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Original Article

# Vitreoretinal surgery in patients with intraocular lens dislocation into the vitreous

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**Abstract**

**Aim:** To evaluate the demographic and clinical characteristics of patients who underwent pars plana vitrectomy (PPV) for intraocular lens (IOL) dislocation into the vitreous cavity and the visual and anatomical outcomes of PPV in these patients.

**Material and Methods:** This retrospective study reviewed the files of patients who underwent PPV for IOL dislocation into the vitreous in our clinic between January 2014 and December 2018. Patient age, gender, preoperative and postoperative best corrected visual acuity (BCVA), intraocular pressure (IOP), comorbid ocular pathologies, causes of IOL dislocation, time from IOL dislocation to PPV surgery, surgical methods, and preoperative and postoperative complications were recorded.

**Results:** This study included 15 eyes of 15 patients with IOLs dislocated into the vitreous, of which 5 (33.3%) were female and 10 (66.7%) were male. Mean patient age was 60.8±22.67 (12-94) years. Seven (46.7%) of 15 eyes underwent a secondary IOL implantation in the same session as IOL extraction, whereas eight eyes were planned to undergo a secondary IOL implantation in a second session. Meanwhile, 2 (13.3%) eyes did not undergo IOL implantation. Median preoperative BCVA was 1.7 (0.4-1.92) logMAR and median postoperative BCVA was 0.5 (0-2) logMAR across all patients (p=0.002). After surgery, BCVA was higher in 12 patients (80%), unchanged in 2 patients (13.3%) and lower in one patient (6.7%). In our series, 3 eyes were detected to have preoperative RD and 2 eyes high IOP, whereas one patient showed recurrent RD and 4 eyes showed high IOP postoperatively. Median postoperative BCVA was significantly higher in patients who underwent secondary IOL implantation in a second session than those who underwent IOL implantation in the same session (p=0.035).

**Conclusion:** PPV is a safe method for achieving successful visual and anatomical outcomes in patients with IOL dislocated into the vitreous cavity. In these patients, performing the secondary IOL implantation in a second session can result in a higher final visual acuity. Also, monitoring these complex cases closely is important in order to achieve better visual and anatomical outcomes.

**Keywords:** Intraocular lens; pars plana vitrectomy; retinal detachment

## INTRODUCTION

Cataract is one of the leading causes of visual impairment and intraocular lens (IOL) implantation is a routine component of cataract surgery (1,2). The incidence of IOL dislocation varies between 0.2% and 2% (3,4). While the dislocation of the IOL within the capsular bag is common in eyes with pseudoexfoliation (PEX), retinitis pigmentosa (RP), history of trauma, high myopia, and history of vitrectomy, the dislocation of the IOL into the vitreous is rare and can be encountered in the early or late period after cataract surgery. IOL dislocation in the early postoperative period usually arises from the disruption of the integrity of the posterior capsule and zonular dialysis. On the other hand, the most common cause of IOL dislocation in the late period is trauma, while it can also appear spontaneously after a cataract surgery without any complications (5-7).

Dislocated IOLs in the vitreous cavity can be well-tolerated for an extended period if they are in a stable position outside the visual axis unless they lead to complications (8). They can cause complications that result in visual impairment, such as vitreous hemorrhage, retinal tears and retinal detachment. The treatment involves the extraction of the dislocated IOL via the transpupillary route by pars plana vitrectomy (PPV) or the internal fixation of the IOL. In cases where the dislocated IOL is extracted, a secondary IOL implantation can be performed in the same surgical session or in a second session (5,6,9,10). The timing of surgery, the time of secondary IOL implantation, and surgical techniques required to achieve better visual outcomes in these patients continue to be discussed. This study evaluates the demographic and clinical characteristics of patients who underwent PPV for IOL dislocation into the vitreous cavity and the visual and anatomical outcomes of PPV in these patients.

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## MATERIALS and METHODS

Files of patients who underwent PPV for IOL dislocation into the vitreous at Inonu University, Faculty of Medicine, Department of Ophthalmology between January 2014 and December 2018 were retrospectively reviewed. Patients who were lost to follow-up before three months and who had missing data in the files were excluded from the study. Patient age, gender, preoperative and postoperative best corrected visual acuity (BCVA), intraocular pressure (IOP), comorbid ocular pathologies, causes of IOL dislocation, time from IOL dislocation to surgery, and the surgical methods were recorded. Preoperative and postoperative complications including bullous keratopathy, retinal tear/detachment, cystoid macular edema, glaucoma and endophthalmitis were recorded. Visual acuity was assessed using the Snellen chart and the obtained values were converted to units of logMAR to simplify the statistical analysis. IOP was measured using Goldman applanation tonometry and patients with IOP higher than 21 mmHg were also administered topical antiglaucoma medications. Anterior segment was examined using slit lamp biomicroscopy and fundus examination was conducted using a 90 D lens. B-scan ultrasonography was performed in order to determine the localization of the IOL within the posterior segment and identify posterior segment pathologies, where necessary. Anatomical success was defined as the stabilization of IOL and an attached the retina at final follow-up.

