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Original Article

Visual and anatomical outcomes of pars plana vitrectomy for dropped intraocular lens: A Retrospective Study.

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Abstract

Background: Intraocular lens (IOL) dislocation is a serious cataract surgery complication that can cause significant visual impairment, often necessitating surgical intervention. Pars plana vitrectomy (PPV) has become the preferred method for treating dislocated IOLs, effectively managing both the lens and related vitreous issues. This study aims to assess the visual and anatomical outcomes of PPV in patients who experienced IOL dislocation following complicated phacoemulsification (PE).

Methodology: A retrospective analysis was conducted at the Ophthalmology Department of Lahore General Hospital. The study included 51 patients (33 males, 18 females) aged 35 to 85 years who were referred after experiencing IOL dislocation post-complicated PE. Data were collected on the interval between PE and PPV, preoperative and postoperative visual acuity (VA), and complications. All patients underwent 23-gauge PPV, involving the removal and re-implantation of the IOL.

Results: The average interval between cataract surgery and PPV was 14 days. All patients presented with aphakia and preoperative visual acuity at the counting finger (CF) level. PPV was successfully performed in all cases, with the dislocated IOL being completely freed from any residual vitreous adhesions. Postoperatively, 38 patients (74.51%) achieved a final best-corrected visual acuity (BCVA) between 20/20 and 20/50, while 12 patients (23.53%) attained BCVA ranging from 20/60 to 20/200. Visual acuity remained unchanged in 1 patient (1.96%) due to bullous keratopathy following anterior chamber (AC) IOL implantation.

Conclusion: Pars plana vitrectomy for the removal of a dislocated IOL following complicated phacoemulsification yields excellent visual and anatomical outcomes with a low incidence of postoperative complications.

Keywords

Pars Plana Vitrectomy, Intraocular Lens Dislocation, Phacoemulsification, Visual Outcomes, Anatomical Outcomes.

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Introduction

Cataracts are the leading cause of blindness worldwide, accounting for nearly half of all cases, particularly in developing countries. Cataract surgery, specifically phacoemulsification combined with intraocular lens (IOL) implantation, remains the only effective treatment and is highly successful in restoring vision[1-3]. However, as the number of cataract surgeries increases globally, so too does the incidence of complications[4-6]. Among these, IOL dislocation, though rare, is a significant concern, with dislocation rates ranging from 0.05% to 1.7% in late-onset cases[7, 8]. Approximately 0.8% of IOLs are dislocated post-cataract surgery[9-11].

One of the most severe and vision-threatening complications following cataract surgery is the displacement of lens fragments or the nucleus into the vitreous cavity. Although infrequent, this complication can lead to a host of serious ocular issues, including cystoid macular edema (CME), glaucoma, uveitis, corneal edema, rhegmatogenous retinal detachment (RRD), and vitreous hemorrhage[12,13]. Given the high volume of phacoemulsification procedures, the risk of such complications is an important concern for ophthalmic surgeons[14,15].

Pars plana vitrectomy (PPV) is widely regarded as the preferred technique for retrieving dropped lens fragments or nuclei from the vitreous cavity following complicated cataract surgery. This procedure not only minimizes the risk of complications such as uveitis and glaucoma but also has the potential to significantly improve visual acuity[16].

However, the timing of PPV post-phacoemulsification remains a subject of ongoing debate. Some studies advocate for early intervention, suggesting that it offers superior outcomes, while others have found no substantial differences between early and delayed vitrectomy. A meta-analysis has shown that performing vitrectomy within 3 to 7 days after phacoemulsification for retained lens material is associated with better outcomes, including improved best-corrected visual acuity (BCVA), a lower risk of retinal detachment (RD), reduced intraocular pressure (IOP), and decreased incidence of intraocular infection and inflammation[16]. Farrahi et al. further supported these findings, reporting significant improvements in BCVA and IOP elevation following PPV[17].

Despite the recognized efficacy of PPV in managing phacoemulsification complications, research in this area is fraught with challenges. Studies often face limitations such as the underreporting of the size and density of retained lens fragments, a bias towards early intervention in more complicated cases with poorer prognoses, and timing decisions influenced by physician discretion, introducing selection bias. These factors complicate the ability to draw definitive conclusions.

