

The patient-reported outcome of age-related cataract using Catquest-8SF questionnaire

Sheng-Xia Wang^{1,2}, Xin Liu³, Yun-Hong Du², Wen-Jing Liu², Ping Liu², Ying-Chao Li², Xin-Yi Wu¹

¹Department of Ophthalmology, Qilu Hospital of Shandong University, Jinan 250012, Shandong Province, China

²Department of Ophthalmology, the Central Hospital of Tai'an, Tai'an 271000, Shandong Province, China

³Department of Psychology, TaiShan Medical College, Tai'an 271000, Shandong Province, China

Co-first authors: Sheng-Xia Wang and Xin Liu

Correspondence to: Xin-Yi Wu. Department of Ophthalmology, Qilu Hospital of Shandong University, 107 Wenhua Xi Road, Jinan 250012, Shandong Province, China. xywu8868@163.com

Received: 2019-02-03 Accepted: 2019-10-29

Abstract

• **AIM:** To assess the patient-reported outcome of phacoemulsification with posterior chamber single focus foldable intraocular lens (SIOL) using the Chinese version of Catquest-8SF questionnaire (Catquest-8SF-CN), evaluate the applicability of Catquest-8SF scale in northern Chinese and its sensitivity to cataract surgery.

• **METHODS:** Prospective clinical case follow-up study. The patients were recruited from the Central Hospital of Tai'an and completed the Catquest-8SF questionnaire by face-to-face interviews before and 3mo after surgery at the hospital.

• **RESULTS:** A total of 120 cataract patients with median age 67.6y and 52.5% female completed the Catquest-8SF. The Cronbach's α coefficient of the total scale, daily-activity sub-table and comprehensive-evaluation sub-table were 0.861, 0.853 and 0.748 respectively. There was a high level of consistency between two investigators. The cumulative contribution rate was 66.64% by using the principal component analysis and the maximum variance orthogonal rotation method. The preoperative score of the Catquest-8SF-CN had a significant negative correlation with preoperative binocular mean weighted visual acuity and age ($P<0.05$), while a significant positive correlation with education level ($F=6.094$, $P<0.001$). The patients without systemic comorbidities got higher score than those who with ($P<0.05$). Three months after surgery, 102 (85%) patients came for follow-up and completed the questionnaire. Significant improvement of visual acuity

was observed in both binocular and monocular surgery groups ($t=10.404$, $P<0.001$). There was higher improvement in binocular weighted visual acuity of binocular surgery group than in monocular surgery group ($t=-20.77$, $P<0.001$). The postoperative score was significantly higher in both groups than before ($P<0.001$). There was a significant improvement in the total score after cataract surgery. The 94 patients (92.2%) were very satisfied or satisfied with the operation; 92 patients (90.2%) thought the surgery achieved their expectations, and they all felt satisfactory. The degree of satisfaction was significantly correlated with the improvement score of the scale and it was also correlated with their expectation of the surgery.

• **CONCLUSION:** The Chinese version of Catquest-8SF questionnaire is suitable for the age-related cataract population in northern China. It is highly responsive to cataract surgery and brief, so it may have the potential to become part of a routine clinical assessment for cataract surgery in China. The patient's overall satisfaction is high, which illustrates that the medical service we provide matches the patient's needs. The degree of satisfaction was significantly correlated with the improvement score of the scale and it was also correlated with their expectation of the surgery.

• **KEYWORDS:** age-related cataract; phacoemulsification; visual function; Catquest-8SF; satisfaction

DOI:10.18240/ier.2020.03.03

Citation: Wang SX, Liu X, Du YH, Liu WJ, Liu P, Li YC, Wu XY. The patient-reported outcome of age-related cataract using Catquest-8SF questionnaire. *Int Eye Res* 2020;1(3):145-153

INTRODUCTION

Cataract is the leading cause of blindness in the world, which account for 46% of global 40 to 45 million blind people. There are over 5 million cataract patients in China, among which nearly 2 million patients are in urgent need of surgical treatment. Additionally, there are about 0.4-1.2 million new cataract patients each year^[1]. With the beginning of "vision 2020" and the popularization of modern cataract surgery, Cataract Surgical Rate in China was more than 1500 per million people in 2015, but still far away from the aim

of eliminate cataract blindness^[2]. For the arrival of the aging society and the improvement of life expectancy, the number of age-related cataract surgery will continue to increase greatly. We should pay more attention not only to the quality of the surgery but also to the recovery after surgery so as to improve the visual function and life quality of the patients. So far, the clinical effect of phacoemulsification with intraocular lens implantation has been fully affirmed for age-related cataract^[3-6]. But it is still an urgent task to study for how to evaluate its therapeutic effect and recovery much more comprehensively. The patient's expectation of surgery is not only to improve the vision, but also to improve the life quality^[7]. However, there are few studies focused on this field from the patients' own perspective in China.

