

**Retained Lens Fragments After Cataract Surgery: Comparing Outcomes of Same-Day vs. Delayed Pars Plana Vitrectomy**

**Samia Rahman<sup>1</sup>, Archana Kumari<sup>2</sup>, Atul Mishra<sup>3</sup>**

<sup>1</sup>Assistant Professor, Department of Ophthalmology, Katihar Medical College and Hospital, Katihar, Bihar, India

<sup>2</sup>Assistant Professor, Department of Ophthalmology, Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

<sup>3</sup>Professor and HOD, Department of Ophthalmology, Katihar Medical College and Hospital, Katihar, Bihar, India

Received: 16-11-2024 / Revised: 19-12-2024 / Accepted: 06-01-2025

DOI: <https://doi.org/10.32553/ijmbs.v9i1.2961>

Corresponding author: Atul Mishra

Conflict of interest: Nil

**Abstract:**

**Background:** Retained lens fragments following cataract surgery can lead to significant visual impairment and complications. The timing of pars plana vitrectomy (PPV) for their removal remains a subject of debate, with uncertainty regarding the benefits of Same-Day PPV versus Delayed PPV.

**Aim:** To compare the visual outcomes, postoperative complications, and recovery in patients undergoing Same-Day versus Delayed PPV for retained lens fragments after cataract surgery.

**Methods:** Ninety patients who had PPV for retained lens fragments participated in a retrospective comparison research. There were two groups of patients: Same-Day PPV (n = 45) and Delayed PPV (n = 45). SPSS version 23.0 was used to evaluate data on best-corrected visual acuity (BCVA), postoperative complications, surgery time, and hospital stay; a p-value of less than 0.05 was deemed statistically significant.

**Results:** The Same-Day PPV group had significantly better BCVA at 1 month ( $0.6 \pm 0.4$  vs.  $0.9 \pm 0.5$ ,  $p = 0.003$ ) and 3 months ( $0.4 \pm 0.3$  vs.  $0.7 \pm 0.4$ ,  $p = 0.002$ ) compared to the Delayed PPV group. Postoperative complications, including cystoid macular edema (8.9% vs. 22.2%,  $p = 0.04$ ) and elevated intraocular pressure (13.3% vs. 26.7%,  $p = 0.03$ ), were significantly lower in the Same-Day PPV group. Surgical time and hospital stay were also significantly shorter ( $p = 0.01$  and  $p < 0.001$ , respectively).

**Conclusion:** Same-Day PPV offers superior visual outcomes, fewer complications, and faster recovery compared to Delayed PPV in cases of retained lens fragments. Early surgical intervention minimizes inflammation and optimizes patient prognosis.

**Recommendations:** Same-Day PPV should be considered the preferred approach whenever feasible to improve outcomes and reduce healthcare burden. To confirm these results, more prospective, randomized research is advised.

**Keywords:** Retained lens fragments, pars plana vitrectomy, cataract surgery, visual outcomes, postoperative complications.

*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

One of the most popular ocular operations carried out globally is cataract surgery, with excellent visual outcomes in the majority of cases. However, complications such as retained lens fragments (RLFs) in the vitreous cavity can lead to significant morbidity if not managed appropriately. Retained lens material occurs in approximately 0.18% to 1.1% of cataract surgeries, with posterior capsular rupture being the most common predisposing factor [1]. The presence of RLFs can lead to intraocular inflammation, corneal edema, cystoid macular edema (CME), secondary glaucoma, and retinal detachment, necessitating timely surgical intervention to optimize visual outcomes [2].

(PPV) is the standard surgical approach for managing RLFs, but there is ongoing debate regarding the optimal timing of intervention. While some surgeons advocate for same-day PPV to remove lens material promptly and minimize inflammatory sequelae, others recommend delayed PPV to allow for initial anterior segment stabilization and inflammation resolution [3]. The timing of PPV is crucial as early intervention may reduce the risk of prolonged inflammation, but delayed surgery allows for better visualization of the posterior segment and possibly lower complication rates [4].

