Original Article

Comparison of Quality of Life in Patients with Glaucoma Undergoing Shunt Surgery and Trabeculectomy

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Abstract

Introduction: Glaucoma is one of the most common causes of irreversible blindness worldwide and one of the three causes of visual impairment in developed countries. In addition to visual impairment and increased treatment costs, this disease also affects the quality of life of patients.

Patients and Methods: This cohort study was performed on patients with glaucoma. All patients were definitively diagnosed with glaucoma, then patients in both groups underwent surgery. In selected patients, intraocular pressure was within the desired range after surgery. Finally, the vision-related quality of life before and 6 months after surgery was assessed by using the VFQ-25 questionnaire.

Results: 80 patients were included in the study. A significant difference was observed between the two groups (P = 0.006) in terms of gender. The mean age of patients undergoing shunt surgery was 55.6 ± 15.8 years and in patients undergoing trabeculectomy was 56.9 ± 17.5 years, which showed no significant difference between the two groups (P = 0.723). Furthermore, no significant difference was found between the two groups in terms of living conditions (P = 0.327). There was no significant difference between the two groups in terms of family history of glaucoma (P = 0.259). A significant difference was found between the two groups in terms of the duration of glaucoma (P = 0.012).

Conclusion: No significant difference was found between shunt surgery and trabeculectomy in terms of impact on patients' quality of life.

Keywords: Quality of Life, Glaucoma, Visual Field, Trabeculectomy, Glaucoma Drainage Implant.

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INTRODUCTION

Glaucoma is one of the most common causes of irreversible blindness worldwide and one of the three leading causes of vision impairment in developed countries (1). Glaucoma is a group of diseases that are associated with damage to the optic nerve. Damage to the optic nerve caused by an abnormally high pressure due to congestion of the aqueous humor in the eye and eventually results in decreased vision and blindness (2). The prevalence of glaucoma in people over 40 years of age is 2% and increases with age. Risk factors for glaucoma include cardiovascular disease, myopia, and trauma (3). Glaucoma is called the silent thief of vision because most patients are unaware of their disease until they have vision changes and vision loss. The patient may not see a doctor until the onset of symptoms such as halos around light objects, concentration difficulties, difficulty in low light, loss of peripheral vision, pain and discomfort around the eyes, and headache (4).

Treatment of glaucoma reduces the internal pressure of the eye by reducing the production or increasing the excretion of aqueous humor. Cyclodestructive procedures and cyclodialysis surgery reduce IOP (intraocular pressure) by reducing the production of aqueous humor and other surgeries (trabeculectomy, goniotomy, trabeculectomy, and shunt) by increasing the excretion of aqueous humor.

Mostly the patients with glaucoma undergo trabeculectomy to increase the excretion of aqueous humor. However, this operation cannot be or is associated with high failure in patients with severe conjunctival scars caused by previous surgery, limbus disorders and uveitis glaucoma. In this group of patients, shunt implantation is recommended (5, 6).

Shunts have two main parts, the tube that enters the eye and

the plate that is fixed on the scleral equator. The shunts are divided into two general categories, including with and without valves.

Krupin and Ahmed shunts have valves, this valve opens at a pressure of 10-12 mmHg and allows the clearing out of the eye and is closed in 8 mmHg, preventing aqueous humor from leaving the eye. This reduces the risk of premature postoperative hypotension (7). Although shunt implantation is effective in inhibiting IOP in many patients with advanced glaucoma, but it is associated with many complications (8).

The inevitable complications of glaucoma in the absence of proper treatment can have a clear impact on the level of quality and life satisfaction in patients. Therefore, it is necessary to study this disease from all aspects and to examine the psychological and physical aspects for planning and providing better services. Visual impairment can affect health-related quality of life and cause irreparable damage to individuals, families and society.

