

The Outcomes of Primary Retinal Detachment Surgery with 23-gauge Vitrectomy in Patients without Severe Proliferative Vitreoretinopathy: A Single Surgeon Case Series

ABSTRACT

Aims: To evaluate the outcomes vitrectomy in patients with primary RRD without a significant proliferative vitreoretinopathy (PVR).

Study Design: Retrospective, interventional, single surgeon case series.

Place and Duration of the Study: Beyoglu Eye Training and Research Hospital, Istanbul, Turkey, between January 2013 and December 2016.

Material and Methods: The patients who had undergone vitrectomy for grade A or B PVR with a follow up period of at least 12 month, and had a post-silicone oil (SO) removal follow-up of at least 6 months (if SO was used as a tamponade) were included. Functional success was defined to have a postoperative BCVA ≥ 1.0 LogMAR, and anatomical success was defined to have an attached retina after postoperative month 6 in patients with gas tamponade or after post-silicone oil removal month 6 in patients with silicone oil tamponade. Primary outcome measure of this study was the anatomical success rate after a single surgery.

Results: A total of 85 eyes of 85 patients were included. The mean follow-up period was 16.8 ± 5.7 months. Single operation success was obtained in 78 of the 85 patients (91.8%). Recurrent retinal detachment was detected in 7 patients (8.2%). All of the patients were operated again and at the last follow-up visit anatomical success was achieved in 83 of the 85 patients (97.6%), the remaining 2 patients (2.4%) had attached macula and they were planned to left with permanent silicone oil tamponade.

Conclusion: Vitrectomy is an effective method in the treatment of primary RRD without significant PVR.

Keywords: Retinal detachment, tamponade, vitrectomy.

1. INTRODUCTION

The surgical treatment choices for rhegmatogenous retinal detachment (RRD) are pneumatic retinopexy, scleral buckling, and vitrectomy [1-3]. As the goal of the RRD repair is to relieve abnormal vitreoretinal traction, to reattach the retina to the retinal pigment epithelium and to seal the retinal breaks with either photocoagulation or cryotherapy, all of these may be successfully achieved with all of the three techniques [1,2]. Although pneumatic retinopexy is a simple and successful treatment method for superior RRDs with a single retinal tear, and scleral buckling was proven to be very efficient for any kind of RRD –either with single or multiple tear, superior, inferior or total RRD- without a significant proliferative vitreoretinopathy (PVR), vitrectomy gained popularity all over the world in the treatment of primary RRDs against the other two techniques since the last two decades [4,5]. Especially after the introduction of minimally invasive vitreous surgery (MIVS) with the use of 23, 25, and 27-gauge systems there had been a significant shift to vitrectomy in the treatment of primary RRD [6-14]. The success rate of vitrectomy was evaluated in various previous studies and was reported to be between 62% and 98% in different series [12,14]. In this single surgeon case series study we aimed to evaluate the outcomes vitrectomy in patients with primary RRD without a significant PVR.

2. MATERIALS AND METHODS

The records of the patients with primary RRD with only grade A and B PVR who underwent vitrectomy for the treatment of retinal detachment by a single surgeon (A.O.) between January 2013 and December 2016 were reviewed for this interventional, retrospective study. A written informed consent

was obtained from all patients before the treatment and the study adhered to the tenets of the Declaration of Helsinki.

The patients who had undergone vitrectomy for grade A or B PVR with a follow up period of at least 12 month, and had a post-silicone oil (SO) removal follow-up of at least 6 months (if SO was used as a tamponade) were included. The patients who had any degree of grade C PVR, or did not complete a follow-up period of 12 months, had a previous surgery for RD, or had a history of trauma were not included.

