Original Article

Posterior Capsular Opacification

A Retrospective Study on the Principal of "No Space-No Cell" to Reduce Epithelial Cell Proliferation Resulting in Reduced Posterior Capsular Opacification Following Cataract Surgery

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ABSTRACT

Objective: To identify achievable factors that can lead to reduction in incidence of posterior capsular opacification by control of postoperative epithelial cells proliferation and migration by good anatomic relation of IOL in the capsular bag.

Study Design: Retrospective study

Place and Duration of Study: This study was conducted at the Multan Medical and Dental College and Bodla Eye Care, Multan from August 2016 till July 2018.

Materials and Methods: A retrospective study performed at Multan Medical and Dental College and Bodla Eye Care, Multan on patients who had cataract extraction with intra ocular lens implant procedure by two surgeon. Retrospective analysis of 250 Eyes of 137 male and 113 female patients, who underwent phacoemulsification on ALCON, Infiniti system was done. Posterior chamber lens used was ALCON MA30AC multipiece posterior chamber lens with optic size of 6.0mm and over all length of 13.0 mm. Its a modified C-loop lens with anterior asymmetric biconvex configuration. Patients were followed up and incidence of posterior capsular opacification was observed, retrospectively for two years.

Results: A total of 250 patients were included in the study who completed the desired follow up span of 24 months to identify the incidence for posterior capsular opacification. Sex incidence shows 55% male and 45% females. Among different types of cataracts, 133 were cortical (53.2%), 65 Nuclear (26%), and 52 posterior capsular (20.8%) Incidence of PCO, after a follow-up period 24 months, was observed to be 15.2%. In first 6 months, only 4 patients (<2%) presented with posterior capsular opacification , while in 12 months 8 males and 2 females (4%) developed posterior capsular opacification . In 18 months period, number of patients with posterior capsular opacification increased to 16 males and 8 females (9.6%), and finally at 24 months, out of 137 males, 14 developed , posterior capsular opacification and out of 113 females, 5 developed posterior capsular opacification. Thus in 24 months, out of 250 eyes, 38 eyes developed posterior capsular Opacification, bringing an overall incidence to 15.2%.

Conclusion: Our study looked at the surgical techniques and factors pivotal to reduce incidence of posterior capsular opacification in patients undergoing cataract surgery. We believe that use of ALCON MA30AC multipiece posterior chamber lens with optic size of 6.0mm and overall length of 13.0 mm provided greater surface area of optic in contact with posterior capsule and is still a valid alternative to single piece PMMA lenses. Its overall length keeps the capsular bag taut with a symmetrical stretch, not allowing wrinkles formation. Thus a well fitted IOL, with atraumatic surgery, complete cortical clean up, and posterior capsular polishing, delays PCO by contact inhibition and barrier effect, to epithelial cells proliferation, and migration, on the principal of "No space No cells.

Key Words: Cataract Extraction. Posterior Capsular Opacification, Intraocular Lens.

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INTRODUCTION

Posterior capsular opacification (PCO), is a major persisting complication of phaco emulsification cataract surgery.[1] Severe opacification, which impairs visual function, should be rare within the first three months, following cataract surgery, and has a higher incidence in younger patients[2]. Time to, onset of opacification, following cataract surgery is variable, as is the frequency of YAG capsulotomies performed[1]. Etiologic and pathogenic factors of PCO include the proliferation and migration of remnant lens epithelial cells that can form pearls, or fibrosis on the posterior lens capsule[3, 1] Posterior capsular opacification may be reduced by thorough cortical clean-up[4] and atraumatic surgery, thus reducing inflammation from excessive disruption of the blood-aqueous-barrier[3, 1.] There are other note able

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mechanisms of posterior capsular opacification that includes ,proliferation/migration of residual lens epithelial cells (Equatorial cells) [5,] ,remnants of lens epithelial cells beneath the anterior capsule edge (Cuboidal cells),fibrous dysplasia of residual lens epithelial cells observed in pseudo exfoliation and other pathologies, causing weakened zonules[6], capsulorhexis opening is of the same size or larger than, the optic diameter[7] and last but not the least is blood-aqueous barrier disruption causing fibrin formation[3] and migration of sells on posterior capsule.

Capsular opacification is primarily classified as anterior and posterior. In our study we primarily aim to address the latter type as this is the main limiting factor in compromised visual acuity post cataract extraction. Posterior capsular opacification has been referred to secondary cataract in many previous studies. It can present primarily as fibrous changes, pearl formation or a combination of both.

In the past studies a very important limiting factor mentioned is adequate placement of intraocular lens with posterior capsule. .[7,8] In our study, surgeons ensure to follow the desired techniques to achieve the optimum balance without damaging posterior capsule. [9,10] It was ensured that viscoelastic is removed behind the posterior lens surface in order to decrease the potential space for cell migration. The choice of lens again is to enhance the firm placement of optic in order to achieve the desired "no space, no cells" effect.

