

Posterior capsule opacification after cataract extraction in patients with an acute attack of phacomorphic angle-closure

Chong Fai Chung,¹ MRCSEd, Jimmy S. M. Lai,^{1,2} FRCS, FRCOphth, MD, Dennis S. C. Lam,^{1,2} MD, FRCS, FRCOphth

¹Department of Ophthalmology, United Christian Hospital, Hong Kong, China.

²Department of Ophthalmology and Visual Sciences, The Chinese University of Hong Kong, Hong Kong, China.

Correspondence and reprint requests:

Jimmy S. M. Lai, Department of Ophthalmology, United Christian Hospital, Hip Wo Street, Kwun Tong, Kowloon, Hong Kong, China.

Abstract

Aim: To report the rates of posterior capsule opacification after cataract extraction in patients with acute phacomorphic angle-closure attack.

Patients and methods: A retrospective case-series study to evaluate the rate of posterior capsule opacification after cataract extraction and posterior chamber intraocular lens implantation was performed in 29 consecutive patients with an acute phacomorphic angle-closure attack. Posterior capsule opacification was defined as the presence of a thickened posterior capsule under slit-lamp examination causing impaired visual acuity that warranted neodymium:YAG laser posterior capsulotomy. Factors including diabetes mellitus, method of cataract extraction, and intraocular lens material were analyzed.

Results: In this series of 29 eyes with an acute phacomorphic angle-closure attack, the posterior capsule opacification rate after cataract extraction and posterior chamber intraocular lens implantation was 10.3% with a mean follow-up of 22.0 ± 14.1 months. No statistically significant association was found between posterior capsule opacification and diabetes mellitus, method of cataract extraction, and the material of the intraocular lens (Fisher's exact test).

Conclusion: The reported posterior capsule opacification rate in this series of patients with an acute attack of

phacomorphic angle-closure was 10.3% after cataract extraction and posterior chamber intraocular lens implantation.

Key words: Acute, Angle-closure, Posterior capsule

Introduction

Posterior capsule opacification (PCO) is one of the common complications after cataract surgery and causes glare and a decrease in visual acuity and contrast sensitivity. A meta-analysis has found the rate of PCO to be 11.8% at 1 year, 20.7% at 3 years, and 28.4% at 5 years after cataract surgery, and up to 38.0% of patients with PCO required neodymium:YAG (Nd:YAG) laser capsulotomy.¹ This implies a higher cost for the management of cataract patients. Moreover, Nd:YAG capsulotomy is associated with potential complications, including post-laser intraocular pressure (IOP) spike, damage to the intraocular lens (IOL), rupture of the anterior hyaloid face, cystoid macular edema, and retinal detachment.²

In an acute attack of phacomorphic angle-closure, the drainage angle is closed by the large cataractous lens. During the attack, the IOP is markedly elevated and the eye is acutely inflamed. The initial treatment is to lower the IOP with medications. The definitive treatment is removal of the lens. Eyes with pre-existing and prolonged intraocular inflammation are associated with a higher rate of PCO after cataract

extraction.³ The PCO rate in eyes that have undergone an acute attack of phacomorphic angle-closure has not been reported although in an acute attack, the inflammation is only transient without chronic breakdown of the blood-aqueous barrier as in chronic uveitis. The purpose of this study was to evaluate the rate of PCO after cataract extraction and posterior chamber intraocular lens (PCIOL) implantation in eyes that had suffered an acute attack of phacomorphic angle-closure.

Patients and methods

This was a retrospective case-series study. The medical records of consecutive patients with acute phacomorphic angle-closure who had cataract extraction at the United Christian Hospital and the Prince of Wales Hospital between January 1997 and November 2002 were reviewed. Exclusion criteria included past history of uveitis, history of previous intraocular surgery, cataract extraction combined with trabeculectomy, intraoperative complication of posterior capsular tear, and a follow-up period of less than 6 months. The diagnosis of acute phacomorphic angle-closure was made clinically, based on the following signs and symptoms:

- acute ocular pain with or without associated headache, nausea, and vomiting
- decrease in vision
- corneal edema with a semi-dilated pupil and injected conjunctiva
- IOP >40 mm Hg
- angle-closure in the presence of a mature or intumescent cataract.

The standard treatment given to all these patients included systemic acetazolamide, topical β -blocker, topical prednisolone acetate 1% 4 times a day until cataract extraction, or intravenous mannitol if the IOP was not controlled with acetazolamide and topical β -blocker. All patients had their IOPs lowered to <21 mm Hg within 3 hours.

