Review

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Review

Pars Plana Vitrectomy Alone or Combined with Hacoemulsification to Treat Rhegmatogenous Retinal Detachment: A Systematic Review of the Recent Literature

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Abstract: Pars plana vitrectomy is today a common first-line procedure for treatment of rhegmatogenous retinal detachment (RRD). Removal or preservation of the natural lens at the time of vitrectomy is associated with both advantages and disadvantages. The combination of cataract extraction (i.e., phacoemulsification) with pars plana vitrectomy (PPVc) enhances visualization of the peripheral retina and the surgical management of the vitreous base. However, PPVc prolongs the surgical time and is associated with iatrogenic loss of the accommodation function in younger patients, possible postoperative anisometropia, and unexpected refractive results. Performance of pars plana vitrectomy alone (PPVa) requires good technical skills to minimize the risk of lens damage, and quickens cataract development. We retrieved all recent papers that directly compared PPVc and PPVa using parameters that we consider essential when choosing between the two procedures (the success rate of anatomical RRD repair, postoperative refractive error, intra and postoperative complications, and costs). PPVa and PPVc were generally comparable in terms of RRD anatomical repair. PPVc was associated with fewer intraoperative, but more postoperative, complications. Macula-off RRD PPVc treatment was often associated with undesirable myopic refractive error. PPVa followed by phacoemulsification was the most expensive procedure.

Keywords: pars plana vitrectomy; rhegmatogenous retinal detachment; cataract surgery; phacovitrectomy; lens-sparing vitrectomy

1. Introduction

Rhegmatogenous retinal detachment (RRD) is a major vision-threatening disease; the incidence ranges from 6.3 to 17.9 per 100,000 peoples per year. RRD develops after retinal tears caused by trauma; or may be attributable to retinal structural anomalies, pathological myopia, complicated cataract surgery, or posterior vitreous detachment. Subretinal fluid accumulates between the neurosensory retina and the retinal pigment epithelium. When the retina separates from the pigment epithelium, surgical management is required [1–4]. Although RRD is more common in adult myopic and/or pseudophakic patients, retinal tears may also occur in younger patients, especially after trauma or associated with hereditary collagen anomalies [5–7]. There are currently three surgical techniques for RRD repair: scleral buckling, pneumatic retinopexy, and pars plana vitrectomy (PPV). Buckling is the oldest method. In this method, silicone bands are placed outside the ocular globe and sutured to the sclera to relieve vitreal traction and approximate the pigment epithelium to the retinal tears. This procedure may be combined with retinopexy. Pneumatic retinopexy is usually employed to treat only RRD cases with few, small retinal tears in the superior quadrants of the eye. An injected intraocular air/gas bubble tamponades the RRD, followed by laser or cryo-retinopexy. Appropriate postoperative head positioning is essential to allow the bubble to tamponade the retinal tear.

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Currently, PPV using 23/25/27-gauge instruments is the procedure of choice for many surgeons; the primary anatomical success rate attains 80% [8–10]. The vitreous is fragmented and aspirated, thus removing the retinal traction and flattening the detached retina, followed by a gaseous or viscous tamponade. Despite the success of repair, a frequent side-effect of PPV performed on a phakic eye is progressive cataract development and thus a rapid need for cataract surgery. This is technically more challenging than usual because the vitreous support is lacking [11,12]. A combination of phacoemulsification with PPV affords certain advantages including better visualization during retinal surgery and wider access to the vitreous base; this allows more complete vitreous shaving and facilitates intraoperative laser treatment. Also, tamponade filling is more extensive, thus reducing the risk of RRD recurrence. However, the combined procedure also has certain disadvantages, such as a longer surgery time with possible additional complications (e.g., corneal edema), increased risk for postoperative refractive errors (when the macula is detached, the axial length [AL] measurement may be erroneously short if particular caution is not taken), and postoperative anisometropia in myopic eyes. Also, removal of the natural lens is associated with complete loss of any residual accommodation function [13–24].

Both phacoemulsification combined with PPV (PPVc) and PPV alone (PPVa) are associated with some advantages and disadvantages; surgeons usually select treatment by reference to the patient characteristics and their personal experience. A recent meta-analysis reported that the two techniques yield statistically comparable results, with the exception that PPVa is associated with slightly better final visual acuity [25]. This review complements the cited study; we consider additional publications and individual clinical and technical parameters.