The aim of this study is to evaluate the visual and anatomical outcomes of PPV in patients who experienced dropped IOL following complicated phacoemulsification, thereby contributing to the ongoing discussion about the optimal management of such cases.

Methodology

Study Design

This study is a retrospective cohort analysis conducted to evaluate the outcomes of PPV following complicated phacoemulsification surgery, specifically for cases involving a dropped nucleus. The study period spanned from July 2017 to December 2023.

Setting

The study was conducted at the Department of Ophthalmology, Lahore General Hospital, a tertiary care facility in Lahore, Pakistan. The department is equipped with specialized ophthalmic surgical units and handles a high volume of cataract surgeries, including complex cases referred from other centers.

Ethics

This study was conducted in accordance with the ethical standards laid out in the Declaration of Helsinki and was approved by the Institutional

Ethics Committee of PGMI/ADMC (Reference no. 157, Dated: 20-02-2024). Informed consent was obtained from all patients prior to their inclusion in the study.

Participants

The study included 51 patients who were referred to the Department of Ophthalmology after experiencing complications during phacoemulsification, specifically resulting in a dropped nucleus. To be included in the study, patients were required to have complete medical records and a minimum follow-up period of three months. Additionally, only those who underwent PPV within 30 days of the complicated phacoemulsification procedure were considered. Patients with traumatic cataract, traumatic lens subluxation, or advanced proliferative diabetic retinopathy were excluded from the study. The cohort consisted of 33 males and 18 females, ranging in age from 35 to 85 years, with a mean age of 52.5 years.

Variables

The primary variables assessed in this study included the interval between phacoemulsification and PPV, preoperative visual acuity (VA), postoperative visual acuity (VA) at follow-up, final IOL status, and any postoperative complications.

Data Sources/Measurement

Data were collected from patients' medical records, which included detailed preoperative and postoperative ophthalmic examinations. Preoperative VA was documented at the time of presentation (typically at the counting finger level). Postoperative VA was assessed during follow-up visits. The interval between the PE and PPV was recorded in days, and details regarding the IOL status and any complications encountered during or after surgery were meticulously noted.

Bias

To minimize selection bias, only patients who met the strict inclusion criteria and had complete follow-up data were included in the study. Furthermore, the retrospective nature of the study inherently limits the control over confounding variables, but efforts were made to standardize the data collection and analysis procedures.

Quantitative Variables

The primary quantitative variables included the interval between PE and PPV, preoperative VA, postoperative VA, and final IOL status. Descriptive statistics, including mean and standard deviation values, were calculated for these variables.

Statistical Methods

Data entry, cleaning, and analysis were performed using IBM SPSS Statistics for Windows, version 21.0 (IBM Corp., Armonk, NY, USA). Frequency tables were generated to summarize categorical data, while mean and standard deviation were calculated for continuous variables.

Results

Participants

The study included a cohort of 51 patients who underwent pars plana vitrectomy (PPV) following complicated phacoemulsification surgery that resulted in a dropped nucleus. The patient population comprised 33 males (64.7%) and 18 females (35.3%), with ages ranging from 35 to 85 years and a mean age of 52.5 ± 5.26 years. The mean interval between the initial cataract surgery and the subsequent PPV was 14 ± 0.92 days. All eyes were aphakic at presentation, and the preoperative visual acuity was recorded at the counting finger (CF) level.

Descriptive Data

During the PPV procedure, successful removal of the dropped IOL was achieved in all cases, with no residual vitreous adhesions. The method of IOL retrieval varied: in 14 eyes (27.45%), heavy liquid was utilized to float the IOL to the pupillary plane, while in the remaining 37 eyes (72.55%), forceps were employed to grasp and position the IOL at the pupillary plane. Regarding the final positioning of the IOL, 18 eyes (35.29%) had the IOL placed in the ciliary sulcus, whereas in 33 eyes (64.71%), the IOL was removed by extending the limbal incision. Scleral fixation of the IOL was performed in 30 eyes (58.82%), with 27 eyes undergoing concurrent PPV and 3 eyes having scleral fixation at a later date.