As patients' opinions on health care have got more and more attention, patient-reported outcome has been thought as much more important in clinical research. Many studies have shown that Catquest-9SF showed excellent psychological properties and highly sensitive to cataract surgery^[8-11]. There has been study shown that the Chinese version of Catquest-8SF was simple, efficient and suitable for clinical use in southern China^[12], so we planned to study whether Catquest-8SF would be efficient and suitable for clinical use in northern China. Furthermore, we analyzed the patient's satisfaction with the operation combined with the recovery of visual function and the patient-reported outcome, so as to make better clinical guidance for postoperative recovery of age-related cataract and to improve the visual function and life quality of the patients.

SUBJECTS AND METHODS

Ethical Approval This study was approved by the review board of the Central Hospital of Tai'an and followed the tenets of the Declaration of Helsinki. Written informed consent was obtained from all the participants.

Research Tool The Chinese version of Catquest-8SF was developed from the Catquest-9SF using Rasch analysis. The Catquest-9SF was translated into Chinese (Catquest-8SF-CN) and re-translated back into English and cultural modification of the items^[13]. The Catquest-8SF consists of 3 types of items (8 items in total); a global daily life difficulty item (item 1), a global vision satisfaction item (item 2) and a group of 6-items referring to difficulties in performing daily activities, *e.g.* reading books, recognizing people's face, seeing to walk on uneven road (items 3-8; Table 1).

The response categories for questions 1, 3-8 are "yes, very great problems", "yes, great problems", "yes, slight problems", "no, no problems" and "cannot determine". The response category for question 2 "satisfaction with vision" is "very unsatisfied", "fairly unsatisfied", "fairly satisfied", "very satisfied", or "cannot determine". Patients completed the scale at the day before and three months after the operation respectively.

Table 1 Item score and response rate of the Catquest-8SF-CN

Items	Score	Response rates (%)
C1 daily-life activities in general	2.3±0.7	100.0
C2 satisfaction with vision	1.9±0.7	100.0
C3 reading text in the newspaper	1.7±1.3	74.2
C4 recognizing faces of people you meet	2.4±1.0	100.0
C5 seeing prices of goods when shopping	2.1±1.3	87.5
C6 seeing to walk on uneven ground	2.5±1.0	97.5
C7 reading text on television	2.4±1.0	86.7
C8 seeing to carry out a preferred hobby	2.2±1.3	88.3

In order to ensure the comparability of the results and reduce the patients' errors in filling the scale, the survey was hold by the experienced investigator. We also required the patients to fully cooperate with them, tried their best to understand the scale, and to express their feelings carefully. In addition, two investigators hold the survey of the patients to ensure the reliability.

At the same time, we designed the related follow-up questionnaire to record the baseline data such as demographic, visual functional and ocular characteristics of the patients and record the perioperative subjective symptoms such as eye pain. Furthermore, we recorded the patient's satisfaction with the operation and whether the effect met the patient's expectation during the follow-up of 3mo after the surgery. The satisfaction of the operation was based on the Likert five-component scale, which was "very unsatisfied", "fairly unsatisfied", "fairly satisfied", "very satisfied" or "cannot determine".

Subjects Prospective clinical follow-up study was carried out. Age-related cataract patients undergone phacoemulsification with posterior chamber single-focal intraocular lens (SIOL) were included in the study in the Central Hospital of Tai'an during October 2016 to March 2017. The exclusion criteria were: 1) implantation of multifocal intraocular lenses; 2) with history of severe ocular trauma; 3) patients with psychiatric disorders or cognitive disorders.

Presenting visual acuity (PVA) was used to record the vision. PVA means that the patients who normally do not wear glasses record the sight of the naked eyes, and the patients who normally wear glasses record the corrected visual acuity^[14]. PVA was converted to logarithm of the minimum angle of resolution (logMAR) visual acuity when it came to the statistical analysis^[15-16]. A total of 102 patients completed three months follow-up after the operation. The main outcomes of the study were compared with the monocular surgery group and the binocular surgery group.

