

Original Article

Comparison of incidence of Posterior Capsular Opacification following implantation of different types of Intraocular Lenses

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(a) To find out incidence of Posterior Capsular Opacification (PCO) in 3 different types of Intraocular Lens (IOL) (Foldable silicone, Foldable acrylic hydrophobic, Foldable acrylic hydrophilic). (b) To compare the development of PCO in 3 different types of IOL (Foldable silicone, Foldable acrylic hydrophobic, Foldable acrylic hydrophilic IOL).

A prospective non-randomised study was conducted on 150 patients undergoing cataract surgery in BR Singh Hospital within the time period of January 2017-August 2018. Patients were divided in three groups, 50 in each group. Group A received foldable hydrophobic acrylic IOL, Group B received foldable hydrophilic acrylic and Group C received foldable silicone IOL. They were followed in postoperative period at interval of 6, 12 and 18 months. Patients were clinically examined for best corrected visual acuity (BCVA) by logmar chart. Posterior Capsular Opacification was evaluated as per following grading scale : (1) No PCO, (2) Minimum wrinkling of capsule with a fine layer of Lens Epithelial Cells (LECs), (3) Mild honeycomb PCO, thicker layer of LECs with dense fibrosis, (4) Classic Elschnig's pearl, very thick layer of LECs, (5) Severe opacity with darkening effect.

In 3 groups, most of the patients were in the age group of 66 years to 80 years. Incidence of PCO was maximum in group C (26%) and minimum in group A (8%). Only 4 among 50 patients with hydrophobic IOL developed PCO after 18 months of surgery. In group B 7 patients developed PCO. In group C 13 patients developed PCO and among them 2 have the PCO score of 3 and 4.

Incidence of PCO in hydrophobic IOL is 8%, in hydrophilic group it is 14% and in the silicone group it is 26% that means hydrophobic IOL is least associated with development of PCO. Development of posterior capsular opacification is dependent on the IOL material used. Hydrophobic IOL is associated with least PCO development after 18 months of surgery and silicone IOL are maximally associated with development of PCO.

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Key words : Posterior Capsular Opacity, Cataract, Intraocular Lens.

The crystalline lens is a biconvex, avascular, transparent structure enclosed by a capsule, which is a basement membrane secreted by lens epithelium. The lens is conceptualized as consisting of the nucleus, the central compacted core, surrounded by the cortex. The normal lens is transparent; any congenital or acquired opacity in the lens capsule or substance, irrespective of the effect on vision, is a cataract.

Small incision cataract surgery and the phacoemulsification are modern surgical methods of cataract extraction.

Opacification of the posterior capsule caused by postoperative proliferation of cells in the capsular bag

remains the most frequent complication of cataract-intraocular lens (IOL) surgery^{1,2}. Secondary cataract (PCO) has been recognized since the origin of Extra Capsular Cataract Extraction (ECCE) surgery and was noted by Sir Harold Ridley in his first IOL implantations^{3,4}. The interval between surgery and PCO varies widely, ranging from three months to four years after the surgery. Although, the causes of PCO are multifactorial as reported in several studies⁵, there is an inverse correlation with age. Young age is a significant risk factor for PCO, and its' occurrence is a virtual certainty in paediatric patients⁶⁻⁸.

Visual symptoms do not always correlate to the observed amount of PCO. Visually significant PCO is usually managed by creating an opening within the opaque capsule using the Nd: YAG laser. A surgical posterior capsulotomy may be indicated in children for dense PCO associated with secondary membrane formation.

MATERIALS AND METHODS

A prospective non-randomized study was conducted

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in the period of March 2010-August 2011 on patients undergoing phacoemulsification surgery in BR Singh Hospital. The study protocol has been approved by the institutional ethical committee and scientific committee. Written consent was obtained from patients.