2.1 Preoperative Assessment

Data collected from the patients included age, gender, best corrected visual acuity (BCVA), duration of RD, lens status, number of retinal tears, localization of RD, status of macula, tamponade choice, complications, and functional and anatomical outcomes of the surgeries. The patients underwent a standardized examination including measurement of BCVA via a projection chart in decimals at 4 meters, slit-lamp biomicroscopy, measurement of IOP via applanation tonometry, and biomicroscopic fundus examination. All examinations were repeated at post-operative day 1, week 1, and month 1, 3, 6, 9 and 12, then according to each individual patient's clinical situation. Functional success was defined to have a postoperative BCVA ≥ 1.0 LogMAR [10], and anatomical success was defined to have an attached retina after postoperative month 6 in patients with gas tamponade or after post-silicone oil removal month 6 in patients with silicone oil tamponade.

2.2 Surgical Technique

All of the surgeries were performed by a single surgeon (A.O.). A 23-gauge transconjunctival vitrectomy with the Constellation system (Alcon Surgical, Ft. Worth, TX) and a wide-field viewing system was used. The phakic patients with a significant cataract underwent a combined phacoemulsification and vitrectomy procedure, whereas the patients without significant lens opacity did not undergo phacoemulsification. Standard 4 port vitrectomy sclerotomies were prepared first, 3 for infusion, endoillumination, and vitreous cutter and 1 25-gauge sclerotomy for chandelier light. Vitreous was completely removed, triamcinolone assisted vitreous base shaving was performed, vitreoretinal traction was released around all of the breaks. Subretinal fluid was drained via a flute needle from the existing breaks with or without the assistance of a heavy perfluorocarbon fluid, endolaser photocoagulation was applied to all of the breaks. If the patient showed diffuse retinal degenerations of tears all around the retina then 360 degree barrier laser photocoagulation was applied. Air-fluid exchange was performed and suitable tamponade was exchanged with air at the end of the surgery. Sclerotomies were checked in regard to leakage and all leaking sclerotomies were sutured with 7/0 polyglactine suture. Silicone oil was used as a tamponade in patients who would fly, or required early visual rehabilitation, or was not able to maintain strict head positioning. Silicone oil was then removed between month 2 and 6 from all of the eyes.

2.3 Outcomes Measure

Primary outcome measure of this study was the anatomical success rate after a single surgery.

2.4 Statistical Methods

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) software (version 21.0). The continuous variables were expressed as means $\pm$ standard deviation (SD). The categorical variables were expressed as number (n) and percentages (%). Visual acuity was converted to the logarithm of the minimum angle of resolution (LogMAR) for statistical analysis. Categorical variables were presented as numbers and percentages, while numerical variables were expressed as the mean and standard deviation. First the data was analyzed in terms of normality using Kolmogorov-Smirnov test. As the distribution of the data was found to be normal, the visual acuity and the CRT values between baseline and the other time points were assessed with repeated measures test. Categorical variables were compared using chi-square test. A p value <0.05 was considered statistically significant.

3. RESULTS AND DISCUSSION

A total of 85 eyes of 85 patients were included. The mean age was 58.5 ± 12.2 years (range 25-83 years). Fifty-seven patients (67.1%) were men and 28 (32.9%) were women. The mean follow-up period was 16.8 ± 5.7 months (range 12-41 months). The baseline characteristics were summarized in table 1.

Table 1. Baseline characteristics of the patients

	Whole group, n,85
Age	58.5 ± 12.2 years
Gender (Female/Male)	57/18
Lens status (Phakic/Pseudophakic/Aphakic)	50/33/2
Duration of visual decrease	14.4 ± 17.1 days
Number of retinal tears (single/multiple)	52/33
Presence of choroidal detachment, n (%)	5 eyes (5.9%)
Localization of RD (superior/inferior/total)	36/23/26
Status of macula (attached/detached)	17/68
Baseline BCVA	1.95 ± 0.97 LogMAR
Tamponade (SO/C3F8)	62/23
Peroperative 360 degree barrier photocoagulation, n (%)	32 eyes (37.6%)

Abbreviations: n, number, RD, retinal detachment, BCVA, best corrected visual acuity, SO, silicone oil, C3F8, perfluoropropane.

