5. Discussion

5.1 Indications of primary PPV

Since its introduction by Machemer in the 1970s [17], primary PPV has established itself in the treatment of complicated RRD. To date several indications have been defined: retinal detachment complicated by dense media opacities (e.g. dense cataract and vitreous haemorrhage); PVR; giant retinal tears; and retinal detachment associated with holes at the posterior pole [46]. In our series of 512 eyes, the preoperative characteristics indicating the PPV technique included dense media opacities (moderate or severe cataract and vitreous haemorrhage in 35 and 49 eyes respectively), PVR (102 eyes), unidentified retinal breaks(77 eyes), giant or unusual or both breaks (117 eyes), retinal holes posterior to the equator (63 eyes), and IOL or lens fragments in the vitreous (5 eyes). The remaining eyes in our series had some characteristics, which preferred the PPV method to scleral buckling as the appropriate choice of the treatment, including multiple breaks, bullous retinal detachment and pseudophakia. In addition, scleral buckling procedures were chosen as the initial operating method in 33 (6.4%) eyes, however, the operation was converted to primary vitrectomy due to insufficient intraoperative retinal reattachment and/or the occurrence of its complications.

5.2 Primary vitrectomy and intraoperative complications

Primary pars plana vitrectomy is one of the major surgical methods for rhegmatogenous retinal detachment. It has rapidly gained a tremendous popularity during the past 20 years because of its presumed advantages and the rising number of patients with RRD due to the increasing age of the population and number of cataract surgeries performed [28].

It is a clear advantage of PPPV that opacities in the vitreous can be removed. Hoerauf et al. [43] reported an 86.5% (32/37) and 100% primary and final success rate with PPV in eyes with RRD and dense vitreous opacities. In our series, vitreous haemorrhage was removed by PPV in 75 eyes, its primary and final reattachment rates were 74.7% and 97.3%. Meanwhile, combined cataract surgery was performed in 32 of 35 eyes with moderate or severe cataract. It is one of advantages of PPV that a high rate of intraoperative reattachment, even in very

difficult cases, can be achieved by internal drainage and endotamponade. The retinal reattachment was achieved intraoperatively in all 512 eyes, in more complicated eyes, such as eyes with giant and/or unusual break, PVR, and no break undetected, drainage or relaxing retinotomy (41 eyes), PFCL (355 eyes) and endotamponade of silicone oil (81 eyes) were used during the operations.

An important advantage of PPV for RRD is the low rate of intraoperative complications. Iatrogenic retinal break is the most frequent complication observed, occurrence rates were from 1.9% to 9.2% of cases in series of reports [12,19,40,41,43]. It may result from traction on the vitreous base from the insertion of instruments through the sclerotomies, from accidental aspiration of the retina with the vitreous cutter, from retinal incarceration and consequent trauma in the sclerotomies. Lens damage was noted in 2.7% ~ 6.9% of phakic eyes [40,41,43]. Subretinal and choroidal bleeding are two unusual complications, observed in 0% ~ 2% and 0% ~ 4% of cases respectively [12,19,40,41,43, 49,10,18]. Subretinal or vitreous bleeding is usually the result of retinal vessel trauma during removal of the vitreous close to a retinal tear or a consequence of sclerotomy trauma or owing to retinal vessel rupture during exocryo treatment [12]. Choroidal bleeding may result from hypotony and/or choroidal detachment [10,18]. Some authors reported that no complications occurred during PPV [8,9]. In our study, the intraoperative complications included 7% (36/512) of iatrogenic breaks, 5.1% (26/512) of lens damage in phakic eyes, 1.2% (6/512) of subretinal bleeding, 0.2% (1/512) of choroidal bleeding and 1.7% (9/512) of both or more.