Study Technique :

Patients detected with cataract in the OPD of Department of Ophthalmology in BR Singh Hospital were selected for this study as per the inclusion and exclusion criteria. Patients were evaluated preoperatively by BCVA, applanation tonometry, slitlamp examination, fundus examination and biometry. Total 150 patients were included in the study. They were divided in three groups 50 in each group. Group A received foldable hydrophobic acrylic IOL, Group B received foldable hydrophilic acrylic and Group C received foldable silicone IOL. All eyes underwent an uneventful surgery with posterior chamber IOL implantation. All surgeries were performed by a single surgeon. A clear corneal or scleral temporal incision was made with a 2.8 mm keratome blade. Viscoelastic was used to deepen the anterior chamber and continuous curvilinear capsulorrhexis of 5-6 mm (d) was performed. Hydrodissection and phacoemulsification were done and the cortex was removed with automated irrigation and aspiration. Irrigation and aspiration was done. Viscoelastic was then injected into the bag and in-the-bag implantation of posterior chamber IOL was done. They were followed in postoperative period at interval of 6, 12 and 18 months. Patients were clinically examined for BCVA by logmar chart. Posterior capsular opacification was evaluated as per following grading scale:

- (1) No PCO
- (2) Minimum wrinkling of capsule with a fine layer of LECs.
- (3) Mild honeycomb PCO, thicker layer of LECs with dense fibrosis
- (4) Classic Elschnig’s pearl, very thick layer of LECs
- (5) Severe opacity with darkening effect

Plan for Analysis of Data :

The information obtained from this study was tabulated in a master chart and then statistically analysed, using standard methods like mean, standard deviation and frequency.

Statistical Methods :

Data is expressed as mean ±SD for continuously distributed variables and in absolute numbers and percentages for the discrete variables.

Tests of significance

- (1) Unpaired Student’s t-test
- (2) Chi-square test

- (3) Kruskal–Wallis one-way analysis of variance
- (4) Mann–Whitney U test

ANALYSIS AND RESULT

Table 1 and Fig 1 show the incidence of PCO, developing after 18 months of IOL implantation in different groups of lenses. Incidence of PCO is maximum in group C (26%) and minimum in group A (8%).

Group	Percentage of PCO
A	8%
B	14%
C	26%

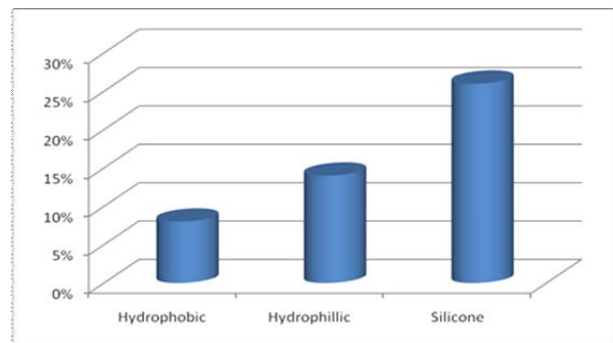


Fig 1 — Incidence of PCO

BCVA after 6 Months :

Table 2 and Fig 2 show the postoperative BCVA in Logmar chart after 6 months of surgery. Here majority of patients had BCVA of 0.3.

Group	0	0.3	0.5	0.6	0.7	0.8	1
A	7	23	11	3	5	1	0
B	4	24	15	2	4	1	0
C	5	26	9	7	1	2	0

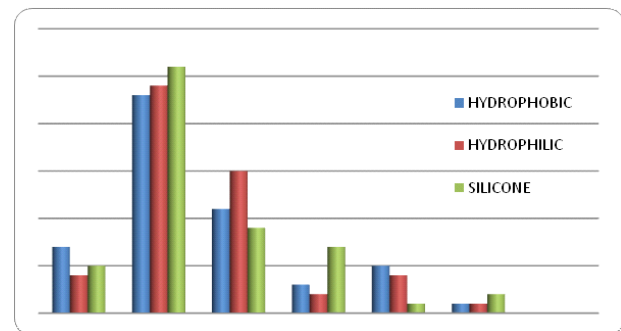


Fig 2 — Postoperative BCVA in Logmar chart after 6 months of surgery

BCVA after 12 Months :

Table 3 and Fig 3 show the postoperative BCVA in Logmar chart after 12 months of surgery. Here majority of patients had BCVA of 0.3.