### Surgical Technique

All patients underwent 20 or 23 Gauge (G) PPV. Trocars were inserted in the inferotemporal, superotemporal and superonasal quadrants, 3,5 mm posterior to the limbus. Following core vitrectomy, vitreous around the dislocated IOL was cleared to release it. The IOL was moved to the anterior chamber using perfluorocarbon liquid and micro forceps and removed via limbal incision. Where necessary, endolaser photocoagulation (LPC) and silicone oil endotamponade were used. The IOL was planted into the sulcus in patients with adequate posterior capsular support and implanted by scleral fixation in patients with lacking capsular support.

This study was approved by Inonu University Health Sciences Non-invasive Clinical Research Ethics Committee (date: 30.07.2019, approval number: 2019/284) and conducted in accordance with the Helsinki Declaration.

### Statistical Analysis

The data were tested for normality using the Shapiro-Wilk test. The distributions of non-normal data were presented in the form of median, minimum, and maximum values. A dependent groups t-test was used to compare dependent groups. The Mann-Whitney U test was used in the pair-wise comparison of independent groups due to the low number of observations. Categorical data were compared using the Fisher's exact chi-square test. Preoperative and postoperative data were compared using the paired samples Wilcoxon test. The level of significance was considered as 0.05 for all analyses. SPSS for Windows version 25.0 was used for all analyses.

## RESULTS

This study included 15 eyes of 15 patients with IOLs dislocated into the vitreous. Of these patients, 5 (33.3%) were female and 10 (66.7%) were male, with a mean age of 60.8±22.67 (12-94) years. 20-gauge (G) PPV was performed on 7 eyes (46.7%) and 23-G PPV was performed on 8 eyes (53.3%). The right eye was affected in 5 cases (33.3%) and the left eye was affected in 10 cases (66.7%). When evaluated based on the etiology; 9 patients (60%) showed spontaneous dislocation in the late period after cataract surgery, 3 patients (20%) showed dislocation in the early period after phacoemulsification surgery (two within the first postoperative week, one in the same surgical session), one patient (6.7%) showed dislocation after blunt trauma, one patient (6.7%) showed dislocation in a vitrectomized eye, and one patient (6.7%) showed dislocation on the 3rd day after secondary IOL implantation into the sulcus (Table 1). B-mode US was performed on one patient to determine the localization of the IOL.

Seven of fifteen eyes (53.3%) underwent a secondary IOL implantation in the same session as IOL removal. The IOL was planted into the sulcus in 4 of these patients and implanted by scleral fixation in 3 of these patients. None of the patients underwent internal fixation of the IOL. Eight eyes (46.6%) were planned to undergo secondary IOL implantation in a second session. The IOL was planted into the sulcus in 5 of these patients and implanted by scleral fixation in one patient. IOL implantation was not performed on one eye that showed chronic retinal detachment (RD) and phthisis bulbi and another eye with glaucoma that was operated for RD, which was recommended refractive correction with spectacles. Median length of time from PPV to secondary IOL implantation was 3.5 (2-11) months. Median follow-up time after PPV surgery was 9 (3-52) months. Median preoperative BCVA was 1.7 (0.4-1.92) logMAR and median postoperative BCVA was 0.5 (0-2) logMAR (p=0.002). After surgery, visual acuity was higher in 12 patients (80%), unchanged in 2 patients (13.3%) and lower in one patient (6.7%). The patient who showed reduced visual acuity was found to have preoperative proliferative diabetic retinopathy (PDR) and postoperative phthisis bulbi due to chronic retinal detachment. In our series, 3 eyes (20%) were detected to have preoperative RD, whereas one patient (6.7%) showed recurrent RD after surgery. Ocular comorbidities detected in our series included; PDR in three eyes (20%) and corneal leukoma, melting, and traumatic mydriasis in one eye each (6.7%). One eye with traumatic mydriasis underwent pupilloplasty in a later session. Two eyes with preoperative RD were administered silicone oil endotamponade in the end of the operation (Table1). In total, 7 eyes (46.7%) underwent 360° endolaser LPC. Three eyes with PDR and three eyes with RD underwent 360° endolaser photocoagulation during PPV. In one eye that had been vitrectomized previously because of traumatic RD, 360° endolaser photocoagulation was completed by applying laser to untreated areas.