Surgeons nowadays have become more familiar with PPV compared to scleral buckling surgery, as the indications for vitrectomy and the total number of cases outside retinal detachment surgery have increased immensely during the past decade. Further, endoillumination, indentation, a higher magnification, wide angle viewing systems, the removal of opacities, membranes, and the unfolding of detached retina with perfluorocarbon liquids enable a better view of the pathological anatomy and an improvement in the identification of previously unseen breaks. In retinal detachment series, 4-14% of primary detachments have no detectable breaks [50-53]. The retinal break could be identified during PPV in 38.3% ~ 92.7% eyes, in which no break was found preoperatively [3,6,33,48]. In our series, the retinal breaks were detected during operation in 54 (70.1%) of 77 eyes of

previously unseen breaks. Of 23 eyes (4.5%) without break identified pre- and intraoperatively, 13 (56.5%) eyes were phakic, 10 (43.5%) were pseudophakic or aphakic.

The problems associated with external drainage, such as choroidal haemorrhage, retinal incarceration, and retinal perforation, as well as that of scleral perforation during suturing of the exoplant (if PPPV is not combined with additional scleral buckling surgery) are avoided. Miki et al. [41] reported that a 4.3% and 2.9% subretinal bleeding and penetrating suture with scleral buckling, while no two complications occurred with PPV. In the present study, scleral buckling procedures were chosen as the initial operating method in 33 (6.4%) of 512 eyes, however, the operation was converted to primary vitrectomy due to insufficient intraoperative retinal reattachment (26 eyes), very thin sclera (3 eyes), and occurrence of its complications (2 eyes of retinal incarceration and 2 eyes of scleral perforation).

5.3 Anatomic results

5.3.1 Anatomic success rate

We reported the results of 512 patients with RRD that underwent the PPV procedure with or without scleral buckling or encircling as the initial surgery to repair the detachment. The reattachment rate was 70.7% (362/512) after one procedure and 97.5% (499/512) after one or more operations. In other series of RRD managed by primary PPV with or without scleral buckling, the primary and final success rate ranged from 64% to 100%, and 83% to 100% [3,6-12, 14, 18-19, 25, 32-44]. The primary reattachment rate is comparable to the results of Schmidt JC et al. [44] and better than the results of Hakin et al [11] and our first series of published cases [12] but worse than published in other studies of primary vitrectomy [3,7,18,32-37]. The reasons for this could be the inclusion of more complicated types of RRDs such as preoperative PVR, large/giant breaks, retinal holes at the posterior pole and IOL or lens fragments in the vitreous in our series. The final success rate of 97.5% is comparable favourably with that of previous reports [3.7.18.32-37]. It is important to mention that in papers reporting a 100% primary and final reattachment rate, cases with PVR were excluded, while 19.9% (102/512) eyes had preoperative PVR in our study. Escoffery [37] and Sharma [40] reported that all their failures were due to PVR.

The retinal reattachment rate after the first PPV exceed 90% in reported series in aphakic and pseudophakic eyes with no detectable breaks and no PVR preoperatively [3,6,8]. A 59.6% of lower reattachment rate was reported by Wong et al. [48] in phakic and pseudophakic/aphakic eyes with unseen retinal holes. However, in that study 44.7% patients had preoperative PVR. In our series, the primary success rate was 63.6% in 77 eyes (43 phakia and 34 pseudophakia or aphakia) with no break detected preoperatively, and 15 eyes (19.5%) of them had PVR. Kocaoglan et al. [54] found that the primary and final reattachment rate were 62.2% and 87.2% in 45 (17.4%) eyes without detectable breaks pre- and perioperatively, while 78.9% and 90.2% in 213 eyes with detectable breaks respectively. The results of our study were comparable to that of Kocaoglan et al. [54] i.e. 65.2% and 87% in 23 (4.5%) eyes with unseen breaks pre- and intraoperatively, and 72.4% and 98% in 489 eyes with breaks seen respectively. At the same time we found that there was a statistically significant difference in final reattachment rate between eyes with and without breaks detected (p = 0.03), however, no significant difference was found in Kocaoglan's series. The cause of it could be that the patients with PVR more than grade C2 were excluded in Kocaoglan's series.