2. Materials and Methods

PubMed, EMBASE, and the Cochrane library were searched between January and April 2023 for papers comparing PPV alone, and combined with phacoemulsification, as RRD treatments published from January 2010 to March 2023. We did not consider earlier papers because PPV instrumentation has evolved consistently over the last decade. The following keywords were used separately and in combination: "Vitrectomy," "Pars plana vitrectomy," "PPV," "Lens-sparing vitrectomy," "Vitrectomy with cataract surgery," "Phacovitrectomy," "Vitrectomy with phacoemulsification," "Combined vitreoretinal surgery," "Rhegmatogenous retinal detachment," and "Retinal detachment.". Papers addressing at least one of the following issues were included: rate of RRD anatomical repair, postoperative refraction, rate(s) of intra and/or postoperative complications, and costs.

Preprints, papers not in English, non-peer-reviewed studies, and papers using PPV to treat conditions other than RRD were excluded.

3. Results

The search yielded 3319 citations, reduced to 13 after removal of duplications and irrelevant works, with a total of 7379 eyes considered. The characteristics of the included studies are listed in Table 1.

Table 1. Characteristics of the included studies.

First Author, year	PPVc (N°)	PPVa (N°)	Follow up (months)	Design
Lee 2012	311	54	> 3	R
Seider 2014	n.a.	n.a.	n.a.	R
Caiado 2015	28	69 (41 pseudo-phakic)	> 12	R
Kim 2015	38	25	> 1	R
Erçalık 2017	458	376	> 6	R
Loukovaara 2018	126	1564	12	R
Guber 2019	516	501	n.a.	R
Helmy 2020	20	20	4	PR
Tan 2021	127	139	> 6	R

Mora 2021	30	29	> 6	PR
Moussa 2021	70	41	3 to 6 after gas reabsorption or oil removal	R
Kim 2021	82	111	> 6 (mean 26.3)	R
Radeck 2022	2163	451	3	R

PPVa: pars plana vitrectomy alone; PPVc: pars plana vitrectomy combined with cataract extraction, n.a.: not available; R= retrospective; PR= prospective randomized.

Below, we discuss the 4 above mentioned relevant issues and, for each of them, the cited studies are presented in chronological order. The values of statistical significance (p) are detailed in the respective tables.

3.1. Efficacy of RRD repair

Data on primary anatomical healing rate after RRD was treated via PPVa and PPVc are given in Table 2.

Table 2. Rate of RRD successful repair in the considered studies.

First Author, year	PPVc (N°)	PPVa (N°)	Tamponade	SR of PPVc (%)	SR of PPVa (%)	P value
Caiado 2015	28	28 (phakic)	Gas, SO	91 with Gas 94 with SO	71 with Gas 72 with SO	0.043*
Loukovaara 2018	126	1564	Gas, SO	81	90.5	n.a.
Guber 2019	516	501	Gas, SO	89.3	90.4	N.S.
Helmy 2020	20	20	SO	100	99.5	N.S.
Tan 2021	127	139	Gas	84.3	89.2	N.S.
Mora 2021	30	29	Gas	96.7	89.7	N.S.
Kim 2021	82	111	Air, Gas	91.5	92.8	N.S.
Radeck 2022	2163	451	Gas, SO	93	88.7	0.002*

PPVa: pars plana vitrectomy alone; PPVc: pars plana vitrectomy combined with cataract extraction; SO: silicone oil; SR: success rate; *statistically significant; N.S. not significant (>0.05); n.a.: not available.

The earliest paper that we reviewed was that of Caiado et al. [19] This retrospective study included 97 RRD eyes classified by lens status (phakic or pseudophakic), the surgical technique used (23-gauge PPVc or PPVa), and the tamponade agent (long-lasting gas or silicone oil); the minimum follow-up was 12 months. The primary PPV success rate for pseudophakic eyes, using either a gas or silicone oil tamponade, was higher than that for phakic eyes, suggesting that the combination of phacoemulsification with PPV was valuable in terms of RRD anatomical repair.

Loukovaara et al. [17] retrospectively assessed 1,690 consecutive RRD patients, of whom 1,564 (92.5%) underwent PPVa and only 126 (7.5%) received PPVc. The primary endpoint was the reoperation rate to 1 year. That rate was 2.67-fold higher after PPVc than PPVa.

Guber et al. [21] retrospectively studied 1,017 RRD eyes, of which 516 (50.7%) underwent PPVc and 501 (49.3%) received PPVa. No significant between-group differences in the redetachment rate were noted, being 9.6% in the PPVc group and 10.7% in the PPVa group. However, the details of postoperative follow-up were not described.

More recently, Helmy et al. [26] published a comparative, prospective randomized study that compared two groups each of 20 patients, of which the first underwent primary PPVa with a silicone oil tamponade followed 3 months later by PPV to remove the silicone oil, and phacoemulsification. The second group underwent PPVc followed by silicone oil removal only 3 months later. Follow-up concluded 1 month after the second PPV. The RRD repair efficacy was identical in both groups.

The retrospective, comparative case series of Tan et al. [22] included 127 phakic RRD eyes treated via PPVc (mean follow-up 42.6 ± 14.3 months) and 139 such eyes treated with PPVa (mean follow-up 41.6 ± 15.8 months). The primary reattachment rates were 84.3% for PPVc and 89.2% for PPVa.

Mora et al. [4] conducted a prospective randomized trial comparing PPVa and PPVc RRD treatments, with 6 months of follow-up. The groups were comparable in terms of the extents and locations of the retinal breaks and the surgical tamponades employed. Of 59 eyes of 59 patients, 29 underwent PPVa and 30 received PPVc. RRD recurred in three of the PPVa group and one of the PPVc group; the difference was not statistically significant.

During a retrospective review of the medical records of 193 patients with primary RRD, Kim et al. [23] included those who underwent either PPVa (111) or PPVc (82). The mean follow-up period was 26.3 months. Lens-sparing procedures were performed on 60 eyes (58.8%) by experienced surgeons and on 51 eyes (56.0%) by surgical fellows; PPVc was performed on 42 eyes (41.2%) by experienced surgeons and on 40 eyes (44.0%) by fellows. In the PPVa group, the RRD repair efficacies did not significantly differ (91.7% for experienced surgeons and 94.1% for fellows). In the PPVc group, the primary success rate was higher when surgery was performed by senior surgeons (97.6% vs. 85% for fellows). This difference was termed "marginally significant".

Radek et al. [27] retrospectively analyzed 5,502 eyes with uncomplicated primary RRD operated upon by 13 vitreoretinal surgeons with different levels of surgical experience in a single center over a 15-year period. Of 2,614 phakic eyes treated via PPV, 2,163 (82.7%) underwent PPVc and the rest received PPVa. The RRD anatomical repair rate was better in the group that underwent combined surgery (93%) than in the PPV-alone group (88.7%).

3.2. Postoperative refraction

Postoperative refraction data after both PPVa and PPVc are listed in Table 3.

Table 3. Postoperative refraction of the considered studies.

First Author, year	PPVc (N°)	PPVa (N°)	Ocular Biometry	IOL power formula	ME PPVc (SE in D)	ME PPVa (SE in D)	P value
Kim 2015	38	25	IOL Master, ARK, ultrasound	SRK/t	–0.40 ± 1.07 D	0.07 ± 0.56 D	0.028*
Helmy 2020	20	20	Haag-Streit optical biometer (-0.5 D refractive target)	n.a.	−2.5 D (range: +1.5 D to −6.6 D)	−0.75 D (range: +1.25 D to −3.25 D)	0.031*
Tan 2021	127	139	IOL Master, ARK, ultrasound	SRK/t	-0.32 ± 1.28 D	0.16 ± 1.53 D	0.047*
Mora 2021	30	29	IOL Master 500, ultrasound	SRK/t	n.a.	n.a.	n.a.
Moussa 2021	70	41	IOL Master 700, ultrasound	Hoffer Q if AL< 22mm SRK/t if AL > 22 mm	-0.08 ± 0.92 D	-0.07 ± 0.56 D	n.a
Kim 2021	82	111	IOL Master, ultrasound	n.a.	-0.58 ± 0.97 D	-0.18 ± 0.84 D	0.014*

PPVa: pars plana vitrectomy alone; PPVc: pars plana vitrectomy combined with cataract extraction; IOL: intraocular lens; ARK: autorefractor keratometer; ME: mean refractive error; SE: spherical equivalent, D: diopters, n.a.: not available. * statistically significant.

