

Phacofragmentation For The Management of Dislocated Nucleus Into The Vitreous – A Prospective Clinical Study

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Purpose: To evaluate the visual outcome and complication of phacofragmentation for removal of dislocated nucleus into vitreous.

Material And Methods: A total of 22 patients were included in the study. There were 15 males (68.2%) and 7 females (31.8%) with a mean age of 42.25 ± 8.05 years. Eighteen (81.8%) patients had a dropped nucleus secondary to trauma, 10 with blunt ocular trauma (45.5%) and 8 with surgical ocular trauma (36.3%). Four patients (18.2%) had spontaneous dislocation of cataractous nucleus into the vitreous (two with pseudoexfoliation syndrome and two with hypermature cataract). Complete nucleus was dislocated into the vitreous in 15 patients (68.2%), more than half in 5 patients (22.7%) and less than half in two patients (9.1%). Preoperative best-corrected visual acuity (BCVA) was 6/12 or better in 14 patients (63.6%), and 6/24 or less in 8 patients (36.4%). All the patients underwent three-port parsplana vitrectomy (PPV) and phacofragmentation for the removal of dropped nucleus.

Results: All the patients were followed up to one year. Postoperative best corrected visual acuity (BCVA) of 6/12 or better was achieved in 20 patients (90.9%). One patient had traumatic optic neuropathy and the final BCVA was 3/60. One patient developed retinal detachment (RD) following vitrectomy and later underwent retinal attachment surgery (RAS). Final BCVA in this patient was 6/18. There were no peroperative complications noted. Postoperatively one patient developed RD and three patients had cystoid macular edema, which resolved later on and at final follow up visit no patient had such problem. No other complications were noted.

Conclusion: Phacofragmentation is a safe and effective procedure for removal of dropped nucleus and nuclear fragments from the vitreous with minimal complication and good visual outcome.

The most common cause of nucleus dislocation is trauma. Any penetrating trauma to the eye or blunt trauma to the face or eye may result in dislocation of the nucleus into the vitreous. Surgical trauma to the eye like phacoemulsification may also result in dislocation of whole or part of the nucleus into the vitreous secondary to posterior capsular rupture or zonular dehiscence. Spontaneous dislocation of the nucleus may also occur in patients with

Pseudoexfoliation syndrome, Marfan's syndrome, Weil Marchasani syndrome etc. Any hypermature cataract may spontaneously dislocate into the vitreous.

Methods for removal of the dropped nuclei have been under discussion for a long time. There are many modalities to remove the nucleus from the vitreous. It can be removed through a large limbal incision after pars plana vitrectomy (PPV). It can also be retrieved with the help of foreign body forceps after the

completion of pars plana vitrectomy and then removed through a limbal incision. If the nucleus is present in the anterior vitreous and is visible, it can be removed with the help of a wire vectus. Some surgeons advocate vigorous attempts to retrieve the nucleus with infusion of large volume of fluid posteriorly into the eye and catch the nucleus with lens loop. This practice can result in devastating results with giant retinal tears and retinal detachment^{1,2}.

Phacofragmentation of the dropped nucleus is a technique by which the nucleus is emulsified with the ultrasonic energy in the vitreous cavity after three-port parsplana vitrectomy. It is performed through the same pars plana incisions for PPV and there is no need for a large limbal incision.

The aim of this study was to evaluate the effectiveness, visual outcome and complications of Phacofragmentation of dropped nucleus into the vitreous.

MATERIAL AND METHODS

This was a prospective, interventional hospital based study. Patients were selected from the out patient department of LRBT Eye Hospital Lahore. Total 22 cases were included in the study and all underwent phacofragmentation.

Out of 22 patients, 15 (68%) were male and 7 (32%) were female. Mean age was 42.25 ± 8.05 . 18 patients (81.8%) had traumatic dislocation of the nucleus into the vitreous. (Table 1) Out of these 18 patients, 10 (45%) had blunt ocular trauma and 8 (36.3%) had operative ocular trauma (phacoemulsification). Four patients (18.18%) had spontaneous dislocation of cataractous lens into the vitreous. Two had Pseudoexfoliation syndrome and two had hypermature cataract (Table-1).

Complete nucleus was dislocated into the vitreous in 15 patients (68.18%), more than half in 5 patients (22.72%) and less than half in 2 patients (9.09%).

Preoperative best-corrected visual acuity (BCVA) was recorded for each patient (Table-2).

Preoperatively raised intraocular pressure was noted in 4 patients (18.18%), 4 patients (18.18%) had vitreous hemorrhage and three (13.63%) had cystoid macular edema. Five patients (22.72%) had intraocular inflammation. Other complications like retinal detachment, choroidal detachment or endophthalmitis were not seen in any of the patients.

Most common indication for the removal of the dropped nucleus was the size of the nucleus (15 Patients). Four patients (18.18%) underwent surgery due to raised intraocular pressure and five patients secondary to intraocular inflammation caused by the nucleus. Most of the patients had more than one indication for the removal of the nucleus.

Eight patients (36.3%) that had dropped nucleus or fragments due to complication during phacoemulsification underwent surgery at the time of primary surgery. Nine (40.9%) had phacofragmentation within two weeks of dislocated nucleus and five (22.7%) within one month. In 15 patients (68.18%) where the whole nucleus was dislocated into vitreous heavy liquid was used to lift the nucleus into the mid vitreous cavity and phacofragmentation was performed, where as in rest of the cases no heavy liquid was used.

All the patients underwent three port PPV and phacofragmentation.