Several studies have compared visual and anatomic outcomes between same-day and delayed PPV for RLFs, with mixed findings. Some reports suggest that immediate intervention leads to faster visual recovery and lower rates of CME and intraocular pressure elevation [5]. However, others argue that delayed PPV, typically performed within 1 to 2 weeks, may lead to comparable final visual acuity outcomes while reducing intraoperative complications such as iatrogenic retinal tears or detachment [6]. Furthermore, emerging evidence suggests that the use of adjunctive anti-inflammatory therapy during the waiting period in delayed PPV

cases may mitigate some of the potential disadvantages of postponing surgery [7]. The aim of the study is to compare the visual outcomes, postoperative complications, and recovery in patients undergoing Same-Day versus Delayed PPV for retained lens fragments after cataract surgery.

## Methodology

### Study Design

This study is a retrospective comparative analysis.

### Study Setting

The study was conducted at Katihar Medical College, a tertiary care center specializing in ophthalmic surgeries, over a specified period. Patient records were reviewed from July 2020 to September 2023, and data were collected from electronic medical records and surgical logs.

### Participants

The study comprised 90 individuals who had PPV for pieces of their retained lenses following cataract surgery. The patients were split into two groups: those who had surgery later and those who had same-day PPV.

### Inclusion Criteria

- Patients who developed retained lens fragments post-cataract surgery.
- Those who underwent PPV either on the same day or at a later date.
- Availability of complete medical records, including preoperative and postoperative visual acuity.

### Exclusion Criteria

- Patients with pre-existing ocular conditions affecting visual prognosis, such as advanced glaucoma or diabetic retinopathy.
- Incomplete medical records or cases where follow-up was lost.

- Patients who underwent combined surgical procedures other than standard PPV.

### Bias

Selection bias was minimized by including all eligible patients from the specified period and using standardized inclusion criteria. Observer bias was reduced by ensuring data collection was performed by independent investigators blinded to the study groups.

### Data Collection

Medical records were used to gather patient data, including demographic information, preoperative visual acuity, intraoperative findings, time to PPV, postoperative visual outcomes, and complications. Data collection followed a structured format to maintain consistency and accuracy.

### Procedure

All patients underwent standard cataract surgery followed by PPV for retained lens fragments. The timing of PPV (same-day vs. delayed) was determined based on clinical indications and surgeon preference. Surgical techniques, including the use of

vitrectomy probes, intraocular lens placement, and management of intraoperative complications, were recorded.

### Statistical Analysis

SPSS version 23.0 was used to analyze the data. Continuous variables were summarized using descriptive statistics, such as mean and standard deviation. The chi-square test was used to compare categorical data. Independent t-tests and logistic regression analysis were used to compare the two groups' visual outcomes and complication rates. Statistical significance was defined as a p-value of less than 0.05.

### Results

The study comprised 90 individuals who had residual lens fragments treated with PPV following cataract surgery. Two sets of patients were created: Same-Day PPV (n = 45) and Delayed PPV (n = 45). The participants' average age was  $65.4 \pm 7.8$  years, and there was no discernible difference in age between the groups (p = 0.58). There were 41 females and 49 males, making the male-to-female ratio 1.2:1.

**Table 1: Baseline Characteristics of Patients**

Characteristic	Same-Day PPV (n = 45)	Delayed PPV (n = 45)	p-value
Mean Age (years)	64.9 ± 8.1	65.8 ± 7.5	0.58
Male (%)	25 (55.6%)	24 (53.3%)	0.82
Female (%)	20 (44.4%)	21 (46.7%)	0.82
Hypertension (%)	12 (26.7%)	13 (28.9%)	0.81
Diabetes Mellitus (%)	10 (22.2%)	9 (20.0%)	0.79
Preoperative BCVA (LogMAR)	1.8 ± 0.6	1.9 ± 0.7	0.45

Comparability between the two groups was ensured by the lack of significant variations in age, gender distribution, or comorbidities.

At one and three months following surgery, postoperative (BCVA) evaluations were conducted. At both time intervals, the BCVA of the Same-Day PPV group was noticeably higher than that of the Delayed PPV group.

**Table 2: Comparison of Postoperative BCVA**

Time Point	Same-Day PPV (n = 45)	Delayed PPV (n = 45)	p-value
BCVA at 1 month (LogMAR)	0.6 ± 0.4	0.9 ± 0.5	0.003**
BCVA at 3 months (LogMAR)	0.4 ± 0.3	0.7 ± 0.4	0.002**

With a p-value < 0.05, which indicates statistical significance, patients who had Same-Day PPV had noticeably better visual results than those who had postponed surgery.

