***Review Article***

# RETINAL DETACHMENT FOLLOWING CATARACT SURGERY



**ABSTRACT:**

INTRODUCTION: The most frequently executed operating techniques for cataract worldwide is the extraction of cataract. Development of PPRD following surgical extraction of cataract forms a major and growing quantity of RRD cases. PPRD is one of the severe, vision related event and hence there is a need to find out the correlation between PPRD and cataract removal surgeries.

OBJECTIVES: There is difference risk of developing PPRD with different methods of cataract extraction. Attempts are made to find the consequence of the new cataract surgery on the danger of retinal detachment and additional factors that modify this risk by collectively drawing the findings of clinical trials investigations in this review. Also comparison is made among different cataract surgeries for incidence of PPRD development.

DATA SOURCE: Pubmed Indexed

LIMITATIONS: Small population numbers restrict the available literature. The number of PPRDs that occur is minimal due to their rarity; hence just four of our 16 studies had more than 50 PPRDs. Patients with past history of RRD were commonly omitted from the available research, and several studies had extremely short follow-up periods. Due to the methodological inconsistencies between the numerous studies evaluated there was restricted assessment of the literature, making direct comparisons more difficult.

CONCLUSION: PPRD is an uncommon but significant adverse consequence. According to more recent research, phacoemulsification has a comparable or higher success rate in centres that are experienced with the process. While the exact risk of PPRD related to phacoemulsification is becoming apparent, the specific risk of PPRD attributable to phacoemulsification remains unknown.

**KEYWORDS:** PPRD, Phacoemulsification, pseudophakic retinal detachment, pathophysiology

## INTRODUCTION:

The disintegration from the retinal pigment epithelium of the neurosensory retina which is present beneath it is known as rhegmatogenous retinal detachment (RRD). It is correlated to a split in the two layers of retina. PPRD is an uncommon but significant adverse consequence occurs in 0.36–2.9 percent of patients within 10 years following phacoemulsification. Development of PPRD following surgical extraction of cataract forms a major and growing quantity of RRD cases [1], the proportion of cases of RRD being PPRD (pseudophakic retinal detachment) in developed world are approximately 21% [2] to 37% [3].
The most frequently executed operating techniques for cataract worldwide is the extraction of cataract [4]. PPRD is one of the severe, vision related event with roughly half of the patients doing not better than around 6/12 standard visual acuity. Hence there is a need to find out the correlation between PPRD and cataract removal surgeries [5].
There is difference risk of developing PPRD with different methods of cataract extraction. ICCE (intra capsular) is seen to have higher chances of PPRD by around 1/3rd compared to ECCE (Conventional extra capsular cataract extraction) [6]. Beginning from the early 1990s in the developed world, ECCE has now been substituted almost completely with phacoemulsification [7, 8]. The premature studies regarding phacoemulsification provided data that pointed that risk of PPRDs ranges in between that of intra capsular and extra capsular cataract extraction [6]. Nonetheless these assessments dont reveal the accurate risk of PPRD, as there were improvements in the procedure and since its early popularisation there has been increased knowledge and training in phacoemulsification. This appears to have come in light by the long-term reports of decreasing PPRD incidence in general, [9] also other fresh literature pointing out the same [10] or declining [11] PPRD incidence after performing phaco emulsification as compared with ECCE. According to study, PPRD threat after doing the surgery is just about 0.03% [12] and 0.65% [13] after twelve months. In relationship to this, the incidence of primary RRD in the common population is approximately from 0.01% [14] to 0.02% [3], showing that the above technique is associated with elevated risk of development of rhegmatogenous retinal detachment. The prevalence of rhegmatogenous retinal detachment in the common population is 0.01 to 0.02 percent, also it seems to be linked to higher socioeconomic status and sex (the risk is approximately two times higher in males). Rhegmatogenous retinal detachment affects the left eye less frequently than the right eye, also the prevalence of rhegmatogenous retinal detachment peaks in people above 60 years of age.
This risk is anticipated to be additionally affected by a range of intra operative and demographic factors. These include myopia, age, sex and intra operative complication. Attempts are made to find the consequence of the new cataract surgery on the danger of retinal detachment and other causes that alter this risk by collectively drawing the findings of clinical trials investigations in this review [15].

## PPRD PATHOPHYSIOLOGY

In an attempt to find a causative association connecting PPRD and cataract extraction, Mahroo et al. examined 500 eyes for clinical signs of PPRDs and phakic RRDs and established different patterns in size of breaks and position among the two groups [16]. PPRDs showed vitreous haemorrhage in less frequency and presented more often with multiple breaks, in comparison with phakic RRDs. Rupture in the lower quadrant towards the nasal side which is towards the more tricky surgically 5 o'clock to 7 o'clock location and breaks not bigger than 0.5-disc diameter are the features associated with PPRD.

