E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/16.02.703

Research Article

Risk Factors and Surgical Techniques for Pars Plana Vitrectomy of Posteriorly Dislocated Intraocular Lenses

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Received: 02.07.2026, Revised: 13.09.2026, Accepted: 24.09.2026

ABSTRACT

Introduction: IOL is a rare but serious complication of cataract surgery that may necessitate PPV for anatomical and visual recovery.

Objective: To determine the risk factors of posteriorly dislocated IOLs and the surgical outcomes of PPV.

Methods: This was a retrospective, observational study carried out at the Quetta Institute of Medical Sciences Quetta, Balochistan, over a period of six months (November 2025-April 2026) on 60 patients who were undergoing treatment for posterior IOL dislocation with PPV, selected by non-probability consecutive sampling.

Results: Mean age was 61.8 ± 8.7 years, with male predominance (60.0%). Delayed in-the-bag dislocation was the most common cause (40.0%), followed by complicated cataract surgery (25.0%), trauma (20.0%), and pseudoexfoliation (15.0%). The most frequently used technique was scleral fixation (35.0%), followed by repositioning (31.7%). Anatomical success rate was 95.0%, and ≥ 2 Snellen lines were obtained in 80.0% of eyes. Mean BCVA improved from 1.08 ± 0.36 to 0.42 ± 0.31 logMAR. Transiently raised IOP (10.0%), cystoid macular edema (8.3%), and retinal detachment (3.3%) were complications, but there was no endophthalmitis.

Conclusion: PPV is a safe and effective method of the management of posteriorly dislocated IOLs with high anatomical success and a good improvement in visual acuity, especially when predisposing risk factors are identified early.

Keywords: Intraocular Lens Dislocation, Pars Plana Vitrectomy, Scleral Fixation, Visual Acuity, Cataract Surgery Complications, Zonular Weakness.

INTRODUCTION

Intraocular lens (IOL) dislocation is a serious complication after cataract surgery which can lead to considerable visual disturbance. IOL instability is an important vitreoretinal problem with the increase in IOL implantation. Dislocation can occur due to zonular weakness, trauma, or surgery. Pars plana vitrectomy (PPV) is a way of gaining controlled access to remove, reposition, fix, or exchange the IOL when it enters the vitreous cavity. The goal of management is to improve vision while decreasing vitreoretinal traction and retinal damage (1). The method is based on the position, integrity, and capsular support of the IOL and the presence of any ocular disease (2). Posterior IOL dislocation is a multifactorial process that can happen at once or years later. The weakness of the zonules can cause destabilization of the lens, and trauma and previous vitreoretinal surgeries can expedite this. Pseudoexfoliation, high myopia, previous PPV, ocular trauma, and repeated intravitreal injection are important risk factors (3).

All these factors affect zonular support and worsen delayed IOL displacement. Previous PPV is relevant because it could affect the stability of the lens. Some retinal disease may be present at the same time and may need to be treated at the same time, which can reduce visual recovery (4). Clinical signs depend on the severity of the displacement and the

condition of the eye. Patients can experience poor vision, double vision, glare, inflammation, increased intraocular pressure, or retinal complications. In some cases, the original IOL can be retained after repositioning and fixation when the optical quality and integrity are good. If the lenses are damaged or unstable, they may need to be replaced (5). Vitreous management is important as posterior lens manipulation can create vitreoretinal traction. The choice of anterior vitrectomy vs complete PPV is determined by the location of the lens, the involvement of the vitreous, and associated pathology (6).

Modern PPV techniques give controlled access to the posterior segment via pars plana ports and enable removal of the vitreous before any manipulation of the displaced IOL is performed. If the implant is in close proximity to the retina, it is essential to perform adequate vitrectomy and to gently elevate the lens to prevent retinal tears, hemorrhage, or detachment. The same is true for posterior-segment foreign-body removal, in which care must be taken to limit the amount of retinal trauma incurred by careful pars plana entry (7). It is evident from the visual outcomes following PPV for lens fragments that significant improvement is possible, but ultimate visual outcome will depend on the preexisting macular, retinal, optic nerve, and other eye conditions (8).

