Nucleus Drop or Intraocular Lens Drop Underwent Pars Plana Vitrectomy Due to Complication of Cataract Surgery
Noviana Kurniasari Vivin1, Ari Djatikusumo2, Elvioza2, Gitalisa Andayani2, Anggun Rama Yudantha2, Mario Marbungaran Hutapea2, Andi Arus Victor2

1 RS Mata Undaan, Surabaya, East Java
2 Department of Ophthalmology, Faculty of Medicine, Universitas Indonesia
dr. Cipto Mangunkusumo National General Hospital, Jakarta

ABSTRACT
Background: The incidence of nucleus drop or intraocular lens (IOL) drop as the complication of phacoemulsification increases concomitant to the increased frequency of phacoemulsification. Pars plana vitrectomy (PPV) followed by endofragmentation and secondary IOL implantation is the choice of management procedure. This study aims to determine the frequency, outcome, and complication of PPV in the case of nucleus drop or IOL drop in the Department of Ophthalmology, dr. Cipto Mangunkusumo Hospital, Jakarta.

Methods: This study is a retrospective descriptive study conducted in the Vitreoretinal Division of the Department of Ophthalmology, dr. Cipto Mangunkusumo Hospital, Jakarta. Research data were collected from medical records of patients with nucleus drop or IOL drop underwent PPV in January-December 2017.

Results: There were 19 cases studied. The incidence of nucleus drop occurred in phacoemulsification surgery techniques (94.7%) and ECCE techniques (5.3%). Vitrectomy surgery was performed ≤2 weeks in 31.6% and >2 weeks in 68.4% after the first arrival at the vitreoretinal clinic. Most pre-PPV visual acuity (VA) was 1/60-6/60 (47.1%). In the final follow-up, there was an improvement in visual acuity of 6/45-6/6 with a final percentage of 42.2%. Complications after PPV and secondary IOL implantation include elevated IOP (10.5%), IOL decentration (5.3%), corneal decompensation (5.3%), macular edema (5.3%), and retinal detachment (5.3%).

Conclusion: Nucleus drop or IOL drop generally occurs in phacoemulsification cataract surgery techniques. Improvement of VA achieved after PPV and secondary IOL implantation at the end of the follow-up period. The most common post-PPV complication is elevated IOP.

Keywords: Nucleus Drop, IOL drop, Pars Plana Vitrectomy, Complication of Cataract Surgery


INTRODUCTION
Cataract is a major cause of blindness throughout the world. The increase in frequency of phacoemulsification as a method of cataract surgery causes an increased incidence of surgical complication such as vitreous loss, posterior capsule rupture, nucleus drop, and intraocular lens (IOL) drop. The incidence of nucleus drop is about 0.09-0.8%.1 Factors affecting the nucleus drop include operator experience, the surgical technique, complicated cataract conditions such as posterior polar cataracts and hard nuclear cataracts, history of trauma, history of vitrectomy surgery, high myopia, zonular weakness, and floppy iris syndrome.2, 3
Dropped nucleus or dropped IOL after cataract surgery potentially causing serious complication. Therefore, the right timing of operation for nucleus drop or IOL drop is very important to prevent visual loss. The nucleus that falls into the vitreous cavity must be removed, unless for the small-sized nucleus and no inflammation occurred. Perfluorocarbon fluid (heavy fluid) can also be used to lift/push the nucleus or IOL upward in the vitreous cavity. The choice of procedure to remove the nucleus or IOL is very dependent on the expertise of the surgeon. This study aims to determine the frequency, outcome, and complication of PPV surgery in cases of nucleus drop or IOL drop in the Department of Ophthalmology, dr. Cipto Mangunkusumo Hospital, Jakarta in 2017.

METHODS
This research is a retrospective descriptive study carried out in the Vitreoretinal Division of the Department of Ophthalmology, dr. Cipto Mangunkusumo Hospital, Jakarta. Data were collected from medical records of patients with nucleus drop or IOL drop underwent PPV in the period January-December 2017. Patients with incomplete medical record data will be excluded from this study.

Pre-PPV BCVA is the best correction of visual acuity before PPV surgery which measured by Snellen chart. Post-PPV BCVA is the best correction of visual acuity after PPV or secondary IOL implantation which measured by Snellen charts. Secondary IOL implantation is an intraocular lens insertion surgery performed in conjunction with PPV or at a different time. The PPV time interval is the period from diagnosis to the date of operation. Postoperative complications are unexpected conditions after the surgery.