The earliest relevant paper was Kim et al. [28] The authors retrospectively compared a "combined procedure group" (cataract surgery immediately followed by PPV, 38 eyes) to a "delayed group" (PPV followed by delayed cataract surgery, 25 eyes). AL and keratometry were measured by ultrasound (patient in supine position) and by auto refracto-keratometer, respectively. For 54 of the 63 cases, intraocular lens (IOL) Master Biometry (Carl Zeiss Meditec AG, Germany) was also performed, with patients upright. The SRK/t formula was used for IOL power calculation (eyes who had undergone prior refractive surgery were excluded) and the final refractive error evaluated at least 1 month after cataract surgery. A significant myopic shift of –0.40 ± 1.07 D was found in the PPVc group; the mean refractive error was only 0.07 ± 0.56 D in the PPVa group.

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Helmy et al. [26] used a Haag-Streit (Köniz, Switzerland) optical biometer to measure AL and perform keratometry in a PPVc/PPVa cohort (for the PPVa eyes, phacoemulsification was performed at the time of the second PPV that removed the silicone oil); the refractive target was –0.5 D for both groups. The formula used for IOL power calculation was not specified. A significant myopic shift was evident in the PPVc group, thus a mean spherical equivalent of −2.5 D (range +1.5 to −6.6 D) but a much lower value of −0.75 D (range +1.25 to −3.25 D) in the PPVa group.

Tan et al. [22] measured keratometric values using an auto refracto-keratometer and derived the AL via optical biometry (IOL Master). The AL was also checked using immersion A-scan ultrasonication in patients with macula-off RRD or dense optic media. If the AL measurement was significantly shorter than that of the fellow eye by both methods, and no preexisting anisometropia was apparent, the final refractive target was determined using the AL of the fellow eye. The SRK/t formula was used in all cases (prior refractive surgery was among the exclusion criteria). In line with the findings of other studies, the PPVc group exhibited a greater myopic refractive error than did the delayed group (–0.32 ± 1.28 D vs. 0.16 ± 1.53 D) but the difference was significant only for patients with macula-off RRD.

Mora et al. [4] used optical biometry (IOL Master 500) to derive the AL of cases with macula-on RRD, derived keratometric values, and measured anterior chamber depths. Combined vector-A/B-scan ultrasound biometry was employed to measure AL in patients with macula-off RRD. The IOL power was calculated using the SRK/t formula for all eyes except those that had undergone prior refractive surgery, for which the Barrett true-K formula was employed. Refractive outcomes were not reported. The visual outcome was somewhat better in the PPVa group but statistical significance was not attained. At the 6-month follow up, only 16/30 eyes (53%) in the PPVc group had attained the preoperative refractive target (previously unpublished data).

In a retrospective comparative study of 154 eyes with RRD, Moussa et al. [29] analyzed refractive outcomes; evaluated the accuracies of optical biometry, swept-source optical coherence tomography, and contact ultrasound biometry; and explored the effect of macular status. Three groups were defined: phakic patients with RRD treated via PPVc (70 eyes) (group 1), RRD patients treated via PPVa (41 eyes) (group 2), and matched patients without RDD undergoing cataract operations (controls) (group 3) (43 eyes). An IOL Master 700 was used to obtain optical biometric measurements, but immersion ultrasonography was performed when IOL Master data were considered unreliable, thus for cases with macula-off RRD. The SRK/t formula was used when the AL was > 22 mm and the Hoffer Q formula when the AL was < 22 mm. Group 1 evidenced an overall myopic shift of –0.08 ± 0.92 D and group 2 a shift of –0.07 ± 0.56 D, not significantly different than that of the control group. However, a wider myopic shift and a significantly increased mean absolute error were apparent when ultrasound biometry data were used for macula-off RRD IOL power calculation. In particular, the mean absolute error was greater for the group 1 than the group 2 macula-off ultrasound biometry subgroups ($p < 0.001$).

Kim et al. [23] used optical (IOL Master) and ultrasound biometry to assess the refractive outcomes of two groups but did not specify how they chose between the two measurement methods. Also, the formula employed for IOL power calculation was not mentioned. A combined group evidenced a significant postoperative myopic shift of –0.58 ± 0.97 D compared to a delayed cataract group (–0.18 ± 0.84 D).

3.3. Intra and/or postoperative complications

We do not discuss RRD redetachment rates; these have been reviewed previously.