Preoperative Examination and Treatment Routine physical and ocular examinations were performed to rule out contraindications. Preoperative ocular examinations included the tests of visual acuity, slit lamp microscope, noncontact

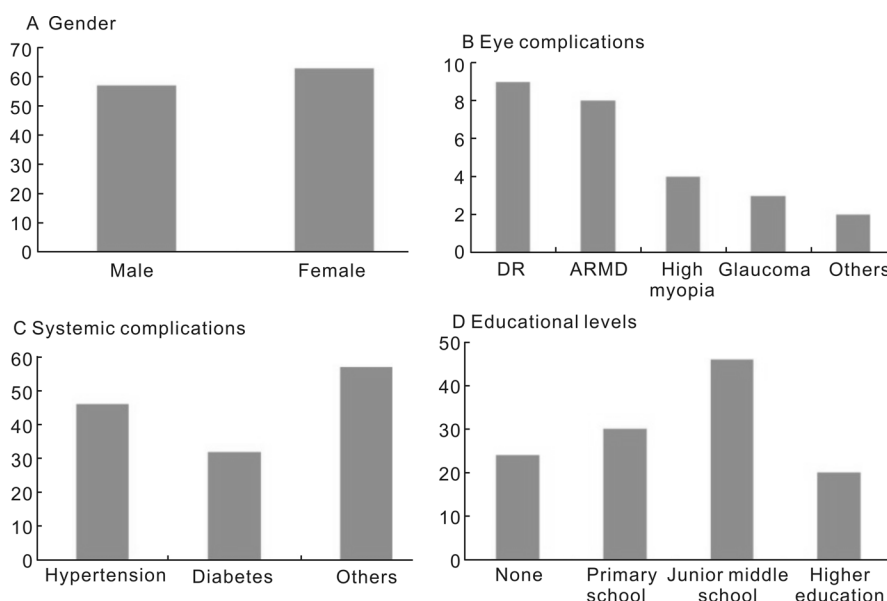


Figure 1 Characteristics of the participants before surgery.

intraocular pressure, direct ophthalmoscope, corneal curvature and axial length. Furthermore, the SRK/T formula was used to calculate the diopter of intraocular lens. The lacrimal passage irrigation was performed before the operation to rule out dacryocystitis. The B-mode ultrasound was applied to examine whether there was retinal detachment or severe vitreous opacity. Optical coherence tomography was used for patients with suspected macular disease. The examination of visual field, optic nerve optical coherence tomography and 24h intraocular pressure was performed for the patients with high intraocular pressure or increasing cup disc ratio. Gatifloxacin, tobramycin and pranoprofen eye drops were given 1-2d before the operation.

Operation Methods Patients were given compound tropicamide eye drops (1 mL/5 mg and 5 mg tropicamide phenylephrine hydrochloride) half an hour before operation for mydriasis. Oxybuprocaine (0.04%) surface anesthesia was given 3 times before the surgery. Routine eye disinfection was done before opening eyelid by blepharostat. Puncture at 2 point of the corneal limbus with 15° knife and sodium hyaluronate was injected into the anterior chamber. The 3 mm clear corneal incision was made at 10 point of the corneal limbus and continuous circular capsulorhexis were made with the diameter of 5.5-6 mm. And then water separation and water stratification were carried out. Stop-and-chop and phacoemulsification were given. The lens cortex was irrigated and absorbed. The anterior chamber was formed with sodium hyaluronate and foldable intraocular lens was implanted into the lens sac. The sodium hyaluronate was irrigated and absorbed and then made the incision watertight. Finally, the surgical eye was covered at the end of the surgery.

Postoperative Treatment and Follow-up Tobramycin dexamethasone eye drops and pranoprofen eye drops were

given to reduce inflammation. Complications such like high intraocular pressure, corneal edema were treated in time. Patients were asked for further follow-up in our hospital after 1, 2wk, 1 and 3mo, with examination of visual acuity, intraocular pressure, slit lamp microscopy, direct ophthalmoscope and optical coherence tomography, fundus fluorescein angiography if necessary.

Statistical Analysis This study used Excel to establish database, and data analysis was carried out using SPSS 22.0 statistical software. Data was presented as mean±SD for continuous variables with normal distribution and frequency (percentage) for categorical variables. Student's *t*-test was used for two groups. The Kruskal Wallis test was used for variables with more than two levels. Mann-Whitney test was used for variables with two levels. Chi-square test was used to compare the proportion of the patients achieving expected improvement between groups. Spearman's rank correlation coefficients were calculated for measuring the strength of the association between binocular weighted logMAR visual acuity and Catquest-8SF score. The significance level was at $P < 0.05$.

RESULTS

The Clinical Feature of the Patients Before the Surgery Phacoemulsification with posterior chamber SIOL was performed and the Catquest-8SF-CN was filled before the surgery in 120 people with 153 eyes (Figure 1).