The prognosis after PPV depends on the ocular pathology and postoperative complications. Traumatic eyes can also have significant tissue damage and inflammation, which may prevent good recovery of vision even if the vitrectomy is performed successfully (9). Late in-the-bag IOL dislocation is a sign of progressive zonular deterioration following cataract surgery. Predisposing factors must be recognized to identify those patients who need more careful monitoring and prompt intervention (10). Early assessment may allow for appropriate fixation/exchange before further complications occur. These may include IOL repositioning, fixation of the iris, scleral fixation, or exchange. The choice is mainly based on the amount of capsular support, the design of the lens, the anatomy of the eyes, and the surgeon's preference. If there is sufficient support, repositioning may be possible, while if there is no capsular support, scleral or iris fixation or another lens implant (11) may be necessary.

Individualized planning is necessary because there are different risks involved with fixation techniques. When choosing the operative approach, the timing and cause of the displacement are important (12). Patients who have an initial cataract surgery may be more likely to undergo a later vitreoretinal surgery if there are complications during the original surgery. Posterior capsular rupture, vitreous loss, and inadequate capsular support may affect the stability of the IOL and may necessitate anterior vitrectomy (13). When appropriate, PPV can facilitate the retrieval and preservation of the original implant. Repositioning or fixation can be effective to achieve the anatomical and visual results, and exchange should be considered if there is implant damage (14). Long-term IOL suitability may also be influenced by postoperative changes. The opacification of the lens has been reported following PPV with gas tamponade in traumatic lens luxation and retinal detachment, indicating that postoperative conditions can have an impact on the transparency and function of the lens (15).

Optical clarity, integrity, material, and stability over time must be taken into account in deciding whether to preserve or exchange. In selected cases, combined PPV and IOL implantation may be done, and the refractive outcome is determined by the lens selected and biometry (16). Retinal pathology has a significant bearing on surgical planning and visual outcome. IOL displacement can occur with retinal detachment, which needs to be treated together with the lens (17). Macular complications can also impact recovery, and the presence of epiretinal membrane following vitreoretinal surgery may cause ongoing visual symptoms and sometimes necessitates further peeling. A careful retinal and macular evaluation should be performed in the postoperative period.

In summary, posteriorly dislocated IOLs are a complex vitreoretinal disorder in which the patient-related risk factors, previous ocular surgery, lens characteristics, and associated retinal disease should be taken into consideration. The key to PPV is that it allows for vitreous manipulation and safe removal of the displaced lens, followed by repositioning, fixation, or exchange, depending on the anatomy of the individual. While the outcomes of modern techniques are generally good, there are risks of recovery, such as retinal detachment, inflammation, glaucoma, cystoid macular edema, and vitreous hemorrhage (18). To enhance the operative planning and visual outcome, a systematic assessment of the risk factors and techniques is necessary. Careful

postoperative follow-up is also required to detect recurrence and delayed complications.

Objective: To determine the risk factors for posteriorly dislocated intraocular lenses and assess the surgical methods of pars plana vitrectomy for anatomical restoration, visual outcomes, complications, and recovery.

MATERIALS AND METHODS

Study Design: A retrospective observational study was performed to assess the risk factors and surgical techniques in pars plana vitrectomy for patients with posteriorly dislocated intraocular lenses.

Study Setting: This study was carried out in a tertiary-care ophthalmology department that offers surgical services for vitreoretinal diseases at Quetta Institute of Medical Sciences Quetta, Balochistan.

Study Duration: The study lasted for six months from November 2025 to April 2026.

Sample Size: The number of patients included in the study was 60, as this would be the number of patients that would be expected to have posterior IOL dislocation, and would also be feasible to recruit over the timeframe of the study.

Sample Technique: Consecutive sampling (non-probability) was performed and all eligible patients who appeared during the study period were recruited until the desired sample size was reached.

