# Lower Visual Acuity Improvements with Silicone Oil in Comparison to Gas Tamponades in Rhegmatogenous Retinal Detachment Repair: Twelve-Month Results of 151 Patients

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## ABSTRACT

**Purpose:** To compare the effect of different endotamponades on primary surgical success rate and best corrected visual acuity (BCVA) in patients with rhegmatogenous retinal detachment (RRD).

**Methods:** A total of 151 patients who received pars plana vitrectomy for RRD between the years 2018 and 2022 were retrospectively reviewed. Patients were divided into three groups: 20% Sulfur hexafluoride (SF6), 14% octafluoropropane (C3F8), and silicone oil groups (SiO). Reattachment of the retina after six months of SiO removal was accepted as a surgical success in the SiO group. Primary and final surgical success rates, secondary PVR development, secondary glaucoma, and BCVA values at 12 months were noted and compared between the groups.

**Results:** The mean age was 61.9±10.3, and 69 (45.2%) patients were female. Primary surgical success rates were 91.9%, 97.6%, and 90.4% in SF6, C3F8, and SiO groups, respectively (p=0.361). All groups have significant BCVA improvements postoperatively compared to baseline BCVA (p<0.001 for all). Although there was no significant difference regarding the BCVA at baseline between the groups (p=0.685), the SF6 and C3F8 groups showed higher BCVA improvement than the SiO group postoperatively (p=0.004, p=0.041, respectively). In logistic regression analysis, only the initial PVR was a statistically significant factor in overall surgical success (p=0.011). Secondary glaucoma was not detected in any gas endotamponade cases, whereas in six patients (8.2%) in the SiO group (p=0.036).

**Conclusions:** Similar primary anatomical success rates were found between the three endotamponades; however, both C3F8 and SF6 gas tamponades were superior to the SiO group regarding BCVA.


**Keywords:** Sulfur hexafluoride, Octafluoropropane, silicone oil, endotamponades, rhegmatogenous retinal detachment

## INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is still an important visual loss problem despite improvements in vitreoretinal surgery. Releasing the tractions by identifying all retinal breaks and providing retinal reattachment are the main goals of the RRD repair.[1] Different treatment modalities, such as scleral buckling, pneumatic retinopexy, and pars plana vitrectomy (PPV), are performed for RRD repair; however, PPV has recently been considered a gold standard, especially in complicated cases.[2] Preventing the entry of new fluid through the retinal break until the chorioretinal adhesion is achieved requires using endotamponades. For this purpose, silicone oil (SiO), sulfur hexafluoride (SF6), hexafluoroethane (C2F6),

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octafluoropropane (C3F8), and even air in selected situations are used, and success rates over 90% have been reported.[3-7]

Previous investigations have compared the anatomic and functional results of gas and silicone oil endotamponades and have reported different results.[8-10] In Silicone Study Report 1, a historically important study about the endotamponades, significantly higher BCVA values and macular attachment rates were reported in the SiO group than in the SF6 group in patients with RRD and Grade C PVR.[11] In addition, in Report 2, comparable BCVA improvements and anatomical success rates were reported between SiO and C3F8 groups.[12] Although these favorable results are related to SiO, in recent years, surgeons have used gas tamponades at the end of the surgery. Silicone oil has disadvantages over the gas endotamponades, such as keratopathy, glaucoma developments secondary to emulsified SiO, and paracentral scotomas.[13, 14] Moreover, except for the restricted positioning postoperatively and high altitude problems, short recovery time and not requiring a second surgery are the additional factors that affect the surgeon's preference. To minimize the problems mentioned above, several authors have recently suggested using even air in different situations that can be treated with SF6 and C3F8 gases.[6, 15] In addition to well-known complications, recent studies showed significantly worse BCVA with SiO use than with gas endotamponades.[9, 16] Silicone oil-induced retinal layer thinning has been blamed for the possible mechanism. Mechanical pressure, inflammation, and the effect of silicon microglobules in the retina and optic nerve are the proposed pathogenic factors for this thinning. However, despite all these reports, the effect of silicone oil on visual acuity has not been clearly elucidated. Furthermore, the number of studies that directly compare the three endotamponades regarding the BCVA in RRD repair is limited. Therefore, we aimed to compare the visual and anatomical outcomes of three different endotamponades in RRD patients. Furthermore, we also aimed to evaluate factors that affect the overall surgical success rates.