The mean age of the patients was 67.6y and 63 (52.5%) were women. There were 84 (70.0%) patients combined with hypertension, diabetes and cardio-cerebrovascular disease and other systemic diseases. Besides, there were 26 (23.2%) patients the operative eye with an ocular comorbidity including diabetic retinopathy, age-related macular degeneration and combined with glaucoma *etc.*

Table 2 Item analysis and the Cronbach’s α coefficient of the Catquest-8SF-CN

Items	Total score after deleting this item	Calibration of total correlation coefficient	Cronbach α after deleting this item
C1 daily-life activities in general	15.13	0.587	0.850
C2 satisfaction with vision	15.54	0.472	0.859
C3 reading text in the newspaper	15.73	0.585	0.850
C4 recognizing faces of people you meet	14.99	0.724	0.833
C5 seeing prices of goods when shopping	15.34	0.687	0.836
C6 seeing to walk on uneven ground	14.96	0.721	0.832
C7 reading text on television	14.97	0.733	0.831
C8 seeing to carry out a preferred hobby	15.19	0.482	0.863

Items Score and Response Rate of each Item Items score and response rate of each item was shown in Table 1. Item 3 missed some data and the reason might be 45% patients were under primary education and they did not have the habit of reading newspapers or books.

Analysis of Reliability and Validity of the Catquest-8SF-CN The score of every item were positively correlated with the total score. The Cronbach’s α coefficient of the total scale, daily-activity sub-table and comprehensive-evaluation sub-table were 0.861, 0.853 and 0.748 respectively (Table 2).

The Cronbach’s α coefficient would decline after deleting any item excluded C8. There was high consistency between the two investigators, and the total score of the two investigators were highly correlated (Figure 2).

The value of KMO was 0.876 and the value of Bartlett sphericity was 419.95 ($P<0.001$). The principal component analysis and the maximum variance orthogonal rotation method were used to extract the factors. The cumulative contribution rate was 66.64% (Table 3). Finally, the Catquest-8SF-CN showed the advantages of high internal consistency, reliability, clear factor structure, high variance contribution rate and good structure validity in northern Chinese cataract patients.

The Influence Factors of the Catquest-8SF-CN Score The preoperative score of the Catquest-8SF-CN had a significant negative correlation with preoperative binocular weighted logMAR visual acuity ($r=-0.452$) and the age ($r=-0.335$; both $P<0.05$), while a significant positive correlation with education level ($F=6.094$, $P<0.001$). The patients without systemic comorbidities got higher score than those who with the systemic comorbidities ($P<0.05$). There was no statistically significant difference in the score of patients with different gender and whether with an ocular comorbidity ($P>0.05$; Table 4). Totally 102 patients completed 3mo follow-up with eye examination and questionnaire filling. There was no statistically difference between monocular surgery group and binocular surgery group in terms of sex, age, systemic comorbidities, ocular comorbidity and education ($P>0.05$; Table 5).

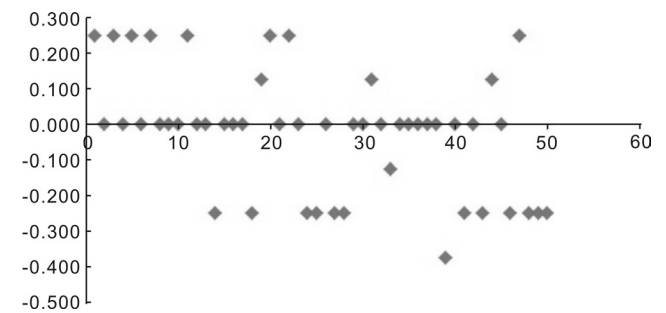


Figure 2 Scatter plot of the results of two reviewers’ measurements
Y-axis show population mean, ± 0.200 shows standard deviation.

Table 3 Result of factor analysis of the Catquest-8SF-CN

Items	The first factor	The second factor
C1 daily-life activities in general	0.249	0.810
C2 satisfaction with vision	0.050	0.892
C3 reading text in the newspaper	0.714	0.203
C4 recognizing faces of people you meet	0.581	0.585
C5 seeing prices of goods when shopping	0.843	0.172
C6 seeing to walk on uneven ground	0.648	0.489
C7 reading text on television	0.619	0.543
C8 seeing to carry out a preferred hobby	0.708	0.059

Table 4 The influence of different genders, cultural degrees, CC and SC on preoperative scale score

Characteristics	<i>n</i>	Score (mean \pm SD)	Statistics (<i>t</i> / <i>F</i>)	<i>P</i>
Male	57	17.35 \pm 6.38	-0.319	0.751
Female	63	17.70 \pm 5.57		
With SC	84	16.83 \pm 6.06	1.995	0.048
Without SC	36	19.17 \pm 5.43		
With CC	26	16.92 \pm 6.13	0.590	0.556
Without CC	94	17.70 \pm 5.92		
Education			6.094	0.000
None	24	13.71 \pm 3.72		
Primary school	30	18.20 \pm 6.16		
Junior high school	46	17.70 \pm 6.21		
High school and above	20	20.75 \pm 5.03		

CC: Ocular comorbidity; SC: Systemic comorbidity.

