



## Prospective study for the evaluation of etiology of posterior capsular opacification formation in patients after cataract surgery

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### Abstract

**Background:** Posterior capsular opacification (PCO) is the most common late complication of cataract surgery. Once PCO start covering pupillary area patient complain of blurry vision. This can be treated by using laser or surgical capsulotomy.

**Aim:** The aim of the study proposed is to evaluate the most likely cause of PCO formation and role of Neodymium: Yttrium Aluminum Garnet Laser capsulotomy in its management in patients presenting with PCO, operated at the Department of Ophthalmology MGMMC, Indore.

**Methods:** A prospective observation study was conducted on 600 patients (600 eyes) who underwent cataract surgery by small incision cataract surgery technique at MYH Indore. PCO formation at 6 month postoperatively and role of Neodymium: Yttrium Aluminum Garnet Laser capsulotomy in its management was evaluated.

**Result:** In our study we found that, most of the patients who developed PCO were either suffering from any systemic illness like Diabetes or have any ocular pathology, which correlates with other studies on PCO development. Clinically significant PCO was found in 226 patients (37.66%) and were treated with Nd YAG capsulotomy.

**Conclusion:** PCO develops early in patients with some systemic illness, if the IOL is fixed in sulcus, in ocular pathology like pseudoexfoliation syndrome. Its prevention includes accurate hydrodissection, removing of cortical mass, polishing of capsule and intracapsular fixation of lens, control of post-operative inflammation.

**Keywords:** Posterior Capsular Opacification, Cataract surgery, Nd-YAG capsulotomy.

### Introduction

Cataract is the most common cause of blindness after 50 years of age and it is treatable. Sushruta treated cataract by the technique of couching.

Previously intracapsular cataract extraction (ICCE) was the only option, where the whole lens along with the entire capsule was extracted. In this

method, the lens epithelial cells (LECs) were completely removed but there were no capsule left for IOL implantation.

Extra capsular cataract extraction (ECCE) gained popularity in 1980's, it preserved posterior capsule permitting IOL insertion, the learning curve is easy but incision of 10-11 mm with suture is

required. Small incision cataract surgery (SICS) is a good alternative. Phacoemulsification further reduces the size of incision.

Posterior capsular opacification (PCO) is the most common late complication of modern cataract surgery occurring in approximately 50 % of patients within 2 years post operatively<sup>1,2,3</sup>. The first IOL implantation was performed by Sir Harold Ridley in 1950, since then the technology has undergone a variety of improvement that reduces the incidence of PCO.

PCO is caused by lens epithelial cells that remain in the capsular bag after cataract surgery. They migrate, proliferate and transform to produce PCO. When it encroaches over the pupillary area, it leads to light scattering and visual deterioration<sup>4</sup>. PCO development is age dependent occurs more in younger patients<sup>5,6,7</sup>. It is managed by creating opening (capsulotomy) within opaque posterior capsule using Neodymium-doped yttrium aluminum garnet (Nd: YAG) laser. With more advanced technique and IOLs the rate of PCO and its treatment has reduced to less than 10 %

### Material and Methods

A prospective study of 600 patients (600 pseudophakic eyes), selected randomly of either sex attending OPD who underwent SICS with PMMA PCIOL, was conducted. Patients were thoroughly examined.

On follow up of patients on 1st, 3rd and 6 months postoperatively, the following parameters were examined:

- Distant and near visual acuity, unaided and aided
- Slit lamp Biomicroscopy for evaluation of anterior segment
- Direct and Indirect ophthalmoscopy to assess media clarity and retinal pathology
- PCO was determined by calculating the area of opacity from retro-illumination image.
- Patients were asked for history of systemic illness

A detailed history of any systemic illness or long-term medication is asked to the patient. History of any operative complication/event is asked for.

After thorough examination Nd: YAG laser capsulotomy was done in cases with visually significant PCO and the patients were put on topical antiglaucoma medication and steroid for a week and reviewed thereafter for visual acuity assessment and refractive correction if required.

### Results

A total of 600 patients were evaluated on postoperative 6th month, which underwent cataract surgery. Out of which 237 patients complained of blurry vision. After thorough examination it was found that 228 patients were having PCO formation out of which 226 patients were having clinically significant PCO development. On examination it was found that 12 patients had dry age related macular degeneration (ARMD), 3 patients were having both ARMD and PCO. It was found that about eighty-seven (87) patients had residual lens matter after cataract surgery on their follow up. Twenty-one (21) patients were having IOL capture with fibrous type of PCO suggesting implantation of lens in sulcus, predispose PCO formation. 93 patients with PCO on history found to be suffering from diabetes, out of which 11 patients had diabetic retinopathy of various grades and some degree of Macular edema. 23 patients had posterior synechiae suggestive of uveitis.

226 patients who had clinically significant PCO were treated with Nd-YAG laser and their pupillary area was cleared. They were put on anti-glaucoma and steroid eye drops for a week and on their follow up on 7th day, they were examined with slit lamp for any residual PCO and refractive correction was given, if required. It was found that thick PCO (2 patients) were not satisfactorily treated with Nd-YAG, in such patients needle capsulotomy was planned.

**Table 1:** Findings and Counts of PCO Patients

On examination	No.of patients
Cortical matter	87
Synechiae	23
Diabetic	93
PXS	4
IOL in sulcus	21
Total	228

Note: Two diabetic patients were not having visually significant PCO.

### Discussion

Visually significant PCO develops in more than 25% of patients having undergone SICS with PCIOL implantation in first 6 months after surgery. Patients suffering with diabetes, uveitis, having some residual lens matter postoperatively, having IOL in sulcus was prone to PCO development. Some studies correlate a large incision with increased post-operative blood-aqueous barrier damage and thus increased risk of PCO formation<sup>8</sup>. Ebihara et al 2007, in his study concluded that diabetic patients had significantly more severe PCO after cataract surgery than non-diabetic patients<sup>9</sup>.

