e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(2); 532-535

Original Research Article

The Efficacy and Safety of Primary Posterior Curvilinear Capsulorhexis in Adult Patients with Cataract: A Retrospective Study

M.V.D.L. Sathyanarayana[1], Sajja Aruna Kumari[2], P. Mallikarjun Raju[3], M. Kiranmai[4], M.S. Raju[5], B. Architha[6]

[1]Associate Professor, Department of Ophthalmology, GGH Eluru, A.P., India
[2]Assistant Professor, Department of Ophthalmology, GGH Eluru, A.P., India
[3]Assistant Professor, Department of Ophthalmology, GGH Eluru, A.P., India
[4]Professor & HOD, Department of Ophthalmology, GGH Eluru, A.P., India
[5]ADME & Superintendent, GGH, Eluru, A.P., India
[6]Senior Resident, Department of Ophthalmology, GGH Eluru A.P., India

Received: 01-11-2025 /Revised: 15-12-2025 / Accepted: 21-01-2026
Corresponding author: Dr. M.V.D.L. Sathyanarayana
Conflict of interest: Nil

Abstract

Background: Despite advances in surgical techniques, posterior capsular opacification (PCO) remains a predominant long-term complication of cataract surgery. It results from residual lens epithelial cells (LECs) that proliferate, migrate, and undergo metaplasia within the capsular bag, leading to visual axis obscuration. Clinically, PCO causes reduced visual acuity, diminished contrast sensitivity, and may hinder posterior segment evaluation. The reported incidence of PCO ranges from 20–50% within five years after cataract surgery in adults and approaches nearly 100% in paediatric cases. Although primary posterior continuous curvilinear capsulorhexis (PPCC) is routinely performed in paediatric cataract surgery, its use in adults is limited. PPCC involves the removal of the central posterior capsule at the time of surgery to prevent LEC migration toward the visual axis.

Aim: To evaluate the long-term safety and efficacy of phacoemulsification and manual small-incision cataract surgery combined with PPCC and posterior chamber intraocular lens (PCIOL) implantation in adult patients.

Materials and Methods: This interventional case series included 50 adult patients who underwent cataract surgery with PPCC at Government General Hospital, Eluru, Between March to July 2025. Only patients with age-related cataract undergoing PPCC were included. Preoperative and postoperative visual outcomes and complications were assessed over a structured follow-up period.

Results: The study population comprised 27 females and 23 males. Postoperative corrected distance visual acuity (CDVA) showed significant improvement and remained stable throughout follow-up. No sight-threatening complications such as retinal detachment or endophthalmitis were observed.

Conclusion: Cataract surgery combined with PPCC in adults appears to be a safe and effective strategy to reduce PCO, minimize the need for Nd:YAG capsulotomy, and maintain long-term visual outcomes. Further evidence from large-scale randomized controlled trials with extended follow-up is necessary to substantiate these findings.

Keywords: Posterior capsular opacification, Primary posterior capsulorhexis, Nd:YAG capsulotomy, Phacoemulsification, Manual small-incision cataract surgery, Intraocular lens.

DOI: 10.25258/ijcpr.18.2.83

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Despite advances in surgical techniques, posterior capsular opacification (PCO) remains a predominant long-term complication of cataract surgery. It results from residual lens epithelial cells (LECs) that proliferate, migrate, and undergo metaplasia within the capsular bag, leading to visual axis obscuration. Clinically, PCO causes reduced visual acuity, diminished contrast sensitivity, and may hinder posterior segment evaluation. The reported incidence of PCO ranges from 20–50% within five years after cataract surgery in adults and approaches nearly 100% in paediatric cases. Although primary posterior continuous curvilinear capsulorhexis (PPCC) is routinely performed in paediatric cataract surgery, its use in adults is limited.

PPCC involves the removal of the central posterior capsule at the time of surgery to prevent LEC migration toward the visual axis.

Aim: To evaluate the long-term safety and efficacy of phacoemulsification and manual small-incision cataract surgery combined with PPCC and posterior chamber intraocular lens (PCIOL) implantation in adult patients.