Lee et al. [18] retrospectively but directly compared the intraoperative complications during phacoemulsification of patients who underwent cataract surgery after PPV (54 patients) and those who received PPVc (311). The main indications for PPV were RRD and vitreous hemorrhage for diabetic retinopathy. A control group of 334 patients underwent cataract surgery alone during the same period. The most common complication during cataract surgery was posterior capsule rupture, which was higher in the sequential (6 eyes, 11.4%) than the combined (14 eyes, 4.5%) and control (8 eyes, 2.4%) groups. Lens dislocation and iris trauma were rare and the rates did not significantly differ among the groups.

Erçalık et al. [20] reviewed the records of 834 patients who recieved PPV mainly for RRD, proliferative diabetic retinopathy, and epiretinal membrane. 376 patients underwent cataract surgery after PPV (the sequential group) and 458 received PPVc. The principal intraoperative complication was posterior capsule rupture and was significantly more common in the sequential than the combined group. Zonular dehiscence was also significantly more common in the former group. Other complications included iris trauma, lens drop, and complicated capsulorhexis, all of which were somewhat more common in the sequential group, but statistical significance was not attained. In terms of early postoperative complications, PPVc eyes exhibited a significant rise in intraocular pressure (IOP), fibrinous exudations with formation of pupillary synechiae, posterior capsule opacification, and IOL dislocation. The incidence of endophthalmitis was comparable between the two groups.

Loukovaara et al. [17] reported more postoperative complications that required additional surgery in a PPVc than a PPVa group. The principal complications in both groups were a secondary epiretinal membrane, a secondary macular hole, vitreous hemorrhage, mechanical IOL complications, secondary glaucoma, complicated cataracts, and suspected endophthalmitis.

Helmy et al. [26] did not find statistically significant differences in intraoperative complication rates among two groups studied. However, the PPVc group evidenced a higher rate of early postoperative complications including an increase in IOP associated with a need for anti-glaucoma drops (13 patients, 65%), corneal edema (6 patients, 30%), and anterior chamber reactions (14 patients, 70%). Moreover, 11 patients (55%) in the combined group experienced emulsification of silicone oil in the anterior chamber compared to only 1 patient (5%) in the PPVa group.

In terms of peri- and postoperative complications, Tan et al. [22] did not find any significant difference between two groups studied. One case of posterior capsule rupture occurred in each group. In terms of postoperative complications, the rates of epiretinal membrane formation and macular edema were similar in the two groups. Combined cataract extraction was associated with more rapid visual recovery. A total of 109 eyes (78.4%) in the PPVa group required cataract extraction during the follow-up period (mean delay of 8.0 ± 7.5 months, from 1 to 41 months).

Mora et al. [4] found no difference between two groups studied. The cataract status of the PPVa group was prospectively followed-up until cataract surgery was indicated, at a median of 14.5 months from PPV.

Kim et al. [23] reported one case (2.4%) of zonular dialysis during a combined procedure performed by an experienced surgeon and four cases (10%) of posterior capsular rupture during combined procedures performed by surgical fellows. Of 60 patients in the PPVa group treated by experienced surgeons, 32 (53.3%) developed cataracts and underwent subsequent surgery by the same surgeons, of whom one required additional scleral fixation surgery because of IOL subluxation. Of 51 patients in the PPVa group operated upon by fellows, 31 (60.8%) underwent cataract surgery, posterior capsular ruptures occurred in five cases (16.1%), IOL subluxation was observed in two cases (6.5%), and one patient (3.2%) developed intraoperative zonular dialysis. In patients treated by both experienced surgeons and fellows, epiretinal membranes were significantly more common after PPVc (23 patients, 28%) than PPVa (9 patients, 8.1%). Cystoid macular edema developed in 10 patients of the PPVc group (12.2%) but no significant between-group differences were apparent in terms of macular hole formation.

3.4. Costs

The only paper to compare costs was Seider et al. [30] The total costs of PPVc, and PPVa with subsequent phacoemulsification, were derived. These included the fees of surgeons, ambulatory surgical centers, and anesthesiologists. The sequential procedure cost $4,680.86 and the combined procedure $3,729.88, thus 20.3% less.