Table 3 — Postoperative BCVA in Logmar chart after 12 months of surgery

Group	0	0.3	0.5	0.6	0.7	0.8	1
A	9	21	12	2	6	0	0
B	3	25	14	3	4	0	1
C	4	27	9	7	1	2	0

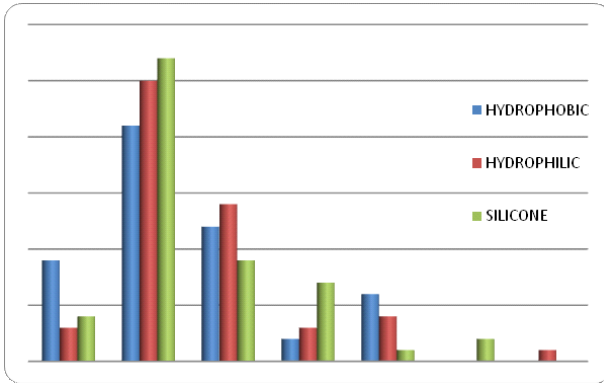


Fig 3 — Postoperative BCVA in Logmar chart after 12 months of surgery

BCVA after 18 Months :

Table 4 and Fig 4 show the postoperative BCVA in Logmar chart after 18 months of surgery. Here majority of patients had BCVA of 0.3.

Table 4 — Postoperative BCVA in Logmar chart after 18 months of surgery

Group	0	0.3	0.5	0.6	0.7	0.8	1
A	9	20	13	3	3	0	0
B	2	24	15	3	4	0	1
C	1	25	13	7	0	2	1

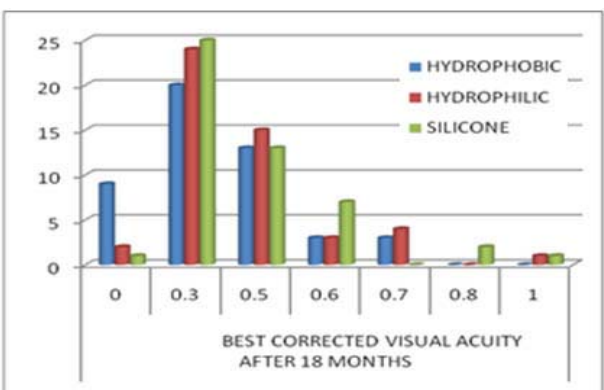


Fig 4 — Postoperative BCVA in Logmar chart after 18 months of surgery

PCO Score after 18 Months in Different IOL Biomaterial :

Table 5 and Fig 5 show distribution of patients according to the PCO score in foldable hydrophobic,

Table 5 — Distribution of patients according to the PCO score

Group	0	1	2	3	4
A	44	3	1	0	0
B	42	6	1	0	0
C	36	6	5	1	1

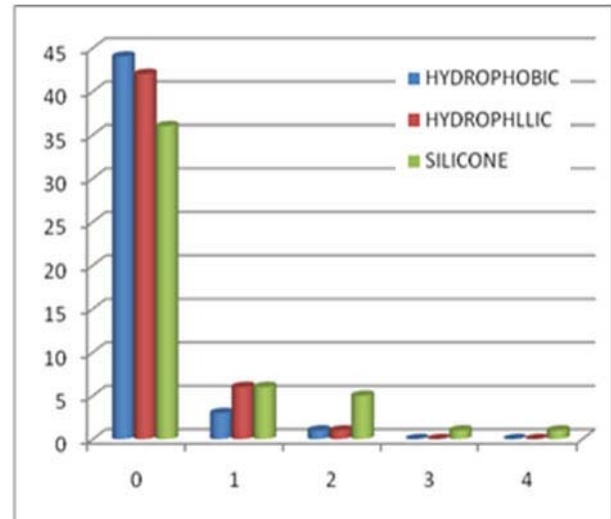


Fig 5 — Distribution of patients according to the PCO score

foldable hydrophilic and foldable silicone IOL after 18 months of surgery as evaluated by the slit-lamp examination. Most of the patients are having PCO score 0. Only 4 among 50 patients with hydrophobic IOL developed PCO after 18 months of surgery. In group B, 7 patients developed PCO. In group C, 13 patients developed PCO and among them 2 have the PCO score of 3 and 4. Applying the Kruskal Wallis statistical test the p value is 0.034 that is statistically significant. This result signifies that the development of PCO is dependent on biomaterial of the IOL. Table 6,7 and Fig 6 show the statistical analysis.