Patients and Methods

Study design

This cohort study was done on patients with a diagnosis of glaucoma who were referred to the 22 Bahman Hospital in Mashhad, Iran. Inclusion criteria include: patients with glaucoma, age over 18 years, no blindness due to glaucoma and the patient's ability to take the Visual Acuity Testing (Snellen Chart). Exclusion criteria include: unwillingness to continue cooperation, patients with mental retardation and the presence of other underlying diseases that cause visual field defects such as significant media opacities, history of lazy eye (amblyopia), age-related maculopathy (ARM), vascular obstructive lesions, history of ischemic optic neuropathy and brain lesions.

Procedure

After entering the study, a clinical file was created for each patient, the file included demographic and general information. Then a history was taken which included: subjective symptoms, history of systemic, familial and medical diseases. For all patients, visual acuity was measured by using standard routine method and Snellen chart. Color recognition test was taken If vision was reduced to the extent of perceived hand movement, and Marcus Gunn test was obtained for all patients to evaluate optic nerve function.

Comparative study of hippocampal neuronal loss and biomicroscopic examinations were carried out using a slit lamp device by glaucoma specialists. Gonioscopy (measuring the size of the anterior chamber angle) was performed with a gonioscope lens. Intraocular pressure was measured by Goldman Tonometer and then posterior segment examination was obtained after drug mydriasis using MYdrax eye drops by indirect ophthalmoscope. Following clinical examinations, the results of the condition of all parts of the eyeball were recorded in the patient's medical record.

In case of possible diagnosis of glaucoma, intraocular pressure was measured at intervals of three hours and four times to confirm the diagnosis. Para-clinical tests were applied to measure the central thickness of the cornea and to measure the visual field by a Humphrey Perimeter. Para-clinical measurements were evaluated by an optometric technician using a standard method.

International questionnaire of VFQ-25 version 2000 was used, the validity and reliability of which have been previously examined (9). This questionnaire includes: international vision score, difficulty in doing things that require near and far vision, limitation of social functioning due to vision, limitation of social role due to vision, dependence on others due to vision, driving problems, psychological symptoms related to vision, environmental vision limitation, color vision limitation and eye pain (10).

Statistical analysis

Central tendency and dispersion statistics like mean and standard deviation for continues variables and frequency (percentage) were used to describe the data. Fisher's exact test was used to check the differences between nominal variables between two groups. To compare quantitative data, the normality of the data in the subgroups was determined by Kolmogorov-Smirnov test if the sample size was less than 30. For normal variables, two-sample independent t-test and paired t-test were used, and Wilcoxon and Mann-Whitney U tests were used for non-normally distributed variables. Moreover, Analysis of Covariance has been used to control the effect of confounders especially the scores of "before" surgery. Then the data were analyzed with IBM SPSS software Version 22.0 and the significance level of the tests was considered to be 5%.

Results

In this study, 80 patients were included in the study, which was divided into two groups of 40 patients undergoing shunt and trabeculectomy. In terms of gender, among the patients undergoing trabeculectomy, 30 were male (75%) and 10 were female (25%), and shunt group consisted of 18 males (45%) and 22 (55%) females. Statistically significant differences were observed between the two groups in terms of gender ($P = 0.006$). The mean age of patients undergoing shunt surgery was 55.6 ± 15.8 years and it was 56.9 ± 17.5 years in patients undergoing trabeculectomy, where no significant difference was found between the two groups ($P = 0.723$). In terms of living conditions, 33 patients were married (82.5%) and 7 were single (17.5%), but no significant difference was observed between the two groups

(P = 0.327). Regarding the history of glaucoma, 15 patients (37.5%) in the shunt group and 20 patients (50%) in the trabeculectomy group had a family history of glaucoma. There was also no significant difference between the two groups in terms of family history of glaucoma (P = 0.259). Patients were examined for history of disease and in the shunt and trabeculectomy group, 6 patients (15%) had a history of mental illness and 34 patients (85%) had no history of disease. The frequency distribution of glaucoma disease duration in patients of the two groups was shown in Table 1, most of whom had glaucoma disease for more than 5 years, and a statistically significant difference was observed between the two groups in terms of disease duration (P = 0.012).