Significant improvement of visual acuity was observed in both groups ($t=10.404$, $P<0.001$). There was higher improvement

Table 5 Characteristics of the patients at the end of the follow-up

Characteristics	Monocular surgery cohort	Binocular surgery cohort	Statistics (t/c^2)	<i>P</i>
Age (mean±SD)	68.1±10.6	66.4±8.2	0.765	0.446
Gender (M/F)	37/37	12/16	0.415	0.519
CC (<i>n</i> , %)	12 (16.2)	9 (32.1)	0.152	0.076
SC (<i>n</i> , %)	56 (75.7)	21 (75.0)	0.005	0.944
Education (<i>n</i> , %)	18 (24.3)	3 (10.7)	2.789	0.425
None	18 (24.3)	8 (28.6)		
Primary school	30 (40.6)	12 (42.8)		
Junior high school	8 (10.8)	5 (17.9)		
High school and above				

SD: Standard deviation.

Table 6 Score of the questionnaire and binocular weighted visual acuity

Parameters	Monocular surgery cohort	Binocular surgery cohort	Statistics	<i>P</i>	mean±SD
Score of preoperative	17.24±6.51	17.64±5.40	0.289	0.773	
Score of postoperative	28.34±3.84	28.64± 2.11	0.397	0.692	
Score of improvement	11.09±5.47	11.00±5.24	0.079	0.937	
Postoperative visual acuity	0.34±0.27	0.23±0.16	2.69	0.009	
Improvement visual acuity	-0.35±0.30	-0.16±0.18	3.01	0.003	

SD: Standard deviation.

Table 7 The effects of different genders, age, CC and SC on postoperative scale score

Characteristics	Improvement score in monocular surgery group	<i>P</i>	Improvement score in binocular surgery group	<i>P</i>	Total score of improvement	<i>P</i>	mean±SD
With SC	11.71±5.58	0.086	11.38±4.91	0.516	11.62±5.38	0.067	
Without SC	9.17±4.73		9.86±6.41		9.36±5.12		
With CC	11.17±5.83		9.00±4.56		10.24±5.31	0.43	
Without CC	11.08±5.44	0.961	11.95±5.39	0.169	11.28±5.41		
Gender							0.26
Male	11.57±5.72		12.08±5.63		11.69±5.65		
Female	10.62±5.24		10.19±4.96		10.49±5.11		
Age (y)							0.95
≥65	11.11±5.29	0.461	11.06±4.51	0.363	11.10±5.05		
<65	11.07±5.85	0.978	10.91±6.46	0.943	11.03±5.94		

CC: Ocular comorbidity; SC: Systemic comorbidity; SD: Standard deviation.

in logMAR visual acuity in binocular surgery group than in monocular surgery group ($t=-20.77$, $P<0.001$). The postoperative score was significantly higher in both groups than before ($P<0.001$). However, there were no significant difference between the two groups in the preoperative score, postoperative score, and the improved score ($P>0.05$; Table 6). The improvement of the questionnaire score was correlated significantly with the improvement of the visual acuity. The improvement of the total score and the one or binocular surgery group score was not obviously influenced by systemic comorbidity, co-existing ocular comorbidity, sex or age (Table 7).

The Preoperative, Intraoperative and Postoperative Pain

All surgeries were completed under facial anesthesia. The 17 patients (16.7%) had preoperative pain symptom, 33 patients (32.4%) had postoperative pain, and 53 patients (16.7%) had intraoperative pain. Among those who had intraoperative pain,

51 patients (50%) had mild pain and 2 (1.96%) had moderate pain, while no patient with severe pain.

Overall Satisfaction The overall satisfaction included the patients' satisfaction of preoperative examination and communication, the surgical procedure and the postoperative care and recovery. Totally 94 patients (92.2%) were very satisfied or satisfied with the operation; 92 patients (90.2%) thought the surgery achieved their expectations. Three months after the operation, different factors such like gender, age, education level, presence of systemic comorbidities or ocular comorbidities, preoperative/postoperative discomfort and pain in surgery had no obvious effect on satisfaction of patients (Table 8).

Correlation analysis showed that the satisfaction was significantly correlated with the improvement of the scale score ($P<0.05$) and there was no significant correlation

Table 8 The influence of gender, age, etc. on satisfaction

Items	Gender	Age	SC	CC	Education	Uncomfortable preoperative	Uncomfort preoperative	Pain during-operative
Statistics	0.158	1.381	1.899	0.860	4.253	1.383	0.609	4.616
<i>P</i>	0.875 ^b	0.167 ^b	0.058 ^b	0.390 ^b	0.235 ^a	0.167 ^a	0.542 ^b	0.465 ^a

^aKruskal-Wallis test; ^bMann-Whitney test.

