A study of incidence of posterior capsular opacification after cataract surgery with square edge PMMA intra ocular lens

Naga Suresh V[1], Radhika R[2,*]

[1]Associate Professor, [2]Assistant Professor, Dept. of Ophthalmology, Viswabharathi Medical College, Kurnool

***Corresponding Author:**
Email: cpmreddy@gmail.com

Abstract

Introduction: PCO usually leads to a decrease in visual acuity (VA), glare disability and a loss of contrast sensitivity. It has been reported earlier that sharp edge intraocular lens optics are better than rounded edge IOL optics. This study was performed to identify the incidence of Posterior capsular opacification after a cataract surgery with square edge IOLs.

Materials and Methods: 75 patients with Senile cataract –irrespective of grade &type, between the ages of 40 – 80 years who underwent cataract surgery were included in this study. The cataract surgery was conducted and square edge IOLs was places within the capsular bag. Signs for PCO was observed during one year of follow-up.

Results: The most common type of cataract in our study was mature senile cortical cataract, seen in 23 (28%) of the patients. Post-operative course was uneventful in 64 patients (85.33%). 3 patient(4%) had mild iritis and 8(10.67%) patients were noted with minimal corneal edema at first post-operative day and resolved in the next week with topical medications. capsule opacification was seen in 5 of the 75 patients (6.67%). 2 of the 5 patietns had fibrous membrane type and 3 developed Elsching's pearl type of PCO.

Conclusion: The design of IOLs specially the one with square edge plays a major role in preventing posterior capsule opacification especially in the elderly with a very good visual outcome.

Keywords: Posterior capsular opacifications, Intraocular lens, Cataract surgery

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Introduction

Cataract surgery is currently the most common and well-established ophthalmic surgical procedure in the world. This procedure involves the extracapsular extraction of the natural opaque lens fibers and implantation of an intraocular lens (IOL), which restores good vision. However, posterior capsular opacification (PCO), which is also termed secondary cataract, is a common long-term complication of modern cataract surgery[1]. It is caused by the lens epithelial cells which remain in the capsular bag after surgery. These epithelial cells migrate, multiply and produce Eischnig's pearls and capsular fibrosis. They do not cause any symptoms in the peripheral capsular bag, but instead move to the visual axis and cause light scattering and visual deterioration[2].

PCO usually leads to a decrease in visual acuity (VA), glare disability and a loss of contrast sensitivity. It also precludes examination of the posterior segment. The interval between surgery and PCO varies widely, ranging from three months to four years after the surgery. The causes of such PCO are multifactorial.

Various published articles on PCO estimate a postoperative PCO incidence of 11.8% at 1 year, 20.7% at 3 years, and 28.5% at 5 years. PCO is a major problem in pediatric cataract surgery where the incidence approaches to 100%[3,4].

One of the crowing achievements of modern surgery has been a gradual, almost unnoticed decrease in the incidence of this complication with the modern techniques of surgeries and various modifications of the IOLs. Many researchers have tried to identify the major factors to reduce the incidence of PCO[5,6]. It has been reported earlier that sharp edge intraocular lens optics are better than rounded edge IOL optics[7]. Some other researchers have suggested the modification of IOL surface which inhibit cell and protein adhesion[8]. Other modifications of the IOL design include the maintenance of an open capsular bag technique, enhancement of the aqueous endocapsular inflow or the use if an bag in the lens technique, all of which are expected to prevent or reduce the capsular bag opacification[9,10].

This study just highlights one of such modifications of the IOLs which has proved to be of importance in preventing the PCO.

Materials and Methods

75 patients with Senile cataract –irrespective of grade &type, between the ages of 40–80 years who underwent cataract surgery were included in this prospective study which was conducted by the department of Ophthalmology at Viswabharathi medical college. All patients with Cardiac & serious

illness, Glaucoma, patients with Pseudo-exfoliation, traumatic cataract, uveitis & complicated cataract, posterior segment pathology with diabetic retinopathy were excluded from the study.