Inclusion Criteria: Patients 18 years of age or older who had a previously implanted intraocular lens with clinically and/or ultrasonographically diagnosed posterior dislocation that was managed surgically by pars plana vitrectomy were included. Patients who underwent IOL repositioning, scleral fixation or IOL exchange during PPV were also included.

Exclusion Criteria: Patients who did not have complete medical records, had severe ocular trauma outside of the IOL dislocation, had an active ocular infection, had advanced retinal disease with severe irreversible visual loss, or had been treated with non-vitrectomy procedures were excluded. Patients who did not have adequate postoperative follow up were also excluded.

METHODS

Patients with posteriorly dislocated intraocular lenses who underwent pars plana vitrectomy during the study period were included in the study. Medical records were used to obtain demographic data, pertinent ocular history, indication for cataract surgery, interval between cataract surgery and IOL dislocation, history of ocular trauma, pseudoexfoliation, high myopia, previous vitreoretinal surgery, and other potential risk factors. Best-corrected visual acuity, slit-lamp examination, intraocular pressure measurement, dilated fundus examination and ocular ultrasonography were performed when visualization of the posterior segment was poor. Surgical procedure was recorded, such as vitrectomy gauge, extent of vitrectomy, and how the IOL was retrieved, and how the IOL was managed (repositioned, scleral fixed, iris fixed, or exchanged). Intraoperative and postoperative complications were recorded. Postoperative complications, anatomical retinal status, intraocular pressure and best-corrected visual acuity were evaluated at follow-up. The data were entered into a structured proforma and appropriate descriptive statistics were used to analyze the data. Frequencies and percentages were used to represent categorical variables and means and standard deviations were used for continuous variables.

RESULTS

During the study period, 60 patients with posteriorly dislocated intraocular lens (IOLs) underwent pars plana vitrectomy (PPV). The mean age was 61.8 ± 8.7 years, with the majority in the 61–70-year age group (27, 45.0%), followed by the 51–60-year group (18, 30.0%). Male patients predominated (36, 60.0%) over female patients (24, 40.0%). The most frequent etiology was delayed in-the-bag dislocation in 24 (40.0%) patients, complicated cataract surgery with inadequate capsular support in 15 (25.0%) patients, ocular trauma in 12 (20.0%) patients and pseudoexfoliation-related zonular weakness in 9 (15.0%) patients. The demographic characteristics and distribution of risk factors are presented in Table 1 and Figure 2A.

Table 1. Demographic Characteristics and Risk Factors (N=60)

Variable	Frequency (n=60)	Percentage

Age group		
18–40 years	3	5.0%
41–50 years	6	10.0%
51–60 years	18	30.0%
61–70 years	27	45.0%
>70 years	6	10.0%
Sex		
Male	36	60.0%
Female	24	40.0%
Risk factors / etiology		
Delayed in-the-bag dislocation	24	40.0%
Complicated cataract surgery / inadequate capsular support	15	25.0%
Ocular trauma	12	20.0%
Pseudoexfoliation / zonular weakness	9	15.0%

Regarding surgical management, scleral fixation was the most common procedure (21, 35.0%) followed by IOL repositioning (19, 31.7%), IOL exchange (12, 20.0%), and iris fixation (8, 13.3%) as shown in Table 2 and Figure 2B. Fifty-seven patients (95.0%) were completely retrieved or stabilized with IOL. Intraoperative retinal tears were seen in 4 (6.7%) eyes and treated with endolaser and proper tamponade, and 3 (5.0%) patients had a vitreous hemorrhage. Postoperative complications were transient increase in intraocular pressure in 6 (10.0%) patients, cystoid macular edema in 5 (8.3%) patients and retinal detachment in 2 (3.3%) patients, without any cases of endophthalmitis.