5.3.2 Predictors of postoperative retinal redetachment

In the present study, we surprisingly found that the risk factors for primary and final retinal reattachment differed using multivariate logistic regression analysis.

Four preoperative variables were demonstrated to be predictors for postoperative primary retinal redetachment of PPV, i.e. low IOP, inferotemporal detachment, specialists, and giant and unusual breaks. Five predictors for final retinal failure were: refraction more than –10D, amblyopia, a history of macular disease, no break seen and scleral buckling. This is different to the results reported by Girard et al [45]. The causes may be Girard et al's results from only pseudophakic retinal detachment, and from all surgical methods. The giant and unusual breaks as risk factors of retinal redetachment have been identified by Yoshida et al [100] and Scott et al [47]. A high degree of myopia results in greater susceptibility to retinal detachment [22,61], and amblyopia results most often from a high degree of myopia. In our study 67.5% patients with amblyopia had more than – 5D myopia. It is a fact that the retinal reattachment is lower in the patients of RRD from inferior retinal breaks comparing with from superior

breaks. In our series 54.6% and 19.8% inferotemporal RRDs result from inferotemporal and inferonasal retinal breaks respectively. Scleral buckling was usually used in more complicated patients such as PVR grade C or greater (36.9%), giant or unusual breaks and inferior breaks (73%). Interestingly, in the present study 77.5% (79/102) of patients with PVR had simultaneously inferior retinal breaks, and in 48.8% large or giant retinal breaks occurred in the inferior retina. Although we failed to find that preoperative PVR was a predictive factor of retinal redetachment, many investigators have demonstrated that preoperative PVR was one of the most important factors determining the anatomic outcome [100,37,40,7,35].

As stated above, PVR is a major cause of retinal redetachment in the patients without detectable breaks, in addition, in 41 of 54 patients (75.9%) the breaks were found in inferior retina during operation. These may be the reasons for no break seen preoperatively as a risk factor. Retinal detachment results in low IOP, and the main associated factor of IOP is extent of retinal detachment and choroidal detachment; when accompaning choroidal detachment occurs, the IOP can rapidly fall, so far as to not be measured. In addition, the extent of retinal detachment and choroidal detachment significantly influence retinal anatomical recovery [7,100,45]. We also found that extent of retinal detachment was a significant factor (p = 0.004) of final success rate by univariate analysis. With regard to surgeon, Thompson and associates [117] indicate that a significant difference in reattachment rate between specialists and non-specialists, specialists had higher reattachment rate of RRD treatment. However, our result was on the contrary, the inclusion criteria of patients for surgeons and surgical methods may be the most important reasons. In our study, surgical method was only primary PPV and specialist operated more complicated patients.

5.3.3 Causes of postoperative retinal redetachment

The formation of PVR (20-100%), new breaks formation (20-71.4%), reopened or not sealed retinal breaks (15.9-80%) and missed retinal breaks (around 15% to 20%) were the most often described causes of postoperative retinal redetachment in previous series [3,7,14,37,34,35,40,41,18,19,10-12]. Early studies on PPV treatment of RRD report higher incidence of recurrent retinal detachment owing to missed break [10,11]. With increasing experience [1] and refinements in instruments and techniques, the incidence of recurrent retinal detachment

owing to the missed breaks has substantially decreased [6,7]. The incidence of this complication may be diminished with adequate examination of the retinal periphery before closure of the sclerotomies, as well as prompt treatment and tamponade of the break [32]. However, in 2000, Richardson et al. [56] retrospective analyzed reasons for retinal redetachment after primary PPV in 25 of 171 cases with RRD. He again found that missed retinal breaks are the commonest cause (64.3%) of failure of primary PPV for RRD, this re-emphasises the importance of assiduous intraoperative retinal examinaton.

