

Assessment of Vision-Related Quality of Life and Stereopsis in Patients Who Underwent Successful Rhegmatogenous Retinal Detachment Surgery

Başarılı Yırtıklı Retina Dekolmanı Cerrahisi Geçiren Hastalarda Görmeyle İlgili Yaşam Kalitesinin ve Stereopsisin Değerlendirilmesi

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ABSTRACT

Purpose: Assessment of vision-related quality of life (QoL) and stereopsis level in patients who underwent successful 23-gauge pars plana vitrectomy (PPV) for rhegmatogenous retinal detachment (RRD).

Methods: This retrospective, non-randomized clinical trial included patients who underwent non-complicated RRD surgery. PPV either combined with cataract surgery or alone was applied to the patients for RRD. This study were included 25 patients and 30 healthy individuals. Perfluoropropane gas or silicone oil was used as a tamponade in surgery. The effect of vision on QoL was assessed using a Visual Function Questionnaire (National Eye Institute Visual Function Questionnaire-25 (NEI VFQ-25)). Stereopsis was measured using a Stereo Optical Stereo Fly Test. Statistical analyzes were performed using SPSS 15.0 software package. Pearson chi-squared and Fisher's exact chi-squared tests were used to compare categorical variables. A p value of <5% was considered statistically significant.

Results: Differences between the measured VFQ composite score of the patients (80.89 ± 16.75) and the control group (85.11 ± 6.06) were not statistically significant (p=0.906). Stereopsis was significantly lower in patients who underwent successful RRD surgery than in the control group (175.2 ± 150.59 arc / sec, 48.0 ± 18.64 arc/sec, respectively) (p<0.001). No significant difference was observed in terms of stereopsis or VFQ composite scores in patients treated with silicone oil or C3F8 tamponade.

Conclusion: PPV, which is one of the most important surgical treatments of rhegmatogenous retinal detachment, may not reduce the quality of life related to vision; however, it can reduce stereopsis. A better stereopsis level may be achieved in patients who have better visual acuity before and after surgery.

Key Words: Stereopsis, vision-related quality of life, rhegmatogenous retinal detachment, vitrectomy, silicone oil, perfluoropropane gas (C3F8)

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ÖZET

Amaç: Yırtıklı retina dekolmanında (YRD) başarılı 23-gauge pars plana vitrektomi (PPV) geçiren hastalarda görmeyle ilgili yaşam kalitesi ve stereopsis seviyesinin değerlendirilmesi.

Yöntemler: Bu retrospektif, randomize olmayan klinik çalışma komplike olmayan YRD cerrahisi geçiren hastaları içermektedir. YRD için hastalara katarakt cerrahisi ile kombine veya tek başına PPV uygulandı. Bu çalışmaya 25 hasta ve 30 sağlıklı birey dahil edildi. Ameliyatta tamponad olarak perfluoropropan gazı veya silikon yağı kullanıldı. Görmenin, yaşam kalitesi üzerindeki etkisi Görme İşlevi Anketi-25 (Ulusal Göz Enstitüsü Görme İşlevi Anketi (GİA-25)) kullanılarak değerlendirildi. Stereopsis; Stereooptical Stereo Fly Test kullanılarak ölçüldü. İstatistiksel analizler SPSS 15.0 istatistik paket yazılımı kullanılarak yapıldı. Pearson ki-kare ve Fisher'in kesin ki-kare testleri kategorik değişkenlerin karşılaştırılmasında kullanıldı. P değerinin <5 olması istatistiksel olarak anlamlı kabul edildi.

Bulgular: Hasta (80.89 ± 16.75) ve kontrol grubunda (85.11 ± 6.06) ölçülen GİA kompozit skoru arasındaki farklar istatistiksel olarak anlamlı değildi (p=0.906). Stereopsis, başarılı YRD cerrahisi geçiren hastalarda kontrol grubuna göre anlamlı olarak daha düşüktü (sırasıyla 175.2 ± 150.59 arc/sec, 48.0 ± 18.64 arc/sec) (p<0.001). Silikon yağı veya C3F8 tamponadları kullanılarak tedavi edilen hastalarda stereopsis veya GİA kompozit skorları açısından anlamlı bir fark gözlenmemiştir.