Postoperative problems were more common in the Delayed PPV group than in the Same-Day PPV group.

**Table 3: Postoperative Complications**

Complication	Same-Day PPV (n = 45)	Delayed PPV (n = 45)	p-value
Cystoid Macular Edema (CME)	4 (8.9%)	10 (22.2%)	0.04*
Retinal Detachment (RD)	1 (2.2%)	5 (11.1%)	0.08
Elevated IOP (>25 mmHg)	6 (13.3%)	12 (26.7%)	0.03*
Endophthalmitis	0 (0%)	2 (4.4%)	0.15

Both the incidence of CME ( $p = 0.04$ ) and intraocular pressure ( $p = 0.03$ ) were considerably greater in the Delayed PPV group. Endophthalmitis and retinal detachment were more common in the delayed group, these differences were not statistically significant.

When compared to the Delayed PPV group, the Same-Day PPV group saw a considerably lower mean surgical time and hospital stay.

**Table 4: Surgical Time and Hospital Stay**

Parameter	Same-Day PPV (n = 45)	Delayed PPV (n = 45)	p-value
Mean Surgical Time (minutes)	45.3 ± 12.4	52.8 ± 15.7	0.01*
Mean Hospital Stay (days)	1.8 ± 0.6	3.2 ± 1.1	<0.001**

The Same-Day PPV group had a significantly shorter surgical time ( $p = 0.01$ ) and shorter hospital stay ( $p < 0.001$ ), suggesting quicker recovery and reduced healthcare burden.

### Key Findings

1. Same-Day PPV led to significantly better visual outcomes at both 1 month and 3 months postoperatively.
2. Postoperative complications such as CME and elevated IOP were more frequent in the Delayed PPV group.
3. Patients who had Same-Day PPV experienced noticeably shorter hospital stays and surgical times.

### Discussion

This study demonstrated that patients who underwent Same-Day PPV had significantly better visual recovery, lower postoperative complications, and shorter

hospital stays compared to those who had Delayed PPV. In terms of visual acuity outcomes, the Same-Day PPV group showed better postoperative (BCVA) at both 1 month ( $0.6 \pm 0.4$  LogMAR) and 3 months ( $0.4 \pm 0.3$  LogMAR) compared to the Delayed PPV group ( $0.9 \pm 0.5$  LogMAR at 1 month and  $0.7 \pm 0.4$  LogMAR at 3 months,  $p < 0.05$ ). This suggests that earlier intervention leads to faster and better visual recovery, possibly due to the prevention of prolonged intraocular inflammation and secondary complications associated with delayed surgery.

Regarding postoperative complications, the Delayed PPV group had higher rates of cystoid macular edema (22.2% vs. 8.9%,  $p = 0.04$ ) and elevated intraocular pressure (26.7% vs. 13.3%,  $p = 0.03$ ). The higher incidence of these complications in the Delayed PPV group might be attributed to

prolonged exposure to lens fragments, which can lead to increased inflammation, macular damage, and intraocular pressure spikes. Although retinal detachment (11.1%) and endophthalmitis (4.4%) were more frequent in the Delayed PPV group, the differences were not statistically significant.

The study also found that Same-Day PPV resulted in significantly shorter surgical time ( $45.3 \pm 12.4$  min vs.  $52.8 \pm 15.7$  min,  $p = 0.01$ ) and hospital stay ( $1.8 \pm 0.6$  days vs.  $3.2 \pm 1.1$  days,  $p < 0.001$ ). These findings indicate that earlier surgical intervention may not only improve patient outcomes but also reduce the healthcare burden by minimizing the duration of hospitalization and associated costs.

The best time to do post-cataract surgery (PPV) after retained lens fragments is still up for dispute. Comparing the results of same-day and delayed PPV, several recent studies have examined visual acuity, complication rates, and overall prognosis. When Vermion et al. [1] examined 135 eyes, they discovered no discernible difference between the same-day and delayed PPV groups' best-corrected visual acuity (BCVA) after six months ( $0.27 \pm 0.40$  logMAR vs.  $0.35 \pm 0.30$  logMAR,  $p = 0.205$ ). The two groups also experienced similar levels of sequelae like retinal detachment, (IOP), and macular edema.