Table 1: Frequency distribution over the course of glaucoma

course of glaucoma	shunt	trabeculectomy
Less than 1 year	4 (10%)	2 (5%)
Between 1 and 5 years	11 (27.5%)	24 (60%)
More than 5 years	25 (62.55)	14 (35%)

Figures 1 and 2 show the mean dimensions of the questionnaire in patients undergoing shunt and trabeculectomy. The lowest patient problem or the highest score of the questionnaire among patients undergoing shunt surgery before surgery was in the field of peripheral vision. 6 months after surgery, the least problem of these patients was related to eye pain. Most of the problems of these patients before and after surgery were related to driving. On the other hand, in patients undergoing trabeculectomy, the least problem before and after surgery was social functioning and the most problem was driving at both times.

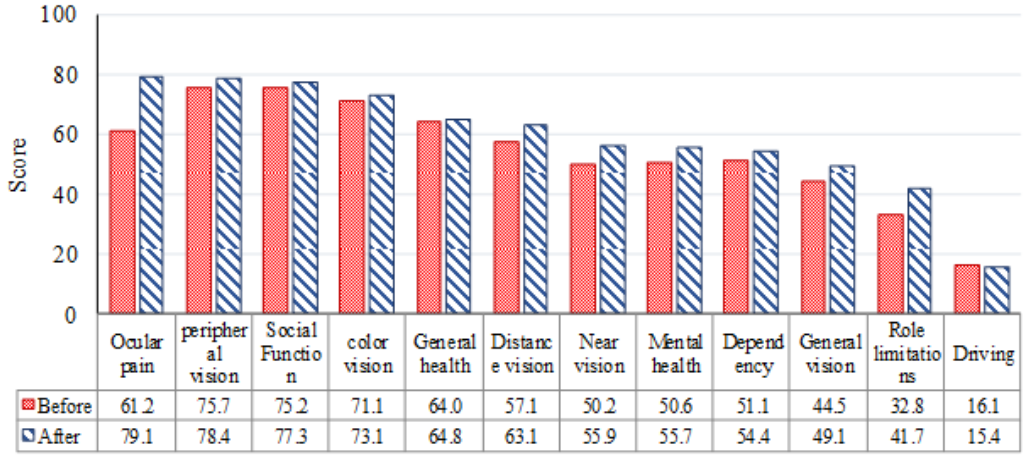

Figure 1: Mean dimensions of the questionnaire in patients undergoing shunt surgery.

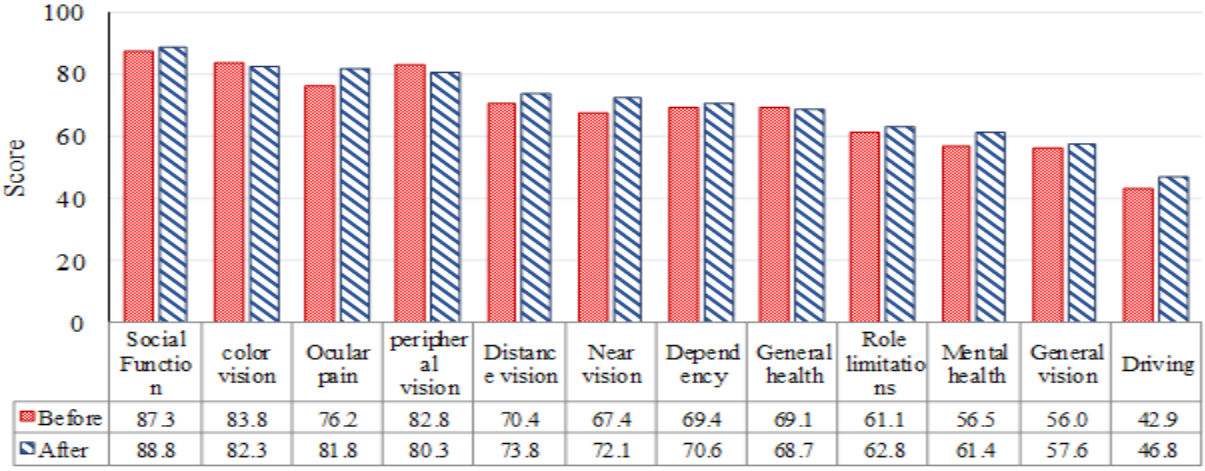

Figure 2: Mean dimensions of the questionnaire in patients undergoing trabeculectomy