## Methods

### *Subjects and Design*

This retrospective study was conducted in the Department of Ophthalmology of Ondokuzmayıs University, Faculty of Medicine, Samsun, Türkiye. Informed consent was obtained from all patients after the study design was explained. Study ethics was approved by the ethics committee of All surgeries were performed by one experienced surgeon (Number: 2023090359), and the study adhered to the tenets of the Declaration of Helsinki.

A total of 151 patients with the diagnosis of RRD who received PPV between the years 2018 and 2022 were included in the study. Patients were divided into three groups according to tamponades: 20% Sulfur hexafluoride (SF6), 14% octafluoropropane (C3F8), and silicone oil groups (SiO). All patients underwent a comprehensive ophthalmological examination, including refractive status with a refractometer (Canon TX-20P, Japan), best corrected visual acuity (BCVA) test with Snellen chart, anterior segment assessment with biomicroscopy, intraocular pressure (IOP) measurement with Goldmann applanation tonometer, and dilated fundus examination after the instillation of cyclopentolate 1% eye drop three times with an interval of 5 minutes. The best corrected visual acuities were tested with the Snellen chart and converted to the LogMAR unit. Light perception (LP), hand motion (HM), and counting fingers were considered 4.0, 3.1, and 2.0 LogMAR units, respectively. Patients with IOP values higher than 21 mmHg without IOP-lowering medication postoperatively were considered emulsified SiO-induced secondary glaucoma. The onset of the symptoms to admission time (symptom duration), quadrant of RRD involvement, number of retinal breaks and/or retinal holes, macular involvement status, lens status (phakic/pseudophakic), and initial PVR presence were noted. Symptom duration was divided into 0-7 days, 7-30 days, and >30 days. Retinal breaks/holes were classified according to the presence of over and under the 4–8 o clock, and the quadrant of RRD involvement was categorized as subtotal RRD or total RRD. Spectral domain-optical coherence tomography (Heidelberg Engineering, Heidelberg, Germany) was used to determine macula on-macula off status in patients whose macular involvement was not evaluated clearly in clinical examination. The updated Retina Society Classification was used for grading the initial PVR.[17]

Patients with myopia <6 dioptres (D), grade A and grade B PVR, without a history of previous ocular surgery except for phacoemulsification and intraocular lens implantation, age >18 years old, at least twelve months of follow-up

after surgery were included in the study. Patients who have previous ocular surgery such as scleral buckling and pneumatic retinopexy, previous retinal laser treatment, glaucoma, retinal diseases such as age-related macular degeneration and diabetic retinopathy, history of trauma, grade C PVR, and myopia >6 D were excluded from the study.

