC (preservative free 1mg in 1ml ampoule) to infusion bottle. Shallow AC is managed

by decreasing posterior segment volume by hyper osmotics and increasing anterior segment volume by visco elastics. Side port is given for rigid pupils with poor pupillary dilation for manoeuvres like cortical aspiration, IOL dialing. Gentle (6 mm) continuous curvilinear capsulotomy(CCC) is given using needle cystitome.

To prevent stress on zonules while manoeuvring nucleus and while aspirating cortical matter, radial cuts are given to capsular margin when there is large nucleus (>10mm) with inadequate capsulorrhexis due to small pupil size (<3mm) to prolapse nucleus. Under visco, nucleus is delivered after controlled Hydrodissection. The procedures of capsulorrhexis, hydrodissection, nucleus expression into AC, its removal from AC with visco, cortical cleanup and IOL insertion are carried out in the same manner in all the cases by the same surgeon having more than 10 yrs experience. Additional care is taken to prevent stress on zonules by avoiding fluctuations in anterior chamber pressure by controlled paracentesis, profuse use of viscoelastics and by gentle nucleus manoeuvres. Large nucleus with phacodonesis is managed by avoiding stress on zonules, with adequate capsulorrhexis size and by giving radial cuts to capsular rim.

Postoperatively patients are treated with topical antibiotics and steroids tapered over 4 - 6 weeks. Patients are followed from day 1, 2, 7, 14, at 2 weeks intervals for 2 months and at monthly intervals for 6 months to evaluate corneal status, inflammation, lens position, intra ocular pressure and visual acuity. The data is entered and analysed using MS-Excel.

RESULTS

In the present study forty five eyes having cataract with pseudoexfoliation of 45 patients who underwent cataract surgery by Manual SICS are included to evaluate various preoperative, intraoperative, and postoperative complications.

Age group of patients is above 40 years. Among 45 patients 40 (88.8%) patients are above fifty years age group. There is a male preponderance of 27 out of 45 patients.

Preoperatively 80%(36 eyes) produced 6mm and 20%(9 eyes) produced <6mm pupillary dilatation. Pupil equal to or less than 6 mm is considered as abnormal after mydriatic instillation. Eyes diagnosed as PEX by having exfoliative material at pupillary margin are 39(86.6%), on lens surface are 4(8.8%) and gonioscopically revealed cases are 2(4.4%). Pigment dispersion on endothelium is seen in 4(8.8%) cases. Nuclear sclerosis is seen in 35 (77.7%) of cases and cortical cataract is present in 10 (22.2%) cases. IOP ranged from 16 - 18 mm Hg. Shallow anterior chamber is seen in 2 (4.4%) cases because of intumescent cataract. There is one case (2.2%) of phacodonesis. In most of the case excess pigmentation over trabecular meshwork is seen (Table 1).

Intraoperative difficulties

All patients underwent cataract surgery using Manual SICS technique. Difficulty faced in 15(33.3%) cases while pro-

lapsing nucleus because of its hardness and greater size (L.S.of grade-III and above) and pupil size is <5mm. Mechanical dilatation of pupil is required before capsulotomy. Radial cuts are given to capsular rim at 1,5 &10 clock hours in 4 (8.8%) cases of Grade IV nuclear cataract to prolapse nucleus. 2 (4.4%) cases required Sphincterotomy due to rigid and <5mm size of pupil with Grade-IV cataract. One case required multiple sphincterotomies.

Nucleus Delivery

2 (4.4%) cases required tunnel conversion where in spite of capsulotomy & big tunnel, nucleus delivery is difficult. Conversion is done to prevent endothelial damage. Nuclear break-up occurred in 2(4.4%) cases. While attempting to remove the second piece, adequate visco is used to disengage and to remove the broken piece.

Aspiration of Lens Matter

Inspite of poor pupillary dilatation and cortico capsular adhesion, thorough cortical clean up especially subincisional cortex is done without any left over lens matter by means of sustained maintenance of pupil dilatation and anterior chamber depth and giving radial cuts to capsular margin at subincisional area. In 1 (2.2%) case where there is difficulty of subincisional cortex aspiration, which lead to Zonular disruption of less than 3 clock hours. The case is managed by adequate visco, meticulously clearing vitreous. In 44 (97.7%) cases PC IOL could be inserted. In one case (2.2%) IOL is placed in sulcus due to zonular disruption. Three (6.6%) cases required suturing with 10-0 nylon for tunnel closure. (Table-2)

Post operative complications

One case (2.2%) of Striate Keratopathy of Gr III is noted, due to nucleus maneuver. The expected post operative complications like inflammation, raised IOP and pupillary block are nil at 6months follow up. Round pupil could be achieved in 43 (95.5%) cases and irregular pupil is noted in 2 (4.4%) of cases due to sphincterotomy. Inspite of adequate intraoperative precautions, the eye with phacodonesis has decentration of IOL, observed at 6 months follow up due to zonular weakness. 6/12 to 6/6 of visual acuity could be achieved in 44 (97.7%) cases. The visual acuity is less than 6/60 in decentered IOL which is considered as poor visual outcome. 5 (11.1%) of cases developed PCO within 6 months of follow up and are managed by Nd YAG capsulotomy (vide table No.4).