3.1 Anatomical Outcomes

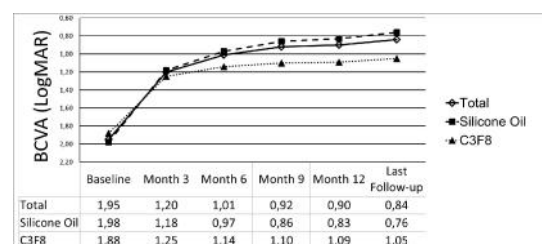
Single operation success was obtained in 78 of the 85 patients (91.8%). Recurrent retinal detachment was detected in 7 patients (8.2%). The reason was PVR in 6 of them (5 silicone oil, 1 C3F8 endotamponade used patients) and missed retinal tear in 1 patient (C3F8 endotamponade used patient). The duration of recurrence was 68.2 ± 47.3 days (30-150 days). All of the patients were operated again and at the last follow-up visit anatomical success was achieved in 83 of the 85 patients (97.6%), the remaining 2 patients (2.4%) had attached macula and they were planned to left

with permanent silicone oil tamponade. The primary success rate of silicone oil and C3F8 subgroup was 91.9% and 91.3%, respectively ($p=0.9$).

3.2 Visual outcomes

The mean baseline and last BCVA was 1.95 ± 0.97 LogMAR (range 0.15-3.0) and 0.84 ± 0.58 LogMAR (range 0.0-3.0), respectively. The mean BCVA was statistically better than baseline at month 3, 6, 9, 12, and the last visit ($p < 0.0001$) (Figure 1). Sixty-eight eyes (80.0%) showed increased vision, 10 showed (11.8%) stable, and 7 showed (8.2%) decreased vision at the last follow-up visit compared with the baseline. Functional success (BCVA ≥ 1.0 LogMAR) was achieved in 67 of the 85 eyes (78.8%). The mean baseline and last BCVA was 1.98 ± 0.95 LogMAR (range 0.22-3.0) and 0.76 ± 0.38 LogMAR (range 0.0-3.0) in silicone oil group. The mean baseline and last BCVA was 1.88 ± 0.103 LogMAR (range 0.15-3.0) and 1.05 ± 0.90 LogMAR (range 0.15-3.0) in C3F8 group (Figure 1). The change in mean BCVA from baseline to month 3, 6, 9, 12, and the last visit was not statistically different between silicone oil and C3F8 groups ($p=0.5$ for month 3, $p=0.2$ for month 6, $p=0.1$ for month 9, $p=0.1$ for month 12, $p=0.1$ for the last follow-up). Functional success was achieved in 83.9% of the eyes in silicone oil and 65.2% in C3F8 group ($p=0.08$).

Figure 1. The visual outcomes of the whole study group, silicone oil and perfluoropropane group.



Abbreviations: BCVA, best corrected visual acuity, C3F8, perfluoropropane.

3.3 Tamponades, Lens Status and Intraocular Pressure

Silicone oil was preferred as a tamponade in 62 eyes (72.9%) and C3F8 was preferred in 23 eyes (27.1%). Mean silicone oil removal time was 4.5 ± 1.2 months (range 2-6 months).

Fifty eyes (58.8%) were phakic, 33 were pseudophakic (38.8%) and 2 were aphakic (2.4%) at the baseline and 5 eyes underwent phacoemulsification with vitrectomy. Then 45 eyes were phakic after the vitrectomy and silicone oil was used as a tamponade in 34 of them (75.5%), and C3F8 was used in 11 (24.5%). Significant cataract was detected in 16 of the 34 eyes (47.0%) in the silicone oil subgroup and 5 of the 11 eyes (45.5%) in the C3F8 subgroup of phakic patients ($p=0.7$).

