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INCIDENCE AND ASSOCIATED FACTORS OF POSTERIOR CAPSULAR OPACIFICATION WITH FOLDABLE ACRYLIC AND PMMA INTRAOCULAR LENS

Ophthalomology

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ABSTRACT

A prospective study was conducted with 60 patients who had undergone cataract surgery, 30 patients each were in group A (PMMA IOL), and group B (Foldable Acrylic intraocular lens-FAL). Posterior capsular opacification (PCO) was evaluated after mydriasis was achieved by topical tropicamide (1%). Data were analysed using Excel Data Analysis Tool and Jamovi 2.3.20 statistical analysis tool. There was no significant difference in the age or gender or time elapsed after the cataract surgery between two groups. In group A, 19 (63.33%) patients and in group B 8(26.67%) patients had shown PCO (p=0.0043). In group-A, 4 (13.33%), patients showed grade1 PCO, and 7 (23.33%) showed grade 2 and grade 3 respectively. Grade 4 was seen in 1 (3.33%). Whereas in group B, 2 (6.67%) patients showed grade 1 PCO, and 6 (20%) showed grade 2.. No patients showed grade 3 and grade 4 PCOs. The distribution of PCO was statistically significant (p=0.0043). The present study indicate that, the probability of developing PCO as well as severity of PCO is higher with the patients who had PMMA-IOL, when compared to those who had FAL.

KEYWORDS

FAL, IOL, PMMA, POC.

INTRODUCTION

During cataract surgery, the opaque natural lens is removed from the posterior chamber and intraocular lens (IOL) is placed generally in the Posterior Chamber (PCIOL) or less frequently in the Anterior Chamber (ACIOL). In spite of the tremendous advancement in the cataract surgery, some people develop posterior capsular opacification (PCO), also called “Secondary cataract” or an "After-cataract". After cataract surgery, posterior capsular cells usually undergo hyperplasia due to the proliferation, migration, and differentiation of residual lens epithelial cells (LECs) onto the posterior capsule, leading to fibrotic or regenerative opacification. This condition can cause visual disturbances such as decreased visual acuity, glare, and contrast sensitivity, necessitating further intervention such as neodymium-doped yttrium aluminum garnet (Nd-YAG) laser capsulotomy.[1]

The type of IOL material and design may play a crucial role in the development of PCO. Foldable Acrylic Lenses (FAL), with their hydrophobic or hydrophilic properties, have been shown to have a lower incidence of PCO compared to rigid PMMA IOLs.[2] The adhesion properties, biocompatibility, and edge design of these lenses influence the interaction between the IOL and the residual LECs. Furthermore, patient-related factors such as age, diabetes mellitus, the degree of intraoperative inflammation and other related comorbidities are also significant contributors to PCO development.

This study aims to investigate the incidence of PCO associated with foldable acrylic (FAL) and PMMA IOLs. By elucidating these associations, we seek to provide insights that could guide the selection of IOL materials and surgical techniques, ultimately improving postoperative outcomes and reducing the need for secondary interventions.

MATERIALS AND METHODS

A prospective non-interventive study in 60 eyes of 60 individuals were enrolled for the study. Of the 60 individuals who had undergone phacoemulsification surgery, 30 patients were in group A comprising of patients with single piece PMMA intraocular lens implantation and 30 patients in group B with single piece hydrophobic Foldable Acrylic intraocular lens (FAL) implantation, were included in the present study conducted at the Department of Ophthalmology, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bangalore-562110, India. Posterior capsular opacification was evaluated after mydriasis was achieved by topical tropicamide (1%).Data were entered into MS Excel sheet, data were analyzed using Excel Data Analysis Tool and Jamovi 2.3.20 statistical analysis tool. Statistical significance was limited by 'P' value < 0.05.

Inclusion Criteria:

All the patients who underwent uneventful phacoemulsification surgery between March to December 2022 with either foldable acrylic or PMMA intraocular lens were included

Exclusion Criteria:

Patients who had post-operative complications such as Posterior Capsule Rupture (PCR) and Zonular Dialysis (ZD) were excluded.

Posterior capsular opacification (PCO) grading system:

The grading system used to record the extent of PCO [3] is given in Table-1.

Table – 1 Posterior Capsular Opacification Grading Scale.

Grade	Posterior Capsular Opacification
0	Clear capsule
1	Low-density peripheral involvement of quarter of the total capsule area
2	Medium-density peripheral involvement of half of the total capsule area
3	High-density total peripheral involvement of capsule area
4	High-density peripheral and central involvement of the capsule area

RESULTS AND DISCUSSION

Age Distribution:

The age of the patients in group A ranged between 38-65 years with mean age of 48.7 ± 7.63 years and in group B ranged between 39-70 years with a mean age of 53.5 ± 9.69 years. There was no statistically significant difference between the mean age of both groups (p=0.656).