**Table 1. Demographic and clinical characteristics of the patients**

| Case No | Gender (F/M) | Age (year) | Initial BCVA | Final BCVA | Preop. IOP | Postop. IOP (mmHg) | Reasons for dislocated IOL | Seconder IOL implantation procedures | Surgical procedure | Ocular comorbidites (Preoperative) | Postoperative complications | Follow-up time (months) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M | 70 | 1.52 | 0.22 | 8 | 11 | Late dislocation | Sulcus | PPV | None | None | 14 |
| 2 | M | 82 | 1.52 | 0.4 | 14 | 18 | Late dislocation | Scleral fixation | PPV | None | Glaucoma | 14 |
| 3 | M | 41 | 1.7 | 0.5 | 38 | 16 | Vitrectomized eye | Scleral fixation | PPV | Glaucoma | None | 23 |
| 4 | F | 39 | 1.7 | 0.22 | 13 | 15 | Early dislocation | Scleral fixation | PPV | None | Glaucoma, OD soluk | 18 |
| 5 | M | 73 | 1.7 | 0.5 | 9 | 13 | Late dislocation | Scleral fixation | PPV | None | None | 6 |
| 6 | F | 73 | 1.92 | 2 | 12 | 20 | Late dislocation | Aphakia | PPV | RD | Recurrent RD, Phthisis bulbi, Glaucoma | 69 |
| 7 | M | 12 | 0.4 | 0 | 14 | 14 | Late dislocation | Scleral fixation | PPV | RD | None | 3 |
| 8 | M | 28 | 1.92 | 1.4 | 10 | 28 | Late dislocation | Aphakia | PPV+Scleral buckling | RD, Glaucoma | Glaucoma | 9 |
| 9 | F | 94 | 1.0 | 0.22 | 9 | 9 | Late dislocation | Sulcus | PPV+IOL implantation | None | None | 6 |
| 10 | M | 79 | 1.3 | 1.3 | 12 | 12 | Early dislocation | Scleral fixation | PPV+PK+PE+ IOL implantation | Corneal opacity, melting | None | 16 |
| 11 | F | 70 | 1.92 | 1.3 | 48 | 14 | Late dislocation | Sulcus | PPV+IOL implantation | PDR, Glaucoma | Glaucoma | 3 |
| 12 | M | 45 | 0.7 | 0.7 | 14 | 16 | Trauma, Vitrectomized eye | Scleral fixation | PPV+IOL implantation | Opere RD, traumatic mydriasis | None | 3 |
| 13 | M | 66 | 1.7 | 0.7 | 14 | 14 | After secondary IOL implantation | Scleral fixation | PPV+IOL implantation | PDR | None | 9 |
| 14 | F | 76 | 1.92 | 1.3 | 12 | 10 | Early dislocation | Sulcus | PPV+IOL implantation | None | None | 3 |
| 15 | M | 64 | 1.52 | 0.4 | 10 | 12 | Late dislocation | Sulcus | PPV+IOL implantation | PDR | None | 8 |

BCVA: Best Corrected Visual Acuity, F: Female, IOL: Intraocular lens, IOP: Intraocular pressure, M: Male, OD: Optic disc, PPV: Pars plana vitrectomy, PK: Penetrating Keratoplasty, PE: Phacoemulsification, PDR: Proliferative Diabetic Retinopathy, RD: Retinal Detachment

In our study, two eyes demonstrated IOP higher than 21 mmHg before PPV surgery and 4 eyes showed high IOP postoperatively. High IOP was controlled with topical antiglaucoma medications in three of these four eyes. One patient showed high IOP in the final examination despite having undergone glaucoma surgery (trabeculectomy) and topical antiglaucoma medication was added to the treatment. Mean preoperative IOP of our patients was 12 (8-48) mmHg and mean postoperative IOP was 14 (9-28) mmHg. There was no significant difference between the preoperative and postoperative IOP values (p=0.396). None of our patients showed complications such as bullous keratopathy, endophthalmitis, vitreous hemorrhage, uveitis, or macular edema.

Patients who underwent IOL implantation in the same session and those who underwent IOL implantation in a second session were compared with respect to BCVA and IOP. These two groups were not significantly different in terms of the difference between median preoperative and postoperative IOP (respectively, p=0.945, p=0.181). While the two groups were not significantly different with regard to median preoperative BCVA (p=0.945), patients who underwent IOL implantation in a second session demonstrated a significantly higher median postoperative BCVA than those who underwent IOL implantation in the same session (p=0.035) (Table 2).