RESULTS
There were 19 patients underwent PPV due to nucleus drop or IOL drop.

Table 1. Characteristics of patients who underwent PPV

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (n=19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>13</td>
<td>68.5</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>31.4</td>
</tr>
<tr>
<td>Age (n=19)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on table 1, the majority of subjects was male (68.5%), compared to female (31.4%). Out of the 19 cases, there were 13 cases (68.5%) of nucleus drop and 6 cases of IOL drop (31.4%). Based on surgical technique, cases of nucleus drop commonly occurred in phacoemulsification cataract surgery technique (94.7%), while in ECCE technique only occurred in 5.3% of cases. Triamcinolone acetonide injection was done in every nucleus drop or IOL drop patient who underwent PPV. The majority of vitrectomy operations performed >2 weeks in 13 eyes, and the most common location of the secondary IOL implantation was iris claw.
Figure 1. The frequency of pre-PPV BCVA

Figure 1 and 2 show the frequency of changes in visual acuity before PPV and after follow-up. The highest proportion of pre-PPV BCVA was in group 1/60-6/60 (47.1%). The patient with pre-PPV BCVA of >6/45 was only 1 patient (5.3%), while patients with post-PPV BCVA of >6/45 was 8 patients (42.2%), which 4 patients (21.1%) with visual acuity between 6/45-6/15 and 4 patients (21.1%) with visual acuity between 6/12-6/6.

Table 2. Pre-PPV condition and post-PPV complications

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-PPV condition (n=19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevated IOP</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>Corneal edema</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>Uveitis</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>Macular edema</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>Retinal detachment</td>
<td>1</td>
<td>5.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post-PPV complications (n=19)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevated IOP</td>
<td>2</td>
<td>10.5</td>
</tr>
<tr>
<td>IOL decentration</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>Corneal decompensation</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>Macular edema</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>Retinal Detachment</td>
<td>1</td>
<td>5.3</td>
</tr>
</tbody>
</table>

After PPV and secondary IOL implantation, several complications were found, including elevated IOP in 2 patients (10.5%), IOL decentration in 1 patient (5.3%), corneal decompensation in 1 patient (5.3%), macular edema in 1 patient (5.3%), and retinal detachment in 1 patient (5.3%).

**DISCUSSION**

The incidence of nucleus drop after cataract surgery has been increasing as the use of phacoemulsification increases. Even though several studies reported the incidence of nucleus drop as low as 0.09-0.8%, it is potentially threatening the vision if it is not handled appropriately. In this study, as high as 94.7% of nucleus drop cases were found after cataract surgery using phacoemulsification technique.

There is no definite consensus about the ideal time for vitrectomy in the case of nucleus drop, but early vitrectomy which performed within 1 to 2 weeks after cataract surgery could prevent the occurrence of glaucoma, chronic uveitis, and cystoid macular edema. Borne et al compared vitrectomy performed within two days with one week after cataract surgery, it resulted there were no significant differences in final visual acuity. Salehi et al and Blodi et al found that vitrectomy performed on the same day or in less than 3 weeks after cataract surgery were both resulted in improvement of visual acuity and reduction in risk of chronic elevated IOP. The meta-analysis by Vanner and Stewart reported significantly better outcomes with early vitrectomy, namely increased in visual acuity and decreased in the incidences of retinal detachment, elevated IOP, and the degree of inflammation/intraocular infection. If vitrectomy cannot be done on the same day, it is recommended to do the surgery within the first week moreover, before performing the surgery, the surgeon has to ensure that the cornea is clear enough to be able to visualize vitreous and retina.

In our hospital, the majority of vitrectomy in nucleus drop cases performed >2 weeks after the patient first came to the vitreoretinal clinic, namely in 13 patients (68.4%). Only 31.6% of patients were treated by vitrectomy at ≤ 2 weeks since their first arrival. However, the results showed an increase in the frequency of patients with improved visual acuity.
The pre-PPV patients with BCVA of >6/45 were found in 5.3% of patients and improved to 42.2% after vitrectomy.