Materials and Methods: This interventional case series was conducted on 50 eyes of 50 adult patients undergoing cataract surgery combined with PPCC. All surgeries were performed at Government General Hospital, Eluru. The study adhered to the principles of the Declaration of Helsinki.

Inclusion Criteria: PPCC was selectively performed in adult patients with cataract who were considered at high risk for postoperative posterior capsule opacification or had residual posterior capsular changes despite meticulous cortical cleanup and capsule polishing, and all patients with nystagmus. Exclusion Criteria: Patients with glaucoma, uveitis, zonular instability, proliferative diabetic retinopathy, or a clinically clear posterior capsule were excluded from the study.

Surgical Technique: All patients underwent comprehensive preoperative evaluation, including corrected distance visual acuity (CDVA) measurement using a Snellen chart, slit-lamp biomicroscopy, intraocular pressure (IOP) assessment by applanation tonometry, and posterior segment evaluation by indirect ophthalmoscopy. B-scan ultrasonography was performed when fundus visualisation was not possible. Cataract extraction was performed using either manual small-incision cataract surgery or phacoemulsification, followed by posterior chamber intraocular lens implantation (rigid or foldable). All procedures were carried out under peribulbar anaesthesia. Pupillary dilation was achieved using topical phenylephrine 2.5% and tropicamide 1%.

Following nucleus removal, the capsular bag was inflated with 1% sodium hyaluronate. A central puncture was made in the posterior capsule using a 26-gauge needle. Viscoelastic was gently injected through the opening to separate the posterior capsule from the anterior hyaloid face. Using Capsulorhexis forceps, the posterior capsule opening was enlarged circumferentially to create a well-centred 3–4 mm PPCC. A PCIOL with a 6 mm optic was implanted in the capsular bag. Residual viscoelastic was thoroughly aspirated, and all wounds were self-sealing. Postoperatively, patients were prescribed topical Moxifloxacin and dexamethasone eye drops six times daily, tapered over subsequent weeks.

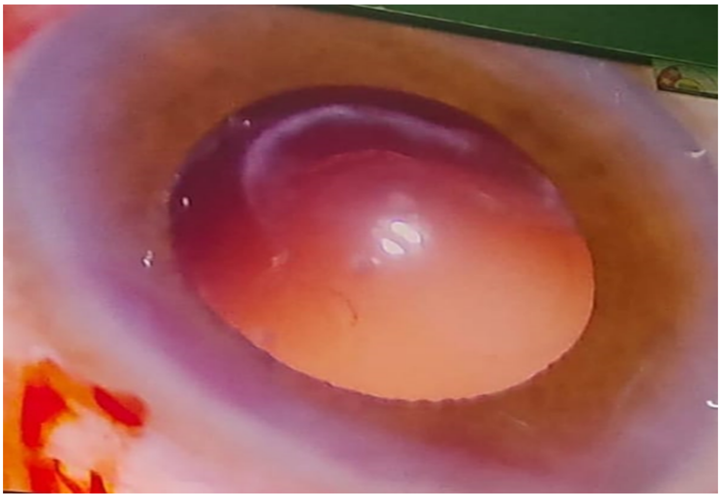

Figure 1: PCC

Follow-Up and Outcome Measures: Patients were evaluated postoperatively at day 1, 1 week, 1 month, 3 months, 6 months, and at the final follow-up visit. Demographic details, visual outcomes, intraocular pressure, and intraoperative and postoperative complications were documented. Data were analysed using SPSS software (version 16.0). Appropriate statistical tests, including paired t-tests and chi-square tests, were applied, with statistical significance defined as a p value < 0.05.

Results

In the study population there were 28 male cases and 22 female patients. 29 cases had right eye involvement and 21 cases had left eye involvement.

Visual Outcomes: The mean preoperative BCVA was 0.26 ± 0.18. Postoperative BCVA improved significantly to 0.75 ± 0.23 at 1 week and 0.78 ± 0.24 at final follow-up, demonstrating sustained visual improvement. At the final visit, the majority of eyes achieved BCVA of ≥ 20/30, while the remaining achieved ≥ 20/40.

