

Incidence of posterior vitreous detachment (PVD) and PVD related complications after phacoemulsification surgery in patients with senile cataract

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Abstract

The study intended to highlight the possible association of cataract surgery by phacoemulsification as a risk factor for the development of PVD and PVD related complications independent of the other known predispositions for the same. The study was a randomized controlled prospective study involving a followup of the patients over a period of 9 months. 100 eyes underwent phacoemulsification surgery whereas the other unoperated 100 eyes of the same patients were taken as a control group. The study found a postoperative incidence of PVD of 10% over the nine month followup period while the incidence in the control group was 1%, which was significant at p value 0.005 by Chi Square test clearly attributing the development of PVD to the procedure of phacoemulsification. The average age of patients developing PVD was 66.27 years while the average age of all the 100 patients was 61.12 years, which had a p value of <0.001. None of the cases in our study developed any complication of PVD like retinal breaks, vitreous haemorrhage or retinal detachment. We thus would like to conclude that unlike the common misbelieve, uneventful phacoemulsification does have an association with post operative development of PVD. It is of immense importance for the operating surgeon to be careful and vigilant for the possibility of the development of PVD and related complications in the followup period so that the patients can present early on their development and avoid dreadful eventual complications.

Key words: Phacoemulsification, Posterior Vitreous Detachment (PVD), Cataract.

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INTRODUCTION

Cataract surgery is a known risk factor for posterior vitreous detachment (PVD) and related complications like retinal tears, retinal detachment and vitreous hemorrhage and this risk is even higher in myopic eyes with respect to

emmetropic eyes. The introduction of phacoemulsification technique seems to have lowered the risk for postoperative retinal detachment. Even though the posterior capsule remains intact in an uneventful phacoemulsification and the size of the incision is smaller, it is not uncommon to find PVD after uneventful phacoemulsification surgery in long followup. The exact association of PVD and its sequel with uneventful phacoemulsification needs more light. The present study intended to do the same in a prospective manner,

MATERIALS AND METHODS

Patients with bilateral senile cataract were recruited for the study from after written informed consent Aashirwad Hospital, Aurangabad after written informed consent.

AH cases were selected on the basis of age between 45 to 75 years, bilateral senile cataract grades 1 and 11, suitable

for fundus evaluation and otherwise normal fundus, uneventful phacoemulsification surgery. Patients suffering from glaucoma, uveitis, scleritis, presence of PVD or any vitreous changes, diabetic or hypertensive retinopathy, H/o eye surgery or trauma, intraoperative complications (eg, capsular rupture and vitreous incarceration), presence of peripheral retinal degeneration (eg. Lattice degeneration), axial length >24.50 mm and intraocular injection were excluded from the study.

The following examinations were performed in baseline condition for each patient: Best corrected Visual Acuity (BCVA) by Snellen's chart, slitlamp examination, slitlamp with + 90 D, indirect binocular ophthalmoscopy, ultrasonographic A and B scan, biometry, 3D OCT for evaluation of posterior hyaloid phase (Hiedelberg., Spectralis OCT protocol ETDRS version 5.4.7.0).

Postoperatively, all the patients were followed up with, all the examinations done preoperatively, except biometry at days 30, 60, 90, 180 and 270 days. The entire period of followup was thus 9 months.

Sample size: Hundred eyes each for the study and the control group.

Sampling design: Simple randomized sampling.

RESULTS AND ANALYSIS

At the end of the study period, it was found that 10 eyes (10%) developed PVD in operated eyes while only one eye developed PVD in control group. As far as the, associated complications like retinal breaks or RD is concerned, none of the patients developed any of these complications in the entire 9 months followup period in either group. As far as the time of development of PVD is concerned, it was detected in 3 eyes on the 60th post operative day, in 3 eyes on the 90th postoperative day and in the remaining 4 eyes on the 270th postoperative day respectively. Whereas, PVD developed only in one eye among the control group and that was detected on 180th postoperative day. Out of the 10 PVD cases in the operated eyes, 6 (60.00%) were females and 4 (40.00%) were males. The only patient whose control eye developed PVD was a female. Thus out of the total 11 cases with PVD, 7 (63.64%) were female and 4(36.36%) were male.

As far as the major associated visual complaints were concerned, 10 out of the 11 patients (90.90%) complained of floaters while 2 (18.18%) among those 10 also complained of occasional flashes on being asked. One patient (09.10%) had no complaints at all and was completely asymptomatic. The eyes which did not develop PVD had absolutely no complaints of flashes or floaters. The average age of patients developing PVD was 66.27 years while the average age of all the 89 patients was 61.12 years, which had a 'p' value of < 0.001.

DISCUSSION

PVD and related changes like retinal tears, retinal detachment and vitreous haemorrhage are known complications of cataract surgery.¹⁵ Retinal detachment occurs in 0.23.6% of persons after extracapsular performed.⁶ Predisposing factors for retinal detachment include Nd: YAG laser capsulotomy, axial length greater than 24.5 mm, myopic refractive error, lattice degeneration, male gender, intraoperative vitreous loss, postoperative ocular trauma, uveitis, intravitreal injections, posterior vitreous detachment, and history of retinal detachment in the fellow eye.⁷⁹ There are many different theories in the literature regarding the mechanisms at the basis of changes of vitreous status after cataract surgery.¹⁰¹¹ For instance, it is observed that decrease of hyaluronic acid concentration¹⁰ and the onset of postoperative PVD may be implicated in the development of RD after cataract surgery. Hayreh and Jonas reported that, among other demographic and ophthalmic factors, the occurrence of PVD correlated significantly with increasing age and surgical aphakia.⁹ After cataract extraction even with intact posterior capsule torsional movements of vitreous cavity is increased because the lens with its posterior convexity exerts a "grip" or mechanical hold on the vitreous body, above and beyond the vitreolenticular attachment at Egger's line, imparting rotational forces completely independent of these attachments. The only major study in the recent years assessing the association of PVD and related complications with phacoemulsification is that of Ripandelli et al. Their results revealed the development of postoperative PVD in 78.7% (148/188 eyes) of eyes without preoperative PVD after undergoing uneventful phacoemulsification. Among these 148 eyes, 11 (7.4%) developed postoperative RD after the occurrence of PVD. When analysing the development of postoperative PVD, they considered time elapsed from cataract surgery, age of patients and absence or presence of peripheral retinal degenerations such as lattice areas as risk factor for subsequent development of retinal breaks or RD. They had observed that a postoperative PVD was detected between 2 days and 26 months (mean 7.3 ± 0.91 months). This led them to believe that onset of PVD may occur a short time after cataract surgery. In their series of eyes, the majority of postoperative PVD's were present in the younger group of patients (age .. between 50 and 57 years). Nevertheless, no statistically significant differences were observed with respect to the other age groups which suggested that age is not a predominant factor for the development of postoperative PVD. In eyes without preoperative PVD and lattice degenerations, the onset of postoperative PVD was detected in 75.88% of the total number of eyes. Nevertheless, a large percentage

(87.23%) of postoperative PVDs was detected in eyes with preoperative peripheral retinal lattice degenerations. They found these data very difficult to explain and to their knowledge, there was a lack of information regarding this point in the literature. Their study however suggested that eyes with preoperative peripheral degenerations may be somehow more predisposed to mechanical or structural factors inducing vitreous changes leading to the development of PVD. A second aim of their work was to evaluate the onset of possible complications, such as RD, in relation to postoperative vitreous changes. When analyzing the development of postoperative RD, they considered age of patients, correlation to vitreous changes in the presence or absence of peripheral retinal degenerations (lattice degeneration), and time elapsed from onset of PVD; Although the development of postoperative PVD was not statistically related to age, they observed that RD more frequently developed in younger patients. This was in agreement with previous studies reporting that younger patients appear to have a higher incidence of RD after cataract surgery¹⁴. In their series of patients, postoperative PVD developed in 107 of 141 eyes without preoperative PVD or lattice degeneration. Among these 107 eyes, an RD occurred in one eye only, after the onset of postoperative PVD. Considering these data, they concluded that onset of postoperative PVD cannot be considered an exclusive potential risk factor for RD, in contrast to previous studies reporting PVD as a risk factor for RD after cataract surgery^{4,5,10,12}. This discrepancy, according to them, might have been due to the presence of different factors such as population of patients enrolled (eg. myopic eyes with respect to their population of emmetropic eyes) and/or due to surgical techniques employed (eg. ECCE and intracapsular cataract extraction with respect to phacoemulsification technique). In their study, the majority of RDs were observed in eyes with peripheral lattice degeneration in which a postoperative PVD developed. It was worth noting that in those eyes RD developed very early after the onset of PVD. Their findings were in agreement with other studies suggesting that lattice degeneration may represent by itself the most important fundus lesion predisposing to retinal tears and RD; indeed, the reported risk factor of 0.3% to 0.5% for the development of RD is increased when retinal tears occur along the edges of the areas of lattice degeneration after an acute PVD⁷⁹. Their study had concluded that considering the possible relationship between age of patients, onset of postoperative PVD, presence of peripheral retinal lattice degeneration, and development of RD after cataract surgery by means of phacoemulsification technique, their data suggested that none of those factors may represent, by themselves,

potential risk factors for the development of RD in emmetropic eyes. In contrast, according to them, the development of PVD after cataract surgery in eyes with lattice degeneration may be identified as a possible risk factor for RD, even when the degeneration is circumscribed to only one quadrant. Also these studies, they did not have a control group in the form of unoperated other eye of the patients and also the operating surgeons in all these studies have not been the same person.

We attempted to directly attribute the occurrence of postoperative PVD and related complications to the phacoemulsification procedure by selecting only those patients in our study who had bilateral senile cataract, and the patients did not undergo any cataract extraction during the entire 9 months followup period. Also care was taken to maintain uniform standard of phacoemulsification in all the patients operated. Our study revealed an incidence of post operative posterior vitreous detachment (PVD) of 10 % in a 9 months followup period when compared to 1% incidence in the other eyes of the same patients after uneventful phacoemulsification in cases of bilateral senile cataract, which was significant at 'p' value 0.005 by Chi Square test. The average age of patients developing PVD was 66.27 years while the average age of all the 100 patients was 61.12 years, which had a 'p' value of < 0.001. Although significant, this incidence was much lower compared to other studies done in the past in this regards where the incidence of postoperative PVD was as high as 78.7% in the study by Ripendi *et al.* An important reason for that is the long followup used in those studies compared to our study where the followup period was 9 months. However, since the control group in our study was almost identical to the operated eye and since we had excluded all the factors predisposing to PVD, our results give an incidence of PVD which can be more directly attributed to the phacoemulsification procedure compared to the, previous studies. As far as the visual acuity of the patients is concerned, on the first postoperative followup on the 15th day, 5 of the 11 patients had an unaided visual acuity of 6/12 while the remaining 6 had an unaided visual acuity of 6/9. All these patients had a final visual acuity of 6/6 after refraction of their second followup on the 30th day, none of whom had developed a PVD by which time. All these patients continued to maintain their unaided as well as best corrected visual acuity after the development of PVD. Of special mention here is the fact that no previous studies have used 3D OCT in their studies for the detection of PVD, which has the potential to detect very early vitreoretinal separation, not detectable in USG B scan. USG B Scan and 3D OCT supported the diagnosis in all 11 cases. As far as the followup

examinations are concerned, a review of the data in Dr Byer's study showed that repeat examinations at 1 to 2 weeks after diagnosis of symptomatic PVD and then every 3 to 4 months for the first year perhaps could have resulted in detection of retinal tear and/ or RD before visual loss occurred. Two of the four eyes with retinal tears without detachment occurred in the first year, and three of the four eyes with associated RD occurred during this time and hence the opportunity to prevent three of the four rhegmatogenous RDs by recommending periodic followup examinations during the first year after PVD thus seems logical, especially important if vitreous haemorrhage occurred at the time of PVD.

Thus, the overall result suggests that there is a definite association of postoperative vitreous detachment even in cases of uncomplicated phacoemulsification in eyes with no other predisposing factors for PVD development. Also there is a significant role of older age in the development of PVD in the post operative period. On the other hand, since the main focus in our study was the early changes in the vitreous after uneventful phacoemulsification, associated complications of PVD like retinal breaks, vitreous haemorrhage and retinal detachment were not found in our study but such, complications may arise in these patients in the long term, followup and hence such patients cannot be ignored and should be followed up carefully.

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