Original Article

Visual Outcomes of Immediate Versus Delayed Vitrectomy for Dropped Nucleus during Phacoemulsification

Shakir Zafar, Syed Asaad Mahmood, Munira Shakir, Saima Amin, Syed Fawad Rizvi

Pak J Ophthalmol 2016, Vol. 32 No. 2

See end of article for authors affiliations

Correspondence to:
Syed Asaad Mahmood MBBS
Resident LRBT Free Base Eye hospital Korangi 2½, Karachi.
Email. syed_asaad@yahoo.com
Received: March 25, 2016
Accepted: May 24, 2016

Purpose: To compare the visual outcome of patients undergoing immediate pars plana vitrectomy (PPV) surgery for dropped nucleus during versus delayed phacoemulsification.

Study Design: Retrospective quasi – experimental.

Place and Duration of study: This study was conducted at LRBT Tertiary Eye Hospital, Karachi from February 2008 to February 2014.

Material and Methods: Records of patients who underwent PPV for dislocated lens fragments were reviewed. Patients were divided into two groups depending on whether they underwent PPV immediately following nucleus drop (group A) or as a second procedure within 15 days' time (group B). Data collected included patient demographics, pre-operative best – corrected visual acuity (BCVA), duration of follow up, post-operative intraocular pressure, final BCVA and post-operative complications. Patient data was analysed at 12 months post-operatively. IBM SPSS 21 was used for data analysis.

Results: Fifty seven patients (30 in group A and 27 in group B) were included in this study. The mean postoperative BCVA at 12 months for group A was $6/12^{-1}$ (range 6/6 – 6/36) and for group B was 6/12 (range 6/6 – 6/36). The mean improvement seen in BCVA was by 4.83 ± 1.39 lines of Snellen chart in group A and 4.67 ± 1.94 lines in group B compared to the preoperative visual acuities (p-value = 0.709). Cystoid macular edema (CME) occurred in 16% (5 patients) in group A and 11% (3 patients) in group B while corneal edema was encountered in 7% (2 patients) in group A and 4% (1 patient) in group B.

Conclusion: Although the final visual outcomes were comparable between the two groups, early vitrectomy reduces the morbidity and results in a quicker visual recovery.

Key-words: Dropped nucleus; Lens Subluxation; Phacoemulsification; Posterior Capsular Rupture; Vitrectomy.

Cataract surgery is the most commonly performed ocular surgery in the adult population. The cataract surgical rate (CSR) varies considerably among different parts of the world, from 2000 per million populations to 25000 per million populations[1,2]. The technology involved in this procedure has progressed rapidly over the last few decades which have resulted in ophthalmic surgeons shifting from intra capsular cataract extractions to extra capsular cataract extractions (ECCE) with intra ocular lens (IOL) implantation and later onto sutureless small incision cataract extractions (SICS) and phacoemulsification. The technological evolution is still ongoing with the introduction of femtosecond

laser that has automated several of the manual steps of phacoemulsification surgery resulting in more precise refractive outcomes[3].

Generally, cataract surgery is a very safe procedure with good results in a large majority of the cases. However, like any surgical procedure, it has its associated set of complications. Posterior dislocation of the nucleus (or of a partially emulsified nucleus) into the posterior segment is one of the most dreaded complication, that may lead to further problems secondary to severe inflammation, such as macular edema, glaucoma and retinal detachment[4]. Its incidence is about 0.2% – 1.5%[5]. If detected in the initial stages, there are several approaches that the surgeon may employ to prevent nucleus dropping into the vitreous cavity, including the posterior assisted levitation, HEMA life boat and IOL scaffold technique[6]. However, if the nucleus has reached the posterior pole or is in the posterior vitreous, further management is best left for the vitreo-retinal surgeon as any attempt to chase after the nucleus may result in retinal tears and detachment[7]. Timely pars plana vitrectomy (PPV) for removal of the dropped nucleus/ nuclear fragments is a well – established method for restoring good vision and preventing secondary complications[8,9].

The ideal timing of vitrectomy after cataract surgery still remains debated. Traditionally, the PPV was delayed so that the eye could recover from the inflammation caused by the initial surgery[5]. But several recent studies have advocated for vitrectomy to be performed on the same day as the complicated cataract surgery, citing reduced complication rates and better visual prognosis.[5,10] In practice though, a few other significant factors come into play when deciding the vitrectomy timing including the availability of an experienced vitreo-retinal surgeon and the necessary machinery, both of which are not readily available in all the cataract surgery centres in regions similar to ours.