Twenty-three-gauge pars plana vitrectomy is a standard treatment technique that is widely chosen for nucleus drop or IOL drop cases, but in a hard and large-sized nucleus case, a 20-gauge fragmatome is needed. Furthermore, the nucleus can be removed in-toto through the corneal or scleral tunnel. IOL in the vitreous cavity can be taken using tweezers or vacuum or occlutome, then followed by the removal of the IOL through the corneal or scleral tunnel.7,14

The secondary intraocular lens could be inserted directly after the posterior lens mass destroyed by fragmatome. However, in a hard and large-sized estimated lens, the lens should be removed through the anterior ocular camera and the IOL should not be installed first.13,15 If the sulcus is stable enough to support the IOL, IOL can be implanted in the sulcus. Selected IOLs for sulcus implantation are foldable IOL and 3-piece PMMA with minimum optical diameter of 6 mm and minimum total diameter of 13 mm.15 In this study, the IOL was implanted during vitrectomy in 6 patients (31.6%) and at a different time in 13 patients (68.4%). Most common location of secondary IOL implantation in all cases was at iris claw in 10 patients (52.6%). There is no contraindication of the installation of IOL conjunction with vitrectomy. The after follow-up visual acuity was not related to the timing of IOL insertion.9

The use of Heavy Fluid (HF) can improve the efficiency and safety of the PPV in nucleus drop cases.16 HF can be inserted in the posterior pole, functioning as a protective effect from the ultrasound energy. The ultrasound energy potentially damages important structures such as the macula, optic disc, and large blood vessels at the time of vitrectomy. In large nucleus fragments, enough amount of HF can be used to lift the entire lens into the upper cavity of vitreous. In aphakic patient, the HF can also be used to float the entire lens to the anterior segment so the lens can be removed through the scleral or corneal tunnel.17 HF must be removed after the surgical procedure is complete. In this study, HF was used only in 1 case of dropped IOL because total retinal detachment with PVR occurred while the patient waited for the schedule of operation.

The use of intravitreal triamcinolone acetate (TA) has been carried out for decades because of its function as an anti-inflammatory agent in several intraocular diseases. The advantage of TA as an anti-angiogenic and anti-fibrotic agent is preventing the growth of fibrous tissue after the intraocular surgery is performed.18,19 The use of TA in PVR surgery associated with refractory uveitis provides a fairly good success rate.20,21 Hikichi et al22 and Yamakiri et al23 stated that a long term TA residual in the fovea did not have negative effect on anatomy and visual acuity. Furthermore, the usage of TA also reduced the incidence of intraocular complications such as retinal detachment and retinal break. In this study, TA was used at the end of all operation of nucleus drop (100%).

Corneal edema and uveitis complications cannot be separated from the role of inflammatory mediators triggered by the presence of nucleus fragments in the anterior chamber. In addition, direct mechanical trauma to the cornea caused by nucleus fragments also triggers corneal edema.24 In this study, 3 patients (15.8%) with corneal edema were found. Salehi et al10 reported corneal edema in 58.3% of cases and uveitis in 75% of cases of nucleus drop, where these conditions made a delay in the PPV procedure because a clearer media is needed to visualize the operation.8,13

Salehi et al reported,10 elevated IOP in the case of nucleus drop occurred in about 50% of all cases. IOP elevation, in this case, is associated with intraocular inflammation that is affected by the lens. A clinicopathological study by Yeo et al showed a positive correlation between the degree of response of inflammatory cells to the occurrence of persistent glaucoma. The response of lower inflammatory cells was obtained in the eyes of PPV which performed earlier i.e. less than 1 week.25 In this study, 5 patients (14.2%) had an increase in IOP before PPV was performed.

Romero-Aroca et al26 reported cystoid macular edema (CME) in 31.9% of nucleus drop cases and was a significant risk factor for patients with post-operative visual acuity <6/12. Long-term follow-up is needed to determine the occurrence of CME because CME can occur several months after vitrectomy surgery and even persists for many years.10,26 We found one patient (2.85%) with macular edema.

CONCLUSION
Nucleus drop or IOL drop generally occurs in phacoemulsification cataract surgery technique. Improvement of visual acuity was achieved after PPV and secondary IOL implantation at the end of the follow-up period even though PPV was performed more than 2 weeks after the patient first came to the vitreoretinal clinic in most of the cases. The most common pre-PPV complication was elevated IOP and corneal opacification, whereas most common post-PPV complication was elevated IOP.
REFERENCES