The distribution of score of the questionnaire questions according to the type of shunt surgery and trabeculectomy was examined in Table 2. There was no significant difference between the two groups before and after surgery. However, in the shunt surgery group, significant differences were observed before and after surgery in the questions of general vision, eye pain, near and far vision activities, mental health, role limitation and dependence (P <0.05). Further, after removing the confounding effect, no significant difference was observed between the two groups before and after surgery (P> 0.05) except for the quality of driving, which in the trabeculectomy group before and 6 months after treatment was significantly better than the shunt group. (P> 0.05).

Table 2: Comparison of the sub-scales of of vision-related quality of life between two groups

Variable	**Time**	**Shunt surgery**	**Trabeculectomy surgery**	**p-value***
		Mean ± SD	Mean ± SD	
General Health	Before	64±16.6	69±18.1	0.11
	6 months after	64.8±17.5	68.7±20.2	
P-Value**		0.213	0.599	
Vision	Before	4.5±11.8	56±15.8	0.804
	6 months after	49.1±13.4	57.6±18.2	
P-Value		0.013	0.407	
Eye pain	Before	61.2±27.3	76.2±23.3	0.756
	6 months after	79.1±21.4	81.8±18.3	
P-Value		0.001	0.207	
Activities that require close vision	Before	50.2±28.3	67.4±24.6	0.734
	6 months after	56±28.8	72.1±27.1	
P-value		0.015	0.105	
Activities that require far vision	Before	57.1±29.1	70.5±25	0.702
	6 months after	63.1±30.7	73.8±26.4	
P-value		0.021	0.151	
Social functioni	Before	75.2±25.2	278.3±17.2	0.665
	6 months after	77.3±24.1	88.8±18.1	
P-value		0.208	0.34	
mental health	Before	50.6±19.2	56.5±20	0.865
	6 months after	55.7±19.9	61.4±24	
P-value		0.028	0.065	
Limited role	Before	32.8±27.8	61.1±25.5	0.283
	6 months after	41.7±30.9	62.8±30.8	
P-value		0.02	0.584	
Dependence	Before	51.5±28	69.4±24.2	0.395
	6 months after	54.4±30	70.6±26.3	
P-value		0.049	0.453	
Color vision	Before	71.1±32.3	83.8±27.4	0.63
	6 months after	73.1±34.6	82.3±26.5	
P-value		0.52	0.571	
Driving	Before	16±25.1	42.9±36.2	<0.05
	6 months after	15.4±28	46.8±36.9	
P-value		0.655	0.063	
Peripheral vision	Before	75.9±34.4	82.8±24.1	>0.05
	6 months after	78.4±32.5	80.3±27.8	
P-value		0.648	0.943	

* Based on ANCOVA considering scores of before surgery as covariate.

** Based on paired-t test

According to the results of Table 3, none of the shunt and trabeculectomy groups showed a significant improvement in the total vision-related quality of life score after surgery in patients under 60 years of age. There was no significant

improvement in patients over 60 years of age in the trabeculectomy group. But patients over 60 years of age in the shunt group had a significant increase in quality-of-life score after surgery (P <0.001). Male patients in none of the shunt and trabeculectomy groups had a significant improvement in the total vision-related quality of life score after surgery.

There was no significant improvement in trabeculectomy group but there was a significant increase in quality of life score in female patients of shunt group after surgery (P = 0.001). In the shunt group, there was a significant improvement in the total score of vision-related quality of life after surgery (P = 0.02). In patients with a disease period between 1 to 5 years and more than 5 years in the trabeculectomy group, a significant increase in the quality-of-life score associated with vision was not seen 6 months after surgery.

there was a significant increase in the total score of vision-related quality of life 6 months after shunt surgery in patients with primary education or diploma (P <0.05), but in other cases, a significant increase in the vision-related quality of life score was not seen 6 months after surgery.

Table 3: Comparison of the total score of vision-related quality of life before and after the surgery based on subgroup analysis

Subgroups of demographic variables		Surgical type	Before surgery	6 months after surgery	P-value
			SD ± Mean	SD ± Mean	
Age	<=60 years	shunt	62.6±19.2	66.8±19.6	0.305
		trabeculectomy	70.5±19.4	72.7±21.3	0.305
	> 60 years	shunt	46.4±21.9	54.1±25.6	<0.001
		trabeculectomy	67.4±15.3	69.8±17.6	0.325
Gender	Male	shunt	60.6±19.6	62.1±19.7	0.109
		trabeculectomy	69.5±17.9	71.2±19.9	0.245
	Female	shunt	50.2±22.9	60±26.2	0.001
		trabeculectomy	67.8±17.4	72.1±19.4	0.16
The course of the disease	1-5 years		61±20.8	66.3±20.9	0.021
		trabeculectomy	69±17	71.9±18.4	0.145
	> 5 years	shunt	55±22.3	61.7±24.3	0.02
		trabeculectomy	67±19.1	68.3±22	0.723
Studies	Illiterate	shunt	60.6±28.4	73.1±28.5	0.068
		trabeculectomy	66.4±14.6	72.3±16.2	0.15
	Elementary	shunt	43.3±25	53.8±30	0.019
		trabeculectomy	61.9±20.2	62.4±20.7	0.28
	Diploma	shunt	59.2±14.7	63.7±16.5	0.014
		trabeculectomy	73.7±17.2	77.7±21.4	0.139
	Under-graduate	shunt	60.3±21.1	60.5±20.3	0.929
		trabeculectomy	74.8±14.6	76.1±16.7	0.759

Patients with shunt surgery had a significant improvement in their quality of life, but no significant improvement was seen in the trabeculectomy group (Table 4). After removing the confounding effect of preoperative scores, there was no significant difference between the total vision-related quality of life between the two groups 6 months after treatment (P = 0.29).

Table 4: Comparison of the total score of vision-related quality of life before and after the surgery

Variable	**Time**	**Shunt**	**trabeculectomy**
		± SD Mean	Mean ± SD
The total score of the questionnaire	Before surgery	54.9±21.8	69.1±17.5
	6 months after surgery	60.8±23.2	71.4±19.5
P-value**		0.002	0.158

** Based on paired-t test

DISCUSSION

Glaucoma is one of the most common causes of irreversible blindness worldwide and one of the three leading causes of vision impairment in developed countries. In addition to visual impairment and increased treatment costs, this disease affects the quality of life of patients. These effects usually begin at the time of glaucoma diagnosis. Initially, the patient's fear of blindness and disease progression lead to a decrease in the patient's focus on daily activities and a decrease in the patient's self-confidence (11). Therefore, the aim of this study was to compare the quality of life of patients with glaucoma undergoing shunt surgery and trabeculectomy.

The main goal of the present study was to evaluate their vision-related quality of life before and 6 months after shunt and trabeculectomy surgeries. The mean age of patients undergoing shunt surgery was 55.6 ± 15.8 years and was 56.9 ± 17.5 years in patients undergoing trabeculectomy, which was not significantly different between the two groups (P> 0.05). A significant difference was found in gender distribution between the two groups that the effect of this variable on the results of variables was adjusted in the simultaneous analysis (P <0.05). Moreover, 10% of patients in shunt group and 15% of patients in trabeculectomy group were illiterate. In the group under shunt surgery, the highest frequency was related to patients with diploma education and in the group of trabeculectomy, the highest frequency was related to the category of primary education. 17.5% of patients in the shunt group and 10% of patients in the trabeculectomy group lived alone. A total of 12 patients with a history of mental illness (6 in the shunt group, 6 in the trabeculectomy group) and 1 patient in the shunt group had a new vision-related disease. All the mentioned variables except the disease period were not significantly different between the two groups (P <0.05).