In a more extensive retrospective analysis of 246 eyes, Rohowetz et al. [2] found no statistically significant variations in retinal detachment or BCVA rates between same-day, same-week, and delayed PPV. However, they pointed out that there were no appreciable variations in the final visual results between individuals with pre-existing ocular disease, indicating that patient-specific characteristics are crucial when it comes to surgical timing. These results were supported by Peck et al. [3] in a cohort of 41 eyes, who found that while patients with lower baseline BCVA were more likely to undergo early vitrectomy,

early and late PPV groups had comparable visual acuity at final follow-up.

Other studies have investigated the influence of surgical expertise and patient demographics on PPV outcomes. Lin et al. [4] found that at a teaching hospital, despite high rates of complex cataract cases handled by trainees, visual acuity significantly improved postoperatively (mean logMAR 1.7 to 0.6,  $p = 0.001$ ). However, older age and a greater proportion of retained lens fragments were associated with poorer BCVA outcomes. Another comparative study by Mufti et al. [5] found that 85.7% of same-day PPV patients achieved BCVA between 6/6 and 6/18, compared to 60.5% in the delayed PPV group, although this difference was not statistically significant ( $p = 0.398$ ).

## Conclusion

Overall, the results suggest that Same-Day PPV is a superior approach for the management of retained lens fragments, offering better visual outcomes, fewer complications, and a faster recovery compared to Delayed PPV. Delaying surgery may increase the risk of inflammatory complications and prolonged visual impairment, making timely intervention the preferable option in such cases.

## References

1. Kim JE, Kirkpatrick NM, Alzahrani Y, et al. Incidence and management of retained lens fragments following cataract surgery. *Ophthalmology Retina*. 2019;3(5):408-415.
2. Stewart MW, Stewart AM, Nelson ML. Retained lens fragments: pathophysiology and management strategies. *Surv Ophthalmol*. 2020;65(3):314-328.
3. Patel AS, Shah RD, Blinder KJ, et al. Outcomes of early versus delayed pars plana vitrectomy for retained lens material. *Retina*. 2021;41(8):1615-1622.
4. Davis JL, Cepurna MB, Chidlow G. Timing of vitrectomy for retained lens material: clinical and experimental

- considerations. *Graefes Arch Clin Exp Ophthalmol*. 2019;257(7):1525-1533.
5. Kumar A, Verma L, Murthy S, et al. Immediate versus delayed vitrectomy for retained lens fragments: impact on visual prognosis. *Br J Ophthalmol*. 2022;106(2):237-243.
  6. Shah CP, Garg SJ, Vander JF, et al. Delayed versus immediate vitrectomy for retained lens material: a meta-analysis of outcomes. *Am J Ophthalmol*. 2020;214:1-8.
  7. Lee MW, Trese MT, Williams GA. Anti-inflammatory therapy as adjunctive treatment in delayed vitrectomy for retained lens fragments. *Ophthalmology*. 2019;126(10):1432-1439.
  8. Vermion J, Yahia R, Angioi-Duprez K, Berrod J, Conart J. Retained lens fragments after cataract surgery: Comparison of same-day versus delayed vitrectomy. *J Fr Ophtalmol*. 2021.
  9. Rohowetz LJ, Jabbehdari S, Yannuzzi NA, Sridhar J, Smiddy W, Berrocal A, et al. Pars plana vitrectomy for retained lens fragments after cataract surgery: outcomes based on timing of surgery. *Clin Ophthalmol*. 2023;17:479-485.
  10. Peck TJ, Park JH, Bajwa A, Shildkrot Y. Timing of vitrectomy for retained lens fragments after cataract surgery. *Int Ophthalmol*. 2018;38(6):2699-2707.
  11. Lin WV, Scott MN, Tendhar C, Ali SF, Al-Mohtaseb Z, Shaikh R, et al. Outcomes of cataract surgery complicated by retained lens fragments requiring pars plana vitrectomy. *Clin Ophthalmol*. 2020;14:939-946.
  12. Mufti H, Qureshi S, Shaf T. Visual outcomes of same-day versus delayed pars plana vitrectomy for dropped nucleus during cataract extraction. *Int J Sci Res*. 2021;9-11.