

Visual Outcome of Pars Plana Vitrectomy for Dropped Nucleus after Phacoemulsification

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ABSTRACT

Objective: To determine the visual outcome of patients who underwent pars plana vitrectomy for dropped nucleus after phacoemulsification.

Study Design: Interventional case series.

Place and Duration of Study: LRBT Free Base Eye Hospital, Karachi, from February 2008 to January 2011.

Methodology: Forty-eight eyes of forty eight patients having history of dropped nucleus (soft remnant, half nucleus or complete nucleus) underwent 20 gauge pars plana vitrectomy within 24 days of phacoemulsification. After complete vitrectomy nucleus was lifted with the help of perfluorocarbon and removed either through a limbal incision or by using phacofragmenter, whereas small lens remnants were removed with a vitreous cutter. Intraocular lens was implanted at the end of surgery. Postoperative visual acuity, and any complications were assessed. Patients were followed for a period of 12 months.

Results: Final visual acuity ranged from 6/9 to 6/18 in 34 eyes (70.83%), 6/24 to 6/36 in 8 eyes (16.66%) and 6/60 or less in 6 of 48 eyes (12.5%). Complications included raised intraocular pressure in 6 eyes (12.5%) and retinal detachment in 2 eyes (4.1%), corneal oedema and decompensation in 3 eyes (6.25%) and cystoids macular oedema in 4 cases (8.33%) out of 48 cases.

Conclusion: The loss of crystalline lens in the vitreous during phacoemulsification is a severe complication, but appropriate and timely management can restore good visual outcome and minimize complications.

Key words: *Phacoemulsification. Dropped nucleus. Pars plana vitrectomy. Phacofragmenter.*

INTRODUCTION

Cataract is the leading cause of blindness and accounts for about half of all blindness in the world.¹ Cataract extraction is the most routinely performed surgery in patients over 65 years of age.² Phacoemulsification has become the most preferred method over the last two decades. The smaller incision of phacoemulsification compared to extracapsular cataract extraction renders the operation safer, since decompression of the eye is avoided. In addition, the procedure is associated with little induced postoperative astigmatism and early stabilization of refraction (usually 3 weeks for 3 mm of incision). Postoperative wound related problems such as prolapsed iris are almost eliminated. But dislocation of fragments of lens material into the vitreous cavity after zonular dehiscence or posterior capsule rupture is rare, but potentially serious complication because it may result in glaucoma, chronic uveitis, retinal detachment and chronic cystoids macular oedema.³ The overall incidence of nucleus drop into the vitreous in one

study was found to be 0.8%. The incidence for the experienced surgeon was 0.3% and for those learning it was 1.23%.⁴ Other studies reported that the incidence varies from 0.3%-2.7% in western countries to 0.3%-1.3% in India.⁵ Management of dropped nucleus has controversy with reference to the indications of surgery, timing, long-term results, and scope for medical management. At present, conservative approach only in case of small fragments, where medical management of inflammation and glaucoma may allow time for the fragment to get absorbed. Vitrectomy deals with the removing of fragment, hastening visual recovery, managing secondary complications and dealing with the expectations of the patients.⁶

Various surgical modalities have been described for the safe removal of the dropped nucleus. Some studies have reported the intraoperative utility of perfluorocarbon for this indication⁷, whereas others reported comparable results without its use.⁸ However, the exact procedure varies with the surgeon preference and experience. At present, intravitreal phaco-fragmentation is frequently used, but perfluorocarbon helps in safe removal of dropped nucleus.

The timing of pars plana vitrectomy and factors determining the final visual outcome remains unclear. A final visual acuity of 20/40 or better has been achieved in 51.8% to 82% of patients undergoing the procedure.⁹

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Several retrospective studies failed to show a significant difference in the outcome of pars plana vitrectomy, whether it was performed immediately or was delayed.¹⁰

The objective of the current study was to determine the visual outcome in patients undergoing pars plana vitrectomy to manage posteriorly dislocated nucleus or fragment following phacoemulsification.

METHODOLOGY

The study was conducted in LRBT Free Base Eye Hospital, Karachi, from February 2008 to January 2011. The operative records of patients were retrospectively reviewed, who underwent phacoemulsification and had the disastrous complication of dropped lens fragment or nucleus, followed by the plan for pars plana vitrectomy. All patients with a history of dropped nucleus during phacoemulsification were included in the study. Patients with resultant retinal detachment as a result of dropped nucleus; glaucoma and ocular infections were excluded. A proforma was used to record demographics, pre-existing eye disease, details of previous cataract surgery (including date), effectiveness of anterior vitrectomy, and intraocular lens implantation. In addition, visual acuity using Snellen chart was recorded, intraocular pressure measurement, anterior segment findings included perlimbal injection, corneal oedema, anterior chamber reaction, hyphaema, hypopyon, retained lens matter or vitreous in anterior chamber, the approximate size of nuclear fragments in the vitreous cavity, state of the vitritis, vitreous haemorrhage, retinal detachment, cystoid macular oedema, and choroidal effusion were evaluated. B-scan was performed in cases where fundus was not visible. Complete details of the procedure undertaken (with dates), time interval between phacoemulsification and vitreoretinal surgery, use of phacofragmentation (fragmatome) and perfluorocarbon were taken. Peroperative complications such as retinal tear or retinal detachment, final visual acuity, and postoperative complications were recorded during the follow-up. All vitrectomies were performed within 24 days of phacoemulsification. Patients were followed

postoperatively on 1st day, 1st week, 3rd week and then subsequently on 1st, 2nd, 3rd, 6th month and then finally at 12 months.