### *Surgical Process*

All patients over sixty and, regardless of age, who have cataracts that obscure the media have received standard phacoemulsification and a one-piece foldable intraocular lens at the beginning of the surgery. Following the routine disinfection rules, two 23-gauge (G) trocars were inserted into the eye at the site of two and ten o'clock positions. The third trocar was inserted inferotemporal quadrant for the continuous infusion. Twilight chandelier (DORC, Netherlands) intraocular illumination system was placed in the superior scleral quadrant for the surgeon himself to indentation. First, after the vitreous staining with triamcinolone, a complete core vitrectomy, a meticulous peripheric vitrectomy, and vitreous shaving around the break were performed using the vitreous cutter system (DORC EVA, Netherlands). Perfluorodecalin (Ocu-Deka, Teknomek, Turkey) was filled up to the retinal break level, and thus, the detached retina was flattened. After the fluid air change, all subretinal fluid is aspirated by the backflush (DORC, Netherlands) needle. All PVR membranes were peeled with dual membrane dye after staining, including brilliant blue 0.125 mg and trypan blue 0.75 mg (DORC, Netherlands). Endolaser was applied around the retinal break, and the remaining perfluorodecalin was aspirated totally. At the end of the surgery, after the fluid air exchange, perfluorodecalin and residual subretinal fluid aspirated then 1300 centistokes silicone oil (Oxane 1300, Bausch and Lomb, USA), SF6 20%, and C3F8 14% (ISPAN, Alcon, USA) gases were used to tamponade the retinal breaks until the chorioretinal adhesion is achieved. In patients with giant retinal tear a direct perfluorodecalin silicon oil exchange was used. In gas groups, patients were instructed to maintain a face-down position for one week. Silicone oil was preferred in patients who could not maintain a postoperative face-down position, had planned airplane travel, had significant visual acuity impairment in the fellow eye, did not have proper access to the control examination, such as coming from distant cities, and needed early postoperative vision. For the rest of the patients for whom silicone oil was not used, SF6 20% was used in the superior quadrant breaks, and C3F8 14% was used in the inferior quadrant breaks. All surgeries were performed by one experienced surgeon (N.K).

Reattachment of the retina after six months of SiO removal was accepted as a surgical success in the SiO group. Silicon oil injection was performed in patients who needed additional surgery secondary to retinal re-detachment. If a retinal reattachment was not provided secondary to PVR after the membrane peeling, a minimum of 180 degrees of circumferential retinectomy was used to reattach the retina. Primary surgical success rates, PVR, secondary glaucoma, and BCVA values at 12 months were noted and compared between the groups.

### *Statistical anaylsis*

Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp) version 22.0 was used to analyze the study data. The Shapiro-Wilk test assessed the normality of study variables. Normally distributed quantitive variables are presented as mean ± standard deviation (SD), and non-normally distributed variables are presented as mean ± SD (minimum-maximum). Categorical variables were compared using Pearson chi-square and Fischer's exact tests. One-way ANOVA and Kruskal Wallis tests were performed to compare variables between the three groups. Mann-Whitney U test was used to compare subgroups of variables found statistically significant in the Kruskal-Wallis test. The logistic regression analysis was used to determine factors that affect surgical success after the PPV. A p-value of <0.05 is considered statistically significant.

## RESULTS

### *Preoperative clinical findings*

The study included one hundred fifty-one eyes of 151 patients. The mean age of the study participants was 61.9±10.3 (29–83) years, and 69 (45.2 %) participants were female. There were no significant differences between the groups regarding age and sex (p=0.282, p=0.462, respectively).

The mean symptom duration was 14.9±17.1 (1–96) days; no statistically significant difference was found between the groups. While 47 patients received combined phacoemulsification and PPV, 104 received only PPV. One hundred nine (72.2%) patients had macula-off RRD, and 16 (10.6%) patients had PVR at baseline clinical examination. Initial PVR was significantly higher in the SiO group than in gas tamponades groups; however, this was not true for the macula-off RRD (p=0.04, p=0.617, respectively). Also, there were no significant differences in the number of retinal breaks and holes, and RRD involved quadrants between the groups (p=0.226, p=0.06).