Complete history was taken from all patients for systemic illness like hypertension, diabetes, cardiac status etc. Detailed ocular examination was done with slit lamp biomicroscopy. Intraocular pressure was measured with applanation tonometry and best-corrected visual acuity measured with Snellens E chart. A-scan biometry was done to every patient and IOL with accurate dioptic power implanted.

All the patients were given a local anesthesia (peribulbur) with a combination of a short acting 2% lignocaine (3.5cc) mixed with 1; 200000 adrenaline and 75 units hyaluronidase and long acting 0.75% bupivacaine solution(2cc). No topical anesthesia was used. A scleral incision of 6mm was made and sclero-corneal tunnel was made up to 1mm into the corneal lamellae. Sideport was taken at surgeon's convenience. Anterior chamber was filled with viscoelastic. A continous curvilinear capsulorhexis of 5mm was done with cystotome made with 26-G needle to keep the capsular rhexis central. Anterior chamber entered with sharp keratome in the plane of tunnel. Thorough and proper hydro dissection (1.5cc of ringer lactate solution) was done in 3quadrants by tenting up the capsular rim until a fluid wave was seen in the capsular bag followed by hydrodelineation.

The nucleus was brought into the anterior chamber and the chamber filled with viscoelastic material. Nucleus expressed with wire-vectis without traumatizing the iris. A thorough and extensive cortical cleanup was made with the Simcoe canula by tenting up the anterior capsular rim. The capsular bag is then filled with viscoelastic and the careful implantation of the square edged single piece polymethyl-methacrylate (PMMA) IOL within the capsular bag was done seeing that peripheral 1mm of the anterior capsular rim covers the optic edge of the IOL.

A good aspiration of the viscoelastic material was done from anterior chamber and capsular bag and behind the IOL also, so as not to leave any amount of viscoelastic within the eye. Anterior chamber was well formed. Air bubble was injected into anterior chamber. A subconjunctival injection of dexamethasone and gentamicin 0.5cc was given and the eye closed with pad and bandage.

On the 1st postoperative day, the cases were examined under slit lamp for any postoperative complications. The next visits were conducted at day 7, 1 month, 3 months, 6months and 8 months. The best-corrected visual acuity was tested using Snellens chart, both aided and unaided.

At all visits except first post-operative day, the IOL transparency, relations of the capsulorhexis margin, the IOL optic and centration of the IOL were evaluated under adequate pupillary dilatation. The PCO was assessed by the following grading system.

1. No PCO - No evidence of PCO seen before and after pupil dilatation to a minimum of 6mm. (With a direct ophthalmoscopy a clear view of optic disc, vessels, and nerve fiber layer)
2. Grade I - PCO seen only with pupil dilated to a minimum of 6mm. (With a direct Ophthalmoscopy, a clear view of optic disc, vessels and nerve fiber layer)
3. Grade II - PCO in central axis, detectable with an undilated pupil. (With a direct Ophthalmoscopy, mild obscuration of fundus details. Optic disc seen but not nerve fiber layer)
4. Grade III-PCO in the central visual axis with an undilated pupil. (On direct Ophthalmoscopy, there is marked obscuration of fundus details, even margins of optic disc is not seen clearly)

Results

Out of 75 patients included in the study, 35 (46.67%) were females and 40 (53.33%) were males (Fig. 1)

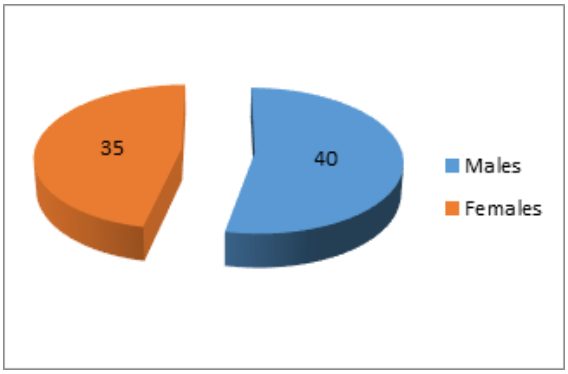

Fig. 1: Age wise distribution of the patients

The most common type of cataract in our study was mature senile cortical cataract, seen in 23 (28%) of the patients. Only one patient had an immature senile cataract with nuclear sclerosis(NS) Grade V, while there were 10 patients with Nuclear sclerosis Grade 4. Of them, 3 were associated with posterior subcapsular cataract and 7 cases without PSC. 8 patients had IMSC with NS grade III and 15 with NS grade II (Table 1).