At present the formation of new break, PVR and reopened alt breaks were the three most important reason of recurrence detachment [3,14,18,19,37,41]. This was also identified by our results. In our study, 32% of primary retinal redetachments (150 eyes) result from the formation of new breaks, 28.7% from combination of PVR and new breaks, 16% from PVR, 11.3% from reopened alt breaks. However, the incidence of new breaks in other studies of PPV was lower than in ours [3,18,19]. One possible explanation could be the high proportion of cases featuring additional scleral buckling which possibly relieves traction of remnant vitreous that could lead to new break formation. However, no statistically significant differences can be found comparing the reattachment rates of PPV with and without additional scleral buckling [11,19] published to date. We also failed to find a significant difference comparing the primary with final reattachment rates by univariate analysis, but we find that scleral buckling was a predictive factor for final retinal reattachment rate of PPV by multivariate analysis. In studies of Hakin [11] and Oshima [19], patients with PVR greater more than grade B and giant retinal tears were excluded, while an additional scleral buckling was performed mainly in these patients (60.3%) and more complicated cases in our series. Therefore, the final retinal reattachment rate was lower in the patients with an additional scleral buckling than that without scleral buckling, however the result was favourable (95.7%).

In addition, occurrence of postoperative new breaks after primary PPV is higher than conventional surgery. The reasons for development of new breaks after PPV have been studied by many investigators. The major reasons may be as follows: accidental touching of the retina during surgery that will later result in a retinal tear; new tangential forces from scar formation, especially in the region of the sclerotomies; contraction forces of the remaining

vitreous cortex; formation and contraction of an epiretinal membrane; and/or continuing PVD after PPV [41,42,46,55].

5.4 Functional results

5.4.1 Postoperative final visual acuity

In our study, postoperative final visual acuity reached 0.4 or better in 247 (48.2%) eyes despite the fact that 49.2% (252 eyes) had preoperative acuity 0.05 or less, and 58.2% (298 eyes) had macular involved. This result is comparable to most previous reports, which published that the final visual acuity of 0.4 or better ranged from 32 to 53% [10-12,14,39,42,18,49]. The final visual acuity of 0.4 or better have been achieved in 65~80% of pseudophakic or aphakic RRD [3,6-8,35], while only 53.7% in our series. The reasons may be inclusion of preoperative PVR i.e. 19.9% versus 0%, and 7.8% patient with amblyopia, a further 5.6% with macular diseases (including 2.5% macular holes and 2.1% macular pucker).

In the studies of Hakin [11] and Oshima [19], final VA was not compared with additional scleral buckling. We found a significant difference (p<0.001) that the final acuity of patients undergoing PPV with scleral buckling was worse than that of patients without scleral buckling, this is proabably due to the fact that scleral buckling was mostly used in more complicated RRD, as mentioned above.

5.4.2 Prognostic factors for postoperative final visual acuity

By multivariate logistic regression analysis, we found that short duration of symptoms, no amblyopia, gas tamponade, younger age of patients, and lens status were the most important predictive factors of final VA. The worse and worst final VAs were observed in patients with the duration of symptoms more than 7 and 30 days respectively. These results are similar to those of some studies [49, 105,106]. Experimental and recent optical coherence tomography studies support this result [49, 104,107]. But Oshima and associates [49] found that preoperative visual acuity and intraocular pressure except duration of macular detachment also were the

best predictors of final visual recovery in 47 patients with macular-off RRD, and PPV was more effective than scleral buckling for achieving early visual recovery.

Kusaka et al [108] and Speicher et al [35] also indicated that younger age was significantly correlated with improvement of final VA. Many investigators have reported that the better final VA could been achieved in pseudophakic or aphakic RRD [3,6-8,34,35]. These support the outcomes of our study that the better visual recovery was achieved in younger age and pseudophakic or aphakic patients. In Scott et al's [102] multicenter study for complex retinal detachment, silicone oil tamponade was a risk factor of final VA. In our series, with gas tamponade 55.2% patients had the final VA of 0.4 or better, and with silicone oil tamponade only 11.1% had it. Amblyopia is a predictor of bad final VA, which is a recognized fact.