The best corrected visual acuities were 1.97±1.04, 2.03±1.08, and 2.14±0.98 LogMAR units in SF6, C3F8, and SiO groups, respectively. No significant difference was found between the groups at baseline (p=0.685). The

**Table 1.** Demographic and clinical characteristics of study participants

| Characteristics | SF6 group | C3F8 group | SiO | Total | p value |
|---|---|---|---|---|---|
| **Age, year** | 63.2±8.4 (37–79) | 59.7±10.8 (30–78) | 62.5±10.8 (29–83) | 61.9±10.3 (29–83) | 0.282 |
| **Sex (Female/male, n)** | 15/22 | 22/19 | 32/41 | 69/82 | 0.462 |
| **Number of eyes (n,%)** | 37 (24.5) | 41 (27.2) | 73 (48.3) | 151 | - |
| **Right/Left eye** | 19/18 | 21/20 | 40/33 | - | - |
| **Symptom Duration, day** | 12.3±13.6 (1–75) | 13.2±14.4 (1–60) | 17.2±19.8 (1–96) | 14.9±17.1 (1–96) | 0.483 |
| **<7 day, n (%)** | 20 (27.4) | 22 (30.1) | 31 (42.5) | 73 | |
| **7-30 day n (%)** | 13 (24.5) | 11 (20.8) | 29 (54.7) | 53 | 0.512 |
| **>30 day n (%)** | 4 (16.0) | 8 (32.0) | 13 (52.0) | 25 | |
| **Myopia, n (%)** | 5 (13.5) | 3 (7.3) | 5 (6.8) | 13 (8.6) | 0.471 |
| RRD | | | | | |
| **Total RRD, n (%)** | 9 (24.3) | 13 (31.7) | 18 (24.7) | 40 (26.5) | |
| **Subtotal RRD n (%)** | 28 (75.7) | 28 (72.8) | 55 (75.3) | 111 (73.5) | 0.674 |
| **Macular status** | | | | | |
| **Macula off, n (%)** | 26 (70.3) | 32 (78.0) | 51 (69.9) | 109 (72.2) | |
| **Macula on n (%)** | 11 (29.7) | 9 (22.0) | 22 (30.1) | 42 (27.8) | 0.617 |
| **Initial PVR, n (%)** | 1 (2.7) | 1 (2.3) | 14 (19.2) | 16 (10.6) | 0.004 |
| **Phakic/ Pseudophakic** | 23/14 | 16/25 | 28/45 | 67/84 | 0.976 |
| **Phacoemulsification + PPV** | 10 (27.0) | 13 (31.7) | 24 (32.9) | 47 (31.1) | 0.818 |
| **Number of retinal breaks/holes** | 1.14±0.48 (1–3) | 1.22±0.47 (1–3) | 1.29±0.58 (1–3) | 1.23±0.53 (1–3) | 0.226 |
| **Retinal break/holes quadrant** | | | | | |
| **Over the 4–8 o clock, n (%)** | 30 (81.1) | 21 (51.2) | 42 (57.5) | 93 (61.6) | 0.016 |
| **Under the 4–8 o clock, n (%)** | 7 (18.9) | 20 (48.8) | 31 (42.5) | 58 (38.4) | |
| **Baseline BCVA (LogMAR)** | 1.97±1.04 (0.1–3.10) | 2.03±1.08 (0.20–3.10) | 2.14±0.98 (0.1–3.10) | 2.07±1.02 (0.1–3.10) | 0.685 |

RRD; rhegmatogenous retinal detachment, PVR; proliferative vitreoretinopathy, BCVA; best corrected visual acuity

demographic features and preoperative clinical findings are summarized in Table 1.

***Postoperative outcomes and complications***

Retinal re-detachment occurred in one eye, three eyes, and seven eyes in SF6, C3F8, and SiO groups. Primary surgical success rates were 91.9%, 97.6%, and 90.4% in SF6, C3F8, and SiO groups, respectively (p=0.361). The overall surgical success rate was achieved in 140 (92.7%) study patients. Seven of eleven patients had retinal re-detachment secondary to postoperative PVR in all groups. Three patients in the SiO group received 180-degree circumferential retinectomy and silicone oil injection at the end of the surgery. Epiretinal membrane peeling and SiO injection were performed on the rest of the retinal redetachment cases. At the end of all surgeries, a hundred percent success rate was achieved in all three groups. Twenty additional surgeries were required for retinal reattachment in primary surgical failure patients.

