ORIGINAL ARTICLE

A 3-Year Review of the Outcome of Pars Plana Vitrectomy for Dropped Lens Fragments after Cataract Surgery in a Tertiary Eye Hospital in Dhaka, Bangladesh

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ABSTRACT

BACKGROUND: ***Dropped lens fragments into the vitreous are uncommon, but potentially sight threatening complications of cataract surgery. The recommended approach for removal of dropped lens matter is pars plana vitrectomy with or without ultrasonic emulsification with the fragmatome. This study aimed to determine the visual outcome following pars plana vitrectomy for dropped lens fragments complicating cataract surgery at 6 weeks, 3 months and 6 months.***
METHODS: ***This study is a retrospective review of patients who had PPV as treatment for dropped lens fragments complicating cataract surgery at Ispahani Islamia Eye hospital and Institute. The case notes of all patients who had PPV for dropped nucleus from January 2013 to December 2015 were reviewed. Information retrieved included the bio-data of the patients, clinical features such as visual acuity, intraocular pressure, cornea clarity, presence of anterior chamber activity, Lens status and fundus findings at presentation, 6 weeks, 3 months and 6 months post surgery. Details of intra ocular procedure (Cryotherapy, Endo laser, Silicon oil or gas tamponade) in addition to PPV were noted.***
RESULT: ***Thirty- two cases were reviewed within the 36-month time period. There were 8(25%) females and 24(75%) males. Male to female ratio was 1:3. The best corrected visual acuity of patients at presentation was better than or equal to 6/60 in 56.3% of the patients. Dropped nucleus occurred during phacoemulsification cataract surgery in the majority (59.6%) of the patients. The best corrected visual acuity was 6/18 or better in 10(31.3%) eyes at 6 months post-surgery. Worsening of visual acuity to light perception occurred in 3(9.4%) eyes at 6 months, and 3 eyes (9.4%) developed phthisis bulbi.***
CONCLUSION: ***Modest improvement in visual acuity can be achieved after dropped nucleus complicating cataract surgery by Pars plana vitrectomy and removal of dislocated lens fragment.***
KEYWORD: ***Visual outcome, Dropped lens, Pars plana vitrectomy***

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INTRODUCTION

Posterior dislocation of lens fragments into the vitreous is a relatively uncommon complication of cataract surgery, but it is potentially sight threatening (1). Retained lens fragments in the vitreous may cause severe intraocular inflammation leading to secondary glaucoma, corneal oedema, retinal detachment and cystoids macular oedema (CME) (1). Small cortical matter in the posterior segment may sometimes be managed conservatively without the need for surgical intervention (2). Larger pieces (>2 mm in diameter) almost always require surgical removal (2,3). The recommended approach for removal of posterior dislocated lens matter includes pars plana vitrectomy (PPV) with or without ultrasonic emulsification with the fragmatome (2). Also, the perfluorocarbon liquids may be used in floating the lens material anteriorly, and removed through the limbus (4,5). Most eyes with retained lens fragments generally do well after vitrectomy, with the majority recovering with good vision (1). Lambrou and Stewart reported excellent visual acuity outcomes in seven of eight eyes that underwent vitrectomy for retained lens material after cataract surgery (6). Kim et al also documented final visual acuities of 20/40 or better in 68% of eyes in their study of 62 patients (7). However, some complications such as retinal detachment, phthisis bulbi etc have been found to occur in patients with posteri were or dislocated lens fragments especially when aggressive attempts were made to retrieve the lens fragments (2,8). The cumulative rate of retinal detachment before or during vitrectomy and after vitrectomy from previous reports is 15.6% (7,9). Vilar et al reported a combined rate of retinal detachment of 17.5% in their study (10). This study aimed to evaluate the outcome of PPV for the treatment of posterior dislocated lens fragments after cataract surgery at Ispahani Islamia Eye hospital and Institute (IIE&I), Dhaka, Bangladesh.

MATERIALS AND METHODS

Study design: The study is a hospital-based retrospective review covering a 36-month period from January 2013 to December 2015.

Study area: The study took place at the Retina Department of IIE & I, Dhaka which is a non-profit, tertiary eye hospital. It is the largest multi-specialty eye hospital in Bangladesh (11). It serves as a major referral centre for specialist eye care in Bangladesh (11). The Retina Department of IIEH & I has seven (7) vireo-retina surgeons. An average of two hundred (200) patients is seen per day in the Retina Outpatient Clinic. Also, about sixty (60) vireo-retinal surgeries are performed per week by the seven (7) vitreo-retina surgeons.