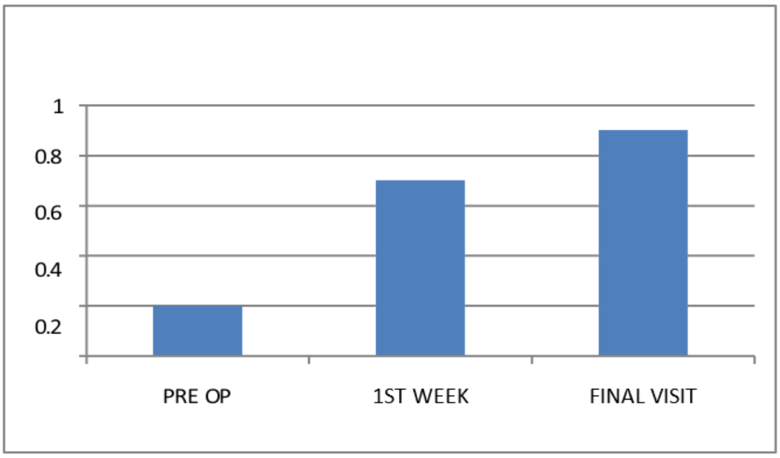

Figure 2: Mean Preoperative BCVA

Complications: One case had Peripheral extension of PPCC and other case had Vitreous prolapse.

Discussion

Posterior capsular opacification, often referred to as "after-cataract," represents a wound-healing response of the lens capsule following cataract surgery. Residual LECs proliferate, migrate, and differentiate along the posterior capsule, resulting in fibrotic or pearl-type opacification that compromises visual quality.

Younger age is a well-established non-modifiable risk factor for PCO. Surgical variables, however, play a crucial role in modulating its incidence. Techniques such as continuous curvilinear capsulorhexis, in-the-bag IOL fixation, adequate cortical cleanup, and IOL material and design significantly influence postoperative outcomes.

PPCC provides a controlled central posterior capsule opening, thereby preventing LEC migration into the visual axis and maintaining long-term clarity. Unlike Nd:YAG laser capsulotomy, PPCC avoids sudden posterior capsule disruption and reduces the risk of vitreoretinal complications and Anterior hyaloid phase disturbance.

In the present study, no cases of retinal detachment or cystoid macular oedema were observed, likely due to preservation of the anterior hyaloid face. Visual acuity remained stable throughout follow-up, supporting the safety and efficacy of this approach.

Treatment of PCO: A nonsurgical Nd: YAG laser capsulotomy or a surgical procedure like posterior capsule scraping can be used to treat central PCO that obscures the visual axis. The latter approach has gained widespread popularity. The patient's functional impairment of vision, discomfort, demand, and the existence of related risk factors, such as high myopia, history of retinal detachment, high risk of cystoids macular oedema, and sole functioning eye, determine if a capsulotomy is necessary. Under scotopic conditions, a size greater than the pupil diameter may prevent visual abnormalities such monocular diplopia. Increased intraocular pressure, glaucoma, cystoid macular oedema, and retinal detachment are among the clinical side effects of Nd:YAG laser capsulotomy. Nd: The growth and shape of regenerative PCO are altered by YAG laser capsulotomy. With different IOL materials, this response varies. Significant pearl formation on the capsulotomy border was caused by silicone and PMMA IOLs, frequently in conjunction with a decrease in peripheral regeneratory PCO (silicone). Reclosure of the Nd: YAG capsulotomy opening was more common with hydrogel IOLs. Regenerative PCO did not change in eyes with acrylic IOLs following the capsulotomy.

A clean visual axis made possible by primary posterior capsulotomy facilitates visual rehabilitation and lessens the need for Nd.YAG capsulotomy. The PPCC's possible closure is the issue. According to Tassignon et al., 6 (12%) of 51 eyes had complete closure. According to Vock et al., PPCC eyes have substantially less visual axis proliferation than non PPCC eyes. It has been demonstrated that retinal problems following posterior capsulorhexis, such as retinal detachment or cystoid macular oedema, are more frequent when posterior capsule integrity breaks down and the aqueous-vitreous barrier is not disrupted. De Groot et al. demonstrated that anterior hyaloid rupture was the sole condition in which the ocular barrier broke down.