Kruskal-Wallis Test :

Table 6 — Distribution of mean rank of PCO score

Ranks			
PCO_Score	Group	N	Mean Rank
0	A	48	67.44
	B	49	71.51
	C	49	81.43
Total		146	

Table 7 — p value result of PCO score Test Statistics^{a,b}

PCO_Score	
Chi-Square	6.783
Df	2
Asymp. Sig.	0.034
(a) Kruskal Wallis Test	
(b) Grouping Variable : group	

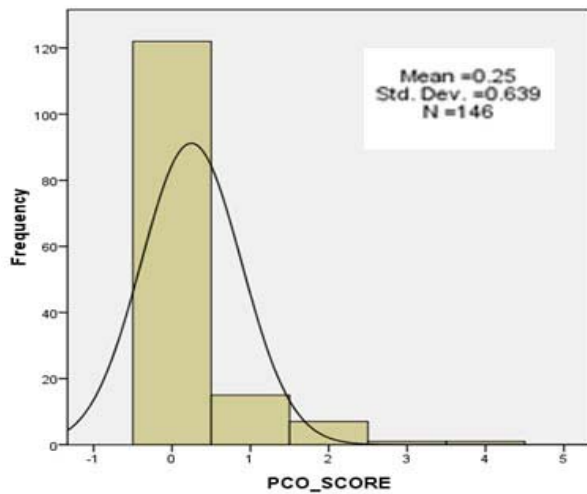


Fig 6 — Frequency of PCO score according to the Kruskal Wallis test

DISCUSSION

Opacification of posterior capsule caused by postoperative opacification of cells in the capsular bag remains the most frequent complication of cataract surgery (Werner L 2000).

In our study the mean age of the patients in group A is 67.42 (SD -7.29), in group B is 67.18 (SD -9.24) and in group C is 67.42 (SD -7.29) with p value of >0.05 which is statistically insignificant and cannot alter the result.

In this study all the three groups had a male female ratio of 3:2 and there is no statistical significance.

In pre-operative evaluation in our study, most of the patients had grade 2 nuclear sclerosis, grade 2 cortical cataract and grade 2 posterior Subcapsular cataract.

There is preliminary evidence that the hydrophobic acrylic IOL biomaterial provides enhanced capsular ‘bioadhesion’ (Linnola R *et al* 1997, Linnola RJ *et al* 2000). They proposed the sandwich theory for explanation of less PCO with hydrophobic IOL material. This is tested in pseudophakic autopsy implanted with PMMA, silicone, hydrophilic acrylic, and hydrophobic acrylic IOLs. Results suggest that fibronectin may be the major extracellular protein responsible for the attachment of hydrophobic acrylic IOL in capsular bag.

In our study the incidence of PCO in hydrophobic IOL is 8%, in hydrophilic IOL is 14% and in silicone IOL is 26%. PCO values of the entire IOL optic area (0.12±0.13 and 0.024±0.02) as well as in the central 3-mm optic zone (0.06±0.11 and 0.001±0.003) was significantly higher in the single-piece hydrophilic acrylic IOL group one year postoperatively (P<0.05). In 33.3% of cases of the single-piece hydrophilic acrylic IOL group, contraction of haptics to IOL optics was present one year postoperatively, which was not present in any case of the single-piece hydrophobic acrylic IOL group⁹.

At 1 year, the hydrophilic acrylic IOL group had a significantly greater percentage area and severity of PCO than the hydrophobic acrylic IOL group (P<0.001)¹⁰.

In our study BCVA assessed by the logmar chart mostly was 0.3 after 6, 12 and 18 months.

In our study PCO score mean is 0.25±0.693 and the p value is 0.034 that is statistically significant (Chi-Square value=6.783, degree of freedom 2). That means development of PCO is dependent on IOL material.

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