MATERIALS AND METHODS

This is a retrospective interventional non-comparative study of 250 eyes who underwent cataract surgery by phaco emulsification. Surgical platform used at both centres was ALCON Infiniti microsurgical system. Intraoperative use of disposables was standardised to ALCON 2.75 mm keratome and ALCON Provisc as the choice of viscoelastic material. It was ensured to achieve a complete cortical cleanup and posterior capsular polishing was performed in required cases using polishing mode of ALCON Infiniti surgical platform. At the end of every surgery it was ensured that optic is appropriately centred in the capsular bag. Patients with anterior or posterior capsular rent were excluded from the surgery.

Patients had a standardized follow up planned on day 1, month 1 and afterwards eight quarterly visits spanned over a period of two years. Patients had a visual acuity check using snellen chart, followed by dilated slit lamp assessments. Development of posterior capsular opacification was identified by clinical assessment of posterior capsule. Regardless of visual acuity , taking in to account other contributing factors as cystoids macular oedema, diabetic maculopathy etc ,clinical development of Elsching's pearls formation, and or capsular fibrosis is taken as the bench mark for the development of posterior capsular opacification. Retrospective analysis was done from the data collected from a period of two years from August 2016 till July 2018.

RESULTS

A total of 250 patients were included for data collection. Age range was from 34 to 78 years. Exclusion criteria was any per or postoperative complications as well as patients who lost to follow up. Out of total number of patients there were approx 55% male and 45% female patients. Among different types of cataracts, 133 were cortical (53.2%), 65 Nuclear (26%), and 52 posterior capsular (20.8%). Incidence of PCO, after a follow-up period 24 months was identified using slip lamp retroillumination system. Total incidence was observed to be 15.2%. Incidence gradually increased over a period of two years starting from 2% in first six months to reaching 15.2% over a period of two years. The incidence of capsular opacification mentioned in different studies is from as low as <5% to as high as 50%, hence our rate was in accordance with the documented data.

MA30AC proved to be a good choice of intraocular lens implant as practically none of the patients had any noticeable postoperative optic displacement. Intraocular lens centration was found to be very adequate.

DISCUSSION

Posterior Capsular Opacification usually causes a visual acuity decrease by direct blockage of the visual axis. [11]Range of the complaints of Posterior Capsular Opacification can be very variable. [12] Some patients with severe Posterior Capsular Opacification have no complaints while other with minimal have more difficulty. [11,14] Most cases of clinically significant Posterior Capsular Opacification are caused by postoperative proliferation and migration of residual epithelial cells and their derivatives after cataract surgery. Cells having the potential to produce significant opacification and visual reduction are cuboidal, anterior epithelial cells and epithelial cells at the equatorial lens bow, that have significant mitotic activity.[12,15] Posterior Capsular Opacification can be caused by fibrosis (cuboidal epithelium), epithelial pearl formation (equatorial epithelium), or generalised haze.[16] Fibrosis is due to transformation of macrophages to fibroblasts and occurs even if the posterior capsule is opposed to the lens optic. [17] Contact between the optic and the posterior capsule frequently acts, as a barrier to epithelial cells migration, as germinal epithelial cells attempt to spread across the capsule. [18] A major goal of surgeons is to control the postoperative proliferation and migration of lens epithelial cells that may lead to Posterior Capsular Opacification. [14,19] Most cases of clinically significant Posterior Capsular Opacification occurs more frequently after cataract extraction without intra ocular

lens implantation than in eyes with intra ocular lens in place, and the amount of Posterior Capsular Opacification can vary considerably with the design and configuration of the intra ocular lens. [20,21] There is an important relationship between the posterior aspect of the IOL optic and the adjacent posterior capsule in providing a mechanical barrier to migration of epithelium into the visual axis. [19,22] A well fitted intraocular lens delays Posterior Capsular Opacification by contact inhibition and barrier effect. Lenses that are too small would not keep the back taut, causing many extra folds in the capsule. Overall large lenses stretch the capsule producing wrinkles allowing epithelial cells to migrate and cause PCO. [20,22] The clinical and laboratory findings provide strong evidence that the concepts of a barrier effects and ''No space No cells" defined in terms of the anatomic relation of the IOL to the surrounding capsular compartment, are valid and important in understanding the pathogenesis, and prevention of at least some forms of Posterior Capsular Opacification. [18] Authors believe that despite of most modern single piece PMMA lenses, multipiece options as MA30AC holds its value with an optic size of 6.0 mm, greater over all length and a C-loop haptic design to keep capsular bag taught.[7,22] It ensures minimal cell migration from periphery to centre and a symmetrical stretch of the capsular bag not allowing wrinkles formation. A well fitted intraocular lens with atraumatic surgery, complete cortical clean up , and posterior capsular polishing, delays PCO by contact inhibition and barrier effect, to epithelial cells proliferation, and migration, on the principal of "NO space No cells".

CONCLUSION

In conclusion Posterior Capsular Opacification still remains a challenge in modern day surgery. The aim to have a clear posterior capsule still remain a top priority. In our study we have tried to high light the possible avoidable causes that can be practiced in less than ideal third world settings as in our country to reduce the incidence of posterior capsular opacification. The choice of intraocular lens remains pivotal as well as the stress on optimum surgical techniques as capsule polishing and reduction of optic and posterior capsule interface.

Author's Contribution:

Concept & Design of Study:	Ali Afzal Bodla
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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