Study population: All the case notes of patients who underwent PPV for posterior lens dislocation following cataract surgery- Small Incision cataract surgery (SICS), Extra-capsular cataract extraction (ECCE) or Phacoemulsification (PHACO) from January 2013 to December 2015 were reviewed retrospectively. Patients with traumatic lens dislocation, Uveitic cataract or patients in whom the primary aim of cataract surgery was not to improve vision were excluded from the study. Patients with documented pre-existing macular disease or retina disease before cataract surgery were also excluded.

Data collection: The operating theatre records were searched for all patients who had PPV for dropped nucleus from January 2013 to December 2015. The medical record numbers (MRN) of these patients were retrieved from the operating theatre records. Only the case notes with the MRN of patients who fulfilled the inclusion criteria were enrolled in the study. The information retrieved from the case notes included the age and gender of the patients, the clinical features at presentation such as visual acuity, intraocular pressure, cornea clarity, presence of anterior chamber activity, Lens status (Aphakia, Posterior chamber intraocular lens, Anterior chamber intraocular lens, or Sclera fixated intraocular lens) and fundus findings (presence of Vitritis, retinal detachment, choroidal detachment). Other information retrieved included the type of cataract surgery done such as SICS, ECCE or PHACO, the gauge of vitrectomy instrument used to remove the dropped lens fragment, the use of extra intra-ocular procedure (Cryotherapy, Endo laser and Silicon oil or gas tamponade) in addition to the PPV. The visual

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acuity, intraocular pressure, cornea clarity, presence of anterior chamber activity, the lens status and presence of vitritis and posterior segment findings (Retinal detachment, Choroidal detachment, Macular oedema etc) were retrieved from the case notes and recorded at 6 weeks, 3 months and 6 months post surgery.

Study procedure: Standard three-port PPV was carried out in all the patients. The instrument used was either 20G or 23G. Small nuclear fragments were chopped up and aspirated using the vitrectomy cutter. Larger nuclear fragments were floated into the pupillary plane with perfluoro-carbon liquid, and delivered through a sclera incision. First, a complete core vitrectomy was carried out aided by staining the vitreous with Triamcinolone acetonide. Perfluoro carbon liquid was introduced and used to float the nuclear fragments into the anterior chamber. All lens materials were removed from the vitreous in each patient. Peripheral vitrectomy was then completed. Extra intra-operative manipulations were carried out when indicated. The vitrectomy unit used in all the patients was either Accurus® vitrectomy machine (Alcon International, CA) or Constellation® Vitrectomy machine (Alcon International, CA).

Data analysis: Data were entered, cleaned and analysed with SPSS Statistical software, version 20. Frequency tables, mean and standard deviation values were generated. Ethical approval for the study was obtained from the Ethical Review Board of IIEH & I, Dhaka, Bangladesh.

RESULTS

A total of 32 patients were identified to have undergone PPV for dropped nucleus following cataract surgery during the period under review. There were 8(25.0%) females and 24(75.0%) males. The male to female ratio was 1:3. The average age of the patients was 60.7 years. Their ages ranged from 40 to 90 years (Table 1).

Table 1 : Socio-demography characteristics of study subjects

Characteristics	Frequency	%
Age in years		
≤ 50	6	18.8
>50-70	23	71.9
>70	3	9.4
Mean age (SD)= 60.7(10.6)		
Sex		
Females	8	25.0
Males	24	75.0

Evaluation of the patients at presentation showed initial best corrected visual acuity (BCVA) better than or equal to 6/60 in 18(56.3%) of the patients. Anterior chamber activities e.g. cells and flare was present in 10(31.3%) of the patients. The majority 22(68.8%) of the patients were aphakic while Intra ocular lenses (IOL) was in situ in 10(31.3%) of the patients at presentation. Intraocular pressure (IOP) was measured as greater than 20 mmHg by applanation tonometer in 10(31.3%) of the patients. Two (6.3%) patients presented with retinal detachment (RD) and choroidal detachment (CD) (Table 2).