Gender Distribution:

The gender of the patients in group A was, females were 15 and males were also 15. In group B females were 14 and males were 16. There was no statistically significant difference in gender between the two groups (p=0.796).

Time Elapsed since Surgery:

The average time elapsed since surgery in group A was 8.31 months (3-12 months). Average time elapsed since surgery for group B was 9.86 months (3-11 months). There was no statistically significant difference found between both the groups (p=0.076).

Incidence of PCO:

Not all the patients had developed posterior capsular opacification (PCO). In group A, 19 (63.33%) patients had shown PCO, while, 11 (36.67%) patients did not show PCO. In group B, 8(26.67%) patients had developed posterior capsular opacification, while 22 (73.33%)

patients did not show any PCO. The difference between the two groups were found to be statistically significant (p=0.0043) (Table-2).

Table – 2 Incidence Of Pco In Two Groups.

PCO	Group-A	Group-B	Chi square P
Yes	19 (63.33%)	8 (26.67%)	0.0043
No	11(36.67%)	22 (73.33%)	Significant

Grades of PCO:

In group-A, the number of patients with grade 1 PCO was found to be 4 (13.33%), patients with grade 2 and grade 3 were 7 (23.33%) each. Patients with grade 4 PCO was found to be 1 (3.33%). Whereas in group B, the number of patients with grade 1 PCO was found to be 2 (6.67%), and grade 2 were 6 (20%). No patients showed grade 3 and grade 4 PCOs. The distribution of PCO was statistically significant in between the two groups (p=0.0043) (Table-3).

Table – 3 Distribution Of Grades Of Pco In Two Groups.

Grades	Group-A	Group-B	P
0	11(36.67%)	22 (73.33%)	0.0043
1	4 (13.33%)	2 (6.67%)	Significant
2	7(23.33%)	6 (20%)	
3	7(23.33%)	0	
4	1(3.33%)	0	

DISCUSSION

Studies have shown that IOL material and design have marked effects on the rate of PCO [4] , anterior capsular opacification [5] as well as the long term IOL centration. [6] After cataract extraction with IOL implantation, the PCO varies significantly depending on the IOL design, optic material and surgical technique. Gold standard material used as IOL is PMMA. Its qualities include being biocompatible, inert and cost effective. Disadvantages include a higher rate of PCO and more astigmatism. Being a rigid IOL, it requires a large wound incision for implantation within the bag. The foldable acrylic lens is the alternate choice. [7,8] The time period between cataract surgery and PCO varies widely ranging from 3 months to 4 years. [9] Such patients develop blurred vision and glare like in cataract before the extraction.

In the present study, In group A, who had PMMA-IOL, 19 (63.33%) patients had shown PCO, and in group B who had FAL, 8(26.67%) patients had developed posterior capsular opacification, The difference in the groups was statistically significant (p=0.0043). Oner et al in their two years study found the PCO rate was 8.7% in acrylic and 24.7% in PMMA groups. [9] In another study by Hennig et al, PCO rate was 36.1% in PMMA groups and 23.3% in FAL at the end of one year. [10] Other investigators like Takkar et al, also opine that there is significant association of PCO with PMMA IOLs. [11] However, Hazra et al found that there was no difference in PCO formation between the rigid and foldable lens designs. [12]

Many investigators have worked on the possible reasons behind the differential influence of IOLs on PCO. Abela et al, [13] opine that the hydrophobic nature of the acrylic lens contributes to the high capsular biocompatibility, which also explains the low PCO rate of FAL as compared to hydrophilic PMMA IOLs. Many experimental studies also have shown that acrylic material shows strong adhesion between the posterior capsule and the acrylic optic. Nagata et al, [14] reported a mean adhesiveness of 2.76 GW for hydrophobic FAL which is three times higher adhesive than hydrophilic PMMA (0.81 GW) with the lens capsule. [14] Hollick et al, [8] at the end of their two-year study, found presence of lens epithelial cells on the posterior capsule of patients with acrylic IOLs to be much lower as compared to PMMA (P=0.001), which corroborates with the clinical finding of less PCO rate in the patients with acrylic IOL. [8]

In the present study, the severity of PCO grade in group A was higher than the group B. The patients in group A (PMMA group) showed all the grades of PCO, wherein, 4 (13.33%) patients showed grade 1, 7 (23.33%) each patients showed grade 2 and grade 3 respectively. Patients with grade 4 PCO was found in 1 (3.33%). Whereas in group B (FAL), the number of patients with grade 1 PCO was found to be 2 (6.67%), and grade 2 were 6 (20%). No patients showed grade 3 and grade 4 PCOs. The difference in PCO was statistically significant in between the two groups (p=0.0043).

CONCLUSION

The present study indicate that, the probability of developing PCO as well as severity of PCO is higher with the patients who had PMMA-IOL, when compared to those who had FAL.

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