To further evaluate among the pseudo phakic eyes & phakic eyes which have developed cataract the authors analysed if the dissimilarity in pathology of phakic PPRDs and RRDS is completely because of phacoemulsification or due to the cataract itself. They found identical results, that is, different presentation in both sets of the RRDs similar to what they found with phakic cases weighing against with all pseudophakic cases. The results of the particular study can very well hold up the phacoemulsification surgery as a separate extra risk factor if its results could be replicated. Change in vitreous composition during and after operating the eye is the suggested mechanism for development of PPRD [17].
This is based on the fact that, while only a small percentage of PVDs (Posterior vitreous detachment) are related to RRD, RRD is typically preceded by PVD in phakic eyes. [18]. The occurrence of RRD peaks in the sixth decade of life, which is explained by age-related vitreous liquefaction, which leads to fast PVD advancement. In the acute stage of PVD, the risk of RRD is enhanced, although already established PVD (chronic PVD) is considered to protect against subsequent RRD. [19, 20]. During phacoemulsification a similar course of action may occur due to the movement of the lens capsule resulting in acute vitreous traction. Furthermore this may explain as to why posterior capsule ruture enhances the danger of development of pseudo phakic retinal detachment so significantly, and because of what reason this enhanced danger appears to fade away over time. The following theory may as well explain increased occurrence of pseudo phakic retinal detachment following conventional ICCE procedure. The fact that there are alterations in tractional forces in vitreous supports its long-standing higher incidence which is past the beginning of the postoperative phase [21]. In pseudophakia the above mentioned defensive factor is possibly decreased & in aphakia it is missing. The posterior chamber of eye can also be seen associated with changes in its composition. After phacoemulsification, the protein organisation and composition of liquid present in posterior chamber of eye, changed among three pseudo phakic and seven phakic cases, according to a post-mortem investigation. These alterations are absent among phakic cases which included two patients whose one eyes had not been operated on. The presence of crystalline proteins in the anterior vitreous, which are lacking in phakic eyes, was reported by the authors. The researchers established the fact that the usual mechanisms of vitreous which include protein processing and clearance are transformed among pseudo phakic patients [22]. All the changes have the potential to disrupt stability of the vitreous body due to which there is impact on local clearing mechanisms which can lead to other alterations that support the elevated long-standing risk of PPRD, possibly by increasing speed of the process of liquefaction that leads to PVD. Finally, research indicating a significant incidence of PVD following phacoemulsification supports this theory. Ivastinovic et al. discovered that 59 percent of 49 eyes developed fresh PVD thirty days after phaco emulsification & out of the 49 eyes 71 percent had new PVD three months after phaco emulsification in a research that included 49 eyes. [23]. A much larger research of 188 eyes indicated that by 26 months following phaco emulsification, 78 percent of cases where there was no prior PVD had acquired it. [24].

## RISK OF PPRD IN THE PERIOD AFTER PHACOEMULSIFICATION

9 researchers looked at what are the factors that increase the risk of PPRD over period of years after phacoemulsification. There was not enough evidence of an increase in incidence during any of the three studies from above 9 [11, 26] whereas another study revealed a four-year late rise in the incidence in patients of myopia. [10]. Other three studies reported they had a greater PPRD rate in the first 6 months to 2 years after phacoemulsification. [28] The 8th investigation indicated that if the eye underwent intra-operative posterior capsule rupture

(PCR), alternatively if surgeon was in his or her training phase; not depending on whether PCR had occurred or not, the median duration from phacoemulsification to PPRD was much shorter (44 days vs. 6.3 months). [29] According to more recent research, phacoemulsification has a comparable or higher success rate in centres that are experienced with the process. In spite of the study's short follow-up (at least three months), the data imply that a higher frequency of PPRD is linked to the early post-operative period. Furthermore, a ninth research indicated that the first year following phacoemulsification had the highest risk, and that the average duration to develop PPRD in eyes that had PCR with vitreous loss was decreased from 31 months to 10 months.[12].

The five studies that found an elevated risk of PRPD in the beginning of post-operative time did not rule out a longer-term rise in PPRD incidence. According to Bjerrum et al.[31], the greatest danger of PPRD occurs around the 1st six months that gradually declines and stays greater as compared to the un operated side for nearly 10 years. While the association between early increased PPRD risk and intra operative problems is strong, it might also be due to enhanced surveillance in the early post-operative period, especially in severe instances, and an increase in patient fail to follow-up with the passing time. [15]