The mean baseline and last IOP was 13.0 ± 4.5 mmHg (range 1-33 mmHg) and 15.0 ± 4.3 mmHg (range 3-27 mmHg). The last IOP was < 6 mmHg in only one eye (1.2%). No eyes showed signs of phthisis bulbi at the last follow-up visit. Early IOP elevation was detected in 6 of the 62 eyes (9.7%) in the silicone oil group and 6 of the 23 (26.1%) eyes in the C3F8 group ($p=0.1$). However, IOP elevation was transient (< 1 week) in all patients in the C3F8 group, in contrast 11 eyes (17.7%) showed prolonged IOP elevation (< 3 months), and in addition to these patients 8 patients (12.9%) showed permanent IOP elevation in the silicone oil group.

3.3 Complications

As peroperative complications iatrogenic retinal tear was created in 10 eyes (11.8). Early postoperative complications were mild-transient anterior chamber reaction in 24 eyes (28.2%), hyphema in 6 eyes (7.1%).

4. DISCUSSION

In this single surgeon case series we evaluated the anatomical and functional outcomes of vitrectomy in patients with primary RRD without a significant PVR. Single operation anatomical success was 91.8% and the success rate increased to 97.6% after multiple operations. The most common reason for reoperation was PVR. The primary success rate was similar between the patients in whom silicone oil or C3F8 was used as an endotamponade.

Since the introduction of vitrectomy in 1971, there had been several advances in vitreoretinal surgery [15,16]. Vitreous cutter speed increased and designs were advanced, new endoillumination sources were introduced, wide-angle viewing systems enhanced our peroperative visualization, peripheral vitreous shaving and membrane peeling became easier with bimanual surgery techniques, and with the introduction of MIVS techniques of vitrectomy became more practical. Primary vitrectomy gained popularity especially after the SPR study by Heussen et al, in which success rates of scleral buckling and vitrectomy was found to be similar in patients with primary RRD [5]. The major advantages of vitrectomy over scleral buckling are, shorter duration for surgery, better diagnosis of retinal breaks intraoperatively, and no change in axial length [5]. However, the most important drawback of vitrectomy is cataract formation and difficulty in peripheral vitreous shaving in phakic patients [5]. Moreover, vitrectomy became very popular with all these advantages and disadvantages and several studies were published regarding the outcomes of vitrectomy in primary RRD [6-16]. Yanyali et al evaluated outcomes of 23-gauge vitrectomy in RRD and reported a single operation success rate of 95.9% after a mean follow-up period of 8.9 months [12]. They used silicone oil in about 67% of the included patients and removed it within 2 months after the surgery. The mean acuity was reported to be increase from 2.01 LogMAR to 1.3 LogMAR in the study. In a similar study by Figueroa et al, 133 eyes of 118 primary RRD patients were evaluated who were operated with a 23-gauge vitrectomy system and the primary anatomical success rate was reported as 96.2% along with significant visual improvements [13]. Mohamed et al, evaluated the success rate of vitrectomy in patients with primary RRD in a relatively large study which included 422 eyes of 411 patients [10]. They used both 23- and 25-gauge systems in their study. The primary anatomical success was reported as 89.8% and the final anatomical success was 100% after 2-6 operations. Schwartz et al, reviewed the outcomes of vitrectomy in primary RRD between 1985 and 2007 and demonstrated a single operation success rate between 71% and 98% [14]. The primary success rate was 91.8% in our study which consisted only the patients without significant PVR and it was consistent with the existing literature.

The main limitation was the retrospective nature of the study and also the study did not have a control group which might consist of a group of patients who were operated with scleral buckling. However, the study was a single surgeon case series with a quite good number of patients which was strong sides of the study. We believe in that single surgeon case series are very important because they may be essential to make a self-assessment for the surgeon, and may help the surgeon to question himself/herself if his/her surgical technique is adequate and successful enough in real-life practice.

4. CONCLUSION

In conclusion vitrectomy is an effective method in the treatment of primary RRD without significant PVR. Taking account several advantages and disadvantages of the technique and it may be the first choice of treatment as we know from previous studies that the high anatomical success rate of vitrectomy is comparable with scleral buckling.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

All authors hereby declare that all the study was in concordance with local ethic rules and in accordance with the ethical standards of Declaration of Helsinki.

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