Primary posterior capsulorhexis, a common treatment during adult cataract surgery, has been linked to retinal problems, according to Galand et al. Three of the 49 eyes in their 15 series experienced vitreous prolapse, three had cystoid macular oedema, and one had a retinal detachment at postoperative week four. According to Lubinski et al., vitreous prolapse to the anterior chamber occurred in 16% (4/25) of the eyes. One consequence of cataract surgery is retinal detachment, particularly in situations where the capsular integrity is compromised. Retinal detachment after cataract surgery occurs in 0.6–1.7% of the general population. Only 1 out of 25 (4%) patients had retinal detachment after cataract surgery using PPCC, according to Lubinski et al. Nevertheless, Nd: YAG laser capsulotomy, a PCO treatment alternative to PPCC, may increase the risk of retinal detachment.

According to reports, 1.0–1.9% of pseudophakic eyes experience retinal detachment following ND: YAG capsulotomy. Uncontrolled posterior capsule disruption brought on by YAG laser capsulotomy causes posterior vitreous and retinal detachment. In our investigation, no retinal detachment was seen during follow-up, and a controlled posterior capsule opening was carried out utilizing PCCC without disturbing the anterior hyaloid surface. CDVA was shown to be stable starting in the early postoperative phase. The low incidence of PCO and other comorbidities in our study probably contributed to this result. Furthermore, the mean IOP before surgery and at every postoperative visit did not alter statistically significantly (P>0.05, all cases). Our study's IOP results are comparable to those of Stifter et al., who found no discernible variations in IOP between traditional cataract surgery and combined PPCC and posterior optic buttonholing.

Conclusion

Cataract surgery combined with primary posterior continuous curvilinear Capsulorhexis in adults is a safe and effective technique for preventing posterior capsular opacification. It provides stable visual outcomes, reduces dependence on Nd:YAG laser capsulotomy, and minimises long-term visual morbidity. Further evidence from large-scale randomized controlled trials with extended follow-up is necessary to substantiate these findings.

References

1. Al-Nashar HY, Khalil AS. Primary posterior capsulotomy in adults with posterior capsule opacification. J Cataract Refract Surg. 2016;42(11):1615-1619.
2. Arbisser LB. Review of primary posterior Capsulorhexis in cataract surgery. Saudi J Ophthalmol. 2022;36(2):149-156.
3. Galand A, van Cauwenberge F, Moosavi J. Posterior capsulorhexis in adult eyes with intact and clear capsules. J Cataract Refract Surg. 1996;22(4):458-461.
4. Georgopoulos M, Menapace R, Findl O, Petternel V, Kiss B, Rainer G. After-cataract in adults with primary posterior Capsulorhexis: comparison of hydrogel and silicone intraocular lenses with round edges after 2 years. J Cataract Refract Surg. 2003;29(5):955-960.
5. Jin KW, Woo SJ, Park KH. Efficacy and safety of primary posterior capsulotomy during phaco-vitrectomy for epiretinal membrane. BMC Ophthalmol. 2022; 22:4.
6. Ouchi M. Primary posterior continuous curvilinear Capsulorhexis combined with diffractive multifocal intraocular lens implantation. Eye (Lond). 2016; 30:95- 101.
7. Shin KS, Park HJ, Jo YJ, Kim JY. Efficacy and safety of primary posterior capsulotomy in combined phaco-vitrectomy in rhegmatogenous retinal detachment. PLoS One. 2019;14(3):e0213457.
8. Stifter E, Menapace R, Findl O, et al. Effect of primary posterior continuous curvilinear Capsulorhexis with and without posterior optic buttonholing on postoperative anterior chamber flare. J Cataract Refract Surg. 2009;35(3):480-484.
9. Studeny P, Benda T. Primary posterior continuous circular capsulorhexis without the use of ophthalmic viscosurgical device. Clin Ophthalmol. 2023; 17:441- 444.
10. Yazici AT, Bozkurt E, Kara N, Yildirim Y, Demirok A, Yilmaz OF. Long-term results of phacoemulsification combined with primary posterior curvilinear Capsulorhexis in adults. Middle East Afr J Ophthalmol. 2012;19(1):115-119.