Table 2. Surgical Techniques and Postoperative Outcomes (N=60)

Outcome / Technique	**Frequency (n=60)**	**Percentage**
IOL management technique		
IOL repositioning	19	31.7%
Scleral fixation	21	35.0%
Iris fixation	8	13.3%
IOL exchange	12	20.0%
Postoperative complications		
Transient raised IOP	6	10.0%
Cystoid macular edema	5	8.3%
Retinal tear	4	6.7%
Vitreous hemorrhage	3	5.0%
Retinal detachment	2	3.3%
Endophthalmitis	0	0.0%
Visual outcome		
≥2 Snellen-line improvement	48	80.0%
Anatomical success	57	95.0%

Preoperatively the mean BCVA was 1.08 ± 0.36 logMAR, which was significantly improved to 0.42 ± 0.31 logMAR postoperatively, and 48 (80.0%) achieved a two-line Snellen improvement. Eyes without retinal detachment had a better visual outcome with a mean postoperative BCVA of 0.35 ± 0.24 logMAR, whereas eyes with retinal detachment had a mean postoperative BCVA of 0.82 ± 0.38 logMAR. This amount of change from pre- to post-means in subgroups is illustrated in Figure 1 and is summarized numerically in Table 3.

Table 3. Visual Acuity Outcomes before and After Pars Plana Vitrectomy, Stratified By Retinal Status

Group	**Preoperative BCVA (logMAR, mean ± SD)**	**Postoperative BCVA (logMAR, mean ± SD)**
Overall (n=60)	1.08 ± 0.36	0.42 ± 0.31
No retinal detachment (n=58)	1.05 ± 0.34	0.35 ± 0.24

Retinal detachment (n=2)	1.20 ± 0.30 (approx.)	0.82 ± 0.38

In general, patients who required IOL repositioning or fixation had better postoperative visual recovery than those who needed IOL exchange, but this difference seemed to be mainly due to the presence of retinal and macular pathology before surgery rather than to the technique itself.

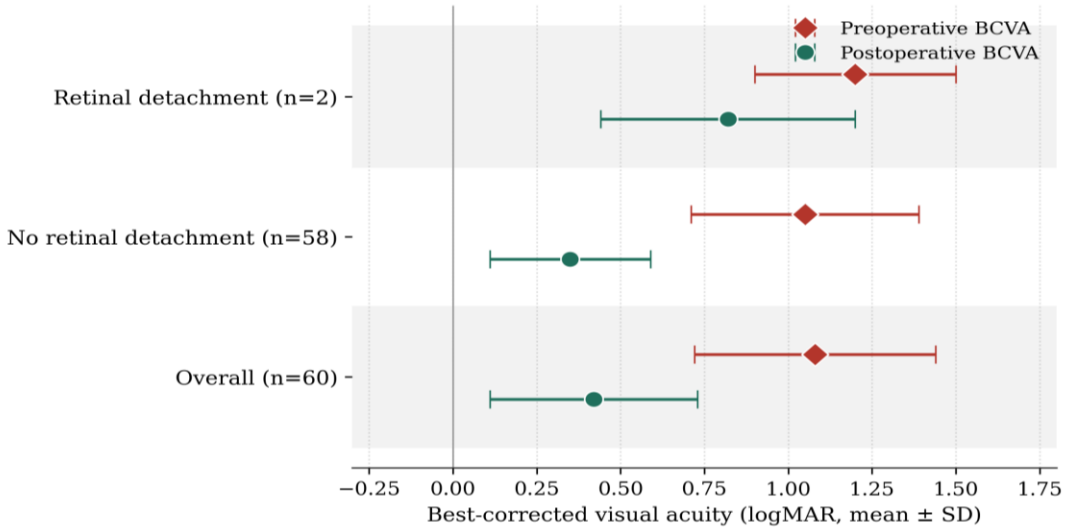


Figure 1. Visual Acuity Outcomes Before and After PPV (Forest-Style Comparison by Retinal Status)

Overall, these results suggest that PPV was successful in achieving anatomical restoration in the vast majority of cases and provided a significant visual improvement in the majority of patients, and that early identification of predisposing risk factors and the judicious use of the IOL management technique were important factors in determining favourable postoperative outcome.

