



COMPARATIVE STUDY OF VISUAL OUTCOME AND INCIDENCE OF RETINAL DETACHMENT IN NUCLEUS DROP PATIENTS WITH OR WITHOUT PROPHYLACTIC 360° LASER BARRAGE DURING LENSECTOMY AND VITRECTOMY

Ophthalmology

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ABSTRACT

Introduction: Dislocation of nucleus in vitreous cavity due to various causes is rare but serious condition which can be managed by pars plana lensectomy with vitrectomy. This procedure also has some major complications such as Retinal Detachment, epiretinal membrane and CME.

Materials And Methods: We studied 84 eyes with nucleus drop in this prospective randomized interventional study. Structured questionnaire with clinical examination was used for data collection. Patients were divided into 2 groups randomly. Group A received 360° laser barrage during vitrectomy whereas group B patients did not receive it. All surgeries were performed by single surgeon and clinical examination repeated on post-operative day 1, week 1, 1, 3 and 6 months.

Results: Out of 84 eyes, cause of nucleus drop was trauma and cataract surgery in 76.19 % and 23.81% patients respectively. Post-operatively vision improved to > 6/18 in 92.9% and 73.80% patients in group A and B respectively. Most common cause of decreased vision was RD with incidence of 0% in group A and 14.29% in group B (p value 0.012). CME developed in 4 patients out of which 3 were from group B. ERM developed in 3 patients and all of them were from group B.

Conclusion: RD is a dreadful complication which can occur post vitrectomy with lensectomy for nucleus drop. Adding a small step of 360° laser barrage during vitrectomy can go a long way and decrease incidence of this complication with early visual rehabilitation post operatively and avoiding another surgery.

KEYWORDS

Lensectomy, Prophylactic Barrage Laser

INTRODUCTION

Dislocation of lens fragments into the vitreous cavity is a rare but serious complication which can occur spontaneously, post trauma or during cataract surgery with the incidence ranging from 0.1–1.5%.^(1,2) This can result in poor visual acuity (VA) and other serious ocular complications.⁽³⁾ Posterior capsule rupture is the most frequent preceding event in cases of nucleus drop post cataract surgery.⁽⁴⁾

Management of dropped nucleus has been controversial with reference to scope for medical management, indications and timing of surgery and long-term results. At present, conservative approach is by and large used only in cases with small retained fragments, where medically inflammation and glaucoma can easily be controlled till the fragments get absorbed. Surgical management usually implies pars plana vitrectomy (PPV) with lensectomy which removes the nuclear fragments. This hastens visual recovery and manages secondary complications ultimately dealing with the expectations of the patients earlier than the medical management.⁽⁵⁾

A complication-free clinical course after PPV has been reported to be the most important predictor of the final degree of vision.⁽⁶⁾ To the best of our knowledge, studies on the complications and final degree of vision after PPV are limited. In this study we intend to determine visual outcome in patients of nucleus drop after pars plana lensectomy and vitrectomy. We also have analyzed the role of the prophylactic 360-degree laser photocoagulation in vitrectomies for dropped nucleus and have examined whether it has any protective effect on development of retinal detachment post-operatively.

MATERIALS AND METHODOLOGY

Ethical measures were adhered to throughout all phases of the research. The study was conducted among patients of 20-80 years age group, attending our tertiary healthcare referral centre, who were diagnosed with nucleus drop in vitreous cavity which occurred either spontaneously or after trauma or cataract surgery and were willing to participate in the study. We included only patients with visual acuity equal to or more than perception of light with good projection of rays in all quadrants. The duration of the study was from August 2014 to June 2016. Patients in whom subluxation of lens was present, who presented

with only cortical fragments of lens in vitreous without nucleus material or in whom nucleus drop was associated with complications such as retinal detachment, concomitant open globe injury, with any other retinal or macular pathology, prior laser or any co-existing ocular pathology were excluded from the study. Patients were not included if any prior intervention apart from cataract surgery had been done. Patients having pre-existing retinal breaks or in whom iatrogenic retinal breaks occurred during pars plana vitrectomy with lensectomy were not included. Those with any pre-existing predisposing ocular or systemic conditions for subluxation or dislocation of nucleus or with known drug sensitivity were excluded from the study.

Ours is a prospective randomized interventional study with total sample size of 84 eyes (84 patients).

For all patients a structured validated questionnaire was administered as an interview to collect the data followed by a detailed clinical examination.

Informed consent was obtained from all the respondents before taking the interviews, with the purpose of the study explained, with emphasis on the fact that refusal to participate would not affect their future treatment. Respondents were also assured of confidentiality and privacy. We asked the same questions and performed uniform clinical examination for all the participants in a precise manner. The interviews were conducted in the language which the patients could understand.