Furthermore, after analyzing the clinical factors for final VA of 0.4 or better and less than 0.1 respectively, we found seven correlating factors for final VA of 0.4 or better: pseudophakic or aphakic eyes, short duration of symptoms, better preoperative visual acuity (≥0.1), no amblyopia, presence of vitreous haemorrhage, no use of scleral buckling and SF6 retinal tamponade. And seven risk factors for final VA less than 0.1: refraction more than –10D, bad preoperative visual acuity (<0.1), presence of amblyopia, silicone oil tamponade, use of scleral buckling procedure, occurrence of intraoperative complications and posterior retinal breaks. The same risk factors were: preoperative VA, amblyopia, vitreous tamponade and scleral buckling.

The better final VA was strongly correlated with better preoperative VA [35,47,49]. As stated above, scleral buckling like silicone oil was used in more complicated patients, therefore, the patients with scleral buckling had a bad final VA. PPV can remove vitreous opacity, therefore a better postoperative VA was achieved in the patients with vitreous haemorrhage. This is one of the major advantages of PPV. The reasons for bad final VA in the patients with posterior holes may be that the posterior holes mostly cause a macular detachment and 20.3% (13/63) of posterior holes were macular holes, and the recurrence of retinal redetachment was higher compared with peripheral breaks. The postoperative VA is worse in the cases with macular detached compared to an attached macula preoperatively. In addition, the intraoperative complications included lens damage (5.1%), subretinal haemorrhage (1.2%), choroidal

haemorrhage (0.2%) and both or more (1.7%) in our series, all these result in reduced visual acuity.

Further, in this series postoperative retinal redetachment, macular pucker and PVR significantly influence postoperative functional outcomes. Postoperative cataract surgery improved postoperative visual acuity.

5.4.3 Reasons for final visual acuity of less than 0.1

In total, 88 eyes (17.2%) had final VA of less than 0.1 in this study. Higher rates were reported using primary PPV treatment of RRD by Haddad (24%) [114] and Heimann (25%) [12]. Presumed macular dysfunction was the most common reason, unsuccessful retinal reattachment and postoperative macular pucker also were major causes, as found in the studies of Haddad [114] and Girard [45]. Moreover, we observed that 10 of 88 patients (11.4%) had postoperative optic nerve head atrophy, which mostly occurred in the patient with increased IOP and silicone oil filled, and caused decreased visual acuity.

5.4.4 Postoperative best visual acuity and prognostic factors

In our study, postoperative best visual acuity referred to best vision of patients at any point during the follow-up period. We found that, as to be expected, the rate of best visual acuity of 0.4 or better was higher than final visual acuity i.e. 60.5% vs 48.2%; and the rate of best vision of less than 0.1 was lower than final vision (10.4% vs 17.2%). Postoperative best VA may be a more real functional result after primary PPV, since it removes the impairments of postoperative retinal redetachment, macular pucker, cataract formation etc..

At the same time, the prognostic factors of postoperative best visual acuity were analyzed by multivariate logistic regression, most factors were the similar to those predictive of the final visual acuity. The prognostic factors of postoperative best visual acuity were duration of symptoms, amblyopia, vitreous tamponade and haemorrhage. The risk factors'' for best visual acuity of 0.4 or better included short duration of symptoms, better presenting visual acuity (≥0.1), no amblyopia, macular on, presence of vitreous haemorrhage, no use of scleral buckling, SF6 retinal tamponade and no intraoperative complication. For best visual acuity

less than 0.1were bad preoperative visual acuity (<0.1), presence of astigmatism and amblyopia, silicone oil retinal tamponade, need for retinotomy and an additional cataract surgery, and macular disease.

5.5 Postoperative proliferative vitreoretinopathy (PVR)

5.5.1 Incidence of Postoperative PVR

The development of postoperative PVR is not only the most common complication but also one of the major causes of failure in retinal detachment surgery. The postoperative incidence of PVR was 16.8% in this series, as previously reported by Hakin (20.2%) [11] and Haddad (16%) [114]. However, lower rates (5.1~10%) were published in other studies of primary PPV for RRD [7,18,35,40]. The most important reason might be that the patients had no preoperative PVR, or patients with PVR grade C or more were excluded in those studies. While a large number of studies had been determined that preoperative PVR was the most important risk factor of postoperative PVR [75,80,81,86].