Cataract extraction by either phacoemulsification or extracapsular cataract extraction (ECCE) with PCIOL implantation was performed for all eyes 1 to 11 days (mean, 4.2 \pm 3.1 days) after remission of the acute attack. In phacoemulsification, a corneal wound was used and capsulorrhexis of an average size of 6 mm was performed. In ECCE, a limbal wound was used and can-opening capsulotomy of an average size of 6 mm was performed. No capsule stain was performed in any of the patients. Posterior capsule polish was performed only if visible cortical remnants adhered to the capsule. Postoperatively, topical chloramphenicol 0.5% 4 times daily and topical prednisolone acetate 1% 8 times daily were prescribed for at least 2 weeks and topical chloramphenicol 0.5% plus topical dexamethasone 0.1% 4 times daily were continued for another 6 weeks. In the control group, topical chloramphenicol 0.5% plus topical dexamethasone 0.1% 6 times daily was given for 4 to 6 weeks. Significant PCO was defined as the presence of a thickened posterior capsule under slit-lamp examination causing impaired visual acuity that warranted Nd:YAG capsulotomy. Medical history of diabetes mellitus (DM), the

type of cataract surgery, and the type of IOL implanted were analyzed. Fisher's exact test was used to detect any significant association between the 2 categorical data.

Results

The medical records of 32 patients were reviewed. Twenty nine eyes of 29 patients (17 women and 12 men) with a mean age of 79.3 \pm 7.6 years and a history of acute phacomorphic angle-closure attack, cataract extraction, and PCIOL implantation were recruited. Two patients defaulted follow-up after 4 months and 1 patient did not have PCIOL implantation after cataract extraction because of no light perception (NLP) at presentation. These 3 patients were excluded. The visual acuity during the acute attack of phacomorphic angle-closure ranged from light perception to 0.2 and the mean presenting IOP was 52.6 \pm 9.8 mm Hg. The mean duration of the attack determined by the onset of symptoms was 4.2 \pm 3.1 days. The visual acuity at the last follow-up visit ranged from NLP to 0.7. The cause of NLP in 2 eyes was uncontrolled chronic angle-closure glaucoma (CACG). The mean IOP at the last follow-up was 15.4 \pm 9.9 mm Hg. Eight eyes developed CACG requiring antiglaucoma medications to control the IOP. Twenty two patients had ECCE and PCIOL implantation (75.9%) and 7 patients had phacoemulsification and PCIOL implantation (24.1%). Four patients had additional procedures performed apart from phacoemulsification or ECCE and PCIOL implantation.

With a mean follow-up time of 22.0 \pm 14.1 months, 3 patients (10.3%) developed visually significant PCO, 1 at 10 months and 2 at 30 months, after the cataract surgery. All 3 patients had ECCE and polymethylmethacrylate (PMMA) PCIOL implantation. Regarding the type of PCIOL, 22 patients had PMMA (Pharmacia 722C[®], Groningen BV, The Netherlands) and 7 patients had acrylic (Alcon MA30BA[®] and MA60BM[®], Fort Worth, USA) lenses implanted. Among the 29 patients, 3 had DM, 1 of whom developed significant PCO. **Table 1** summarizes the characteristics of patients who developed significant PCO. Using Fisher's exact test, no significant association was found between the method of cataract extraction (p = 0.42), type of IOL (p = 0.42), DM (p = 0.27), and PCO (**Table 2**).

Patient number	1	2	3
Age (years)	80	83	69
Sex	Female	Male	Male
Laterality	Left	Left	Left
Diabetes mellitus	No	No	Yes
Type of surgery	ECCE	ECCE	ECCE
IOL implanted	PMMA	PMMA	PMMA
Time of PCO detection (months)	30	10	30

Abbreviations: ECCE = extracapsular cataract extraction; IOL = intraocular lens; PMMA = polymethylmethacrylate; PCO = posterior capsule opacification.

Table 2. Association between type of surgery, intraocular lens, diabetes mellitus, and posterior capsule opacification.

	PCO	No PCO	p Value (Fisher's exact test)
Type of surgery			0.42
ECCE	3	19	
Phacoemulsification	0	7	
IOL material			0.42
PMMA	3	19	
Acrylic	0	7	
Systemic disease			0.27
Diabetes mellitus	1	2	
No diabetes mellitus	2	24	

Abbreviations: PCO = posterior capsule opacification; ECCE = extracapsular cataract extraction; IOL = intraocular lens; PMMA = polymethylmethacrylate.