Sonuç: Yırtıklı retina dekolmanının en önemli cerrahi tedavilerinden biri olan PPV, görmeyle ilgili yaşam kalitesini azaltmayabilir; ancak stereopsisini azaltabilir. Daha iyi stereopsis seviyelerine cerrahi öncesi ve sonrası daha iyi görme keskinliğine sahip olan hastalarda erişilebilir.

Anahtar Sözcükler: Stereopsis, görmeyle ilgili yaşam kalitesi, yırtıklı retina dekolmanı, vitrektomi, silikon yağı, perfluoropropan gazı (C3F8)

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INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is a potentially sight-threatening disease. Most untreated cases of RRD proceed to complete separation, resulting in total vision loss in the affected eye. Although numerous articles exist on the topics of visual outcome and anatomic reattachment in RRD surgery, studies are limited which investigate effects on patient's Quality of Life (QoL).

A couple of questions arise during the course of RRD. Vision-related QoL will differ after PPV surgery for RRD comparing with the normal people or not? Combined surgery with cataract surgery and PPV will have a negative effect on vision-related QoL or not? Which tamponade is better on visual quality after surgery? Vision-related QoL is a method of measuring the effect of visual function on daily activities (1). In recent years, assessment of vision-related QoL has been improved with the use of tools such as the National Eye Institute Visual Function Questionnaire (NEI VFQ-25) (2-3). The 25-item NEI VFQ-25 is the preferred method for evaluating outcomes of several eye diseases including cataract, keratoconus, glaucoma, age related macular degeneration, macular hole, epiretinal membrane, central serous chorioretinopathy, diabetic retinopathy, retinal vein occlusion and RRD (4-6). Previously, correlations between vision-related QoL and metamorphopsia, visual acuity and stereopsis were investigated in subjects who underwent successful pars plana vitrectomy (PPV) for RRD. Metamorphopsia alone was found to be correlated with QoL previously (6).

To date there is no data comparing the effect of vision-related QoL in patients with RRD which received different internal tamponades as C3F8 gas or silicone oil. C3F8 gas and silicone oil have different characteristics and visual effects on patients during the course of disease as well as the need of patient positioning and removal. In the present study, we aimed to evaluate the relationship between vision-related QoL and stereopsis in eyes of patients with RRD who underwent successful PPV with either silicone oil or C3F8 endotamponades and we aimed to compare the effects of these two tamponades on vision-related QoL and stereopsis.

METHODS

This retrospective, non-randomized clinical trial included 25 eyes of 25 patients who underwent successful RRD surgery and of 30 healthy individuals at our institution between January 2013 and May 2015. The patients had a mean age of 60.68 ± 7.19 years (50–74 years). Patients and healthy individuals aged over 50 years were included in the study. The Namik Kemal University Clinical Research Ethics Committee approved this study (Reference number: 2016/68/05/01). Preoperative and postoperative best-corrected visual acuity (BCVA) of patients and control group was measured using a Snellen chart, subsequently converted into a linear logarithm of the minimum angle of resolution (logMAR) value. Inclusion criteria were as follows: patients with RRD treated with combined phacoemulsification and PPV or only PPV and with no complications during operation; patients with at least 1 year follow-up and patients with best corrected visual acuity (BCVA) values of at least 0.8 in Snellen (logMAR 0.1) in their other eye. For the control group, healthy individuals with a BCVA of at least 0.8 in Snellen (logMAR 0.1) for both eyes were included. The exclusion criteria were as follows: patients who underwent any intraocular surgery except cataract surgery; patients with recurrent detachment, proliferative vitreoretinopathy, intraocular haemorrhage, amblyopia, high refractive error, severe cataract, duration of over 1 month, glaucoma and vitreoretinal disorders except RRD and patients with less than 1 year follow-up time. In each case, vitrectomy using a two-step 23 G vitrectomy system (Stellaris PC; Bausch and Lomb, Rochester, NY, USA) was performed by the same, experienced vitreoretinal surgeon. In cases in which the patient was phakic, combined phacoemulsification and intraocular lens implantation were performed via a 2.8 mm clear corneal incision before the scleral incision for PPV

was made. Air–fluid exchange and endolaser treatment were carried out in all cases, along side endotamponades. Silicone oil (1000 cts silicone oil, M 11 1000V, Mersilicon) was preferred for patients in whom Perfluoropropane gas (C3F8, VT 10 CFA, Teknogase) was not used. In eyes with a tear(s) of only superior quadrant, C3F8 was used as a tamponade. In eyes with tears including superior and inferior quadrants or with a tear(s) of only inferior quadrant, silicone oil was used as a tamponade. A follow-up operation was performed in patients receiving silicone oil tamponades to remove the silicone oil.

All patients who underwent surgery were called for routine post-op control on the first day, first week, first month, third month, sixth month and first year after operation. Patients receiving silicone oil were included in the study after at least 12 months of follow-up after silicone oil removal.

Turkish version of the NEI VFQ-25 was used (3). NEI VFQ-25 is scored according to a continuous composite score and 12 subscales, including general health, general vision, near vision, distance vision, driving ability, peripheral vision, colour vision, ocular pain, difficulty performing tasks, dependency, social functioning and mental health. Each item in the survey is rated on five or six scales, resulting in a total score which ranges from 0 to 100. Each subscale contains a range and four items. To obtain each subscale score, the average value of scores from their individual items is taken. The average score of the 11 subscale scores is then taken to obtain the composite score. According to the instructions of Mangione et al. (2), the general health subscale is not included in the VFQ composite score. The VFQ composite and subscale scores are measured on a scale from 0 to 100, representing higher QoL related to better vision (2).

Stereopsis was measured using a Stereo Optical Stereo Fly Test (Stereo Optical Co., Inc., Chicago, IL, USA) in healthy subjects and in patients during their final visit. Stereo circles consist of nine steps of increasing difficulty and four circles. This test was performed at a distance of 40 cm from the eye, with appropriate correction using spectacles.

Statistical Analyses

Statistical analyses were performed using SPSS 15.0 software package (SPSS Inc. Chicago, IL). Data are expressed as mean \pm standard deviation and as median values. To compare categorical variables, Pearson chi-squared test and Fisher's exact chi-squared test were used. To compare measured variables, Kolmogorov–Smirnov test was used to determine normal distribution of the data; when data did not fit a normal distribution, Mann–Whitney U and Kruskal–Wallis tests were used. Spearman's correlation coefficients were calculated to investigate significant correlations between the different postoperative visual function parameters. Once each group was compared within itself, then compared to each other. Statistical corrections have been made for repeated tests at different times. The relationships between age, preoperative factors, stereopsis, postoperative LogMAR BCVA and the NEI VFQ-25 scores were analyzed using Spearman's correlation coefficients. Mann–Whitney U-test was used to evaluate stereopsis and QoL. A p value of $<5\%$ was considered statistically significant.

RESULTS

In this retrospective study, 9 women (36%) and 16 men (64%) were assessed. The control group included 30 individuals; comprising 13 women (43.3%) and 17 men (56.7%) aged at least 50 years. No significant differences existed in gender split between the groups. The mean age was 60.68 ± 7.19 for the patient group and 62.43 ± 6.32 for the control group. A statistically significant difference was observed between mean stereopsis values of the patient group (175.2 ± 150.59 arc/sec) and the control group (48.0 ± 18.64 arc/sec) ($p < 0.001$). No significant difference was observed between the VFQ composite score of the patient group (80.89 ± 16.75) and control group (85.11 ± 6.06) ($p = 0.906$). No significant differences were observed between the scores of the patient and control groups regarding of the VFQ subscales. Table 1 shows a comparison of the clinical factors of the patient and control groups.

Table 1. Comparison of patient and control groups in terms of clinical factors.

Variables	Patient group	Control group	P*
	Mean ± SD	Mean ± SD	P*
Age	60.68±7.19	62.43 ± 6.32	0.392
Stereopsis (arc/second)	175.20±150.59	48.00 ± 18.64	<0.001
VFQ composite score	80.89±16.75	84.19 ± 6.80	0.906
General health	44.00±24.24	51.67 ± 20.69	0.181
General vision	76.00±14.14	78.67 ± 11.67	0.299
Ocular pain	73.00±26.68	85.00 ± 9.51	0.139
Near activities	77.56±19.30	83.57 ± 9.07	0.441
Distance activities	79.24±16.61	85.00 ± 9.94	0.253
Social functioning	86.50±17.65	95.00 ± 6.23	0.188
Mental health	80.56±121.17	78.70 ± 16.86	0.356
Role difficulties	74.00±20.69	67.08 ± 19.28	0.054
Dependency	92.36±20.69	92.30 ± 12.46	0.926
Driving	86.00±17.68	79.87 ± 13.43	0.118
Color vision	89.00±19.20	90.00 ± 12.46	0.671
Peripheral vision	77.00±23.85	75.00 ± 22.74	0.667

*Mann-Whitney U test p<0.05 SD: Standard Deviation
VFQ: Visual Function Questionnaire

The mean follow-up period of the patients was 19.28 ± 7.74 months (12 to 34 months). The mean pre-op time of the patients (time between first instance of vision loss and operation) was 10.64 ± 5.86 days (1 to 21 days). The mean pre-op BCVA value of the patients was 1.49 ± 0.8 in Snellen (logMAR 0.2 to 2.3), and the mean post-op BCVA of patients was 0.36 ± 0.24 in Snellen (logMAR 0 to 0.7). There was a statistically significant visual gain in patients (p=0.026).

No significant difference was observed in post-op BCVA values between patients treated with C3F8 (16 patients) (logMAR 0.30 ± 0.22) and silicone oil (9 patients) (LogMAR 0.48 ± 0.26) tamponades (p=0.065). Mean BCVA of other eyes of the patients was 0.028 ± 0.04 in Snellen (logMAR 0 to 0.1). While fifteen patients (60% of patients) underwent PPV combined with cataract surgery, ten patients who had cataract surgery before (40% of patients) underwent PPV surgery only. All patients were postoperatively pseudophakic. The other eyes of ten patients (40%) were pseudophakic and the rest (60%) were phakic. Patient demographic characteristics are shown in Table 2.

Table 2. Demographic characteristics of the patient group.

Patient group	Number	Percentage
Sex	Male	15 (60.0)
	Female	10 (40.0)
Tamponade	C3F8	16 (64)
	Silicon oil	9 (36)
Macular status	Macula on	10 (40.0)
	Macula off	15 (60.0)
Surgical procedures	Vitrectomy	10 (40.0)
	Combined cataract surgery with vitrectomy	15 (60.0)
Postoperative lens status	Phakia	0 (0)
	Pseudophakia	25 (100.0)
Other eye's lens status	Phakia	15 (60.0)
	Pseudophakia	10 (40.0)

PPV: Pars Plana Vitrectomy

Silicone oil was used in 36% of patients and C3F8 tamponade was used in 64% of patients. Silicone oil was removed via a follow-up operation. The mean silicone oil removal times were 6.44 ± 2.35 months (3 to 10 months).

Table 3 showed comparison of clinical factors between the C3F8 and silicone oil tamponade groups. No significant difference was observed between the two tamponade groups regarding pre-op BCVA values, mean pre-op time, VFQ composite score or any other patient score.

Table 3. Comparison of tamponades (C3F8 - Silicone oil) for clinical factors.

	Tamponade		p*
	C3F8 Mean ± SD	Silicone oil Mean ± SD	
Age	60.75 ± 5.29	60.56 ± 10.14	0.820
Duration of silicone oil tamponade (months)		6.44 ± 2.35	
Time before operation (days)	10.75 ± 5.72	10.44 ± 6.46	0.954
Follow-up period post-operative (months)	16.75 ± 5.69	23.78 ± 9.15	0.056
Postoperative BCVA (logMAR)	0.30 ± 0.22	0.48 ± 0.26	0.065
Preoperative BCVA (logMAR)	1.51 ± 0.78	1.47 ± 0.88	0.931
The other eye's BCVA (logMAR)	0.03 ± 0.04	0.03 ± 0.04	0.972
Stereopsis (arc/second)	128.75 ± 61.95	257.78 ± 221.01	0.065
VFQ composite score	80.16 ± 19.33	82.19 ± 11.75	0.910
General health	40.63 ± 23.94	50.00 ± 25.00	0.367
General vision	75.00 ± 13.66	77.78 ± 15.63	0.665
Ocular pain	74.22 ± 26.80	70.83 ± 27.95	0.790
Near activities	78.00 ± 20.86	76.78 ± 17.36	0.731
Distance activities	79.06 ± 18.57	79.56 ± 13.46	0.863
Social functioning	85.16 ± 17.21	88.89 ± 19.21	0.532
Mental health	78.63 ± 24.93	84.00 ± 12.56	0.820
Role difficulties	73.44 ± 29.54	75.00 ± 31.87	0.861
Dependency	89.13 ± 25.23	98.11 ± 5.67	0.174
Driving	88.00 ± 12.57	83.20 ± 24.61	1
Color vision	92.19 ± 17.60	83.33 ± 21.65	0.209
Peripheral vision	78.13 ± 23.94	75.00 ± 25.00	0.741

*Mann-Whitney U test p<0.05

Mean ± SD: Mean ± Standard Deviation BCVA: Best Corrected Visual Acuity
LogMAR: Logarithm of the Minimum Angle of Resolution

Mean follow-up time was 23.78 ± 9.15 months in patients who received silicone oil and 16.75 ± 5.69 months in patients who received C3F8 tamponades; no significant difference was observed (p=0.056). No significant difference was observed in post-op BCVA values between patients who received C3F8 (logMAR 0.30 ± 0.22) and silicone oil (logMAR 0.48 ± 0.26) (p=0.065). Furthermore, no significant difference was observed in stereopsis between patients who received C3F8 (128.75 ± 61.95 arc/sec) or silicone oil (257.78 ± 221.01 arc/sec) (p=0.065).

Mean BCVA values in non-operated eyes of patients who received C3F8 and silicone tamponades were not significantly different (logMAR 0.03 ± 0.04) (p=0.972).

Fifteen patients (60%) had macular detachment based on pre-op fundoscopic examination. Two of the nine patients treated with silicone oil tamponade had macula-on and seven patients had macula-off RRD. Eight of the 16 patients treated with C3F8 tamponade had macula-on and eight patients had macula-off RRD. Comparison of combined phacoemulsification and PPV and PPV only in terms of clinical factors is shown in Table 4. No significant differences were observed between any of the clinical factors.

Table 4. Comparison of performed operations in terms of clinical factors

	Performed operation		p*
	PPV Mean ± SD	Cataract surgery combined with PPV Mean ± SD	
Age	59.60 ± 9.08	61.40 ± 5.85	0.559
Duration of silicone oil tamponade (months)	5.25 ± 2.06	7.40 ± 2.30	0.217
Time before operation (days)	7.70 ± 4.08	12.60 ± 6.16	0.057
Follow-up period post-operative (months)	21.10 ± 9.31	18.07 ± 6.56	0.551
Postoperative BCVA (logMAR)	0.41 ± 0.30	0.33 ± 0.20	0.352
Preoperative BCVA (logMAR)	1.46 ± 0.72	1.51 ± 0.87	0.672
The other eye's BCVA	0.02 ± 0.04	0.03 ± 0.04	0.379
Stereopsis (arc/second)	154.00 ± 49.93	189.33 ± 191.66	0.667
VFQ composite score	83.91 ± 12.22	78.88 ± 19.34	0.618
General health	52.50 ± 27.51	38.33 ± 20.85	0.216
General vision	80.00 ± 13.33	73.33 ± 14.47	0.226
Ocular pain	80.00 ± 25.82	68.33 ± 27.09	0.236
Near activities	79.80 ± 13.40	76.07 ± 22.75	0.911
Distance activities	80.60 ± 15.42	78.33 ± 17.83	0.844
Social functioning	80.00 ± 20.58	90.83 ± 14.54	0.150
Mental health	86.95 ± 9.93	76.30 ± 25.61	0.386
Role difficulties	77.50 ± 31.07	71.67 ± 29.68	0.528
Dependency	96.70 ± 5.85	89.47 ± 26.25	0.916
Driving	83.14 ± 20.10	90.00 ± 14.82	0.492
Color vision	90.00 ± 17.48	88.33 ± 20.85	1
Peripheral vision	77.50 ± 24.86	76.67 ± 24.03	0.906

*Mann-Whitney U test p<0.05

Mean ± SD: Mean ± Standard Deviation BCVA: Best Corrected Visual Acuity
LogMAR: Logarithm of the Minimum Angle of Resolution
VFQ: Visual Function Questionnaire

Mean silicone oil removal time for the patients with macula-off and macula-on RRD was 7.29 ± 1.89 and 3.50 ± 0.71 months; respectively ($p=0.039$). Table 5

shows a comparison of pre-op macular status (on / off) in terms of clinical factors.

Table 5. Comparison of the pre-op macular status (on / off) in terms of clinical factors.

	Macula on/off		P*
	Macula on Mean \pm SD	Macula off Mean \pm SD	
Age	58.30 \pm 6.11	62.27 \pm 7.61	0.133
Duration of silicone oil tamponade (months)	3.50 \pm .71	7.29 \pm 1.89	0.039
Time before operation (days)	12.40 \pm 6.22	9.47 \pm 5.51	0.275
Follow-up period post-operative (months)	17.10 \pm 6.77	20.73 \pm 8.22	0.268
Postoperative BCVA (logMAR)	0.28 \pm .22	0.42 \pm .25	0.215
Preoperative BCVA (logMAR)	1.06 \pm .89	1.78 \pm .61	0.051
The other eye's BCVA (logMAR)	0.03 \pm 0.04	0.03 \pm 0.05	0.813
Stereopsis (arc/second)	156.00 \pm 100.13	188.00 \pm 178.85	0.626
VFQ composite score	75.64 \pm 22.32	84.40 \pm 11.31	0.560
General health	37.50 \pm 24.30	48.33 \pm 24.03	0.289
General vision	72.00 \pm 10.33	78.67 \pm 15.98	0.304
Ocular pain	71.25 \pm 31.76	74.17 \pm 23.84	0.977
Near activities	75.80 \pm 22.48	78.73 \pm 17.62	0.866
Distance activities	77.40 \pm 19.36	80.47 \pm 15.10	0.736
Social functioning	81.25 \pm 17.92	90.00 \pm 17.17	0.209
Mental health	72.00 \pm 29.00	86.27 \pm 11.84	0.146
Role difficulties	62.50 \pm 31.18	81.67 \pm 27.09	0.075
Dependency	85.90 \pm 31.21	96.67 \pm 7.61	0.277
Driving	87.33 \pm 7.17	84.67 \pm 25.14	0.498
Color vision	85.00 \pm 21.08	91.67 \pm 18.09	0.325
Peripheral vision	70.00 \pm 22.97	81.67 \pm 24.03	0.166

*Mann-Whitney U test $p<0.05$

Mean \pm SD: Mean \pm Standard Deviation BCVA: Best Corrected Visual Acuity

LogMAR: Logarithm of the Minimum Angle of Resolution

VFQ: Visual Function Questionnaire

A significant positive correlation was observed between post-op BCVA and stereopsis, whereas a significant negative correlation was observed between

post-op BCVA and social functioning score in the patients group. Table 6 details clinical factors that had significant correlation with post-op BCVA.

Table 6. Clinical factors showing significant correlation with postoperative logMAR BCVA.

		Pre-op BCVA (logMAR)	Stereopsis (arc/sec)	Social functioning score
Postoperative BCVA (logMAR)	Correlation Coefficient	0.443	0.525	-0.401
	Sig. (2-tailed)	0.026*	0.007**	0.047*
	N	25	25	25

*Spearman test $p<0.05$

**Spearman test $p<0.01$

BCVA: Best Corrected Visual Acuity

LogMAR: Logarithm of the Minimum Angle of Resolution

In the patient group, a significant correlation was observed between the patients' other eye's BCVA and stereopsis ($p=0.032$). A significant correlation was

also found between the patients' other eye's BCVA and the score for difficult performing roles ($p=0.019$).

Table 7. Correlation between other eye's logMAR BCVA and stereopsis of the patients

		Stereopsis (arc/sec)	Role difficulties score
OtherEye's BCVA (logMAR)	Correlation Coefficient	0,431	-0,467
	Sig. (2-tailed)	0,032*	0,019*
	N	25	25

*Spearman test $p<0,05$

BCVA: Best Corrected Visual Acuity

LogMAR: Logarithm of the Minimum Angle of Resolution

A significant negative correlation was observed between stereopsis and general visual score ($p=0.022$). In the patient group, no significant correlation was observed between stereopsis and VFQ composite score.

DISCUSSION

VFQ

NEI VFQ-25 includes 25 questions on visual function in daily life. The survey provides an evaluation of the impact of visual impairment on the emotional wellbeing, social relationships and daily activities of patients. The composite score is the mean of the 11 subscales and used to evaluate vision-related QoL. In the present study, mean VFQ composite scores and subscale VFQ-25 scores corresponding to vision-related QoL did not differ between patients with RRD who underwent PPV and healthy subjects. No significant differences were observed in VFQ composite score based on macular condition (on or off). A good visual acuity gained after successful surgery may have accounted for this. Smretschnig et al. (7) previously observed no significant difference in VFQ composite scores between combined cataract and PPV surgery and only PPV groups. Furthermore, in a study by Lina et al. (6), no differences were observed in VFQ composite scores between scleral buckling and vitrectomy groups. PPV has previously been shown to improve QoL in a study evaluating vision-related QoL in various vitreoretinal diseases (4).

Okamoto et al. (8) previously observed no significant correlation between post-op BCVA and VFQ composite score in their study; however, subgroup analysis revealed significant differences in composite score and two subscales when confined to patients with BCVA $\log\text{MAR} \geq 0.15$ at 6-month follow-up. These results demonstrate that BCVA is a strong interaction factor for visual QoL and that a good BCVA implies that patients with RRD are not exposed to mental stress in the months following surgery. In another study by Smretschnig et al. (7), VFQ composite score was determined to be correlated with BCVA in the operated eye and other eye.

According to significant increases in VFQ scores in a prospective study of the 3-year follow-up of patients who were treated with surgery for RRD, an improvement in vision-related QoL was reported in the first post-op year along side different healing patterns in multidimensional vision functions (9). In light of this finding, we aimed to evaluate changes in vision-related QoL beginning from the first post-op year.

Stereopsis

Stereopsis is one of the major components of binocular vision, and its deterioration after RRD surgery has been reported previously (10). In the study, 75 patients with RRD were treated, including 28 patients treated with scleral buckling and 47 patients with vitrectomy, and post-op stereopsis was noted to be significantly worse compared with healthy cases, in accordance with the results of our study (10). In our study, post-op stereopsis was significantly better in patients who underwent successful RRD surgery.

We encountered no relationship between VFQ composite score and stereopsis in our patients, in agreement with a previous study (6). However, in the study cited, stereopsis was not detected in 20 of 30 RRD patients, operated on by scleral buckling or vitrectomy, but it was evaluated in only 10 patients. Conversely, all patients included in our study had stereopsis. This may be a result of the patients in our study having a good BCVA level in both the operated eye and the other eye. Thus, we were able to compare stereopsis levels of all patients with other clinical factors.

In our study, post-op stereopsis was not significantly different between the pre-op macula-on and macula-off patient groups. In a previous study, stereopsis was found to be significantly different between pre-op macula-on and macula-off groups across both TST and TNO stereo tests. Pre-op stereopsis was reported to be significantly better in macula-on patients in the study cited (10).

In the literature, no publications exist which compare C3F8 and silicone oil tamponades in terms of stereopsis and VFQ-25 in RRD patients treated with primary PPV. Irrespective of which tamponade was used, stereopsis was reduced. We aimed to test them. We observed post-op BCVA in patients with RRD, the BCVA value of the other eye and general visual score were significantly correlated with stereopsis. In other words, we observed that the vision-related gains of the patient after surgery affected to stereopsis.

In another study, stereopsis measured by TST was significantly associated with both post-op BCVA and differences in post-op visual acuity between the two eyes (10). Lam et al. (11) also previously reported that differences in visual acuity between the two eyes caused a reduction in stereopsis.

Visual acuity gain after surgery is known to significantly affect stereopsis (10). With this in mind, protection of the non-operated eye is therefore important. Patients with good stereopsis had better general visual scores.

In the present study, we also demonstrated that decreasing stereopsis had no significant effect on post-op QoL. We found that stereopsis was provided to a certain degree in patients with BCVA of 0.2 ($\log\text{MAR} 0.7$), and stereopsis significantly increased in correlation with increasing BCVA.

Furthermore, it was also shown that stereo-sensitivity decreased after successful RRD surgery; however this had no significant effect on post-op QoL. Long-term adaptation, life experience and common sense may all contribute to patient monocular stereopsis. This may explain why stereopsis has not been associated with post-op QoL in previous studies(6).

Surgery

PPV is frequently used nowadays in the treatment of RRD. Especially in pseudophakic patients, PPV effectiveness as primary therapy is increasing. With this increasing popularity of PPV, new surgical instruments have been developed, leading to 23-, 25- and 27-gauge vitrectomy being practised by surgeons in recent years (12).

Cataract is frequently encountered as a complication of vitrectomy, especially in patients over 50 years of age. Cataract formation may occur early, especially when internal tamponades are used. Therefore, combined phacoemulsification and vitrectomy can speed up functional rehabilitation of patients by eliminating the need for second operation. Combined surgical results indicate this is a safe and effective method, comparable to sequential surgery (13). In our study, no serious complications were observed during operation. All patients were postoperatively pseudophakic. If the patient is phakic, combined surgery can be performed effectively and reliably.

Endotamponades

Silicone oil was removed through a second PPV operation. Mean silicone oil endotamponade duration before removal was 6 months (3 to 10 months). Mean silicone endotamponade duration before removal was 7 months in patients with macula-off detachment and 3 months in patients with macula-on detachment. The risk of recurrence of retinal detachment was found to be significantly higher in patients who received silicone oil tamponade fewer than 2 months after surgery (14). No silicone oil or C3F8 tamponade related intraoperative or post-op complications were detected in patients with RRD who participated in our study.

Mean pre-op detachment time of patients with RRD in our study was 10 days (1 to 21 days). It has been reported that no significant differences exist between visual acuity and anatomic reattachment rates in patients who underwent urgent operations and patients who were operated on under more elective conditions, with a mean delay of 14.5 hours (15). Thus, it has been reported that a short delay before RRD surgery may not be entirely harmful, and may even be beneficial in terms of patient outcomes (16).

It has been shown that macular structure and function gradually improve in the first year following successful RRD repair (17). This finding demonstrates that external retinal segments were repaired gradually after surgery. Therefore, it may be more appropriate to assess visual function to evaluate QoL more than 12 months after operation. In our study, patients treated with silicone oil endotamponade were included in the study after at least 12 months of follow-up following removal of the tamponade.

Limitations of our study included the retrospective study design, relatively small patient series. Despite these limitations, this is the first report that compares the effects of endotamponades on vision-related QoL after successful RRD surgery.

In conclusion, vision-related QoL of patients with RRD did not change with using C3F8 or silicone oil, moreover there was no difference between operated subjects and non-operated control group. Stereopsis was found to be reduced in patients after successful RRD surgery with PPV, either combined with cataract surgery or alone; however, this did not affect vision-related QoL. A better stereopsis level was achieved in patients who possessed good vision prior to surgery, and these patients achieved better visual acuity after surgery. Further studies will aim to focus on preserving stereopsis in RRD patients using different surgical techniques.

Conflict of interest

No conflict of interest was declared by the authors.

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