We took thorough history under following sections:

- (1) Preliminary / Demographic data
- (2) Chief complaints
- (3) Past history
- (4) Systemic illness
- (5) Personal history
- (6) Family history

Following the interview, a thorough ocular examination was done of each patient through best corrected visual acuity (BCVA), torch light and slit lamp examination including intraocular pressure measurement by noncontact tonometry followed by posterior segment examination

with help of slit lamp biomicroscopy using 90 dioptre lens and indirect ophthalmoscopy. We have uniformly used combination eye drop having tropicamide 0.8% w/v with phenylephrine 5% w/v for dilatation of iris for posterior segment examination in all our patients in all visits.

Patients were divided into 2 groups randomly.

Group A: Those receiving 360° laser barrage during pars plana lensectomy and vitrectomy

Group B: Those not receiving 360° laser barrage during pars plana lensectomy and vitrectomy

All the routine battery of investigations including serology were performed in all patients before surgery. All the surgeries were performed by single skilled vitreo-retinal surgeon to avoid operative bias. We repeated clinical examination including posterior segment examination in the same uniform manner by same examiner at post-operative day 1, after 1 week, 1 month, 3 months and 6 months and noted if any complications occurred at any of the visits.

The data was entered into Microsoft Excel sheet for further analysis. Percentage values were calculated and 'Chi' square test was used for statistical analysis wherever applicable.

RESULTS

We studied 84 eyes of 84 patients and their age varied from 20 to 80 years (mean -54.33 years for Group A and mean -53.55 years for Group B) (Table 1, Chart 1)

Table 1: Age Wise Distribution

Age (years)	Group A	Group B
Number of patients		
20-29	6 (14.29%)	4 (9.52%)
30-39	3 (7.14%)	3 (7.14%)
40-49	5 (11.90%)	10 (23.81%)
50-59	7 (16.67%)	5 (11.90%)
60-69	10 (23.81%)	12 (28.57%)
70-79	11 (26.19%)	8 (19.06%)
Total	42	42

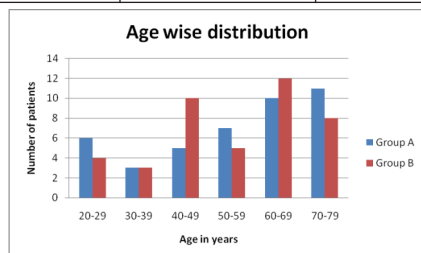


Chart 1: Age Wise Distribution

There were 31 (73.81 %) men and 11 (26.19 %) women in group-A and 25 (59.52 %) men and 17 (40.48 %) women in group-B (Chart 2,3).

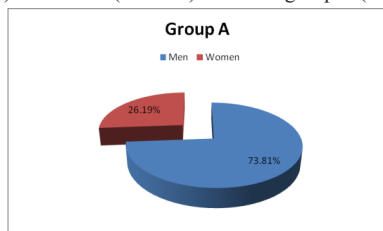


Chart 2: Gender Wise Distribution Of Group A

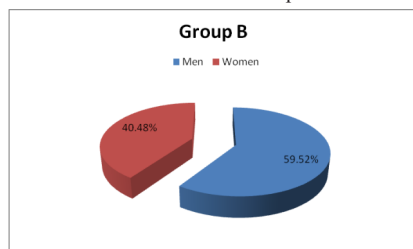


Chart 3: Gender Wise Distribution Of Group B

Among the study participants, the cause of nucleus drop in 64 patients (76.19 %) was trauma and in 20 patients (23.81 %) was post-cataract surgery.

Among group-A, there were 31 patients (73.81 %) having post-traumatic nucleus drop and 11 patients (26.19 %) having post-cataract surgery nucleus drop.

Among group-B, there were 33 patients (78.57 %) having post-traumatic nucleus drop and 9 patients (21.43 %) having post-cataract surgery nucleus drop (Table 2).

Table 2: Cause Of Nucleus Drop

Cause of Nucleus drop	Number of patients		Total
	Group A	Group B	
Post-trauma	31(73.81%)	33(78.57%)	64 (76.19%)
Post-cataract surgery	11(26.19%)	9(21.43%)	20 (23.81%)
Total	42	42	84

In this study, post-operatively visual acuity improved to greater than 6/18 in 39 patients (92.9%) in group A and in 31 patients (73.8%) in group B (Table 3, 4, 5).