Discussion

The pathogenesis of PCO involves the proliferation of lens epithelial cells that remain in the capsular bag. Cytokines, including basic fibroblast growth factor, transforming growth factor β , interleukin-1 (IL-1), and IL-6 have been implicated in the pathogenesis of PCO.⁴ As cytokines are important influential factors for PCO, diseases such as DM, uveitis, and pseudoexfoliation syndrome that alter the blood-aqueous barrier may be implicated in PCO formation.³ In an acute attack of phacomorphic angle-closure, there is increased intraocular inflammation. The blood-aqueous barrier could have been altered even before cataract extraction. Besides, visualization of the anterior segment during cataract operation may not be optimal in eyes with persistent corneal edema. Removal of the lens cortex may be less complete in these eyes than in eyes with senile cataract. This may further increase the chance of PCO formation as a more thorough cortical cleanup is associated with a lower rate of PCO.⁵ However, the rate of PCO in our series was 10.3% with a mean follow-up of 22 months and is not higher than the reported figures.¹ The high dose of pre- and postoperative steroid eye medication may play a role in the prevention of PCO. Corticosteroids can downregulate the production of inflammatory molecules such as IL-1, IL-6, tumor necrosis factor- α , and molecules for remodeling such as collagenase. Different stages of the immune response are modulated including antigen processing, and penetration of basement membrane by antigen-antibody complex, macrophage activity, delayed hypersensitivity, and T cell-mediated cytotoxicity. A

controlled study comparing the PCO rates in acute phacomorphic angle-closure treated and not treated with topical steroids is needed to delineate the role of steroids in the prevention of PCO.

DM has been found to have conflicting results in association with PCO. In our series, there was no significant difference in the rate of PCO in patients with and without DM. As ECCE causes more postoperative inflammation than phacoemulsification, the PCO rate may be higher in ECCE than in phacoemulsification. However, we could not find any significant association between the method of cataract extraction and PCO. Concerning the IOL material, acrylic IOL has been found to be associated with less PCO than PMMA or silicone IOLs. In our study, none of the patients with acrylic IOLs implanted developed PCO. Statistical analysis did not show a significant association between PMMA IOL and PCO. It is important to take into consideration the small sample size when interpreting the statistical results.

The unique feature of this study is that all the patients with acute phacomorphic angle-closure received standard initial treatment before extraction of their cataract. This includes rapid lowering of their IOP with medications and control of the inflammation with intensive topical steroids. The weaknesses of this study include multiple surgeons who might have different posterior capsule cleaning techniques, different types of PCIOL used, mixed techniques of phacoemulsification and ECCE, and a relatively small sample size. Thus, the presence of PCO was subjected to error from subjective observation. Furthermore, there was no control group for comparison. We have attempted to compare the PCO rate within a group of sex- and age-matched patients with cataract. However, besides the phacomorphic disease itself, the 2 groups of patients differed in many aspects in their pre- and postoperative management, especially with reference to the dose of topical steroid used. Thus, direct comparison proved difficult. Nevertheless, our study has demonstrated that in a group of patients with an acute attack of phacomorphic angle-closure, the PCO rate after cataract extraction (phacoemulsification or ECCE) with PCIOL implantation was 10.3% with a mean follow-up of 22 months. The fact that an acute phacomorphic angle-closure attack causes only transient intraocular inflammation, the intensive pre- and postoperative topical steroid regimen, and the fact that the eyes were operated 1 to 11 days after the attack when the inflammation had subsided all contributed to the reported PCO rate.

References

1. Schaumberg DA, Dana MR, Christen WG, Glynn RJ. A systemic overview of the rate of posterior capsule opacification. *Ophthalmology* 1998;105:1213-1221.
2. Steinert RF, Puliafito CA, Kumar SR, Dudak SD, Patel S. Cystoid macular edema, retinal detachment, and glaucoma after Nd:YAG laser posterior capsulotomy. *Am J Ophthalmol* 1991;112:373-380.
3. Krishna R, Meisler DM, Lowder CY, Estafanous M, Foster RE. Long term follow-up of extracapsular cataract extraction and posterior chamber intraocular lens implantation in patient with uveitis. *Ophthalmology* 1998;105:1765-1769.
4. Meacock WR, Spalton DJ, Stanford MR. Role of cytokines in the pathogenesis of posterior capsule opacification. *Br J Ophthalmol* 2000;84:332-336.
5. Apple DJ, Peng Q, Visessook N et al. Surgical prevention of posterior capsule opacification: part 1: progress in eliminating this complication of cataract surgery. *J Cataract Refract Surg* 2000;26:180-187.