5.5.2 Preoperative risk factors of Postoperative PVR

As stated above, we also found that preoperative PVR was a major risk factor of postoperative PVR, as well as use of PFCL, retinal tear, unusual and large/giant breaks and specialist. Retinal tear, a more extensive detachment and large/giant retinal breaks were identified by some studies [76,80,83]. PFCL was mostly used in the more complicated patients such as PVR, large/giant retinal break, more extensive retinal detachment and no detectable breaks preoperatively [32]. As mentioned above, specialist was a risk factor for retinal redetachment, while postoperative redetachment was mostly caused by postoperative PVR.

In a large retrospective study of postoperative PVR after retinal detachment surgery, Girard et al [80] indicated risk factors for postoperative PVR as follows: minor intra- or postoperative haemorrhages, grade A and B preoperative PVR, pre- or postoperative choroidal detachment, giant retinal tears, air tamponade, retinal detachment involving more than 2 quadrants, cumulative break area larger than 3 optic discs and signs of uveitis at initial examination

postoperative. Most risk factors of this study were also identified by other investigators [75,76,81,83], but they did not consider the number of surgeries, aphakia or subretinal fluid drainage as predictors of postoperative PVR development.

Recently, in Kon and associates' prospective study of postoperative PVR after primary PPV, they analyzed 12 pre- and intraoperative variables and vitreous protein concentration and found only two clinical predictors: aphakia and preoperative PVR, and high vitreous protein concentration. Although this was a prospective study, some pre- and intraoperative variables such as size of retinal break, retinal tear and subretinal fluid drainage were not considered as predictors of postoperative PVR. In contrast, we analyzed 37 pre- and intraoperative variables (including variables as mentioned above) of 512 cases as predictors of postoperative PVR in our series. This seem to be an advantage of this study, although this is a retrospective study.

But it is difficult to assess the actual role of each factor in the development of postoperative PVR and to have a clear idea of the factors really associated with postoperative PVR because of the difference in the selection of cases, variables preoperatively and methods of statistical analysis [89]. Fortunately, recent clinical studies indicated that daunoribicin, 5-fluorouracil and heparin might be useful drug in inhibiting development of PVR after surgery of RRD [97,98].

5.6 Postoperative macular pucker

5.6.1 Incidence of postoperative macular pucker

The term "macular pucker" is often reserved specifically for epiretinal membranes secondary to retinal detachment and vitreoretinal surgery [90,91]. It is a common complications after primary PPV for RRD [32,12,18,35,101]. The postoperative incidence of macular pucker was 22.1% (113/512) and 8.6% (44/512) required macular pucker surgery in our study. While the incidences of macular pucker after PPV for RRD were about 6-11% in previously reports [12,18,35]. But in Campo et al's [7] study of PPV for RRD without preoperative PVR grade C or more, 16% eyes had postoperative macular pucker and 6% underwent macular epiretinal membrane surgery.Further, as a matter of fact, Wilson and associates [93] found that 30.6%

and 34.9% of eyes after retinal detachment surgery have macular pucker and subclinical epiretinal membranes at postmortem examination.

5.6.2 Preoperative risk factors of macular pucker

Postoperative macular pucker may not only result in decreased visual acuity and metamorphopsia but also lead to a slower recovery of the visual acuity after PPV for macular membrane removal. Therefore, to prevent the development of postoperative macular pucker, it is necessary to investigate its risk factors after PPV for RRD. In this study, five risk factors were found in all complete data cases (503) i.e. emmetropia or hyperopia, no amblyopia, use of PFCL, endocryocoagulation, and existence of breaks, but only three risk factors in the cases with break detected RRD: use of scleral buckling, no amblyopia and endocoagulation.