Table 3: Visual Assessment In- Group A

Visual acuity	Number of patients					
	Pre-operative	Post-operative				
		POD-1	After 1 week	After 1 month	After 3 months	After 6 months
<6/60	20 (47.6%)	17 (40.5%)	7 (16.7%)	0	0	0
6/60 to 6/24	15 (35.7%)	20 (47.6%)	22 (52.4%)	5 (11.9%)	4 (9.5%)	3 (7.1%)
6/18 to 6/6	7 (16.7%)	5 (11.9%)	13 (30.9%)	37 (88.1%)	38 (90.5%)	39 (92.9%)

Table 4: Visual Assessment In Group B:

Visual acuity	Number of patients					
	Pre-operative	Post-operative				
		POD-1	After 1 week	After 1 month	After 3 months	After 6 months
6/60	29 (69.1%)	31 (73.8%)	13 (30.9%)	4 (9.5%)	3 (7.1%)	3 (7.1%)
6/60 to 6/24	10 (23.8%)	9 (21.4%)	22 (52.4%)	18 (42.9%)	11 (26.2%)	8 (19.1%)
6/18 to 6/6	3 (7.1%)	2 (4.8%)	7 (16.7%)	20 (47.6%)	28 (66.7%)	31 (73.8%)

Table 5: Comparison Of Visual Acuity Between 2 Groups.

Visual acuity	Number of patients	
	Post-operative (After 6 months)	
	Group A	Group B
<6/60	0	3 (7.1%)
6/60 to 6/24	3 (7.1%)	8 (19.1%)
6/18 to 6/6	39 (92.9%)	31 (73.8%)

Table 6: Comparison Of Causes Of Decreased Visual Acuity At 6 Months Post Operatively.

	Number of patients	
	Post-operative (After 6 months)	
	Group A	Group A
Retinal detachment	0	6 (14.29%)
Cystoid Macular Edema	1 (2.38%)	3 (7.14%)
Epi-Retinal membrane	0	3 (7.14%)

In this study, most common cause of decreased visual acuity post operatively is retinal detachment. Six patients (14.29%) in group B developed retinal detachment while none in group A. Cystoid macular edema occurred overall in 4 patients in this study, of which 3 were in group B. Three patients in group B developed epi- retinal membrane whereas none in group A. (Table 6).

Table 7: Incidence Of Retinal Detachment In 2 Groups.

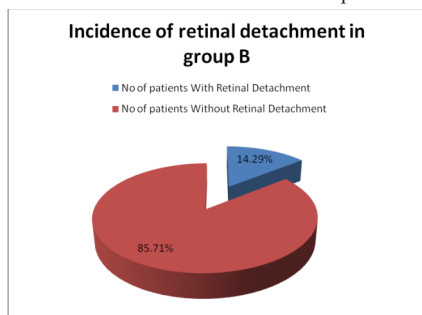
	Number of patients	
	Post-operative	
	Group A	Group A
Retinal detachment	0	6 (14.29%)

The p value has been calculated by Mann- Whitney U Test. In statistics,

the Mann-Whitney U test (also called the Mann-Whitney-Wilcoxon (MWW), Wilcoxon rank-sum test, or Wilcoxon-Mann-Whitney test) is a nonparametric test of the null hypothesis that it is equally likely that a randomly selected value from one sample will be less than or greater than a randomly selected value from a second sample.

The p value in-group B is 0.012, which is significant. Thus, the incidence of retinal detachment in nucleus dropped patients with prophylactic 360° laser barrage during pars plana lensectomy and vitrectomy is much less and the difference is significant (Table 7, Chart 4).

Chart 4: Incidence Of Retinal Detachment In Group B.



DISCUSSION

Nucleus drop is a dreadful complication which can occur as a result of trauma, complicated cataract surgery or rarely spontaneously. With new advancements in surgical techniques it has become relatively easy to treat it and providing good visual outcomes to patients. The incidence of the dropped nucleus occurring after cataract surgery is reported 0.3% to 1.8%.⁽⁶⁾ While this rate can be more in the surgeons in the phacoemulsification learning process, complications can also be seen after the operation performed by experienced surgeons.

The majority of cases occurring in young adult males with male: female ratio of 2:1 and this is in agreement with the findings of Kaimbo et al. (2002).⁽⁷⁾ In our study also we found that the population affected is relatively young with mean age being 54.33 years for Group A and 53.55 years for Group B. We found gender distribution in favour of males in both the groups in our study which was 73.81 % and 59.52 % in group A and group B respectively.

The preferred surgical method in the treatment of dropped nucleus is pars-plana vitrectomy and lensectomy. The timing of pars plana vitrectomy and factors determining the final visual outcome remains unclear.

Several retrospective studies failed to show a significant difference in the outcome of pars plana vitrectomy, whether it was performed immediately or was delayed.⁽⁸⁾ On the other hand many other studies are in favour of early surgical intervention.⁽³⁾ In their retrospective study on patients undergoing PPV for dropped nucleus, Salehi et al. reported early use of PPV for removal of posteriorly dislocated lens fragments within the first week to be advantageous.⁽⁹⁾

Postoperatively, the best-corrected visual acuity was improved in the majority of cases. In this study, post-operatively visual acuity was found to be improved to greater than 6/18 in 84 % of the patients. This is comparable with the results of Ozdek et al. (2002), reported an improvement of the post operative best-corrected visual acuity of 6/12 in 93.3% of the patients.⁽¹⁰⁾ According to literature a final visual acuity of 20/40 or better has been achieved in 51.8% to 82% of patients undergoing the procedure.⁽¹¹⁾

Published data related to the complications after pars plana vitrectomy and lensectomy is limited due to need of long term follow up of patients for its accurate determination.

Some of the common complications hampering final visual outcome are retinal detachment, epiretinal membrane and cystoid macular edema.

In our study, the rate of incidence of retinal detachment after pars plana lensectomy and vitrectomy was 7.14 %. All of these were in the group in which 360° laser barrage was not given during vitrectomy. In the study conducted by Romero-Aroca et al. , 63 patients were evaluated

retrospectively and incidence of retinal detachment after PPV was found to be 6.4%.⁽¹²⁾ In their retrospective study by Salehi et al. the rate of incidence of retinal detachment was 3.3% and 16.7% when the pars plana vitrectomy was performed within first week and after first week post nucleus drop respectively.⁽⁹⁾ In the study of Al-Amri , it was reported that incidence of retinal detachment was 5.4%(2 out of 37 patients) after 2-4 months of PPV performed for nucleus drop post phacoemulsification.⁽¹³⁾

It has been reported in various studies that 360° laser barrage reduces the rate of postoperative complications (new retinal breaks and recurrent retinal detachment) by effectively producing a second ora serrata by laser.^(14,15)

In our study, 42 patients with dropped nucleus were given 360° laser barrage to retinal periphery and none had RD post-operatively. Koh et al. showed that intraoperative 360° laser barrage was associated with a three-fold reduction in the incidence of retinal detachment after PPV.⁽¹⁵⁾ Poor visual acuities before PPV are high risk factor for retinal detachment. While visual acuities having decreased to a significant extent may not be parallel with severe ocular inflammation, close follow up after surgery and aggressive control of postoperative inflammation seems to be appropriate for these patients.

Another entity complicating post operative course is cystoid macular edema which can occur due to a number of reasons. The causes are mechanical (vitreous strands or iris in the wound, vitreo macular traction), iatrogenic (instillation of adrenaline and its derivatives), inflammatory (chronic iris irritation), or physical (ultraviolet radiation reaching the retina at the time of surgery). Blood-retinal barrier disturbances secondary to degenerative vitreous changes have also been suggested. Loss of hyaluronic acid from the vitreous after cataract surgery with vitreous loss or rupture of anterior hyaloid may increase vitreo macular traction and consequently cystoid macular edema. Illumination of the operating microscope and also, the endoillumination may also be a contributing factor, given the considerable time required for surgery.⁽¹⁶⁾

Uthoff and Teichmann (1998), reported an incidence of cystoid macular edema in 5.8% of patients.⁽¹⁷⁾ Mourad (2001), reported 10% of the same.⁽¹⁸⁾ In our study, post operative cystoid macular edema occurred in 4.8% of eyes.

In our study epi-retinal membrane formation occurred in 3.6% of eyes, which is less than that found by Lanzetta et al. (1998), who reported an incidence of 27.7%.⁽¹⁹⁾ The formation of epi-retinal membrane occurred probably because the posterior hyaloid face was not adequately removed. Post-traumatic eyes are usually inflamed and leaving the posterior hyaloid can provide a scaffold for proliferative membrane formation and contraction.

We found that the three most important causes for limited postoperative visual correction were the presence of post-operative development of cystoid macular edema, epiretinal membrane and retinal detachment. The latter being the most dreadful as it will result in sudden drop in visual acuity and will require resurgery which can be frustrating for both surgeon and the patient. This can be potentially avoided by simply adding a small cost-effective step of 360° laser barrage during routine lensectomy with vitrectomy.

According to the results of our study which showed improvement of the postoperative visual acuity in 92% of involved eyes, combined lensectomy and pars plana vitrectomy with 360° barrage laser intraoperatively proves to be an adequate procedure in the management of eyes with dropped nucleus with minimum incidence of postoperative complications.

CONCLUSION:

In conclusion, RD is an important complication that is likely to occur in patients undergoing pars plana lensectomy and vitrectomy for dropped nucleus . Retinal detachment can limit chances of patient getting good post operative visual acuity despite good and uneventful lensectomy and vitrectomy. Our study results suggest that adding 360° laser barrage to PPV for nucleus drop after cataract or trauma is beneficial in decreasing incidence of retinal detachment and thus decreasing need of additional surgery and early and better visual recovery. Thus we strongly believe that if this small step is added to all vitrectomies for nucleus drop it will be beneficial to treating surgeons and patients.

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