Table 2: Clinical features of patients at presentation (multiple response)

Features	Frequency	%
Aphakia	22	68.8
BCVA < 6/60	14	43.8
Vitritis	14	43.8
Pseudophakia	10	31.3
Raised IOP (IOP>20mmhg)	10	31.3
RD	2	6.3
CD	2	6.3

The majority of the patients (59.6%) reviewed had dropped nucleus during phacoemulsification cataract surgery (Figure 1). Follow-up of at least 6 months was available in all the patients reviewed. A final visual acuity was 6/18 or better in 31.3% of the eyes. More than half (56.3%) of the patients had final best corrected visual acuity of 6/60 or better. Worsening of visual acuity to light

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perception (PL) was noticed in 3(9.4%) patients at 6 months. One patient had non perception of light (NPL) at presentation, and visual acuity remained the same at 6 months post-operation. Surgery was carried out on the patient to control inflammation and intra ocular pressure (Table 3).

Table 3: Best corrected visual acuity before and after PPV

BCVA	At presentation N (%)	6 weeks post PPV N (%)	3 months post PPV N (%)	6 months post PPV N (%)
≥6/18	2 (6.3)	1(3.1)	6(18.8)	10(31.3)
<6/18-6/60	8 (25.0)	8(25.0)	10(31.3)	8(25.0)
<6/60-3/60	1 (3.1)	2(6.3)	3(9.4)	3(9.4)
<3/60	11 (34.4)	15(46.9)	7(21.9)	6(18.8)
HM	9 (28.1)	5(15.6)	5(15.6)	1(3.1)
PL	0 (0.0)	0(0.0)	0(0.0)	3(9.4)
NPL	1 (3.1)	1(3.1)	1(3.1)	1(3.1)

The main causes of final visual acuity less than 6/60 at 6 months post-operation were astigmatism (12.5%), and uncorrected aphakia (9.4%). Three eyes (9.4%) eventually developed phthisis bulbi. One eye (3.1%) developed retinal detachment (RD) post-operatively (Table 4).

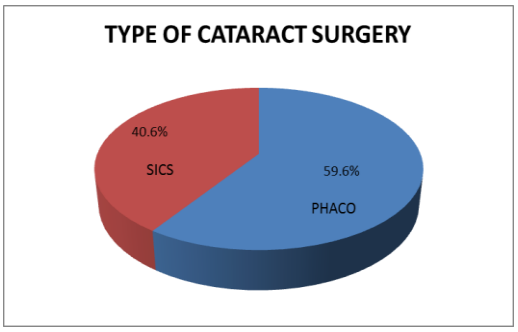

Figure 1*: Types of cataract surgery*

Table 4: Causes of poor final visual acuity (multiple response).

Causes	Frequency	%
Astigmatism	4	12.5
Aphakia	3	9.4
Pale disc	3	9.4
Phthisis bulbi	3	9.4
Macular Pucker	1	3.1
RD	1	3.1

DISCUSSION

Posterior dislocation of lens fragment is a serious complication of cataract surgery particularly after PHACO by inexperienced surgeons (12,13). The literature reported good outcomes in most patients following PPV with removal of the retained lens fragments (12). Complications develop when surgeons try to "fish" for displaced lens fragments from the vitreous cavity manually (4,13). When posterior displacement of the lens occurs during cataract surgery, the residual lens material is removed followed by anterior vitrectomy to remove vitreous from the anterior chamber and surgical incision site. An intraocular lens (IOL) implantation, anterior chamber intraocular lens (ACIOL) or posterior chamber intraocular lens, should be inserted, depending on the extent of residual posterior capsule (3). The patient is then referred to the vitreoretinal (VR) surgeons for the removal of the dropped lens nucleus from the vitreous.

Placing an IOL at the time of the cataract surgery reduces vitreoretina surgery time, and the VR surgeon can concentrate only on the posterior segment surgery. The eye may be left aphakic when the dislocated lens fragment is large to facilitate removal via the anterior segment with the aid of perfluorocarbon liquid.

In this study, all posterior dislocated lens fragments were removed either with the vitrectomy cutter (when the lens fragments are small) or floated through a limbal incision with perfluorocarbon after a complete vitrectomy. No posterior segment

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ultrasound fragmentation was done. This is based on the surgeon's preference and surgical experience.