RESULTS

There were no perioperative complications noted. All the patients were followed up to one year. Postoperative best corrected visual acuity (BCVA) of 6/12 or better was achieved in 20 patients (90.9%) (Table 4). One patient had traumatic optic neuropathy and the final BCVA was 3/60. One patient developed retinal detachment (RD) following vitrectomy and later underwent retinal attachment surgery. Final BCVA in this patient was 6/18. Postoperatively one patient developed RD and three patients (13.63%) had cystoid macular edema, which resolved later on and at final follow up visit no patient had such problem. No other complications were noted.

DISCUSSION

Complete dislocation of the nucleus is a dreadful complication of ocular trauma, whether blunt, penetrating or surgical. Spontaneous dislocation can also occur secondary to certain ocular or systemic disorders resulting in zonular dehiscence like pseudoexfoliation syndrome, hypermature cataract, morgagnian cataract, Marfan syndrome, Weil Marchasani syndrome etc. Actual incidence of nucleus dislocation into the vitreous is not known as the cataract surgery is performed all around the world but it is estimated to be 0.3%³.

Table 1: Distribution gender, etiology and types of dislocation

| | No. of cases n (%) |
|--------------------------|--------------------|
| Total (n) | 22 (100) |
| Male | 15 (68.18) |
| Female | 7 (31.8) |
| Etiology | |
| Blunt ocular trauma | 10 (45.4) |
| Phacoemulsification | 8 (36.3) |
| Pseudoexfoliation | 2 (9.09) |
| Hypermatve | 2 (9.09) |
| Cataract | |
| Lens Size Dropped | |
| Complete | 15 (68.18) |
| More than half | 5 (22.72) |
| Less than half | 2 (9.09) |
| Heavy Liquid Used | 15 (68.18) |

Table 2: Post operative complication associated with dislocated nucleus

| Complication | No. of cases n (%) |
|---------------------|--------------------|
| Increased IOP | 4 (18.18) |
| CME | 3 (13.63) |
| Vitreous hemorrhage | 4 (18.18) |
| Uveitis | 5 (22.72) |

IOP: Intraocular Pressure

CME: Cystoid Macular Odema

Vit. He: Vitreous Hemorrhage

Removal of whole nucleus can be achieved by different methods but all need a large limbal incision with resultant astigmatism and other incision and suture related complications. Further if somebody has placed an intraocular lens (IOL) then the surgeon has to remove the IOL and then proceed for the retrieval of the dislocated nucleus.

Most common surgical trauma for the dislocation of whole or part of the nucleus in our study was phacoemulsification. Not surprisingly, residents were operating all these patients during their initial learning of phacoemulsification. All these patients underwent phacofragmentation during their primary surgical procedure. Indications for the removal of nucleus or nuclear fragments include its size (less than 3 mm

fragments can be watched if not causing any problems), IOP, intraocular inflammation and associated other pathology like vitreous hemorrhage and retinal detachment. It is better to perform the surgery early to remove the nucleus for better visual outcome as described by Hutton et al⁵ and Blodi et al⁶.

Table 3: Preoperative visual acuity

| Visual Acuity (VA) | No. of cases n (%) |
|--------------------|--------------------|
| 6/9-6/6 | 1 (4.54) |
| 6/18-6/12 | 13 (59.09) |
| 6/60-6/24 | 5 (22.72) |
| 6/60 or less | 3 (13.63) |

Table 4: Postoperative visual acuity

| Visual Acuity (VA) | No. of cases n (%) |
|--------------------|--------------------|
| 6/12-6/6 | 20 (90.9) |
| 6/18 | 1 (4.54)* |
| 3/60 | 1 (4.54)** |

*Developed retinal detachment, visual acuity post retinal attachment surgery

**Had traumatic optic neuropathy

The use of heavy liquid has been described to float the nucleus into the mid vitreous cavity away from the retina and perform phacofragmentation⁷. With a specific gravity higher than water and a high surface tension, perfluorocarbon liquids ideally are suited for floating a dislocated IOL or nucleus from the surface of the retina and flattening any underlying retinal tear(s) or detachment at the same time^{8,9}. The perfluorocarbon liquids also may displace associated vitreous, epiretinal, or subretinal blood anteriorly. Heavy liquid is removed at the end of the surgery as if left inside the eye it can damage the photoreceptors. We used heavy liquid (Vitreon) in 15 patients and in rest of the patients, phacofragmentation was performed without it. No complications or adverse effects of use of heavy liquid were noted and there was no statistically significant visual outcome difference in these patients.

In our study the visual outcome was excellent and 90.9% patients received a visual acuity of 6/12 or better. In the study by Lambrou and Stewart¹⁰, 88%

patients achieved a postoperative visual acuity of 6/12 or better. Fastenberg et al found a visual out come of 6/12 or better in 82% patients. Seo MS and Yoon KC got a visual acuity of 6/12 or better in 73.9%¹¹. Imai M Iijima H¹² did intravitreal phacofragmentation in 10 patients and had a favorable out come in all patients including excellent postoperative visual acuity (20/25 in 95% patients) and no intraoperative and postoperative complications. Further the IOP, which was raised in 20% patients, went back to normal in 15% patients.

CONCLUSION

We found that the removal of nucleus or nuclear fragments by PPV and phacofragmentation is a safe procedure with satisfactory visual out come and very few complications. The patient should be referred to a vitreoretinal surgeon as soon as possible to remove the intravitreal nucleus. The nucleus retrieval should not be attempted with wire vectus if it is not visible or if it is in deep vitreous. The use of deep phacoemulsification should also be discouraged as it could also result in devastating complications.

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