Table 9 Correlation analysis between vision and scale score

Statistics	logMAR of postoperative	Improvement of logMAR	Score of postoperative	Score of improvement
<i>r</i>	-0.104	-0.175	0.099	0.205
<i>P</i>	0.296	0.079	0.321	0.039

between satisfaction and postoperative logMAR visual acuity and improved visual acuity ($P>0.05$; Table 9).

DISCUSSION

Age-related cataract is a very common clinical disease. With the increase of the elderly population and the development of surgical technique, the number of phacoemulsification with SIOL for senile cataract will increase steadily. Although many studies have evaluated the effect of cataract surgery on the improvement of the quality of life, but the data on the surgical effect and satisfaction from the patients' own perspective is rare in China. This would be the point which the present study focused on.

Selection and Advantages of the Catquest-8SF-CN Questionnaire The expectation of the patient was not only the improvement of their visual function, but also the improvement of their quality of life. Many studies have shown that Catquest-9SF showed excellent psychological properties and was highly sensitive to cataract surgery, which had also got Rasch analysis verified^[8-11]. This study confirms that the Catquest-8SF-CN is suitable for age-related cataract patients in northern China. It has good reliability and validity. Furthermore, it has good response to cataract surgery. So, we believe that it would be a promising tool worthy of becoming part of a routine clinical assessment for cataract surgery.

Data of 120 patients with age-related cataract had been collected before surgery. The mean age of the patients was 67.6 years, and 63 (52.5%) were women. There were 26 (23.2%) patients the operative eye with an ocular comorbidity including diabetic retinopathy, age-related macular degeneration and combined with glaucoma *etc.* About 45% of the patients had education background of primary school or below while 16.7% of those had high school education or above.

In order to ensure that the survey results were comparable and to reduce the error caused by the patients, we trained the investigators at first. Then they collected the data from the patients by face-to-face interview carefully. In fact, the Catquest-8SF-CN is concise and will not bring any burden to patients, so this is the significant advantage of the Catquest-8SF in the numerous cataract questionnaires.

Item analysis showed that the internal consistency of the items was good. The Cronbach's α coefficient of the total scale, daily-activity sub-table and comprehensive-evaluation sub-table were 0.861, 0.853 and 0.748 respectively. Bland-Altman analysis showed that the reliability of different investigators was good, and the two investigators' items score were highly correlated, which supported that different investigators with standardized training could keep good consistency and stability in the survey.

Postoperative binocular weighted mean visual acuity had been significantly improved than the preoperative visual acuity. Postoperative score increased significantly than the preoperative score. It reflected the sensitivity of this questionnaire to cataract surgery.

The Catquest-8SF-CN consisted of 8 items in total, including a global daily life difficulty item (item 1), a global vision satisfaction item (item 2) and a group of 6-items referring to difficulties in performing daily activities. The latter contains 4 visual function items and 2 active items, which reflected the visual function related quality of life of the cataract patients to some extent. Of course, the Catquest-8SF-CN also has some disadvantages, for example, it does not involve the evaluation of the patient's mental status.

Most scales are designed in highly developed countries, and although the scales are very sensitive to different cultures, most published cataract scale items are similar. Most current scales fail to fully cover all aspects of patient-reported outcomes, and the measurement results between different scales cannot be compared directly. Therefore, developing some intelligent tools on the basis of constructing item pool, customizing special items for special patient groups from the item pool, will be a possible future direction for designing and developing the clinical cataract questionnaire.

Factors Influencing the Catquest-8SF-CN Score Previous studies have shown that visual function related quality of life was significantly correlated to distant visual acuity^[13,17-18]. Our study also found that the preoperative score of the Catquest-8SF-CN and preoperative binocular weighted visual acuity had a significant correlation. The improvement of the postoperative

score were significantly correlated with the improvement of visual acuity. In this study, the score of preoperative scale were significantly negatively correlated with age while gender had no significant influence on the score. The score was negatively correlated with preoperative visual acuity and age. There was a significant difference between different genders in the study of Huang *et al*^[13]. In the study of the Swedish population^[18], gender was one of the influencing factors of the score while age was not. This may be caused by the differences in lifestyle in different living environment.

In this study, it has been observed that the higher of education levels of the patients, the higher preoperative and postoperative score they would get. Score of patients with no systemic comorbidity were significantly higher than those with systemic comorbidity. The improvement score was higher in patients with systemic comorbidity, but lower in patients with an ocular comorbidity. The reasons might be the patients of higher education level would pay more attention on vision loss; thus, they were easier to obtain better clinical treatment. Patients with an ocular comorbidity might visit an ophthalmologist earlier and get earlier treatment, but ocular comorbidity had a certain effect on visual functional related life quality. It reminds us that we should not only consider the visual factors, but also pay attention to the life quality of patients on the timing of the operation. For some patients with high level of education and more social activities or patients with an ocular comorbidity, they were more sensitive to activities limit caused by visual impairment, so the surgical timing should be much earlier than common patients. In addition, gender and age had no significant influence on the improvement score.