Additionally, anterior chamber IOL (AC/IOL) implantation was performed in 3 eyes (5.89%), with 2 eyes receiving primary implantation and 1 eye receiving secondary implantation.

Outcome Data

The visual outcomes post-PPV were assessed using BCVA. At the final follow-up, 38 patients (74.51%) achieved a BCVA in the range of 20/20 to 20/50, indicating a significant improvement in visual acuity compared to their preoperative CF level. A smaller subset of 12 patients (23.53%) attained BCVA in the range of 20/60 to 20/200. Notably, one patient (1.96%) exhibited no improvement in visual acuity postoperatively, attributed to bullous keratopathy, despite receiving an anterior chamber IOL. These results underscore the effectiveness of PPV in restoring visual function for the majority of patients who experienced complications during cataract surgery.

Main Results

Table 2 highlights the BCVA outcomes following PPV. The overall success of PPV is further supported by the significant improvement in visual acuity for most patients. However, postoperative complications were observed in a subset of the cohort. Figure 1 illustrates the complications encountered, with corneal edema being the most common, affecting 5 patients (9.8%). CME was noted in 2 patients (3.9%), while RRD and uveitis each affected 1 patient (1.96%). These findings suggest that while PPV is generally effective in improving visual outcomes, a small percentage of patients may experience postoperative complications that require further management.

Table 1: Demographic details of the participants.

Variables		N(%)
Age (years); Mean±SD		52.5±5.26
Gender	Male	33(64.7)
	Female	18(35.3)
Interval between cataract surgery and PPV (days); Mean±SD		14±0.92
Removal of IOL	Heavy liquid	14(27.45)
	Grasped with forceps	37(72.55)
Placement of IOL	IOL placed in the ciliary sulcus	18(35.29)
	Extending the limbal incision	33(64.71)
Scleral Fixation of IOL	Yes	30(58.82)
	No	21(41.18)

Table 2: Best-Corrected Visual Acuity (BCVA) after PPV.

Range	Initial Visit	Final Visit n(%)	p-value
20/20 and 20/50	Counting Fingers (CF) (100%)	38(74.51)	<0.001
20/60 to 20/200	Counting Fingers (CF) (100%)	12(23.53)	<0.001
Unchanged	Counting Fingers (CF) (100%)	1(1.96)	<0.001

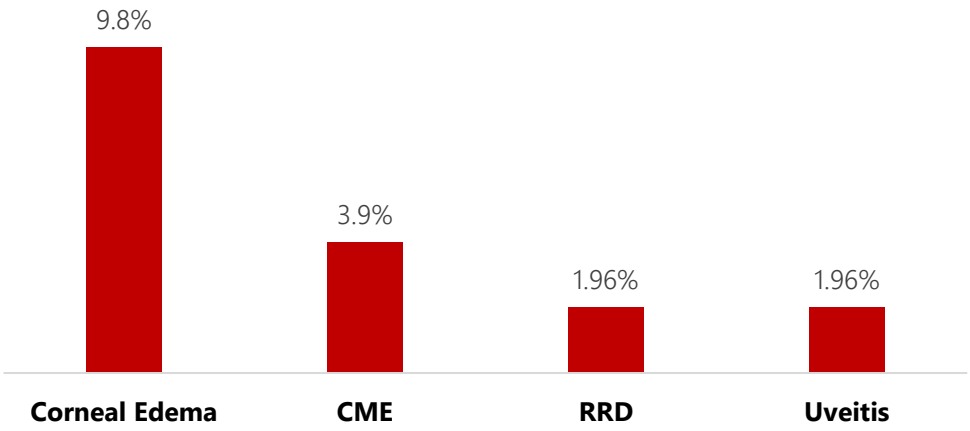

Figure 1: Complications after Pars Plana Vitrectomy.

CME: Cystoid Macular Edema; RRD: Rhegmatogenous Retinal Detachment

Discussion

Phacofragmentor removal remains a preferred technique for managing dropped nuclei, particularly when utilizing the pars plana approach compared to the limbal method. This technique is crucial for stabilizing the nucleus within the mid-vitreous, reducing the risk of slippage. However, it's important to recognize that while effective, this procedure can be time-consuming and may exert considerable force within the eye, especially when addressing harder nuclei, potentially increasing the risk of additional drops.