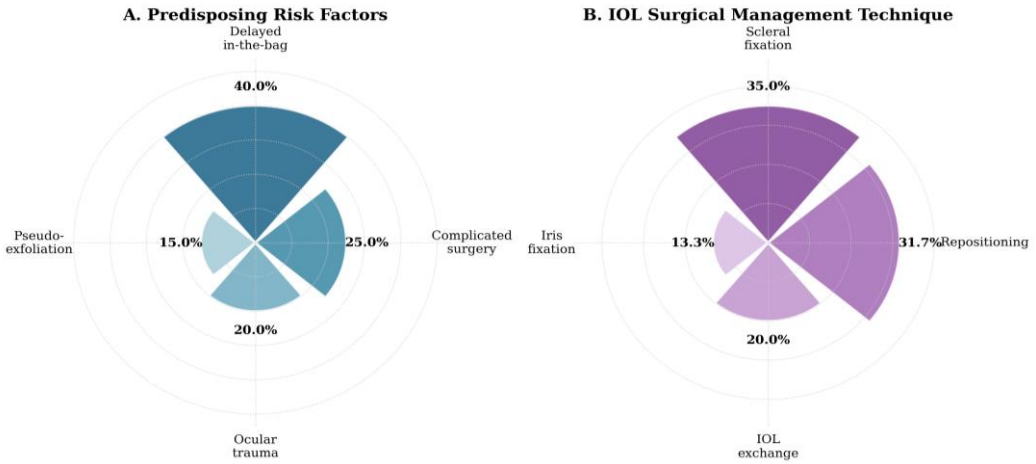


Figure 2. Distribution of Risk Factors and Surgical Techniques (Polar/Nightingale Charts)

DISCUSSION

In the present study, risk factors and surgical techniques for posteriorly dislocated intraocular lens (PIDIL) were evaluated and PPV was found to have favorable anatomical results. The most common presentations included delayed in-the-bag dislocation, inadequate capsular support after complicated cataract surgery, and ocular trauma. The results are in line with the published literature that traumatic lens displacement may necessitate treatment to the posterior segment and that visual recovery is dependent on the status of the retina and macula (1). This is supported by the predominance of delayed dislocation, which reflects a

multifactorial etiology of IOL instability, particularly zonular weakness and ocular comorbidities (2). Delayed in-the-bag dislocation is significant as it can happen years after uncomplicated cataract surgery. Pseudoexfoliation, high myopia, past history of vitrectomy, ocular trauma and zonular compromise are established risk factors (3).

The results also confirmed the importance of pseudoexfoliation and previous complicated cataract surgery. Both the displaced implant and the associated ocular anatomy should be taken into consideration during surgical planning. The literature on PPV with or without combined phacoemulsification highlights the need for individualized treatment based on the lens status and posterior pathology (4). IOL repositioning, exchange, and iris fixation were the other most common techniques used in our study, which were performed less frequently than scleral fixation. In posterior IOL dislocation, this distribution is a result of loss of proper capsular support. Patient and eye factors may be used as a guideline to decide if dislocation is likely to require surgery, which is why careful preoperative evaluation is recommended before choosing a method of fixation (5). If the IOL is intact, it may be possible to re-position or fix it to preserve a functional implant.

Vitreous management is crucial in that the presence of residual vitreous attachments can create traction, and the amount of vitrectomy should be proportional to the location of the lens and the extent of the vitreous involvement (6). The anatomical success rate of 95% shows the efficacy of PPV for the restoration of IOL position and treatment of posterior pathology. The pars plana approach is the one that allows controlled access to the vitreous cavity and safe manipulation of displaced intraocular material. The same principles apply to the removal of posterior segment foreign bodies, in which controlled pars plana entry minimizes retinal trauma (7). The 80% success rate in visual improvement also helps to support the effectiveness of proper PPV. A series of studies on the recovery of visual function following lens fragment removal has demonstrated significant visual improvement following surgery, with final vision remaining dependent on the underlying retinal and macular disease (8).