Significant improvement of visual acuity was observed in both monocular surgery group and binocular surgery group. There was higher improvement in binocular weighted mean visual acuity in binocular surgery group than in monocular surgery group. The postoperative score was significantly higher in both groups than before. However, there were no significant difference between the two groups in the preoperative score and postoperative score and the improved score. So, the recovery of visual acuity and vision related quality of life improvement were not always consistent. Binocular surgery could improve the patients' visual function better but monocular surgery can achieve the improvement of visual function related quality of life similar with binocular surgery. This is consistent with previous findings^[19-20].

Factors Influencing Satisfaction of the Operation Three months after the surgery, we found that the overall satisfaction was high by using the Catquest-8SF-CN, and the majority of patients thought the surgical treatment results achieved their expectation. The degree of satisfaction was significantly correlated with the total score of the postoperative scale,

postoperative visual acuity and the improved visual acuity. Besides, patients' satisfactions were also correlated with their expectation of the surgery. Different gender, age, educational level, systemic comorbidity, ocular comorbidity, preoperative or postoperative eye discomfort, and intraoperative pain level had no significant influence on satisfaction. The satisfaction of the surgery was not always consistent with the clinical vision, for it was also influenced by the patients' expectation and the visual function related life quality. Some patients who had improved visual acuity were not satisfied with the outcome because they had too high expectations for the effects of surgery. While some patients who had an ocular comorbidity, although their visual acuity improvement was not obvious, but in the daily life environment they could see better, combined with good preoperative communication, they were often satisfactory. This was consistent with previous findings^[21-22], which showed that patient satisfaction was not only related to the clinical effect, but also related to the patients' expectations. The study of Pager^[23] showed that displaying the visual prognosis and the risk of the surgery with a simple video may improve patients' understanding of surgery and satisfaction, so that to reduce the preoperative anxiety than simply to show the anatomical structure. The study of Tipotsch-Maca *et al*^[24] showed that multimedia presentations could help patients, especially elderly patients, to understand the operation better and improve their satisfaction. This reminded us that we should attach great importance to the way of preoperative communication with patients, such as using multimedia and communicating with patients according to their individual condition. In this way, patients would have the sufficient understanding and appropriate expectations of surgery, so as to improve their satisfaction. The results of the survey on the satisfaction of phacoemulsification with posterior chamber SIOL were quite different among different studies. Previous study of Chen^[25] showed that satisfaction was associated with visual acuity improvement, age, duration, education, career, payment method, or ability to meet reading etc. Another study^[26] showed that patients' satisfaction was related to the education level, the combination of systemic and ocular diseases, preoperative vision level, and the degree of turbidity of cataracts through the study of cataract patients in southern China. Half of the patients in this study had mild eye pain and eye swelling discomfort during the surgery and 1/3 patients suffered from postoperative eye pain, dryness and foreign body sensation. But the statistical analysis showed those who had no significant effect on overall satisfaction. This suggested that the mild pain, dryness and foreign body sensation during and after the operation did not cause great distress to the patients compared with the recovery of visual acuity and the improvement of the visual functional related quality of life

three months after the surgery. Besides, the overall satisfaction of patients for operation is also influenced by other factors. Mokashi *et al*^[27] believed that the communication between the patients during the surgery could alleviate the anxiety and improve the patients' satisfaction.

We found that the Catquest-8SF-CN is reliability and validity, short and easy to use. Our study also found that the Catquest-8SF-CN was highly responsive to cataract surgery in northern Chinese. It could evaluate the patient-reported outcome conveniently, so it could be used as part of a routine clinical assessment for cataract surgery. There was significantly correlation between the improvement of score and visual acuity. Binocular surgery could improve the patients' visual function better, but monocular surgery could also achieve the similar improvement of the visual functional related quality of life. The influence factors of the score also reminded us that we should not only consider the visual function, but also consider the life quality of the patients in the timing of the surgery, so that to make a more reasonable treatment plan for patients' individual need.

The degree of satisfaction was significantly correlated with the total score of the postoperative scale, postoperative visual acuity and the improved visual acuity. Furthermore, patients' satisfaction was also correlated with their expectation of the surgery. It reminds us that we should attach great importance to the way of preoperative communication with patients, such as using multimedia and communicating with patients according to their individual condition. In this way, patients would have the sufficient understanding and appropriate expectations of surgery, so as to improve their satisfaction.