Two patients (6.3%) had concurrent intra-vitreal displacement of lens fragments and retinal detachment at presentation. Choroidal detachment (CD) was present in two patients (6.3%) at presentation in this study. Retinal detachment (RD) has been reported in 2.0% to 27.0% of eyes with retained lens fragments before vitrectomy (14). Kim et al calculated the total rate of detachment associated with eyes with intra-vitreal dislocation of lens fragments as 18.0% (7). Concurrent retinal detachment with intra-vitreal lens fragments has been attributed to aggressive attempts at retrieval of the intra-vitreal lens fragment from a limbal-based approach at the time of cataract surgery, before proper and complete vitrectomy, causing mechanical traction on the vitreous and vitreous base region (8). In this study, no such aggressive attempts at retrieval of lens fragments at the time of cataract surgery were documented in the case notes of the patients that presented with concomitant RD and CD. Three out of the 4 eyes with RD and CD at presentation eventually developed phthisis bulbi. The 4th eye developed RD at 3 months post PPV for which RD surgery was done. The eye eventually had light perception (PL) vision at 6 months post PPV. Similarly, poor vision was reported by Aaberg et al in a review of 10 patients who presented with concomitant intra-vitreal lens dislocation and giant RD. Useful vision could not be restored in 3 out of the 10 eyes (8).

Most of the lens dislocation occurred during PHACO cataract surgery compared to manual SICS. The incidence of dropped nucleus has steadily increased with the increasing use of PHACO for cataract surgery (1). Phaco-emulsification is still evolving compared to manual SICS. With many surgeons still mastering the learning curve and getting familiar with the various PHACO machines available, this will contribute to the higher incidence of dropped nucleus at surgery.

Studies indicate that most patients with retained lens fragments do well after vitrectomy (1,9). Similarly, in our study of 32 patients with dislocated lens fragments after cataract surgery, there was an increase in the number of patients who achieved visual acuity of 6/18 or better at 6 months compared to at presentation (6.3% vs 31.3%). Also, 56.3% of the patients achieved visual acuity of 6/60 or better at 6 months after surgery. Several studies reported final visual outcome better than what was found in our study (1,7). Kim et al documented final visual acuities of 20/40 or better in 68.0% of eyes in their study of 62 patients (7). Borne et al reported achieving final visual acuities of 20/40 or better in 68.0% of eyes, and visual acuity of 20/400 or better in 85.0% of eyes after vitrectomy(1). Blodi et al reported that 41.0% and 63.0% of their patients achieved visual acuity of 20/60 and 20/200 or better after vitrectomy (15).

The final visual outcomes in our patients were not as good as in those reported in other studies because of astigmatism seen in 12.5% of our patients. In our study, all the patients had nucleus removal either with the vitrectomy cutter (small nuclear pieces) or through a limbal incision. In both methods, sutures were used to secure the sclerotomies and the limbal wounds which may have induced significant astigmatism. Also, this study had patients who developed dropped nucleus from both SICS and PHACO. Sutures were used in the patients who had SICS to secure the sclera wounds. Comparatively, in the studies by Kim et al(7) and Borne et al(1), nucleus retrieval was done by posterior segment phaco-fragmentation. No new incisions were made on the cornea or at the limbus. The study by Blodi et al(15) also included patients who had either SICS or PHACO, and they reported lower final visual acuities in their patients compared to Kim et al(7) and Borne et al(1).

Retinal detachment developed post-operatively in 1 (3.1%) patient. The patient had a large, hard piece of nucleus material displaced posteriorly which was floated out of the eye with perfluorocarbon liquid through a limbal wound. Studies have shown an increased risk of RD in eyes with dislocated intra-vitreal lens that had PPV for retrieval of lens nucleus (7). The rate of RD following vitrectomy is as high as 17.0% (1) thus complete vitrectomy is essential before attempting to retrieve the nucleus from the vitreous in order to prevent engaging the vitreous gel during intraocular manipulations. The use of posterior segment PHACO has also been associated with increased risk of RD after vitrectomy because of the relatively greater suction force by the large bore of the fragmentome, and inadvertent engaging or excessive traction on residual periphery vitreous gel (1). A fragmentome was not used in any of the

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patients in our study which may explain the low incidence of post-operative RD.

Phthisis bulbi developed in 3(9.4%) patients in our study. All of the patients had severe anterior chamber reactions at presentation. Two had CD, and one had RD at presentation. Perfluorocarbone liquid, laser retinopexy and silicon oil were used in all three patients at the time of nucleus retrieval. The retina was re-attached but the globe became phthisical without useful vision. The severe intraocular inflammation at presentation led to cilliary shut down and hypotony with eventual phthisis. Our study is limited by the small sample size but its strength lies in the availability of 6 months follow up data in all the patients.

In conclusion, posterior dislocation of the lens fragment is a vision threatening complication of cataract surgery. PPV and removal of dislocated lens fragment leads to resolution of intra-ocular inflammation and improvement in visual acuity. However, eyes with severe intra-ocular inflammation and RD or CD at presentation have poor visual prognosis. Such eyes may not gain useful vision, and may eventually develop phthisis bulbi.

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