The best corrected visual acuities were 0.61±0.58, 0.70±0.55, and 0.91±0.66 LogMAR units in SF6, C3F8, and SiO groups, respectively. Postoperative BCVA showed a statistically significant improvement compared to baseline BCVA in all groups (p=0.01). Both SF6 and C3F8 group patients had significantly higher BCVA values than SiO group patients (p=0.004, p=0.041, respectively). Patients in the SF6 group had slightly better BCVA values than the C3F8 group, but this discrepancy was not statistically significant (p=0.265). While 130 patients had improvements in BCVA, 18 patients remained stable, and three patients had worsened BCVA. Twenty-eight patients (18.5%) had <3 Snellen line and 102 patients had ≥3 Snellen line improvements (67.5%). Patients with a symptom duration >30 days have shown a lower improvement than patients with a symptom duration <7 days; however, the difference did not reach a statistical significance (p=0.146). Intraocular pressure elevation was not detected in any gas endotamponade cases, whereas it was observed in six patients (8.2%) in the SiO group. All patients who developed postoperative secondary glaucoma due to emulsified silicone were controlled with topical antiglaucomatous drops without the need for surgery. Hypotony was not observed in any of the study groups. Postoperative clinical findings are shown in Table 2.

In logistic regression analysis, which included age, sex, symptom duration, macular status, type of surgery (combined or PPV), having initial PVR, quadrant of RRD, and number of retinal breaks-holes, only the having PVR

**Table 2** Postoperative clinical findings and visual outcomes of different endotamponade groups

| Characteristics | SF6 group | C3F8 group | SiO | Total | p value |
|---|---|---|---|---|---|
| **Primary surgical success, n (%)** | 34 (91.9) | 40 (97.6) | 66 (90.4) | 140 (92.7) | 0.361 |
| **Primary surgical success** | | | | | |
| **Macula on, n(%)** | 11 (100) | 8 (88.9) | 21 (95.5) | 40 (95.2) | 0.459 |
| **Macula off, n(%)** | 23 (88.5%) | 32 (100) | 45 (88.2) | 100 (91.7) | |
| **Retinal redetachment, n (%)** | 3 (8.1) | 1 (2.4) | 7 (9.6) | 11 (7.3) | 0.361 |
| **Postoperative PVR, n(%)** | 1 (2.7) | 1 (2.4) | 5 (6.8) | 7 (4.6) | 0.456 |
| **BCVA at 12 month** | 0.61±0.58 (0.0-3.1) | 0.70±0.55 (0.1-3.1) | 0.91±0.66 (0.0-3.1) | 0.78±0.62 (0.0-3.1) | **0.010** |
| **BCVA improvement** | | | | | |
| **1-3 Snellen line, n** | 6 | 10 | 12 | 28 | 0.477 |
| **>3 Snellen line, n** | 27 | 27 | 48 | 102 | |
| **Retinectomy, n** | - | - | 3 | 3 | 0.195 |
| **Secondary glaucoma** | **-** | **-** | 6 | 6 | **0.036** |

PVR; proliferative vitreoretinopathy, BCVA; best corrected visual acuity

**Table 3.** Logistic regression analysis of factors affecting the overall surgical success

| Variables in the Equation | | | | | | |
|---|---|---|---|---|---|---|
| | **B** | **S.E.** | **Wald** | **df** | **Sig.** | **Exp(B)** |
| **Age** | -.039 | .035 | 1.215 | 1 | .270 | .962 |
| **Sex** | -.750 | .764 | .962 | 1 | .327 | .473 |
| **Symptom duration** | -.025 | .014 | 2.938 | 1 | .087 | .976 |
| **Myopia** | 18.726 | 10255.024 | .000 | 1 | .999 | 1.22 |
| **Macular status** | -.921 | .889 | 1.075 | 1 | .300 | .398 |
| **PVR** | -1.964 | .769 | 6.523 | 1 | .011 | .140 |
| **Lens status** | .076 | .728 | .011 | 1 | .917 | 1.079 |
| **Constant** | 7.031 | 2.654 | 7.018 | 1 | .008 | 1131.273 |

PVR: PVR; proliferative vitreoretinopathy

was a statistically significant factor in overall primary surgical success (Table 3, p=0.011).