In our study, we adopted a technique described by several authors for the removal of retained materials, involving limbal incisions during phacoemulsification surgery to minimize the need for multiple entries[18-21]. Managing the infusion flow effectively was pivotal in preventing iris prolapse, thereby reducing the duration of the procedure and minimizing the risk of retinal damage by avoiding the release of ultrasonic force into the vitreous cavity. Additionally, the use of Perfluorocarbon liquid (PFCL) played a protective role in preventing retinal toxicity, particularly in cases involving retinal detachment[22].

The interval between the initial cataract surgery and subsequent PPV was relatively short in our cohort, with all cases presenting aphakia and preoperative visual acuity at the counting finger level. Our findings align with those of Chan et al., who demonstrated that delaying PPV for more than two weeks predicts a worse BCVA of less than 20/200 at six months, compared to performing PPV within the first week after phacoemulsification[23].

The surgical outcomes in our study were favorable, with the successful removal of the dropped IOL without any residual vitreous adhesions. Techniques for retrieving the IOL varied, including the use of heavy liquid to float the IOL to the pupillary plane and forceps for manual repositioning. The final IOL positioning also varied: some were inserted into the ciliary sulcus, while others were removed via an extended limbal incision. Scleral fixation of the IOL was a common technique, performed both concurrently with primary PPV and as a secondary procedure. Anterior chamber IOL implantation was used in select cases. Previous studies have reported that dislocation of an IOL initially placed in the ciliary sulcus typically occurs due to inadequate capsular or zonular support[24-26]. Surgical options for managing such cases include repositioning the dislocated IOL or replacing it with a new one. In this context, 23-gauge suture less PPV has shown several advantages over the traditional 20-gauge

PPV, including shorter surgery duration, reduced postoperative discomfort, less astigmatism, and faster recovery. When capsular support is available, repositioning the IOL in the ciliary sulcus is generally preferred for its quick, easy, and less traumatic nature, making it the most commonly employed technique.

Postoperative visual outcomes in our study were generally positive, with the majority of patients achieving significant improvements in visual acuity. These outcomes are consistent with previous research, where a substantial proportion of patients attained visual acuities of 20/40 or better following vitrectomy[27]. Additionally, other studies have documented that a significant number of eyes reached visual acuities of 20/400 or better post-vitrectomy[28]. Some research also highlighted that a considerable proportion of patients achieved visual acuities of 20/60 and 20/200 or better after the procedure[29].

The most frequent complications observed in this study were corneal edema, CME, RRD and uveitis, with corneal edema being the most prevalent. These complications are in line with those reported in previous studies on PPV for nucleus drop. For instance, Al-Amri et al. documented a range of complications, including uveitis, corneal edema, vitritis, and RRD[12]. Similarly, Oruc et al. identified corneal edema and uveitis as common complications, though they did not report cases of glaucoma, RRD, or CME[30]. The consistency in the types of complications observed across different studies underscores the common challenges associated with this procedure.

Limitations

This study has several limitations that should be acknowledged. The retrospective design, small sample size, single-center setting, and short follow-up period limit the generalizability of the findings to a broader population. These factors may also affect the robustness of the conclusions drawn. Additionally, the focus on immediate postoperative visual acuity, without a detailed exploration of other visual function parameters, restricts the comprehensiveness of the outcomes assessed. To address these limitations, future studies should adopt a prospective design, include multiple centers, and extend the follow-up period to capture a more complete picture of visual recovery and long-term outcomes following PPV.

Conclusion

Our study demonstrates that Pars Plana Vitrectomy (PPV) is an effective intervention for managing severe complications arising from cataract surgery, particularly in cases involving dropped lens fragments or nuclei. The findings highlight the critical importance of timely intervention, as PPV performed within one week after complicated phacoemulsification surgery is associated with superior visual outcomes. While corneal edema was more commonly observed with the trans-limbal lens extraction method, it did not negatively impact final visual acuity, emphasizing that early and appropriate management can lead to optimal visual recovery.

Conflicts of Interest

None.

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