DISCUSSION

Cataract surgery in patients with pseudoexfoliation is a risk not only to the patient but to the surgeon also.⁷ Majority of patients in our study are above age of 60 years (53.3%). Epidemiological studies of PEX have shown that it is more common in patients older than 60 yrs and prevalence further in-

Difficulties	No. of patients	%
Nucleus prolapse	15	33.3%
Sphincterotomy	2	4.4%
Cortical clean up	5	11.1%
Zonular disruption leading to sulcus fixated IOL	1	2.2%
suturing required	3	6.6%
Tunnel conversion	2	4.4%

Table-3: Intra operative difficulties

Observations	No. of patients	%
SK	1	2.2%
Irregular pupil	2	4.4%
IOL in position	44	97.7%
PCO	5	11.1%
VA 6/12 to6/6	44	97.7%

Table-4: Post operative observations

creases with age.⁸ Among 45 patients 27(60%) are males and 18(40%) are females with a male:female ratio of 3:2. Reports regarding sex predilection in PEX are conflicting. External environmental factors have also been implicated for causing PEX. Avrademis, Sakkias and Traindis reported a female preponderance.⁹

The signs of zonular instability such as iridodonesis, phacodonesis and lens subluxation should be carefully looked for under slit lamp preoperatively before and after dilation of the pupil.¹⁰

In the present study poor pupillary dilation and hard cataract are the common hazards observed. Among 45 patients, hard cataract is seen in 35(77.7%). Most studies have found a strong association between PEX and nuclear cataract.^{11,12} As prevalence of glaucoma is variable in PEX, there is no incidence of glaucoma capsulare in our study.

In the present study small and rigid pupil is the most common intra operative problem which is managed by bimanual stretching, and intra operative mydriasis is maintained by preservative free adrenaline added to infusion bottle. There are other mechanical methods and devices to enlarge the pupil at cataract surgery, manage zonular disruption which include, stretch pupiloplasty by means of Kuglens hook to retract the iris tissue through four or more corneal stab incisions, or introducing mechanical stretching devices to pull on the sphincter margin, Malyugin rings, Capsular tension rings for zonular weakness.^{13,14} All of these methods are cumbersome, require specialized instruments, difficult intraocular manoeuvres, and are associated with bleeding, permanent loss of iris sphincter function, and abnormal pupil shape postoperatively.

Poor zonular integrity may affect cataract surgery technique and IOL implantation. Meticulous gentle capsulotomy prevents force on the zonules. Radial incisions are to be given to capsular rim when there is abnormal ratio between pupil and nucleus size which will ease nuclear prolapse. Also unlike in

other cataracts, the rhexis should be more than 6.5mm but at the same time should not extend upto zonules. This will reduce the amount of anterior capsular epithelial cells, which in turn will reduce the post operative capsular fibrosis.

Reducing the size of nucleus by hydrodelimitation is a difficult task in nuclear cataracts of grade IV. In these cases due to lack of strong zonules, there is intraoperative chance of zonular rupture, and nucleus drop and shrinkage of the rhexis postoperatively. Hydroprocedure should be done very carefully to prevent zonular stress. As peripheral iridocapsular adhesions are common in pseudoexfoliation eyes, aspiration of cortex is difficult and is the most important threat to cause zonular weakening.

Adequate use of OVD maintains anterior chamber depth, pupil dilatation, prevents stress on zonules and endothelial damage as pseudoexfoliation eyes have compromised endothelium.

Pseudoexfoliation eyes have a tendency for post operative iritis. Incomplete removal of cortical matter due to poor visibility secondary to poor pupillary dilatation may lead to post operative inflammation, and capsular opacification. In our study though no obvious postoperative lens matter is detected, it could be the cause for development of PCO in 5 (11.1%) of our cases. Due to meticulous intraoperative care the inflammation that occurred postoperatively in low grade, responded well with topical steroids and cycloplegics. Studies have reported that IOL decentration is primarily due to decentration of entire bag.¹⁵⁻¹⁶ The IOL decentration that occurred in our study is due to intraoperative zonular disruption. Present methods of managing cataract in pseudoexfoliation eyes by means of SICS have all had limitations. Phacoemulsification technique can not be employed as the standard procedure due to certain reasons. Moreover endothelial cell loss in Phaco depends on density of nucleus. In Manual SICS the skill of the surgeon plays an important role. Manual SICS with intra operative usage of Adrenaline to infusion bottle limits complications, prevents usage of strong mydriatics such as 10% phenylephrine often associated with untoward ocular and systemic side effects. Ignoring pupil size, zonular integrity, hardness of cataractous lens and performing the manoeuvres of small incision surgery through an un-enlarged incision, may result in inadvertent complications like zonular dialysis, iridodialysis, bleeding, increased risk of posterior capsule tear and nucleus drop.

Though the modern techniques and mechanical devices can increase the margin of safety, they are cost effective and can not be employed as standard procedures.

CONCLUSION

Manual SICS is a good alternative to phacoemulsification in countries where very high volume surgery with inexpensive instrument is required. It can be performed on dense cataract having poor pupillary dilatation due to PEX. The procedure has a low rate of complications. Successful surgical

outcomes may be achieved in eyes having cataract and PEX, with associated poor pupillary dilatation and zonular weakness with both mechanical iris dilation and iris retention devices as well as capsular tension rings. The retention devices add to overall surgical cost and generally require more time in the O.R than a mechanical pupillary stretch. Pupillary stretch is more traumatic to the iris and also possibly to the corneal endothelium, but our management method does not appear to detract from the surgical outcome. Besides managing and handling the small pupil, the other precautions like good and wide rhexis, careful Hydroprocedure, very watchful cortical aspiration and in difficult cases implanting IOL and then attempting for cortical removal all are important steps to manage cataract in PEX eyes successfully.

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