The quality of life score of the patients in this study was similar to many studies in other parts of the world. For example, in a study by Hirooka et al. in Japan, the mean score of the VFQ-25 questionnaire before trabeculectomy and after surgery was 67.3±16 and 70±16.8 (12), respectively, which is consistent with the results of the present study. In the study of Kotecha et al., the total score of the quality of life questionnaire in the trabeculectomy group was 72.8 ± 18 before surgery, while this rate was 70.5 ± 17.9 1 years after surgery. In the shunt group, the total score of the quality of life questionnaire was 70.9 ± 17.8 before surgery and this rate was 72.2±16.5 after surgery (13). Coleman et al. reported that the total score of the VFQ-25 questionnaire was 83 ± 16.5 before treatment, and its score was 83 ± 16.8 12 months after treatment (14). In addition, Brazilian version of VFQ-25 questionnaire showed a score of 65 (16). In general, these differences may be due to inclusion criteria and disease severity. For example, in a study conducted by Kim and colleagues in South Korea on 176 patients with mild to severe glaucoma, the mean vision-related quality of life was 89.54 ± 7.9 (17), which was higher than our study. However, in this study, people over the age of 50 were excluded from the study due to the elimination of the confounding effect of age.

By comparing the quality of life scores of the shunt and trabeculectomy groups, it was concluded that the scores of the two groups were not significantly different from each other 6 months after surgery in the present study. The results of our study were quite similar to the results of Khanna (19), Kotecha (13), Hirooka (12) and Coleman et al. (14). In a study conducted by Kotecha et al. with the aim of assessing the quality of life of vision in the Tube Versus Trabeculectomy (TVT), the similar impact on patient-reported vision-specific quality-of-life (13). In the study of Khanna et al., the difference between the total quality of life score of VFQ-25 was not statistically significant between the 3 groups after adjusting all the variables studied in the study (19).

Klink et al. conducted a study to evaluate the quality of life after canaloplasty and trabeculectomy. Patients were followed up for up to 24 months after surgery. The questionnaire included the outcome of surgery, the rate of renewed surgeries, the patient's mood, surgical intervention in daily activities, and postoperative complaints. The results of this study showed that the patient's satisfaction after surgery was higher in the canaloplasty group compared to trabeculectomy (20). Pahlitzsch et al. conducted a study to evaluate the effect of micro-invasive glaucoma surgery (MIGS: iStent, Trabectome), and trabeculectomy (TE) on patients' quality of life. The quality of life score of patients in the groups was compared where the quality of life score of patients was not significantly different between the groups 6 months after treatment (21).

In the present study, the scores of all dimensions of the Vision-Related Quality of Life Questionnaire were compared in the two groups treated with shunt and trabeculectomy 6 months after treatment, where no significant difference was found between the two groups in any of the subscales. The results of the study by Pahlitzsch et al. ere similar to the present study. It means they did not see a significant difference between the groups in any of the dimensions of the questionnaire after treatment (21).

In the present study, the vision-related quality of life score and all its dimensions in each group were compared separately before and after surgery. It was concluded that in the trabeculectomy group, there was no significant increase in the overall score of the questionnaire and none of its dimensions after surgery compared to before. This result was consistent with the study of Hirooka (12) and Coleman et al (14). Hirooka et al concluded that patients undergoing trabeculectomy did not have a significant increase in vision-related quality of life scores (12).

In the present study, the least problem of patients in the shunt group was in the field of peripheral vision (the highest score of the questionnaire). In the trabeculectomy group the most problems were reported in social function and color vision; additionally, the most problems in both groups were driving. Similar results were presented by Asgari et al. (9). In their study, the highest score of the questionnaire in patients with glaucoma was related to the dimension of color vision and eye pain and the lowest score was related to the dimension of vision-related mental health (9). In the study of Wu et al. (22), the highest vision-related quality of life was related to color vision, and the lowest score was related to general health, which contradicted our results. Hirooka et al. reported that in patients with glaucoma under EX PRESS, the highest quality was related to the color vision dimension before treatment and the lowest quality

was related to the driving dimension, which is similar to the present study. In this study, in the surgical group, the highest quality was related to color vision before treatment and the lowest quality was related to general health (12). In Coleman's study, the lowest score was related to general health in the treatment group before surgery and the highest score was related to color vision (14). In the present study, the patients' least problem in the shunt group was eye pain dimension after surgery and in the trabeculectomy group was social function. The most problem in both groups was the driving dimension.