ACKNOWLEDGEMENTS

Foundations: Supported by the Natural Scientific Foundation of Shandong Province (No.ZR2014CL011); the High-School Scientific Research Development Program of Shandong Province (No.2016J16LL57); the Tai'an City Science and Technology Planning Program (No.2017NS0156).

Conflicts of Interest: Wang SX, None; Liu X, None; Du YH, None; Liu WJ, None; Liu P, None; Li YC, None; Wu XY, None.

Peer Review File: Available at: http://ier.ijo.cn/gjykier/ch/reader/download_attache_file.aspx?seq_id=20210325152838001&flag=1&journal_id=gjykier&year_id=2020&issue=3

REFERENCES

- 1 Ge J. *Ophthalmology*. Beijing:People's Medical Publishing House, 2010:209.
- 2 Zou HD. The problems and challenges in the current eye health management in China. *Zhonghua Yan Ke Za Zhi* 2017;53(7):481-483.
- 3 Lundström M, Barry P, Henry Y, Rosen P, Stenevi U. Visual outcome

of cataract surgery; study from the European registry of quality outcomes for cataract and refractive surgery. *J Cataract Refract Surg* 2013;39(5):673-679.

4 Lundström M, Goh PP, Henry Y, Salowi MA, Barry P, Manning S, Rosen P, Stenevi U. The changing pattern of cataract surgery indications: a 5-year study of 2 cataract surgery databases. *Ophthalmology* 2015;122(1):31-38.

5 Mönestam E. Long-term outcomes of cataract surgery: 15-year results of a prospective study. *J Cataract Refract Surg* 2016;42(1):19-26.

6 Hahn U, Krummenauer F, Kölbl B, Neuhann T, Schayan-Araghi K, Schmickler S, von Wolff K, Weindler J, Will T, Neuhann I. Determination of valid benchmarks for outcome indicators in cataract surgery: a multicenter, prospective cohort trial. *Ophthalmology* 2011;118(11):2105-2112.

7 Colin J, El Kebir S, Eyedoux E, Hoang-Xuan T, Rozot P, Weiser M. Assessment of patient satisfaction with outcomes of and ophthalmic care for cataract surgery. *J Cataract Refract Surg* 2010;36(8):1373-1379.

8 Lundström M, Pesudovs K. Questionnaires for measuring cataract surgery outcomes. *J Cataract Refract Surg* 2011;37(5):945-959.

9 McAlinden C, Gothwal VK, Khadka J, Wright TA, Lamoureux EL, Pesudovs K. A head-to-head comparison of 16 cataract surgery outcome questionnaires. *Ophthalmology* 2011;118(12):2374-2381.

10 Khadka J, McAlinden C, Pesudovs K. Quality assessment of ophthalmic questionnaires: review and recommendations. *Optom Vis Sci* 2013;90(8):720-744.

11 Fung SS, Luis J, Hussain B, Bunce C, Hingorani M, Hancox J. Patient-reported outcome measuring tools in cataract surgery: Clinical comparison at a tertiary hospital. *J Cataract Refract Surg* 2016;42(12):1759-1767.

12 Khadka J, Huang JH, Chen HS, Chen CW, Gao RR, Bao FJ, Zhang SF, Wang QM, Pesudovs K. Assessment of cataract surgery outcome using the modified Carquest short-form instrument in China. *PLoS One* 2016;11(10):e0164182.

13 Huang JH, Chen HS, Gao RR, Zhang SF, Bao FJ, Wang QM. Development and assessment of a revised Chinese version of the Catquest 9SF questionnaire for a Chinese cataract population. *Chin J Optom Ophthalmol Vis Sci* 2015;17(7):402-406.

14 Li JJ, Zhao JY, He MG. Meeting minutes of Chinese medical association ophthalmology branch cataract group in 2010. *Journal of Practical Preventing Blind* 2011;06(1):23-24.

15 Holladay JT. Visual acuity measurements. *J Cataract Refract Surg* 2004;30(2):287-290.

16 Bailey IL, Lovie JE. New design principles for visual acuity letter charts. *Am J Optom Physiol Opt* 1976;53(11):740-745.

17 Lundström M, Pesudovs K. Catquest-9SF patient outcomes questionnaire. *J Cataract Refract Surg* 2009;35(3):504-513.

18 Gothwal VK, Wright TA, Lamoureux EL, Lundström M, Pesudovs K. Catquest questionnaire: re-validation in an Australian cataract population. *Clin Exp Ophthalmol* 2009;37(8):785-794.

19 Sach TH, Foss AJ, Gregson RM, Zaman A, Osborn F, Masud T, Harwood RH. Second-eye cataract surgery in elderly women: a cost-

utility analysis conducted alongside a randomized controlled trial. *Eye (Lond)* 2010;24(2):276-283.

20 Zuo L, