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Vision-related quality of life in low-vision patients who underwent epiretinal membrane surgery

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ABSTRACT

Aims: To evaluate the vision-related quality of life (VR-QOL) in patients with low vision, who underwent epiretinal membrane (ERM) surgery with pars plana vitrectomy.

Methods: Twenty subjects with unilateral ERM and 20 healthy subjects as control group (CG) were included in the study. The National Eye Institute Visual Function Questionnaire-25 (NEI VFQ-25) was used. In ERM cases, the two-step 23 G vitrectomy was performed with a similar technique by the same experienced vitreoretinal surgeon. The relationship between the composite score and visual acuity was evaluated. Reliability analysis was performed. Flexible discriminant analysis was performed to group individuals according to the NEI VFQ-25 results.

Results: The preoperative best corrected visual acuity (BCVA) in ERM group was 1.04±0.41. Postoperative visual improvement reached statistical significance ($p<0.001$) and postoperative 6th month BCVA was 0.61±0.41. The composite score was significantly lower in patients with ERM than in CG ($p=0.017$). The subscale scores were significantly lower in the patients with ERM than in the CG in general vision, ocular pain, near activities and distance activities ($p<0.001$, $p=0.005$, $p<0.001$, $p=0.003$, respectively). There was a statistically significant correlation between the composite score and visual acuity ($R^2=0.19$, $p=0.004$). The scale has high reliability (Cronbach's alpha=0.8743). The accuracy of the flexible discriminant function was found to be 100%.

Conclusion: The NEI VFQ-25 questionnaire may help to define the effects of ERM surgery since visual acuity does not fully reflect VR-QOL. Impaired binocular vision may be associated with the deterioration of VR-QOL in patients with ERM in the postoperative period.

Keywords: ERM, epiretinal membrane, NEI VFQ-25, vision-related quality of life, VR-QOL

INTORDUCTION

Vision-related quality of life (VR-QOL) is a measure of the impact of visual impairment on daily activities and quality of life.[1] Recently, VR-QOL assessment has included 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 preferred for evaluating the outcome of treatment of various eye diseases including cataract, keratoconus, glaucoma, age related macular degeneration, macular hole, epiretinal membrane (ERM), central serous chorioretinopathy, diabetic retinopathy, retinal vein occlusion and retinal detachment.[4-6]

Functional assessment and health-related quality of life questionnaires are becoming commonplace to measure the impact of ophthalmic treatments on patients' ability to perform their visual functions. Recent studies have reported a correlation between NEI-VFQ-25 scores and visual acuity, and a beneficial effect on VR-QOL with removal of ERM.[7,8] However, patients undergoing ERM surgery in these studies had relatively good preoperative visual acuity (0.50 logMAR or 6/24 Snellen). In this retrospective study, we evaluated vision-related quality of life (VR-QOL) in patients with preoperative low vision who had epiretinal membrane (ERM), and compared the results with the control group (CG). We aim to accurately characterize visual function with self-reported dimensions in patients who underwent ERM surgery.

METHODS

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Namık Kemal University Non-interventional Clinical Researches Ethics Committee (Date: 28.09.2017, Decision No: 2017/80/08/04) and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

In this retrospective and nonrandomized clinical trial, we evaluated 20 patients (20 eyes) who underwent 23 gauge transconjunctival pars plana vitrectomy (PPV) with internal limiting membrane peeling and air tamponade to treat ERM. Twenty age-sex matched healthy individuals as CG were included in the study.

Surgical Procedures

In ERM cases, a two-stage 23 G vitrectomy (Stellaris PC; Bausch and Lomb, Rochester, NY, USA) was performed with a similar technique by the same experienced vitreoretinal surgeon (FH) under local anesthesia. The standard surgical procedure was core vitrectomy, removal of the ERM and internal limiting membrane, fluid-air exchange. The patients were placed in the face-down position for 1 postoperative day.

Patients

Patients with unilateral idiopathic ERM who were treated with PPV and had no intraoperative complications were included in the study. Twenty age-sex-matched healthy individuals without retinal disease (diabetic retinopathy, retinal vein occlusion, etc) and glaucoma were included in the study. Patients with proliferative vitreoretinopathy, intraocular hemorrhage, amblyopia, high refractive error, severe cataract, glaucoma, vitreoretinal disorders and any intraocular surgery other than cataract surgery were excluded from the study. The best corrected visual acuities (BCVA) of the patients were evaluated before the operation, in the first month, third month, and sixth month postoperatively. BCVA was evaluated using a Snellen chart and converted to the logarithm of the minimum angle of resolution (logMAR) units.

The 25-Item National Eye Institute Visual Function Questionnaire

The VR-QOL was assessed by the NEI VFQ-25. Patients answered the Turkish version of the NEI VFQ-25.[3] This questionnaire contains questions related to their general health status and 11 questions about visual perceptions of patients, including general vision, ocular pain, near activities, distance activities, social functioning, mental health, role limitations, dependency, driving, color vision and peripheral vision. Each item in the survey is scored from 0 to 100. The average score of 11 of the subscales is taken to obtain the composite score. According to the instructions of Mangione et al.,[2] the general health subscale is not included in the NEI VFQ-25 composite score.

Statistical Analysis

All statistical analyses were performed using with NCSS version 12 (Utah, USA) and R Studio version 4 (Vienna, Austria). The Shaphiro-Wilk normality test was performed with the data set. The pearson chi-square test was used for nominal ordinal data. The visual acuity of the ERM group was compared with the repeated measurement ANOVA test. Visual acuity and NEI VFQ-25 results of the CG and ERM group were compared with the Mann-Whitney U test. The relationship between the composite NEI VFQ-25 score and visual acuity was evaluated by simple linear regression. Reliability analysis was performed. Flexible discriminant analysis was performed to group individuals according to the NEI VFQ-25 results. Missing data were available in the driving category in patient with ERM. In the discriminant analysis, the missing data in the driving category was corrected according to the mean and the analysis was performed. Data were expressed as mean±standard deviation. The significance levels were set at $p<0.05$.

RESULTS

The average age was 67.6±5.9 years in ERM group and 64.4±5.1 years in CG. There were no statistical difference ($p>0.05$) between the groups in terms of age and sex. The demographic characteristics of the groups are presented in Table 1. The mean preoperative BCVA in the ERM group was 1.04±0.41. Postoperative visual improvement reached statistical significance ($p<0.001$) and postoperative 6th month BCVA was 0.61±0.41. The change in postoperative visual acuity in patients with ERM is presented in Table 2 and Figure 1. The postoperative 6th month BCVA was significantly lower in ERM patients than in CG ($p<0.001$). The visual acuity comparison is presented in Table 3.

Table 1. Demographic characteristics of groups

	Control (20)	Epiretinal membrane (20)	p
Age	64.4±5.1	67.6±5.9	0.080
Sex	8M/12F	9M/11F	0.749

Student t test, pearson Chi-square test, significance level is p<0.05, M: Male, F: Female

Table 2. Visual acuity change after epiretinal membrane surgery

	Mean±SD	p
Preoperative BCVA	1.04±0.41	<0.001
Postoperative BCVA 1th month	0.73±0.43	<0.001
Postoperative BCVA 3th month	0.63±0.40	<0.001
Postoperative BCVA 6th month	0.61±0.41	<0.001

Repeated Measurements ANOVA test, significance level is p<0.05, SD: Standard deviation, BCVA: Best corrected visual acuity

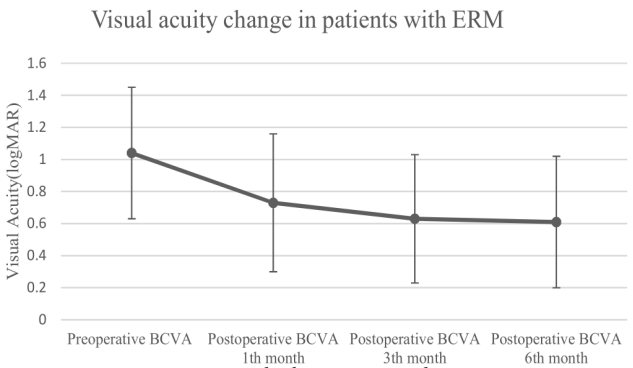

Figure 1. Postoperative 6-month change in visual acuity in ERM patients (with means and standard deviations)

ERM: Epiretinal membrane, BCVA: Best corrected visual acuity

Table 3 Visual acuity comparison of ERM postoperative 6th month and CG

BCVA	Mean±SD		p
Control vs ERM (vitrectomized eye)	0.02±0.02	0.61±0.41	<0.001
Control vs ERM (nonvitrectomized eye)	0.02±0.02	0.05±0.05	0.751
ERM (vitrectomized eye vs non vitrectomized eye)	0.61±0.41	0.05±0.05	<0.001

Mann-Whitney U test, significance level is p<0.05, CG: Control group, BCVA: Best corrected visual acuity, SD: Standard deviation, ERM: Epiretinal membrane

A comparison of the NEI VFQ-25 questionnaire in the 6th month postoperatively is presented in Table 4. The composite score was significantly lower in patients with ERM than in the CG (p=0.017). The general vision, ocular pain, near activities and distance activities scores were significantly lower in the ERM patients than in the CG (p<0.001, p=0.005, p<0.001, p=0.003, respectively). There was a statistically significant correlation between the composite NEI VFQ-25 score and visual acuity (R^2=0.19, p=0.004).

Table 4. Comparison of NEI VFQ-25 between groups

	Control (20)	Epiretinal membrane (20)	p
General health	50.00±22.94	40.00±24.87	0.221
General vision	80.00±0.00	59.00±15.18	<0.001
Ocular pain	85.00±9.60	66.25±22.25	0.005
Near activities	85.00±6.59	63.31±19.00	<0.001
Distance activities	85.00±10.03	67.70±21.54	0.003
Social functioning	95.00±6.28	83.33±22.38	0.108
Mental health	78.70±17.01	71.56±23.48	0.461
Role difficulties	65.00±18.85	61.25±21.42	0.758
Dependency	93.40±6.48	91.24±21.04	0.201
Driving	78.60±9.79	54.12±36.98	0.241
Color vision	88.75±17.16	90.00±12.57	0.968
Peripheral vision	65.00±23.51	75.00±22.94	0.242
Composite score	83.22±8.49	71.95±17.90	0.017

Mann-Whitney U test, significance level is p<0.05

The scale has high reliability (Cronbach's alpha=0.8743). The Cronbach's alpha coefficient ranged from 0.880 to 0.846 for the subscales. It was found that our data did not meet the multivariate normality assumption (Mardia's Kurtosis test p<0.001 and Mardia's Skewness test p<0.001).The accuracy of the flexible discriminant function was found to be 100%. The 11 variables (except general health status) included in the analysis were expressed with 1 canonical variate. The distribution of the groups according to the canonical variate is presented in Figure 2.

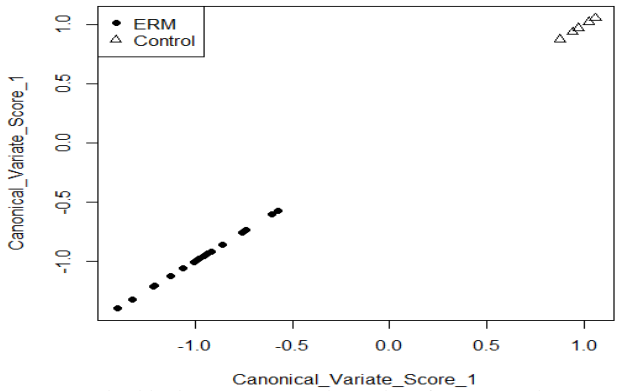

Figure 2. Flexible discriminant analysis plot of a canonical variate score expressing 11 variable of the NEI VFQ-25

ERM: Epiretinal membrane, NEI VFQ-25: National Eye Institute Visual Function Questionnaire

DICUSSION

In the present study, we saw that apart from increased visual acuity there was a lower quality of life with the self-reported dimensions. The reliability of the NEI VFQ-25 questionnaire was evaluated and was found to accurately measure VR-QOL. The NEI-VFQ 25 questionnaire was found to be able to discriminate between the ERM group and the CG.

Successful ERM surgery often results in positive visual outcomes.[9,10] There was a significant increase in visual acuity at 6 month follow up, however visual acuity may be insufficient to express many aspects of visual function and to predict whether individuals experience difficulties in real-world activities.[11] Our results confirm this information and visual acuity explained 19% of the composite score of NEI VFQ-25. More importantly metamorphopsia after ERM surgery may be permanent[7,12] and decrease vision-related quality of life.[8] In our results, the composite score of patients with ERM remained lower than the CG. Additionally, unilateral ERM may impair stereopsis and cause metamorphopsia as an independent condition, and surgery might contribute positively to improving these visual disturbances.

Binocular interference was defined as a condition in which the quality of vision was worse with both eyes open compared with one eye closed. It was reported in a recent study that binocular interference worsens the quality of life of patients with ERM.[13] ERM is usually unilateral or asymmetrically bilateral.[14] The visual performance of the patients' fellow eyes were generally unaffected. Thus, although the composite score of patients with unilateral ERM was lower than CG, patients with ERM were found to be similar to CG in other categories except for general vision, ocular pain, and near and far activity categories. Uneven vision levels after surgery may cause binocular interference and result in lower subscale categories compared to CG. However, the point to be considered when evaluating these results is that we conducted the NEI-VFQ 25 questionnaire at the 6th month postoperatively. After ERM surgery, visual improvement has been reported in 43% of eyes at 12 month, 54% at two year, and 60% at 3 year,[15] and this may lead to an improvement in NEI-VFQ 25 results in the long term.

In previous studies evaluating the postoperative NEI VFQ-25 results of ERM patients, mean NEI VFQ-25 composite score are as follows, respectively; 77.9,[8] 78.5[4]. The mean composite scores of NEI VFQ-25 after vitreoretinal surgery in patients with macular hole, rhegmatogenous retinal detachment, proliferative diabetic retinopathy, and age-related macular degeration have been reported as 82.4,[16] 80.3,[17] 68.5[18] and 54.4[19] respectively. In the present study, the mean composite score of NEI VFQ-25 was 71.9 and was lower than the ERM patients reported in the literature and was similar to the score of patients with proliferative diabetic retinopathy (PDR). It should be noted that the composite score was better in diseases that usually affect only one side, such as ERM, macular hole and rhegmatogenous retinal detachment, than in diseases that usually affect both sides, such as PDR and age-related macular degeneration.

Ghazi-Nouri et al.[7] reported a significant association between binocular BCVA and VR-QOL, but no association with VR-QOL for monocular BCVA, metamorphopsia, and contrast sensitivity in ERM patients. Metamorphopsia in age-

related macular degeneration[20] and vitreomacular traction[21] has been reported to be associated with VR-QOL. Another study reported that stereopsis was consistently altered in patients with ERM and was associated with VR-QOL.[22]

Limitations

The limitation of our study is that we did not evaluate the preoperative NEI VFQ-25 score and did not evaluate the metamorphopsia and steropsis of the patients. However, this study represents the first evaluation of NEI VFQ-25 outcomes following ERM surgery in the Turkish population, highlighting its unique contribution to the field.

CONCLUSION

This is the first paper reporting NEI VFQ-25 after ERM surgery in a Turkish population. In present study, we demonstrated that near and distance activity scores and ocular pain scores were worse in ERM patients. We demonstrated that the NEI VFQ-25 questionnaire may help to define the effects of ERM surgery on visual quality since the visual acuity does not exactly reflect VR-QOL. In conclusion, findings such as metamorphopsia and impaired stereopsis can persist in the postoperative period in patients with ERM and can impair VR-QOL.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Namık Kemal University Non-interventional Clinical Researches Ethics Committee (Date: 28.09.2017, Decision No: 2017/80/08/04).

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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