In the study of Pahlitzsch et al. In all groups of micro-invasive glaucoma surgery (MIGS: iStent, Trabectome) and Trabeculectomy (TE), the highest score was related to color vision after surgery and the lowest score was found to be general health (21), which was not consistent with our findings. Furthermore, Hirooka et al. reported that, the highest quality was related to color vision and eye pain in patients with glaucoma under EX-PRESS after treatment and the lowest quality was found driving dimension (12), which is similar to the present study. In the above-mentioned study, the highest quality was related to the color vision dimension in the trabeculectomy group after surgery, and the lowest quality was found to be the general health dimension (12). Coleman reported that the lowest score after treatment was related to general health in all three groups under laser treatment, other surgical and surgical methods plus medication, and the highest score was related to color vision (14).

In this study, age had no significant relationship with the total score of vision-related quality of life after surgery. The results of some studies were found to be similar to the present study. For example, Khaana et al. did not find a relationship between age and total quality of life score (19). In the study of Labiris (18) and Wu et al. (22), no significant relationship of age with quality of life score was reported. In some studies, the relationship between age and quality of life score has been proven. For example, Asgari et al. (9) and Magacho et al. (23) reported a significant relationship of age with patients' quality of life. In this study, the quality of life score was not significantly related to gender, which is consistent with the study of Chia et al., in which the overall score of the questionnaire did not differ between men and women (24). Khaana et al. did not find a significant relationship between gender and total quality of life score (19). Similar results were reported by Asgari et al. (9), Magacho et al. (23) and Wu et al. (22).

In this study, simultaneous analysis of education variable showed that this variable had no significant relationship with total quality of life score, which was similar to the studies of Magacho et al. (23), Labiris et al. (18), and Wu et al. (22). Some studies, such as the study of Asgari et al. (9) have shown that the level of education was significantly related to most aspects of the questionnaire. In a study conducted in Turkey, people with lower levels of education had significantly lower scores than people with higher levels of education in the areas of public vision, social activity, functioning limitation, dependency, and the overall score of the questionnaire (15).

Conclusion

Patients who underwent shunt surgery showed a significant improvement in their quality of life compared to before surgery, but no significant improvement was seen in the trabeculectomy group. Besides, 6 months after treatment, there was no significant difference between the total vision-related quality of life score between the two groups after removing the confounding effect of preoperative scores. Overall, there is no significant difference between shunt surgery and trabeculectomy in terms of impact on patients' quality of life.

Limitations of the study

Small sample size is a limitation of this study. In the future, further studies with a larger number of patients and a long-term follow-up should be conducted to confirm these initial findings.

Authors' Contribution

A.A, A.E, P.H, contributed to the design and implementation of the research goals and aims. S.H, A.A developed the design of the study. P.H and H.D check the validation of gather data. P.H and S.H run the formal analysis. P.H and H.D write the original draft of the paper and A.A, A.E and S.H review and edit the final version of manuscript. All authors provided critical feedback and helped shape the research. A.A was the main supervisor. A.A and A.E were the project administrators. A.A was in charge of overall direction and planning.

Ethical Issues

The research followed the tents of the Declaration of Helsinki. The Ethics Committee of Islamic Azad University of Mashhad approved this study. The institutional ethical committee of Islamic Azad University of Mashhad approved all study protocols. Accordingly, written informed consent taken from all participants before any intervention. This study was extracted from M.D thesis of first author (Dr. Parisa Heidi) at this university.

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

Conflicts of Interest

The authors declare that they have no competing interests.

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