Table 1: Association with type of cataract

Type of Cataract	No. of Cases	Percentage
MSC	23	30.67%
IMSC, NS GR.V	1	1.33%
IMSC, NS GR.IV	10	13.33%
IMSC, NS GR.III	8	10.67%
IMSC, NS GR.II	15	20%
IMSC, NS GR I	11	14.67%
IMSC	7	9.33%
Total	75	100%

Post-operative course was uneventful in 64 patients (85.33%). 3 patient(4%) had mild iritis and 8(10.67%) patients were noted with minimal corneal edema at first post-operative day and resolved in the next week with topical medications.

Posterior capsule opacification was seen in 5 of the 75 patients (6.67%). 2 of the 5 patietns had fibrous membrane type and 3 developed Elsching's pearl type of PCO. None of the other patients showed any opacifications. All the patients were above 70 years of age. The patients with the posterior capsule opacification also improved to 6/6 after Nd-AG capsulotoky procedure.

Final visual outcome of 6/6 was achieved in 67 (89.33%) patients. The rest (8) had a visual outcome of 6/9.

Discussion

One of the most common complications after the cataract surgery is Posterior capsule opacification. PCO formation not only effects the recovery of the visual ability after the cataract surgery but also has economic implications[4].

In the present study, the incidence of the Posterior capsular opacification among the patient undergoing cataract surgeries was 6.67%. Schaumberg et al in a similar study, reported the incidence to be 11.8% after 1 year, 20.7% after 3 years and 28.5% after 5 years of surgery.

Earlier studies on the edge of the IOLs showed that acrylic IOLs with a sharp optic edge had he lowest PCO rates[13]. Similar studies by Nishi et al attributed the PCO inhibiting effect of IOLs to the barrier effect of the truncated edge rather than to the characteristic of the lens material[14].

The inhibiting effect of the square edges IOLs is explained by the fact that the lens epithelial cells (LEC) scarcely migrate to the posterior capsule which have IOLs with sharp rectangular edges because of inhibition at the distinct sharp bends and the complex folds, thereby ceasing the proliferation of the migrating and proliferating cells[15].

In a study by Findl et al, an incidence of 2.5% of PCO was observed in the eyes which received 3 piece ALL PMMA IOL, while in our study, which received 1-piece PMMA IOL, the incidence was 6.67%.

In another study by Murali et al, by using truncated edged silicone foldable intraocular lenses, there was no significant PCO formed at the end of one year[16]. In our study, 5 patients had significant PCO with 2 of the 5 patients having fibrous membrane type and 3 developing Elsching's pearl type of PCO. The other 70 patients did not form PCO, despite the collection of the epithelial cells at the edges of the IOL, as was reported by Nishi et al, who also observed that the capsular bend can be eliminated by the square edges IOLs[17].

Peng et al have reported hydrodissection to also have a major role in limiting the PCO. The IOLs is sandwiched in the capsular bag to give a shrink wrap effect and prevents PCO with bioactive hydrophobic acrylic IOLs.

In our study, a complete capsularhexis overlap was observed in almost all the patients except in one case, where a fibrous membrane PCO might have contributed for the formation of PCO.

There was a complete visual outcome of 6/6 in most of the patients. In a study by Holladay et al, there was no glare experienced by any of the patients, when treated with square edged IOLs[18].

The limitation in our study was the small number of patients. The length of our study was for one year follow-up, which was also a short time. Further studies can be conducted on a larger number of patients and for at least upto a 4 yea follow up for absolute results.

Conclusion

The design of IOLs specially the one with square edge plays a major role in preventing posterior capsule opacification especially in the elderly with a very good visual outcome. Square edge PMMA IOLs are much better in their efficacy than the rounded edged ones, over a long period of time.

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