**Table 2. The comparison of the clinical characteristics of the cases with IOL implantation in the same session and the cases with IOL implantation in the second session**

| | Cases with IOL implantation in the same session | Cases with IOL implantation in the second session | p |
|---|---|---|---|
| Gender (M/F) | 4/3 | 5/1 | 0.559 |
| Median age (Min.-Max.) | 70 (45-94) | 55.5 (12-82) | 0.295 |
| Preoperative BCVA (logMAR) | 1.5 (0.7-1.9) | 1.6 (0.4-1.7) | 0.945 |
| Postoperative BCVA (logMAR) | 0.7 (0.2-1.3) | 0.3 (0-0.5) | **0.035** |
| Preoperative IOP (mmHg) | 12 (9-48) | 13.5 (8-38) | 0.945 |
| Preoperative IOP (mmHg) | 12 (9-16) | 14.5 (11-18) | 0.181 |
| IOL implantation methods Sulcus/Scleral fixation | 4/3 | 1/5 | 0.266 |
| Follow-up time (months) | 6 (3-16) | 14 (3-23) | 0.181 |

BCVA: Best Corrected Visual Acuity, F: Female, IOL: Intraocular Lens, IOP: Intraocular pressure, M: Male, Min.: Minimum, Max.: Maximum, SD: Standard Deviation

## DISCUSSION

IOL dislocation can be categorized as early dislocation if encountered within three months of cataract surgery or late dislocation if encountered after three months from surgery (11). The most common causes of early IOL dislocations are posterior capsule rupture and inadequate IOL fixation, whereas the most common causes of late dislocation include trauma, PEX, uveitis, vitrectomized eye, high myopia, YAG laser procedures and aging (5,11-16). One study reported that, of patients who underwent PPV due to IOL dislocation, 60% showed late-term spontaneous dislocation, 16.6% showed dislocation in the early period after phacoemulsification surgery, 13.3% showed trauma-related dislocation, 6.6% showed dislocation after a previous vitrectomy and 3.3% after YAG laser capsulotomy (17). In the present study, 9 patients (60%) showed spontaneous dislocation in the late period after cataract surgery, 3 patients (20%) showed dislocation in the early period after phacoemulsification surgery (both within the first postoperative week, one in the same session), one patient (6.7%) showed dislocation after blunt trauma, one patient (6.7%) showed dislocation in a vitrectomized eye, and one patient (6.7%) showed dislocation on the 3rd day after secondary IOL implantation into the sulcus.

PPV offers multiple advantages in the treatment of IOLs dislocation into the posterior segment. Access to the IOL is easier and complications such as retinal tears and retinal detachment that can arise due to the dislocated IOL can be addressed in the same session (16). One study reported that moving the dislocated IOL from the vitreous to the anterior chamber using perfluorocarbon liquid and removing it via the limbus was a safe method that achieved successful anatomical and visual outcomes (18). Perfluorocarbon liquid was used in all of our patients, particularly in order to protect the macula. In cases where an intraoperative IOL dislocation is encountered during cataract surgery, surgical repair was recommended to be performed in the same session, and if not possible, within two weeks of surgery. Meanwhile, early surgical intervention is inevitable in patients with conditions such as retinal detachment (19).

In patients with IOLs dislocated into the vitreous, the IOL can be repositioned intraocularly or a secondary IOL implantation can be performed. When the dislocated IOL is repositioned, excess intraocular manipulation can cause structural damage and result in poor sight in these eyes. Thus, removing the dislocated IOL and implanting a secondary IOL at a later session can be a better alternative than the repositioning of the dislocated IOL (13). Secondary IOL implantation performed after the stabilization of the eye following the primary surgery is associated with a lower risk of macular changes, retinal detachment and uncontrolled glaucoma that impacts vision (20,21). On the other hand, another study showed that internal fixation of the IOL resulted in fewer complications and better final visual outcomes compared with the removal of the dislocated IOL via the limbal route or its replacement (22). In contrary to these views, certain studies reported that there was no difference between IOL repositioning and lens replacement in terms of final visual acuity (19,23). In our study, no eyes underwent internal fixation and performing IOL implantation in a second session resulted in a significantly higher final BCVA. We suggest that excessive intraocular manipulation to reposition the IOL in the same session causes structural damage to the anterior and posterior ocular tissues, resulting in lower final BCVA.