Cortical cleaving hydrodissection of nucleus, followed by its rotation during SICS results in removal of maximum lens fibers and epithelial cells at the equator of the capsular bag, thereby reducing chances of PCO. By freeing and rotating the lens nucleus and cortex removal without zonular-capsular rupture.<sup>10,11</sup>

Yinglei Zhang, MD et al 2017, concluded that PCO formation is the most common complication after cataract surgery in patients associated with uveitis<sup>12</sup>. Michael Kuchle, et al 1997, concluded that increased frequency of secondary cataract could be considered as another potential complication of cataract surgery in eyes with PEX<sup>13</sup>.

In the bag fixation of lens occurs in majority of patients followed by SICS. In cases where one or both haptics are not placed in capsular bag, a potential space is created allowing a way for cells

to grow posteriorly towards the visual axis. In the bag placement of IOL in SICS creates a barrier effect of IOL which results in hindrance to migration of equatorial lens epithelial cells over posterior capsule. Nishi et al support a physiological barrier to cellular migration through the phenomenon of contact inhibition and this factor certainly play a role in prevention of PCO<sup>14</sup>. Donald T.H et al, in his article showed that in the sulcus IOL develops PCO earlier as compared to in the bag IOL<sup>15</sup>.

Central PCO obscuring the visual axis can be treated with either surgical intervention such as posterior capsule scraping or with a non-surgical neodymium: YAG (Nd: YAG) laser capsulotomy. The clinical complications from Nd: YAG laser capsulotomy includes a rise in intraocular pressure, glaucoma, cystoid macular edema, and retinal detachment<sup>16</sup>.

### Conclusion

PCO remains the most common late complication of uneventful cataract surgery and Nd-YAG capsulotomy is an excellent way to treat it. At present, meticulous use of surgical techniques remain the mainstays for retarding the development of post-operative posterior capsule opacification in humans.

### References

1. Schmidbauer JM, Vargas LG, Apple DJ, Escobar-Gomez M, et al. Valuation of neodymium: yttrium-aluminum-garnet capsulotomies in eyes implanted with Acry Sof intraocular lenses. *Ophthalmology*. 2002 Aug;109(8):1421.
2. Dholakia SA, Vasavada AR. Intraoperative performance and longterm outcome of phacoemulsification in age-related cataract. *Indian J. Ophthalmol*. 2004 Dec;52(4):311.
3. Thompson AM, Sachdev N, Wong T, Riley AF, et al. The Auckland Cataract Study: 2 year postoperative assessment of aspects of clinical, visual, corneal

- topographic and satisfaction outcomes. Br. J. Ophthalmol. 2004 Aug;88(8):1042.
4. Buehl W, Sacu S, Findl O. Association between intensity of posterior capsule opacification and visual acuity. J. Cataract Refract Surg. 2005 Mar;31(3):543.
  5. Wormstone IM, Liu CS, Rakic JM, Marcantonio JM, et al. Human lens epithelial cell proliferation in a protein-free medium. Invest Ophthalmol. Vis. Sci. 1997;38:396.
  6. Pandey SK, Ram J, Werner L, Brar GS, et al. Visual results and postoperative complications of capsular bag and ciliary sulcus fixation of posterior chamber intraocular lenses in children with traumatic cataracts. J. Cataract Refract Surg. 1999;25:1576.
  7. Dholakia SA, Vasavada AR, Singh R. Prospective evaluation of phacoemulsification in adults younger than 50 years. J. Cataract Refract Surg. 2005 Jul;31(7):1327.
  8. Cobo LM, Ohsawa E, Chandler D, Arguello R, et al. Pathogenesis of capsular opacification after extracapsular cataract extraction. An animal model. Ophthalmology. 1984;91:857.
  9. Yoko Ebihara, Satoshi Kato, Tetsuro Oshika, Mayumi Yoshizaki, Gentaro Sugita . J Cataract Refract Surg. 2006 Jul; 32(7): 1184–1187. doi: 10.1016/j.jcrs.2006.01.100
  10. Vasavada AR, Raj SM, Johar K, Nanavaty MA. Effect of hydrodissection alone and hydrodissection combined with rotation on lens epithelial cells: surgical approach for the prevention of posterior capsule opacification. J. Cataract Refract Surg. 2006 Jan;32(1):145.
  11. Johar K, Vasavada AR, Praveen MR, Nishi O. Confirmation of the presence of lens epithelial cells in the anterior chamber post phacoemulsification.
  12. Zhang Y, Zhu X, He W, Jiang Y, Lu Y. Efficacy of cataract surgery in patients with uveitis: A STROBE-compliant article. Desapriya. E, ed. Medicine. 2017;96(30):e7353. doi:10.1097/MD.0000000000000735
  13. Küchle M, Amberg A, Martus P, et al. Pseudoexfoliation syndrome and secondary cataract .British Journal of Ophthalmology 1997;81:862-866
  14. Nishi O, Nishi K, Preventing posterior capsule opacification by creating a discontinuous sharp bend in the capsule. J Cataract Refract surg 1999; 29: 587-97.
  15. Journal of Cataract & Refractive Surgery, ISSN: 0886-3350, Vol: 19, Issue: 4, Page: 471-480 , 1993
  16. Billotte C, Berdeaux G. Adverse clinical consequences of neodymium: YAG laser treatment of posterior capsule opacification. J. Cataract Refract Surg. 2004 Oct;30(10):2064.