## DISCUSSION

In the current study, we compared visual acuity and primary surgical success rates between the SF6, C3F8, and SiO groups and found similar primary surgical success rates and significant improvements in BCVA in the three groups. However, the improvements in BCVA in the SF6 and C3F8 gas endotamponade groups were significantly higher than those in the SiO group. In addition, our logistic regression analysis showed that the initial PVR was the only factor that influenced the overall success rate of the primary operation.

The various endotamponades used in RRD repair have been compared in numerous studies. The Silicon Study compared SiO and SF6 gas in patients with RRD who had at least Grade C PVR and reported significantly higher macular attachment rates and BCVA at the end of the year. Silicone Study Report 2 enrolled 265 patients with characteristics similar to those of Report 1 and compared the groups' anatomical and functional results of SiO and C3F8 gas. Comparable anatomical and functional results were reported, and both tamponades were found to be more effective than SF6 gas tamponade in this study.[11, 12] However, in Report 11, the extension study of the previous studies, no significant difference in BCVA and anatomical reattachment rates were found between the three endotamponade groups at six years' follow-up.[18] In a subanalysis of the European Vitreo-retinal Society (EVRS) Retinal Detachment Study, which included patients with complex RRD including macular hole, giant retinal tear, PVR, and choroidal detachment, no significant difference was reported between groups regarding surgical failure.[19] In another study, the Pan-American Collaborative Retina Study (PACORES) group reported similar rates of recurrent RRD in phakic and non-phakic patients with RRD who received C3F8 and SiO endotamponade at the end of surgery. In an additional analysis, recurrent RRD was found to be significantly higher in phakic patients than in non-phakic patients in the C3F8 group.[20] Mancino et al. evaluated the effect of C3F8 and SiO tamponades on surgical success in patients with high myopia, and they reported a significant visual improvement and initial surgical success rates with C3F8 gas tamponade.[21] In the current study, we found generally similar anatomical success rates of over 90% in all groups, in line with previous studies.[6, 22] These results can be explained by a homogeneous distribution of factors influencing surgical success, such as symptom duration, macular and lens status, and combined surgery rate between the three groups. The factors that could have led to bias were the slight tendency to use the silicone oil in patients with initial PVR and to use C3F8 in patients with inferior quadrant detachment. In the current study, sulfur hexafluoride gas was used to tamponade retinal breaks mostly over the 4–8 o'clock. Slightly better visual acuity with SF6 gas than with C3F8 may be explained by the short period from admission to surgery, as patients are generally aware of symptoms earlier with superior quadrant detachments. A short period from admission to receiving surgery can explain better visual outcomes in SF6 group patients.