All surgeries were performed by a single vitreoretinal surgeon under local anaesthesia. MVR knife was used to make 3-ports for 20 gauge pars plana vitrectomy. Central and peripheral vitrectomy was performed to avoid jabbing the vitreous during aspiration. The density of nuclear fragments was re-assessed. If soft remnants were seen at the posterior pole, 1-2 ml of perfluorocarbon liquid was used to float the fragments away from the posterior pole (to avoid damage to the underlying retina) and the fragments were then easily removed with a vitreotome. Sometimes, endoilluminator was used to break the fragments into smaller pieces. If the dropped fragment was medium/hard, 1-2 ml of perfluorocarbon liquid was used to lift fragments away from the posterior pole to protect macula, and low ultrasound power of phacofragmatome / emulsifier between 10-20% was used to avoid the lens fragments from shooting out from the phaco tip. Trapping/ lifting/releasing maneuvers had to be repeated several times until small fragments were left, which were then removed by vitreotome. If there was complete nucleus at posterior pole, perfluorocarbon liquid was used to lift the nucleus away from posterior pole, until it came near the posterior capsule. The nucleus was displaced into the anterior chamber and removed via a limbal incision. After that, revision of peripheral retina was done. Laser photocoagulation of peripheral retina using endolaser was done (in eyes with high myopia or peripheral retinal degeneration), perfluorocarbon removed at the end of the surgery. Intraocular lens implantation (posterior capsule, anterior capsule, scleral fixation) was then performed.

Data was analyzed in Statistical Package for Social Sciences (SPSS, version 13). Frequency with percentage was calculated for follow-up period.

Chi-square test was used for postoperative improvement in visual acuity. P-value ≤ 0.05 was considered significant.

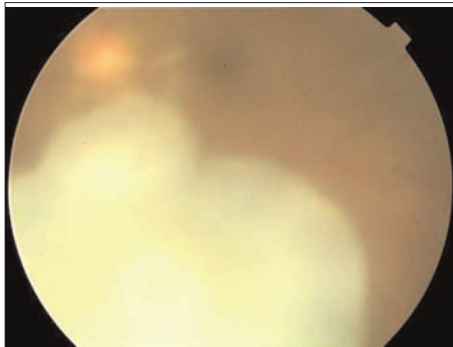


Figure 1: This figure illustrates dropped nucleus after phacoemulsification.

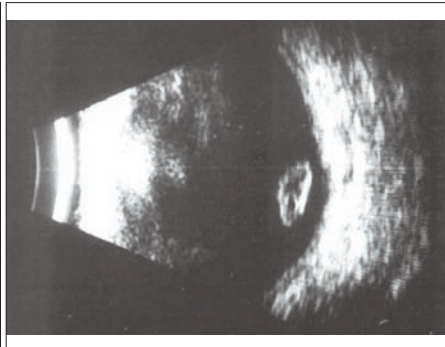


Figure 2: Shows the dropped nucleus as seen on a B-scan. It appears as a well defined hyper-echoic entity in the vitreous cavity.



Figure 3: Illustrates retinal detachment which occurred after pars plana vitrectomy was done for dropped nucleus management.

RESULTS

In the current study, there were 32 males (66.66%) and 16 females (33.33%) with age ranging from 40 to 60 years. After a mean follow-up of 10.8 ± 2.2 months, final visual acuity ranged from 6/9 to 6/18 in 34 eyes (70.83%), 6/24 to 6/36 in 8 eyes (16.66%) and 6/60 or less in 6 eyes (12.5%) out of 48 eyes ($p < 0.001$, Table I). Visual rehabilitation was done with posterior chamber intraocular lens in 31 cases (64.58%), sclera fixation lens in 6 cases (12.5%) and anterior chamber intraocular lens in 7 cases (14.58%) out of 48 cases; 4 cases (8.33%) were left aphakic. Pars plana vitrectomy was performed within 01-07 days in 10 eyes, within 08-15 days in 17 eyes, within 16-24 days in 21 eyes. Complications included raised intraocular pressure in 6 patients (12.5%), retinal detachment in 2 patients (4.1%), corneal oedema and decompensation in 3 patients (6.25%) eyes and cystoid macular oedema in 4 eyes (8.33%).

Table I: Final visual acuity at 12 months (n = 48).