The purpose of this study was to compare the visual outcomes achieved in same-day vitrectomy with the results of delayed vitrectomy for the management of dropped nucleus / nuclear fragments in a tertiary eye care setup.

MATERIAL AND METHODS

Records of patients undergoing surgery at LRBT free eye hospital, Karachi during February 2008 to February 2014 were reviewed retrospectively for this study. The hospital ethics board reviewed the study before it was performed and a written informed consent had been taken from all participants in the study.

Included in this study were all patients who had loss of nucleus (or part of it) into the posterior segment during a phacoemulsification surgery and subsequent pars plana vitrectomy (PPV) surgery to remove it. Patients were divided into two groups depending on the time interval between phacoemulsification and PPV surgeries; whether pars plana vitrectomy was performed immediately following nucleus drop (group A) or it was performed later on, within 15 days' time (group B). In addition to these, patients with corneal opacities, glaucoma, pre-existing macular disorders limiting visual prognosis post-phacoemulsification, and those presenting with concomitant retinal detachments were screened out of the study. Moreover, patients with follow up of less than 12 months were excluded from the analysis.

A proforma was used to record demographics, preoperative and postoperative visual acuity, intra-ocular pressure via applanation tonometry, corneal oedema, anterior chamber reaction, hyphema, vitritis, vitreous haemorrhage, retinal detachment, postoperative complications and time interval between the two surgeries. For sake of comparison, the preoperative visual acuity of group B used for calculation is the visual acuity recorded before the initial cataract surgery. All patients were re-assessed on post-op day 1, day 7, 1 month, 3 months and at 12 months, although a few required more frequent follow-ups.

Data was analysed using IBM SPSS Statistics 21. Pearson Chi-Square test and T-test were applied to test for significance between groups. A p-value < 0.05 was considered significant.

The PPV was performed by one of the two vitreo-retinal surgeons under local anaesthesia using the same procedure. MVR knife was used to make 3-ports for 20 gauge pars plana vitrectomy. Core vitrectomy was performed to avoid jabbing the vitreous during aspiration. The density of nuclear fragments was assessed on the operating table. In case of a complete nucleus drop or a large fragment, perfluorocarbon liquid (PFCL) was used to lift it away from posterior pole, displaced into the anterior chamber and removed via a limbal incision. For small fragments and soft remnants, 1 – 2 ml of perfluorocarbon liquid was used to float the fragments away from the

posterior pole (to protect the underlying retina) and these were then removed with a vitreotome, using the endoilluminator to break the fragments into smaller pieces where needed. Laser photocoagulation of peripheral retina using endolaser was done in myopic eyes. At the end of the surgery, posterior chamber intraocular lens (IOL) was placed in patients with adequate posterior capsular support while anterior chamber IOL was implanted in the rest.

Postoperatively, all eyes received topical drops containing moxifloxacin 0.5% and dexamethasone 0.1% 2 hourly for first week which was tapered off over eight weeks. In addition, ciprofloxacin 500mg twice a day and ibuprofen 200 mg 3 times a day was given for the first 3 postoperative days. Postoperative examination during the follow-up visits included VA, BCVA, IOP measurement, and screening for any postoperative complications, which were managed on individual basis.

RESULTS

Fifty seven patients were included in this study. 53% (30 patients - 17 males and 13 females) were in group A and 47% (27 patients – 18 males and 9 females) in group B. Mean age at the time of surgery was 50.2 ± 11.1 years for group A and 54.8 ± 10.3 years for group B patients (p-value = 0.938). The mean postoperative BCVA (Snellen decimal) at 12 months for group A was 0.484 ± 0.200 (equivalent to Snellen fraction of $6/12^{-1}$) and for group B was 0.507±0.191 (equivalent to Snellen fraction of 6/12). The mean improvement seen in visual acuities on Snellen chart testing was of 4.83 ± 1.39 lines in group A and 4.67 ± 1.94 lines in group B (p-value = 0.709). Details of visual acuities achieved after surgery in the two groups is given in (Table 1).

Table 1: Postoperative BCVA achieved by the two groups at 12 months.

Postop Visual Acuity	Group		No. of Patients n (%)
	A (Immediate) n (%)	B (Delayed) n (%)	
6/36	2 (7)	1 (4)	3 (5)
6/24	1 (3)	1 (4)	2 (4)
6/18	10 (33)	7 (26)	17 (30)
6/12	8 (27)	10 (37)	18 (31)
6/9	6 (20)	5 (18)	11 (19)
6/7.5	2 (7)	2 (7)	4 (7)
6/6	1 (3)	1 (4)	2 (4)
Total	**30**	**27**	**57**

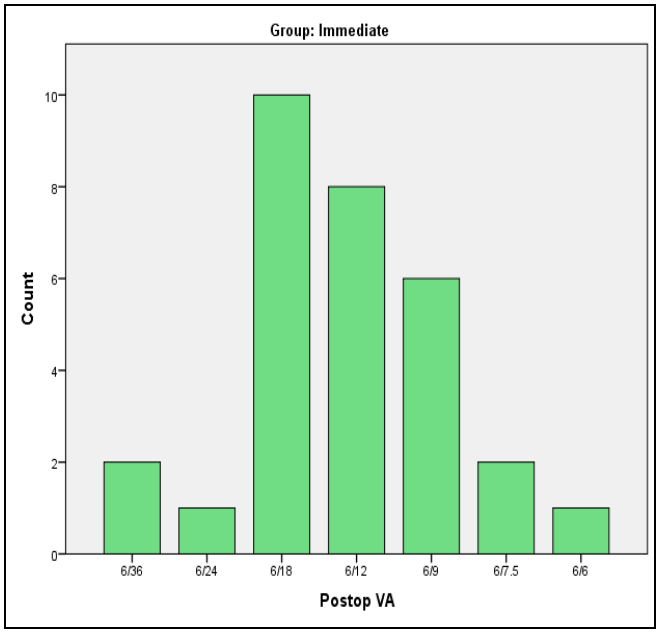

Chart 1: Postoperative BCVA achieved by group A.

Cystoid macular edema (CME) occurred in 16% (5 patients) in group A and 11% (3 patients) in group B while corneal edema was encountered in 7% (2 patients) in group A and 4% (1 patient) in group B. The difference between the groups was statistically insignificant in both cases (p-values of 0.540 for CME and 0.415 for corneal edema). Anterior chamber IOL implantation was done in 10% (3 patients) in group A compared to 29% (8 patients) in group B (p-value = 0.061).

DISCUSSION

While the overall incidence of nucleus drop is low, some institutions such as those incorporating resident training, are likely to have a higher than average incidence of surgical complications[11]. This complication is seen more commonly in cataract procedures done through a smaller incision as they involve more 'in-the-bag' manipulation of the nucleus. Excessive infusion, weak zonules, ultrasound

repulsion, vitreous syneresis, or posterior capsular rupture may all cause the nucleus to fall posteriorly. This may result in a number of complications that include intraocular inflammation, corneal decompensation, glaucoma, cystoid macular edema (CME) and retinal detachment[5].

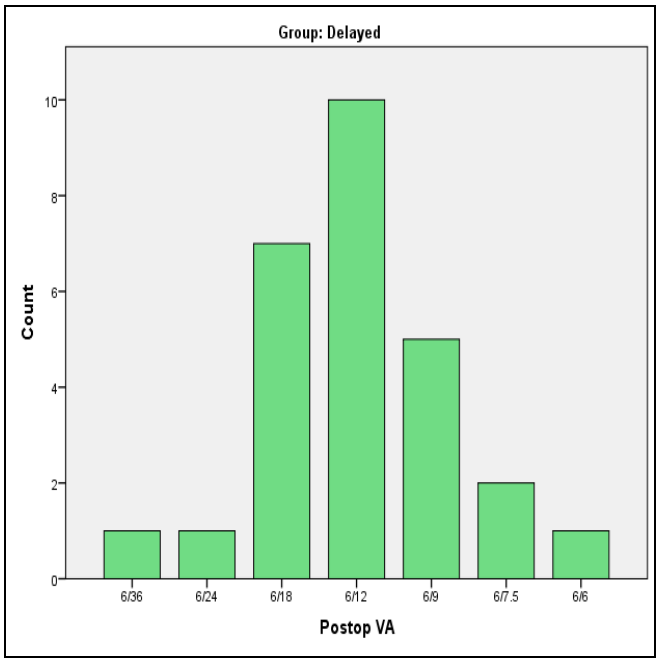

Chart 2: Postoperative BCVA achieved by group B.

Once posterior capsular rupture is detected, the strategy of the cataract surgeon should be to minimize vitreous traction, stabilize anterior chamber volume, maintain capsular and zonular integrity, and protect the corneal endothelium[12]. This includes the use of ophthalmic viscoelastic devices (OVD) to buoy the nucleus fragments and to push back the anterior hyaloid face, removal of as much of the remaining lens matter as safely possible, anterior vitrectomy and placement of an IOL if possible. Conventionally, in case of a complete nucleus drop, the IOL is not implanted as the nucleus may have to be removed anteriorly in case intra-vitreal fragmentation was not possible.

Where secondary vitrectomy is indicated, early referral is recommended by some authors to reduce patient morbidity[13]. A meta-analysis found significantly better outcomes in terms of visual acuity, as well as decreased risk of complications with earlier vitrectomy for retained lens fragments.[10] Chalam et al, mentions decreased patient stress levels, reduced risks of repeated anaesthesia, and reduced collateral damage to intraocular structures due to fewer interventions by cataract surgeon as major advantages of having the patient undergo same day vitrectomy, although reduced visualization due to an edematous cornea, hypotony, suprachoroidal haemorrhage and patient fatigue due to prolonged operative time may occur[5]. In a study by Chen et al., patients who underwent PPV within a day of experiencing a dropped nucleus experienced no complications with 76% achieving a final visual acuity of ≥ 6/12 whereas increasing delays was associated with decrease in visual prognosis and an increase in complication rates[14].

On the other hand, Colyer et al, found no difference between same-day PPV and non-same-day PPV patients[15]. Similarly Orlin et al, found no significant difference in visual acuity or post-operative complications between the same-day or the delayed vitrectomy groups[16]. In contrast to the earlier studies, Orlin et al. also found that visual acuity ≥ 6/12 was obtained in 66.7% of the delayed group compared with 23.1% of the same-setting group[16].

This study shows no statistically significant differences between the visual acuities achieved in the two groups. 29.8% (17 patients) in the immediate vitrectomy group achieved ≥ 6/12 whereas the same was achieved by 31.6% (18 patients) in the delayed vitrectomy group, and a visual acuity of ≥ 6/18 was obtain by at least 90% patients in both groups. No differences were seen in the complication rates either and the number of complications was lower than that reported in earlier studies[17,18,19]. The decrease in the number of complications over the years has also been seen in other parts of the world[1]. Scott et al. has implicated persistent CME as the most common cause of decreased final vision[19]. In a review by Romano et al., the incidence of CME after vitrectomy surgery is reported to be 5.5%[20]. In this study, postoperative CME occurred in 14% (8 cases) and this was managed conservatively. A reason for the relatively higher incidence of CME could be the dropped nuclear material causing intraocular inflammation, and hence CME, before the surgical intervention takes place. Although several patients continued to have sub-clinical CME as assessed by OCT, clinical CME had resolved in all patients by the end point of the study.

In the current study, 3 patients required an anterior chamber IOL implantation in group A compared to 8 anterior chamber IOLs implanted in group B. Although the result failed to achieve

statistical significance, this difference may be an indication that due to the non-availability of a vitreo-retinal surgeon for group B, the cataract surgeon may have attempted retrieval of the dropped nucleus fragment unsuccessfully and enlarged the posterior capsular tear in the process thereby not leaving enough capsular support for a posterior chamber IOL to be placed.

CONCLUSION

The final visual outcomes after nucleus drop during phacoemulsification were comparable in patients who underwent pars plana vitrectomy immediately and those who had the procedure after a delay of up to 15 days. The authors like to recommend immediate vitrectomy in setups where a vitreo-retinal theatre and surgeon are available as it reduces the morbidity and results in a quicker visual recovery. In cases where this is not possible, an ethically acceptable alternative would be to schedule the procedure within 2 weeks' time as it is seen to have similar outcomes in terms of final visual acuity achieved.

Author's Affiliation

Dr. Shakir Zafar
Consultant Ophthalmologist
LRBT Free Base Eye hospital
Korangi 2 ½, Karachi- 74900

Dr. Syed Asaad Mahmood
Resident
LRBT Free Base Eye hospital
Korangi 2 ½, Karachi- 74900

Dr. Munira Shakir
Consultant Ophthalmologist
Liaquat National Hospital
National Stadium Road
Karachi- 74800

Dr. Saima Amin
Resident
LRBT Free Base Eye Hospital
Korangi 2 ½, Karachi-74900

Dr. Syed Fawad Rizvi
Chief Consultant Ophthalmologist
LRBT Free Base Eye Hospital
Korangi 2 ½, Karachi
Postal code: 74900

Role of Authors:

Dr. Shakir Zafar
Conceptualized this study.

Dr. Syed Asaad Mahmood
Literature review.

Dr. Munira Shakir
Statistical analysis.

Dr. Saima Amin
Study design review.

Prof. Syed Fawad Rizvi
Manuscript review.

REFERENCES

1. **Lundström M, Goh PP, Henry Y, Salowi MA, Barry P, Manning S, Rosen P, Stenevi U.** The changing pattern of cataract surgery indications: a 5-year study of 2 cataract surgery databases. Ophthalmology, 2015; 122: 31-8.
2. **Murthy G, Gupta SK, John N, Vashist P.** Current status of cataract blindness and Vision 2020: the right to sight initiative in India. Indian journal of ophthalmology, 2008; 56: 489-94.
3. **Bowling B.** Kanski's Clinical Ophthalmology: a systemic approach, 8th ed. Philadelphia: Elsevier, 2015: 285.
4. **Gilliland GD, Hutton WL, Fuller DG.** Retained intravitreal lens fragments after cataract surgery. Ophthalmology, 1992; 99: 1263-7; discussion, 1268-9.
5. **Chalam KV, Murthy RK, Priluck JC, Khetpal V, Gupta SK.** Concurrent removal of intravitreal lens fragments after phacoemulsification with pars plana vitrectomy prevents development of retinal detachment. International journal of ophthalmology, 2015; 8: 89-93.
6. **Narang P, Agarwal A, Kumar DA, Jacob S.** Clinical outcomes of intraocular lens scaffold surgery: a one-year study. Ophthalmology, 2013; 120: 2442-8.
7. **Lu H, Jiang YR, Grabow HB.** Managing a dropped nucleus during the phacoemulsification learning curve. Journal of cataract and refractive surgery, 1999; 25: 447-50.
8. **Ho LY, Doft BH, Wang L, Bunker CH.** Clinical predictors and outcomes of pars plana vitrectomy for retained lens material after cataract extraction. American journal of ophthalmology, 2009; 147: 587-594 e1.
9. **Hoeve M, Stilma J.** Dropped nucleus' on cataract extraction. Nederlands tijdschrift voor geneeskunde, 2010; 154: A1797.
10. **Vanner EA, Stewart MW.** Vitrectomy timing for retained lens fragments after surgery for age-related cataracts: a systematic review and meta-analysis. American journal of ophthalmology, 2011; 152: 345-357 e3.

11. **Briszi A, Prahs P, Hillenkamp J, Helbig H, Herrmann W.** Complication rate and risk factors for intraoperative complications in resident – performed phacoemulsification surgery. Graefe's archive for clinical and experimental ophthalmology = Albrecht von Graefes Archiv fur klinische und experimentelle Ophthalmologie, 2012; 250: 1315-20.
12. **Hong AR, Sheybani A, Huang AJ.** Intraoperative management of posterior capsular rupture. Current opinion in ophthalmology, 2015; 26: 16-21.
13. **Chiu CS.** 2013 update on the management of posterior capsular rupture during cataract surgery. Current opinion in ophthalmology, 2014; 25: 26-34.
14. **Chen CL, Wang TY, Cheng JH, Tai MC, Lu DW, Chen JT.** Immediate pars plana vitrectomy improves outcome in retained intravitreal lens fragments after phacoemulsification. Ophthalmologica Journal international d'ophtalmologie International journal of ophthalmology Zeitschrift fur Augenheilkunde, 2008; 222: 277-83.
15. **Colyer MH1, Berinstein DM, Khan NJ, Weichel ED, Lai MM, Deegan WF, Katira RC, Phillips WB, Sanders RJ, Garfinkel RA.** Same – day versus delayed vitrectomy with lensectomy for the management of retained lens fragments. Retina, 2011; 31: 1534-40.
16. **Orlin A, Parlitsis G, Chiu YL, D'Amico DJ, Chan RV, Kiss S.** A comparison of same setting versus delayed vitrectomy in the management of retained lens fragments after cataract surgery. Retina, 2014; 34: 1969-76.
17. **Kim IK, Miller JW.** Management of dislocated lens material. Seminars in ophthalmology, 2002; 17: 162-6.
18. **Romero – Aroca P, Fernandez – Ballart J, Mendez – Marin I, Salvat – Serra M, Baget – Bernaldiz M, Buil – Calvo JA.** Management of nucleus loss into the vitreous: long term follow up in 63 patients. Clin Ophthalmol. 2007; 1: 505-12.
19. **Scott IU1, Flynn HW Jr, Smiddy WE, Murray TG, Moore JK, Lemus DR, Feuer WJ.** Clinical features and outcomes of pars plana vitrectomy in patients with retained lens fragments. Ophthalmology, 2003; 110: 1567-72.
20. **Romano V1, Angi M, Scotti F, del Grosso R, Romano D, Semeraro F, Vinciguerra P, Costagliola C, Romano MR.** Inflammation and macular oedema after pars plana vitrectomy. Mediators of inflammation, 2013; 2013: 971758.