4. Discussion

Once PPV is chosen to manage RRD in a phakic eye, safety and efficacy rates are key to orient the attitude toward the natural lens. The best repair results are associated with maximal visualization of the posterior surgical planes, that is when mydriasis is durable and consistent and the cornea, lens, and vitreous-capsule interface are clear. Any permanent or transitory opacity of these structures compromises various critical PPV maneuvers. Opacities may hide small retinal breaks that may thus remain untreated. They could compromise the full release of vitreous traction in the peripheral retina, render endolaser treatment challenging, and complicate retinal drying during tamponade exchange. Although PPVa for eyes with clear lenses or mild cataracts is effective and rapid, the well-known risk of subsequent cataract formation and the difficulties associated with phacoemulsification without vitreous support must be considered. Several of the studies that have compared PPVc and PPVa have found that RRD anatomical repair efficacy is statistically comparable if phacoemulsification is performed either at the time of PPV or later. [4,19,21,22,26] One study reported better anatomical repair results after PPVc. [27] However, that retrospective study evaluated many more PPVc than PPVa patients. In contrast, Loukovaara et al. [17] reported a lower anatomical repair rate of RRD eyes after the combined procedure. However, again, that was a retrospective study in which the numbers in the two groups were not well-balanced. Kim et al. [23] reported that PPVc performed by surgical fellows was associated with marginally poorer results than PPVc performed by experienced surgeons, suggesting that the decision to combine procedures should consider the surgeon's skill. Longer and more stressful surgery can trigger optical media reactions including corneal edema and myosis.

The refractive outcomes after PPVc and PPVa have also been studied but the methods used to perform preoperative ocular biometry were often described only briefly and differed among the studies. [4,22,23,26,28,29] Visual improvement after RRD cannot be guaranteed, especially when the macula is involved in the retinal detachment. However, the accuracy of ocular biometry is critical if PPVc is planned. Optical or ultrasound biometry may be used to assess the AL, which is the most important parameter for IOL power calculation. Optically, AL is measured via noncontact, partial, coherence laser interferometry or swept-source optical coherence tomography that consider the retinal pigment epithelium signal. Ultrasonographically, AL is measured via A-scan ultrasound that consider the internal limiting membrane signal. A detached macula may interfere with such measurements, yielding an erroneously short AL, associated with a possible myopic refractive error after cataract extraction. [31] Postoperative, myopic refractive errors have been reported in several studies that used different ocular biometric methods. [22,23,26,28,29], Such errors may be attributable to AL inaccuracies but the use of old IOL power formulae may also play a role. Third-generation formulae are very dependent on keratometric and anterior chamber depth values. Any measurement inaccuracy of these parameters or a failure to use the most appropriate formula may affect the final refractive results. [32,33].

In terms of surgical complications, some studies [4,22,26] have reported that the rates of intraoperative complications associated with PPVc and PPVa were the same but others [18,20,23] have found higher rates during PPVa. The most frequent complication observed is posterior capsule rupture, followed by zonular dialysis and IOL dislocation, reflecting the lack of vitreous support during phacoemulsification. Cataract extraction after vitrectomy can be challenging, particularly for myopic eyes. In such complicated cases, iris-claw fixation IOLs are commonly placed, but implant positioning can be affected by further pupil distortion or iris atrophy. [11,12,34,35] The most common postoperative complications are epiretinal membrane formation, macular edema, and elevated IOP; the frequencies tend to be similar after both procedures [4,22] or higher after PPVc. [17,20,23,26] Takahashi et al. [36] and Josifovska et al. [37] found that RRD per se increases the levels of intravitreal inflammatory cytokines compared to those of eyes with epiretinal membranes or macular holes. Addition of phacoemulsification to PPV may further increase the cytokine levels, especially when cataract surgery is performed by surgical fellows, possibly explaining the higher incidence of postoperative complications.

When PPV and cataract surgery are performed separately, the patient undergoes sedation or general anesthesia at least twice, and possibly three times if silicone oil removal is separately performed. This increases the risks associated with anesthesia, and costs (multiple hospital admissions, visits, medications, and professional fees). The only study that compared costs strongly supported PPVc compared to PPVa followed by cataract removal. [30].

In conclusion, the primary success rate of RRD repair is generally comparable after PPVc and PPVa. The rate of intraoperative complications is lower for the combined procedure, but the rate of postoperative complications is higher. Macula-off RRD treated via PPVc is commonly associated with myopic refractive error; the ocular biometry method used and the IOL power calculation formula employed should be chosen with great care. Surgical experience is also important. We suggest that PPVa rather than PPVc should be considered for younger patients; this maintains the accommodation function. Also, in such patients, scleral buckling is an effective option.

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