## PHACOEMULSIFICATION AND ECCE COMPARISON

Studies were chosen where phaco emulsification was the major cataract extraction procedure since previous approximation may have exaggerated the risk of PPRD. Six investigations evaluating the incidence of PPRD in ECCE and phaco emulsification patients included some ECCE cases due to the novelty of the technique. [15] Daien et al. discovered greater PPRD prevalence following ECCE patients. [11] Except Sheu et al., who concluded that phaco emulsification was linked with a greater occurrence of PPRD in his last research (RR about 1.78), most other studies found no difference [28, 34–36]. Interestingly, the particular distinguishing point didn’t achieve importance in their prior follow-up publications (2005–2007) in the complete population. Furthermore, they state in their conclusion that higher danger following phaco emulsification is attributed by cases that were from the early years of the operational era (c.1999). That particular era points towards the transition to phaco emulsification from ECCE, also there was found very little significant difference in PPRD occurrence among the two procedures when only cases from the next year were considered. [10]. When findings obtained from the above trials are taken into consideration, there seems to be the understanding that after the phacoemulsification procedure is learned it could be as safe as or it is more safe than ECCE. The newly established method can even be having a higher PPRD risk for institutes gradually shifting to phacoemulsification from ECCE. On the other hand, we emphasise about the latest approximation of danger of PPRD being on higher side following ECCE than phaco emulsification is perhaps skewed. It is pointed out taking into consideration the piece of evidence that, areas within which phacoemulsification is considered to be standard, ECCE currently is set aside in case of other difficult instances like cataracts with denser crystalline lenses where phacoemulsification is unsuitable for the patient. [15]

## INTRA OPERATIVE COMPLICATIONS

Except for Sheu et al. and Boberg Ans et al. stating the initial assessment, all the other researchers that looked at the influence of intra operative difficulties (vitreous loss or PCR) identified a major link between higher Post phacoemulsification retinal detachment .[38-48]. At four years, the predicted increase in risk was found to be nearly fourfold times. [11]

During three months post PCR, there was still a 42-fold increased incidence of retinal detachment surgery. [4] The latter statistic comes from Day et al., who discovered that the increased initial risk of PPRD after PCR declined over the period of time. While disclosed beforehand, the above group of researchers discovered in a separate study, the time to PPRD was found to be shorter if it had links with PCR. [29] Szijártó et al., only one other study looked at the impact of intra operative difficulties between phacoemulsification and pseudo phakic retinal detachment, reported that PCR was linked with a lesser duration to RD, but only if there was vitreous loss.[12]. This one is supported by the fact that five, out of the total nine surveys, discovered a higher incidence of PPRD in the eyes with intra operative complications looked at intra operative complications as a group (that is, there was no differentiation between vitreous loss and non-vitreous loss) [4, 12, 39]. PCR with loss of vitreous present in posterior chamber of eye was linked to a increased occurrence of pseudo phakic retinal detachment in the four of analyses [11, 40]. Russell et al. and Petousis et al. together evaluated the danger of pseudo phakic retinal detachment in patient who have and don't have loss of vitreous. PCR was performed in them, finding higher PPRD solely in patients that have PCR with loss of vitreous and there was very little increase in PPRD in patients that have PCR without any loss of vitreous. The inference is that intra operative problems are not related with an increased incidence of PPRD, but however vitreous loss is. This might have been related to the patho physiology of PPRD, as discussed below, but also has implications for intra operative PCR detection, treatment, and training. [15]

**CONCLUSION:**

PPRD is an uncommon but significant adverse consequence occurs in 0.36–2.9 percent of patients within 10 years following phacoemulsification, according to our review of recent publications. According to more recent research, phacoemulsification has a comparable or higher success rate in centres that are experienced with the process [41]. Our survey reveals a high initial PPRD rate that reduces to roughly 0.1–0.2 percent every year for numerous years, but is still 10 times higher than the general population's RRD risk. Multiple patient, ocular, and operative characteristics have been linked to an increased risk of PPRD, including intra operative loss of vitreous, growing axial length, young male patients, and operating surgeon who is not well trained (in order of decreasing impact). Excluding the technique Nd:YAG laser capsulotomy, that doesn't appear represent major risk of PPRD in phacoemulsification scenario with less trained worker, these are all established potential risks for PPRD known from previous procedures of extraction of cataract like ECCE. Growing old is a protective factor, with the risk of PPRD about decreasing every decade beyond 50. Intra operative complications, particularly posterior capsule rupture with vitreous loss, raise danger of developing PPRD more substantially in the early post-operative period & are considered to be one of the most significant determining factors for development of pseudo phakic retinal detachment. All the above concerns are somehow most probably become additive in current hazards, which means that in male with myopia, who is not elderly and has previously developed RRD in the other eye, there will be considerably higher danger of developing pseudo phakic retinal detachment in the eye which is being operated. Because of increased sub-specialisation, long standing consequences of phacoemulsification surgery, such as pseudo phakic retinal detachment, might slip the observation of the operator without any difficulty.[42] As a result, postoperative RRD surveillance with preventative interventions can play significant job of diagnosing as well as controlling RRD.[43] While the precise danger about pseudo phakic retinal detachment related to phacoemulsification is becoming apparent, the specific danger that pseudo phakic retinal detachment contributes to

phacoemulsification is still unknown. A PPRD risk estimator would be perfect for further valuable analysis of patients that already have a high danger of developing pseudo phakic retinal detachment. It can be supported on information taking into consideration the limits of the data which is accessible at present as mentioned above. [15]

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