Posterior lens displacement is an important cause of trauma in our series and may be related to more complex ocular disease. Even with successful management of the lens, traumatic eyes may also have zonular disruption, retinal injury, inflammation, hemorrhage, and/or structural abnormalities that prevent optimal visual recovery (9). Therefore, visual acuity must not be the only measure of surgical success. The time from cataract surgery to IOL dislocation may help to determine the mechanism, especially progressive capsular-bag instability. The factors affecting the time to in-the-bag dislocations have implications for surveillance and intervention (10). The mean BCVA of 1.08 logMAR improved to 0.42 logMAR, which represents a significant functional gain of PPV. Patients who underwent IOL exchange had poorer recovery, probably due to the fact that IOL exchange was performed in eyes with more capsular loss, damaged implants, trauma, and/or retinal disease, rather than due to poorer outcomes of IOL exchange.

The importance of selecting and managing coexisting vitreous disease in the appropriate manner is highlighted by the evidence presented at PPV. The studies of early and late IOL dislocation also suggest that timing and mechanism of dislocation affect presentation and management (12). Another significant risk factor was complicated cataract surgery. Posterior capsular rupture, vitreous loss, and poor capsular support may cause IOL instability and may necessitate anterior vitrectomy at the time of the initial procedure. The significance of the detection of complications of phacoemulsification and poor capsular integrity (13) is supported by evidence of unplanned anterior vitrectomy. If the IOL is displaced posteriorly, PPV is an effective means for retrieval and stabilization. Retrospective studies also have shown good anatomic and visual results with PPV for dropped IOLs when the right fixation or exchange is used (14). Postoperative complications included elevated intraocular pressure, cystoid macular edema, retinal tears, vitreous hemorrhage, and retinal detachment. The results highlight that even though a lens is retrieved, the risks of vitreoretinal surgery are not negated.

Long-term optical performance may be affected by IOL material and postoperative tamponade, which has been reported following PPV with gas tamponade in traumatic lens luxation and retinal detachment (15). Refractive planning is also a key consideration if an IOL is implanted at the time of PPV. When biometry and lens selection are planned,

combined PPV and IOL can yield refractive outcomes (16). The associated retinal disease was an important factor in determining visual recovery, with patients who developed retinal detachment having poorer acuity. Retinal detachment may also cause damage to the macula and photoreceptors, which could affect vision even if the retina is reattached. There is evidence that supports the use of PPV in selected cases, and that the underlying retinal pathology plays a role in the visual outcome of retinal detachment surgery (17). Postoperative macular changes can also impact recovery, with formation of epiretinal membrane after PPV for retinal detachment causing ongoing visual symptoms and sometimes necessitating peeling (18). The results support PPV as a useful technique for posteriorly dislocated IOLs and highlight the importance of identification of risk factors, careful management of the vitreous, adequate fixation or exchange, and retinal and macular follow-up.

CONCLUSION

Posteriorly dislocated intraocular lenses are an important complication that requires individual vitreoretinal management. Delayed in-the-bag dislocation, lack of capsular support after complicated cataract surgery, trauma to the eye, and pseudoexfoliation were influential in this study. Removal, repositioning, fixation, or exchange of displaced IOLs were successfully achieved during pars plana vitrectomy, and anatomical restoration was achieved in most patients. Scleral fixation was the most common method, especially when the capsular support was inadequate, and repositioning was suitable when the existing IOL was structurally adequate. The majority of patients had good visual outcomes after surgery, though retinal disease and complications of surgery affected the final visual outcome. Preoperative evaluation, selection of the IOL management technique, careful removal of the vitreous, and recognition of retinal abnormalities are all important factors in optimizing results. Long-term follow-up is necessary to monitor for retinal detachment, cystoid macular edema, elevated intraocular pressure, and other late complications.

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