The selection of the secondary implantation technique must consider the general condition and ocular anatomy of the patient. Patient's age, systemic diseases, ocular comorbidities, anterior chamber depth, condition of the iris and the pupil, presence of PEX, and presence of posterior capsular support influence the decision concerning the surgical technique to be adopted (22,24). The IOL can be implanted into the sulcus in patients with adequate posterior capsular support or fixated onto the sclera by suture fixation, fixated to the iris, or implanted in the anterior chamber in patients with lacking capsular support (25). In our study, the IOL was implanted into the sulcus in 4 patients and implanted by scleral fixation in 3 patients in the same session, and it was implanted into the sulcus in 5 patients and implanted by scleral fixation in one patient in a second session.

Various studies have reported achieving a final visual acuity of 20/50 or higher in more than half of the patients who underwent PPV due to IOL dislocated into the vitreous (15,19,22,23,25-29). Final acuity is dependent on the length of time between IOL implantation and dislocation and the initial visual acuity. A longer time interval between IOL implantation and dislocation was reported to be linked to better visual outcomes (13). Moreover, the diagnosis and treatment of IOL dislocation within 2 weeks was associated with better visual outcomes (22). However, Smiddy et al. showed that final visual acuity was not correlated with the length of time between IOL implantation and dislocation or the length of time between IOL dislocation and surgery (19). One study achieved a significantly higher visual acuity in pseudophakic eyes (86%) than eyes left aphakic (59.1%) (22). Studies conducted in our country have reported a higher postoperative visual acuity in most patients who underwent PPV due to IOL dislocation (17,18). In the present study, visual acuity was higher in 12 patients (80%), unchanged in two patients (13.3%) and lower in one eye with PDR (6.7%). The patient who showed reduced visual acuity was found to have preoperative PDR and developed postoperative phthisis bulbi due to chronic retinal detachment. Of the patients with unchanged postoperative vision, one had been operated for traumatic RD and had traumatic mydriasis, whereas the other had preoperative corneal leukoma and melting, and underwent penetrating keratoplasty combined with PPV and IOL implantation by scleral fixation.

Postoperative complications encountered in patients who undergo PPV due to IOL dislocation into the vitreous include RD, cystoid macular edema (CME), glaucoma and vitreous bleeding (24-27). One study reported RD in 8%, CME in 22%, and vitreous bleeding in 5% of their patients (25). Another study reported a complication rate of 15% and these complications included CME and hypotonia (13). 360-degree endolaser photocoagulation was described to be effective in preventing RD and intravitreal hemorrhage complications in these patients (17). Steinmetz et al. detected reduced visual acuity in 8.5% of the patients due to RD, pseudophakic bullous keratopathy and macular hole, and Campo et al. in 29% of the patients, due to macular degeneration and complications such as RD and CME (25,28). The risk of postoperative complications after PPV performed for IOL dislocation was reported to be lower for eyes with no history of ocular diseases than those with a history of diseases such as diabetic retinopathy and myopia, and trauma. The complications reported in the cited study include anterior uveitis, bullous keratopathy, CME, RD and glaucoma (22).

The literature reports the incidence of RD among these patients as 1.3-16.3% and the incidence of CME as 7.7-34% (19,23,25). Another study reported the rate of intraocular pressure higher than 22 mmHg as 6.4% (19). Yang and Chao reported that 20% of their cases developed glaucoma and the IOP was controlled with medication (21). High IOP poses a risk of lower visual gains in patients with IOL dislocation and it is important to decrease the IOP with medication prior to the operation (13). The risk of glaucoma and other complications is significantly lower when the dislocated IOL is treated by pars plana than an anterior approach (30). This result is associated with better visual outcomes, particularly due to the lower rate of complications such as corneal endothelial decompensation. In our series, 3 eyes (20%) were detected to have preoperative RD, whereas one patient (6.7%) showed recurrent RD after surgery. In our study, 4 eyes (26.7%) showed high postoperative IOP, which could be controlled with topical antiglaucoma medication in three eyes. The IOP could not be controlled in one patient despite glaucoma surgery, and topical antiglaucoma medication was added to the treatment.

## CONCLUSION

PPV is a safe method for achieving successful visual and anatomical outcomes in patients with IOL dislocated into the vitreous cavity. Performing the secondary IOL implantation in a second session after the removal of the dislocated IOL can result in a better final visual acuity. This study has some limitations such as small sample size and the retrospective nature of the study. It is important to closely monitor these complex cases in order to achieve better visual and anatomical outcomes by the timely detection and management of the complications that may arise before and after PPV.

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*Ethical Approval: This study was approved by Inonu University Health Sciences Non-invasive Clinical Research Ethics Committee (date: 30.07.2019, approval number: 2019/284) and conducted in accordance with the Helsinki Declaration.*

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