Girard et al [118] also indicated that emmetropia and hyperopia were predictors for macular pucker after surgery of retinal detachment. Interestingly, in our series we still found the rate of macular pucker progressively decreased with increasing degree of myopia and rapidly decreased in the eyes with more than –10D myopia, and 67.5% patients with amblyopia had more than – 5D myopia. Cox et al [95] and Uemura et al [94] identified that multiple retinal breaks and use of cryopexy were predictors for postoperative macular pucker respectively. However, in the present study, only endocryopexy and existence of breaks were risk factors, not exocryopexy and no detectable breaks. The uses of PFCL and scleral buckling were associated with PVR, retinal tear and large, giant/unusual retinal breaks before surgery. While preoperative PVR, retinal tear and large/giant break have been associated with an increased risk for macular pucker [95,118].

Up to now, the risk factors for postoperative macular pucker were investigated in all retinal detachment surgery in previous studies [94,95,118]. We fail to find a relative study of PPV for RRD. In addition, in our study there was no significant association between occurrence of macular pucker and the follow-up period, and macular pucker surgery did not significantly affect the occurrence of retinal redetachment. However, postoperative macular pucker was significantly associated with the retinal survival time.

5.7 Relationship between postoperative cataract surgery and retinal redetachment

Postoperative cataract formation is the most common complication of PPV for phakic RRD, and represents one of the major drawbacks of this surgery in phakic patients. After PPV, more than 30%, as far as to 86%, of phakic patients have a development of a nuclear cataract [12,19,39,43,49]. In this study, 58% of 376 phakic patients required additional cataract surgery because of the development of postoperative cataract. There have been a large number of studies for postoperative cataract formation [12,19,28,38,39,41-43].

However, our attention is that relationship between retinal redetachment after PPV and postoperative cataract surgery and the time of surgery. The incidenc of retinal detachment after cataract surgery ranged from 0.6 to 1.7% during the first postoperative year [66-68]. In comparison, the overall incidence of RRD in the general population ranged 0.008- 0.013% [20,59,60]. Fortunately, in the patients with cataract surgery, postoperative retinal redetachment was not significantly influenced by cataract surgery, and was not significantly associated with the follow-up period, however, significantly associated with time of cataract surgery. Furthermore, the retinal survival time significantly associated with postoperative cataract surgery and time of surgery. These results have not been investigated in the above cited literature.

In summary, primary PPV with or without scleral buckling is an effective surgical method for more complicated RRD; with this technique,a high retinal reattachment and better final visual acuity can be achieved. However, the primary retinal reattachment is comparatively low, which is mostly caused by the postoperative formation of new breaks, PVR and reopened old breaks. Preoperative low IOP, inferotemporal detachment, giant and unusual break, and specialists were predictors for retinal redetachment, and five predictors for final retinal redetachment: were refraction of more than –10D, amblyopia, a history of macular disease, no break seen and scleral buckling. They were different to those for primary redetachment. The reasons for final VA of less than 0.1 mostly included presumed macular dysfunction, unsuccessful retinal reattachment, optic nerve head atrophy, and postoperative macular pucker. Its prognostic factors were refraction more than –10D, bad preoperative visual acuity (<0.1), presence of amblyopia, silicone oil tamponade, use of scleral buckling procedure,

occurrence of intraoperative complications and posterior retinal breaks. While pseudophakic or aphakic eyes, short duration of symptoms, better preoperative visual acuity (≥0.1), no amblyopia, presence of vitreous haemorrhage, no use of scleral buckling and SF6 retinal tamponade were significantly associated with final VA of 0.4 or better.

The rate of postoperative macular pucker was comparatively high, its risk factors included emmetropia/hyperopia, no amblyopia, use of PFCL, existence of break, endocryopexy, and use of scleral buckling. While preoperative PVR was a major risk factor of postoperative PVR, as well as use of PFCL, retinal tear, unusual and large/giant breaks and specialist. The major drawback of this study is a retrospective, noncomparative investigation.