In addition to retinal attachment rates, improvement in visual acuity is another crucial factor in RRD repair. Even after successful surgery as quickly as possible, the expected visual acuity may not be achieved in all cases. Factors such as macular involvement, presence of PVR, lens status, duration of symptoms, and type of tamponade can affect visual outcomes. While some studies have reported similar visual outcomes with SiO and gas tamponade, others have reported poorer visual outcomes with silicone oil. [9, 11, 12, 20, 23, 24] Silicone oil-related visual loss can occur both during the intraocular phase and after the removal; however, most frequently seen in the last situation. Several mechanisms have been proposed for the SiO-related lower visual outcomes. Instead of a vitreous, natural buffer, the buffering effect of SiO may cause imbalanced electrolytes and water-soluble factors by inducing homeostasis alteration. This effect can be seen in 'potassium theory,' where the accumulation of potassium ions at peri silicone oil aqueous spaces may induce metabolic activation, resulting in neurodegeneration of Muller cells.[25] On the contrary, Scheerlinck et al. suggested that decreased magnesium levels were responsible for pathogenesis in cases with normal potassium levels.[26] In another theory, SiO bubbles penetrate the retina and optic nerve, as shown in electron microscopy.[27] This penetration may occur through the chronic contact of emulsified SiO to the internal limiting membrane. Another theory that has been proposed is the dissolution of lutein and zeaxanthin in SiO during the tamponade, which subsequently makes the macula more susceptible to phototoxicity.[28] Inflammation may also play an important role in retinal toxicity. Shimizu et al. demonstrated that proinflammatory interleukin (IL)-8 and monocyte chemoattractant protein (MCP) levels are significantly higher in peri silicone aqueous compartments than in anterior chamber aqueous fluid.[29] In another study that supports the latter, Kaneko reported significantly lower levels of IL-10, an anti-inflammatory IL, in patients with RRD.[30]

In the era of optical coherence tomography (OCT), many studies have investigated the retinal layer thicknesses that affect visual acuity. The vast majority of the studies reported a thinning mainly in inner retinal layers. [24, 31] Özsaygılı et al. reported a thinning in outer and inner retinal layers in their study. In another study, Lee et al. revealed a complete thinning of the retinal thickness, mainly in the ganglion cell layer, the outer plexiform layer, and the outer nuclear layer.[9] In addition to the theories mentioned earlier, the direct mechanical pressure of SiO on the retina and the dehydration effect secondary to the waterproof property of SiO may also contribute to the reduced retinal thicknesses.[24] The current study found a significantly lower BCVA improvement in the SiO group compared to the gas tamponade groups. These possible pathogenetic mechanisms might explain the lower BCVA outcomes in SiO group cases.

Several preoperative risk factors such as age, lens status, extent of retinal detachment, number of breaks, new or missed retinal breaks, and initial PVR have been previously discussed for postoperative anatomical success.[32, 33] In the current study, we investigated factors including age, sex, symptom duration, macular status, lens status, and PVR using logistic regression analyses. Only the initial PVR was a significant factor in overall surgical success. In a second further analysis, we excluded symptom duration from the analysis as it may be related to PVR and observed that the effect of PVR in the analysis increased. The current result was similar to previous studies evaluating the predictive factors of anatomical success. Postoperative increased intraocular pressure is seen with a prevalence of 2.2–56% in patients who underwent PPV and SiO injections. Ocular movements, inflammation, SiO with lower viscosity, and contact with perfluorocarbon liquids increase the emulsification rates of SiO.[34] Eyes with aphakia and zonular dialysis are at a higher risk because the emulsified SiO can easily reach the trabecular meshwork. Lyssek-Boron et al. reported a 4.7 times higher risk for the patient using SiO tamponade instead of SF6 gas in the treatment of RRD.[35] As expected, we found statistically significant secondary glaucoma in the SiO group compared to gas endotamponades in the current study. It is well known that emulsification increases proportionally with the duration of the tamponade. However, three months after the first surgery, we removed SiO in all patients in the SiO group. The factors mentioned above, and even products that vary from batch to batch that belong to the same company, can explain the differences in SiO emulsification from patient to patient. All patients with secondary glaucoma were managed with IOP-lowering medication without the need for glaucoma surgery.

The current study has some limitations. Retrospective design and relatively small sample size are the important limiting factors for the study. In addition, the lack of OCT, which could be used to show the effect of retinal layers on the cause of visual impairment in the silicone oil group, is another important limiting factor.

In conclusion, a similar primary anatomical success rate was found between the three endotamponades. Despite comparable initial BCVA values, visual improvement was significantly higher in the gas groups than in the silicone oil group. Further studies with larger sample sizes are needed to understand the pathogenesis and evaluate SiO's effect on BCVA.

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