ORIGINAL ARTICLE

Posterior Assisted Levitation (PAL) by Using Akahoshi/Wahab Irrigating Pars Plana Levitator

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ABSTRACT

Objective: To assess the outcome of irrigating Akahoshi/Wahab pars plana levitator for posterior assisted levitation in dropped nucleus during phacoemulsification.

Study Design: A case series.

Place and Duration of Study: Ophthalmology Unit-III, Dow University of Health Sciences at Sindh Government Lyari General Hospital and Al-Noor Eye Hospital, Karachi, from January 2008 to December 2009.

Methodology: Cases of dropped nucleus during phacoemulsification were recruited. Predisposing factors and stage of phacoemulsification at which dropped nucleus were recognized. Levitator was inserted through pars plana after vitrectomy around nucleus and levitation was carried out. Follow-up was done till 6 months.

Results: Thirty two patients including 18 males (56.3%) and 14 females (43.8%) underwent pars plana levitation. Predisposing factors were pupillary miosis in 9 cases, Brunescent cataract in 7 cases, pseudoexfoliation in another 7 cases, hypermature cataract in 5 cases and extended capsulorrhexis in 4 cases. Posterior capsular rent occurred in 22 (68.8%) cases while zonular dehiscence / rupture were found in 10 cases (31.3%). Nuclei were dropped during quadrant aspiration in 10 cases (31.3%) and during chopping in 8 cases (25%). Another 5 cases (15.6%) occurred during each hydrodissection and chopping while 4 cases (12.5%) were found during sculpting of nuclei. Final best corrected visual acuity was 6/12 and better in 22 cases (68.8%) while in 10 cases (31.3%) it was 6/18 to 6/36. No complication related to pars plana levitator was observed.

Conclusion: Posterior assisted levitation of dropped nucleus during phacoemulsification by irrigating Akahoshi/Wahab pars plana levitator is a fast and safe surgical technique.

Key words: *Phacoemulsification. Dropped nucleus. Posterior assisted levitation.*

INTRODUCTION

Nucleus drop during phacoemulsification is a devastating complication. A sudden deepening of anterior chamber or constriction of pupil may be a tip-off that the posterior capsule has ruptured and a suddenly clogged phaco tip may indicate prolapsed vitreous. Vitreous loss during cataract surgery is associated with a poor visual outcome.[1] Other association of poor visual outcome includes poor pre-operative vision, age-related macular degeneration, cystoid macular oedema and secondary pars plana vitrectomy following nuclear fragment loss.[2] Cases of nucleus drop are increasing due to handling of hypermature cataract and pseudoexfoliation.[3] Retained posteriorly dropped nuclear fragment or delay in its management greatly increases the risk of vision threatening complications like corneal decompensation, retinal detachment, persistent iritis, secondary glaucoma and cystoid macular oedema.[4,5] Different methods to retrieve the dropped nucleus includes injecting viscoelastic behind the nucleus, Kelmen's posterior assisted levitation, using perfluorocarbon heavy liquids (PFCL) to bring the dropped nucleus in the anterior chamber and three port pars plana vitrectomy and phacofragmentation of the nucleus.[6-9] Charles Kelmen's spatula for levitation is the most popular method. Por *et al*. passed a 20 gauge needle through the pars plana to hold the nucleus.[10] Drawbacks of this technique are that needle passes through the nucleus and nucleus rotates on it and can fall on either side. Besides, the pointed, sharp needle can damage the internal structures and nucleus does not remain in place if phacoemulsification is performed. Akahoshi/Wahab levitator (Figure 1) can hold the nucleus in a more stable manner, while holding the nucleus with the forceps, vitrectomy and phacoemulsification can be performed. As this levitator is of 20 gauge with only 3.0 centimeter length of needle, it also provides passive irrigation. Hence, there is no need of a separate infusion port. Use of heavy liquids for nucleus retrieval can be avoided and nucleus can be pushed back into the bag with the loops of this levitator. It is also helpful, when a surgeon wants to convert phacoemulsification into extra capsular cataract extraction or inspite of impending drop of nucleus; surgeon wants to continue with phacoemulsification.

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The aim of this study was to assess the usage and outcomes of PAL for dropped lens fragments by using Akahoshi/Wahab levitator and to determine the frequency of complications associated with the use of this instrument.

METHODOLOGY

This study was conducted at the Ophthalmology Unit-III of Dow University of Health Sciences, Sindh Government Lyari General Hospital and Al-Noor Eye Hospital, Karachi, from January 2008 to December 2009. Thirty two patients underwent PAL whose nuclei were dropped during phacoemulsification. Position of nucleus whether it is in the anterior or mid vitreous cavity was identified. An incision was made in the temporal sclera 3.5 mm posterior to the limbus with microvitreoretinal blade. The levitator was introduced through this incision. Vitrectomy around nucleus was performed before levitation. Loops of the Akahoshi/Wahab levitator were opened to hold the nucleus by sliding the knob forward. Nucleus was levitated into the anterior chamber. Then nuclei were either emulsified by phacoemulsification with low aspiration flow and low vacuum or delivered manually through limbal incision. Then wire prongs were drawn back by sliding the knob backward. Intraocular lenses were implanted as the situation allowed. Careful follow-up was observed on first postoperative day, on 1st week, 1st month and then every month for 6 months.

Safety of Akahoshi/Wahab pars plana levitator was judged by observing any intraoperative or postoperative instrument related complications while efficacy was judged from postoperative visual outcome.

Data was analyzed on Statistical Package for Social Sciences (SPSS) version 15 for windows. Categorical data including gender, predisposing factors, stage at which complication occurred, zonular/capsular rupture, position of nucleus at retrieval, procedure after PAL and best corrected visual acuity were presented in terms of frequencies and percentages.

RESULTS

Thirty two patients underwent pars plana levitation by using Akahoshi/Wahab pars plana levitator. There were 18 males (56.3%) and 14 females (43.7%). Five predisposing factors were identified that may lead nucleus to drop posteriorly during phaco if not handled properly (Table I). It is important to note the stage of phacoemulsification where nucleus dropped posteriorly. In this regard, most cases were found during quadrant aspiration (n = 10, 31.3%) and chopping (n = 8, 25%) of nuclei. During hydrodissection and cracking, nuclei dropped in 5 cases (15.6%) of each. In 4 cases (12.5%), nuclei sank down in vitreous cavity during sculpting of nucleus (Figure 2).

Figure 1: Akahoshi/Wahab pars plana levitator.

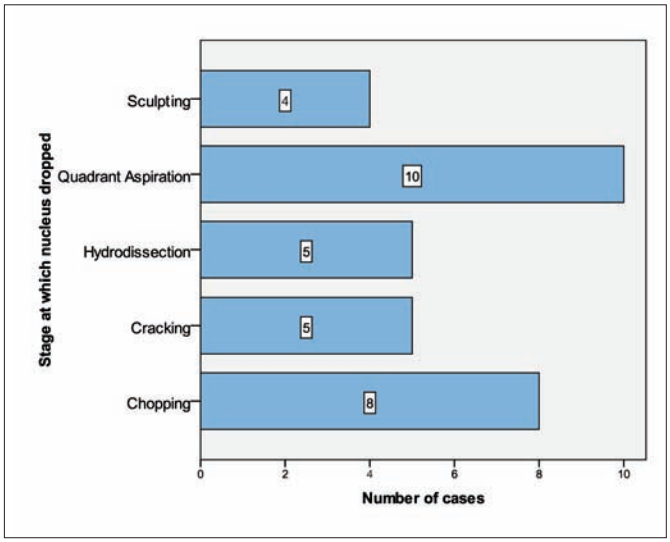

Figure 2: Stage at which nucleus dropped.

Table I: A comprehensive summary of the study.

Variables	Frequency	Percentage
Predisposing factors		
Brunescent cataract	07	21.9
Extended capsulorrhexis	04	12.5
Hypermature cataract	05	15.6
Intraoperative pupillary miosis	09	28.1
Pseudoexfoliation	07	21.9
Per-operative findings		
Capsule rupture	22	68.8
Zonular rupture	10	31.3
Position of nucleus at retrieval		
Anterior vitreous	18	56.3
Mid vitreous	14	43.8
Procedure after posterior assisted levitation		
Vitrectomy, ECCE and A/C IOL	04	12.5
Vitrectomy, ECCE and scleral fixation IOL	07	21.9
Vitrectomy, ECCE and sulcus IOL	16	50.0
Vitrectomy, Phaco and in bag IOL	05	15.6

Vitrectomy was performed in all cases and phaco could be accomplished in 5 (15.61%) eyes only. In the rest of the cases nuclei were delivered from limbal incision. In half of cases i.e. 16 (50%), intraocular lenses (IOL) were

placed in the sulcus while in 5 cases (15.6%) IOLs were kept on remnants of capsular bag. Scleral fixation of IOLs was performed in 7 cases (21.9%) and anterior chamber IOLs were done in 4 cases (12.5%) only (Table I).

Best corrected visual acuity (BCVA) after 6 months follow-up was 6/12 and better in 22 cases (68.8%), while 6/18 in 4 cases (12.5%), 6/24 in 3 cases (9.4%) and 6/36 in another 3 cases (9.4%).

No peroperative or postoperative complication related to Akahoshi/Wahab pars plana levitator was found in any case.

DISCUSSION

Dropped nucleus after posterior capsule/zonular rupture during phacoemulsification is a serious complication. Attempting to chase it with phaco tip can result in giant retinal tears and retinal detachment so such temptation should be avoided.[11] Arbisser *et al*. advocate early referral for standard three port pars plana vitrectomy with fragmenter or levitator in such situation to achieve optimal visual recovery.[12] The critical stage of phaco-emulsification where nucleus dropped posteriorly in majority of the cases was quadrant aspiration in our series while in a study by Tajunisah *et al*. this dreaded complication occurred in majority cases during sculpting the nuclei.[13] Surgeons needs to be very careful at these steps particularly in predisposed eyes. Predisposing factors for dropped nucleus found in this study were Brunescent cataract, hypermature cataract, pseudo-exfoliation, extended capsulorrhexis and intra-operative pupillary miosis. Some of these factors are in addition to those found in earlier studies,[13-15] where they recognized polar cataract, previously vitrectomized eyes and high myopes being more prone to develop such complications. Upon recognition of dropped nucleus, surgeon's first aim is to safely remove the nucleus, epinucleus and cortex.[16]

While levitating with spatula, dropped nucleus can rotate over the spatula because it can only lift it but cannot hold it and the nucleus may fall back again. Due to poor hold, it is difficult to bring nucleus back in the capsular bag if the capsular tear is small. When 21 or 25 gauge needle passes through pars plana to levitate the dislocated nuclear fragments, situation becomes more unstable because the pointed needle could pierce the fragment and the nucleus can rotate over the needle. Furthermore, there are chances of intraocular damage due to sharp pointed instrument. Chang and Packard[6] described Viscoat PAL technique in which instead of spatula, dispersive viscoelastic was used to levitate the nucleus. Although they reported no complication but there may be a potential danger of raised intraocular pressure. “Injecting Viscoat through phaco incision may be too steep an angle to approach a laterally and posteriorly displaced nucleus through a small pupil or capsulorrhexis”, they admitted.[6] A variation of PAL was described by Lal *et al*. and Liu DR *et al*. in chopstick technique.[17,18] Here a Sinskey hook is inserted through a pars plana incision and below the nucleus while a second hook is pressed downward from the anterior chamber. By holding the nucleus between two instruments, the lens is brought forward and removed through an enlarged incision. According to Devgan, if a coaxial irrigation and aspiration device is used, a countercurrent is created that pushes vitreous backward, as well as potentially propelling lens fragments backward, while aspiration works to bring it forward.[19]

With the present technique, the authors used a specially designed levitator which is incorporated with 20 gauge needle and irrigating facility as well. Levitator was inserted through pars plana wound. Specially incorporated two fine wire prongs come out of the levitator by forward sliding of the knob which makes a bowl (Figure 1) to hold the nuclear fragments. After vitrectomy around dropped nucleus, levitator is placed behind the nucleus and the prongs are released maximally out of the levitator to stabilize the nucleus which is then levitated in the remnant capsular bag. Once in the bag, phacoemulsification can be accomplished with good hold of nucleus or its fragments, or even it can be expressed out from limbal incision. Then levitator is withdrawn after ensuring that no vitreous is entangled in the prongs. Now IOL can be implanted safely. Best corrected visual acuity (BCVA) was > 6/12 in 45.5% eyes in a study where dropped nuclear fragments were removed with phaco fragmatome, vitrectomy cutter or delivered through limbus,[13] while with the technique of levitation > 6/12 BCVA was achieved in 68.8% cases.

Few complications related to instrument through pars plana, such as vitreous haemrrohage, iatrogenic retinal break, vitreous and retinal incarceration or endophthalmitis may be anticipated. In this study, no complication was noted peroperatively or postoperatively till 6 months period of follow-up. It suggests the safety of this newly designed Akahoshi-Wahab pars plana levitator.

CONCLUSION

Posterior assisted levitation of dropped nucleus during phacoemulsification by irrigating Akahoshi/Wahab pars plana levitator is a fast and safe surgical technique in experienced hands and can be adopted in settings where anterior and posterior segment surgeons are facing such situations during phacoemulsification.

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REFERENCES

1. Jacobs PM. Vitreous loss during cataract surgery: prevention and optimal management. *Eye (Lond)* 2008; **22**:1286-9. Epub 2008 Feb 22.
2. Konstantopoulos A, Yadegarfar G, Madhusudhana K, Canning C, Luff A, Anderson D, *et al*. Prognostic factors that determine visual outcome following cataract surgery complicated by vitreous loss. *Eur J Ophthalmol* 2009; **19**:247-53.
3. Agrwal A. Technique helps remove lens fragments that have fallen into the vitreous. *Ocular Surgery News* 2006; **24**:93.
4. Kapusta MA, Chen JC, Lam WC. Outcomes of dropped nucleus during phacoemulsification. *Ophthalmology* 1996; **103**:1184-7.
5. Moore JK, Scott IU, Flynn HW Jr, Smiddy WE, Murray TG, Kim JE, *et al*. Retinal detachment in eyes undergoing pars plana vitrectomy for removal of retained lens fragments. *Ophthalmology* 2003; **110**:709-14.
6. Chang DF, Packard RB. Posterior assisted levitation for nucleus retrieval using Viscoat after posterior capsule rupture. *J Cataract Refract Surg* 2003; **29**:1860-5.
7. Kelman CD. Posterior assisted levitation. In: Burrato L, editor. Phacoemulsification: principles and techniques. Thorofare: *Slack Incorporated;* 1998.p. 511-2.
8. Wong D, Briggs MC, Hickey-Dwyer MU, McGilliard JN. Removal of lens fragments from the vitreous cavity. *Eye* 1997; **11**:37-42.
9. Yao K, Shantu X, Jiang J, Du X. Phacofragmentation without per fluorocarbon liquid for dislocated crystalline lenses or lens fragments after phacoemulsification. *Eur J Ophthalmol* 2002; **12**: 200-4.
10. Por YM, Chee SP. Posterior-assisted levitation: outcomes in the retrieval of nuclear fragments and sub-luxated intraocular lenses. *J Cataract Refract Surg* 2006; **32**:2060-3.
11. Rossetti A, Doro D. Retained intravitreal lens fragments after phacoemulsification: complications and visual out¬come in vitrectomized and non-vitrectomized eyes. *J Cataract Refract Surg* 2002; **28**:310-5.
12. Arbisser LB, Charles S, Howcroft M, Werner L. Management of vitreous loss and dropped nucleus during cataract surgery. *Ophthalmol Clin North Am* 2006; **19**:495-506.
13. Tajunisah I, Reddy SC. Dropped nucleus following phacoemulsification cataract surgery. *Med J Malaysia* 2007; **62**:364-7.
14. Aasuri MK, Kompelia VB, Majji AB. Risk factors for and management of dropped nucleus during phacoemulsification. *J Cataract Refract Surg* 2001; **27**:1428-32.
15. Lai TY, Kwok AK, Yeung YS, Kwan KY, Woo DC, Yuen KS, *et al*. Immediate pars plana vitrectomy for dislocated intravitreal lens fragments during cataract surgery. *Eye* 2005; **19**:1157-62.
16. Akura J, Hatta S, Kaneda S, Ishihara M, Matsuura K, Tamai A. Management of posterior capsule rupture during phacoemulsification using the dry technique. *J Cataract Refract Surg* 2000; **27**:982-9.
17. Lal H, Sethi A, Bageja S, Popli J. Chopstick technique for nucleus removal in an impending dropped nucleus. *J Cataract Refract Surg* 2004; **30**:1835-9.
18. Liu DR, Lee VY, Chan WM, Lam DS. Chopstick technique for nucleus removal in an impending dropped nucleus. *J Cataract Refract Surg* 2005; **31**:1685.
19. Devgan U. How to perform an anterior vitrectomy. *Ocular Surg News* 2006; **24**:77.