Visual acuity 6/9 - 6/18	Visual acuity 6/24 - 6/36	Visual acuity 6/60
34 (70.83%)*	08 (16.66%)	06 (12.5%)

$P < 0.001$, highly significant*

DISCUSSION

Posterior descent of the nucleus after posterior capsule rupture is a serious complication. Attempting to chase the dropped nucleus with the phaco tip can result in giant retinal tears and retinal detachment.¹¹ The incidence of dislocation of lens fragments into the vitreous cavity during phacoemulsification has been reported in one study to be 0.20%.¹² Another study in India reported the incidence of this disastrous complication as being 0.3-1.3%,⁴ whereas in USA, the incidence was found to be 0.3%.¹³ The incidence of dropped nucleus with experienced surgeons was 0.2% which was significantly less than that observed with inexperienced surgeons 0.6%.⁴ Vitreous loss increases the risk for postoperative retinal detachment, cystoid macular oedema, inflammation and elevated intraocular pressure.¹⁴ Retained nucleus further elevates the risk for postoperative inflammation, secondary glaucoma and corneal decompensation. Subsequent posterior segment surgery to retrieve the dropped nucleus generally improves the clinical outcome.¹¹ Although observation may be appropriate for small amount of cortex or nuclear fragments, excessive delay in performing the necessary surgery may worsen the prognosis.¹⁵ Once a surgeon recognizes posterior capsule rupture, the aim of the surgeon is to remove the remaining nucleus, epinucleus and cortex safely, followed by excision of vitreous from the anterior chamber using an automated vitreous cutter with a high cutting rate. If enough support by either the posterior capsule or the anterior capsule is present, a posterior chamber intraocular lens is implanted. If the

nucleus dislocates into the posterior vitreous or onto the retina, it is difficult for the anterior segment surgeon to visualize it or to bring it forward. At this time, the surgeon needs to control his nerves and avoid unplanned and unnecessary maneuvers. An experienced vitreoretinal surgeon should be consulted at this point.

Pars plana vitrectomy is considered to be the appropriate surgical approach in the management of posteriorly dislocated lens fragments following phacoemulsification. Review of literature indicates a lack of consensus whether the timing of this procedure effects on final visual outcome. According to several studies, patients undergoing pars plana vitrectomy to manage retained lens fragments experiences a high incidence of long-term complications such as corneal oedema, uveitis, glaucoma, and retinal detachment when the procedure was delayed.⁸ On the other hand, studies shows the timing of pars plana vitrectomy in managing patients with posteriorly dislocated lens fragments after cataract surgery did not have any effect on the final visual outcome and the rate of complications.^{16,17} Some suggested that delaying vitrectomy for two or more weeks can facilitate the eventual procedure by allowing the nuclear material to get soften, posterior vitreous detachment, and better control of intraocular inflammation and pressure.¹⁸ In this study all vitrectomies were done within 24 days of phacoemulsification. After a mean follow-up of 10.8 months, 70.83% eyes had final visual acuity of 6/9 to 6/18 ($p < 0.001$). Another study showed that the final visual acuity after pars plana vitrectomy was 20/40 or better in 27% eyes.¹⁹ Tajunisah showed that the final visual acuity was 6/12 or better in 45.5% eyes.⁵ Verma reported that the final visual acuity was $> 20/60$ in 75% of eyes.⁷ Gurunadh showed that 74% of eyes had a visual recovery of 6/18 or more.²⁰ Borne *et al.* observed a trend towards higher rates of retinal detachment among patients in whom phacofragmentation was used.¹⁷ Similarly, Al-Khaier and co-authors found higher retinal detachment rates in patients who had phacofragmentation.²¹ In a large series, Moorie *et al.* reported retinal detachment in 5.5% patients following pars plana vitrectomy for retained lens fragments.²² Ho and Zaman found retinal detachment in 4.9% of patients in their study.²³ In this study, retinal detachment was encountered in 4.1%. The use of perfluorocarbon in case of posteriorly dislocated crystalline lenses has been used as a means of protecting the retina against ultrasonic energy and lens fragments induced mechanical trauma during phacoemulsification.²⁴ Postoperative cystoids macular oedema has been reported to occur in upto 27% in patients following pars plana vitrectomy for retained lens material.²⁵ In this study, it was 8.37%. Other studies show elevated intraocular pressure in 46.3% of cases,²⁶ whereas in the present study elevated intra-ocular pressure was encountered in 12.5% cases.

Thus pars plana vitrectomy for dropped nuclei was not only associated with good visual outcome but also with low incidence of complications in this study.

CONCLUSION

Posterior dislocation of nucleus or its fragment is a well-documented complication during phacoemulsification. Its proper management depends on many factors including the size of the dislocated lens matter, access to a vitreoretinal surgeon and presence of complications directly related to the retained lens fragments. Prompt removal of the lens matter and management of postoperative complications can ensure good visual outcome for the patient. Moreover, the patient should be counselled pre-operatively concerning the possibility of this complication and the need for subsequent surgical management.

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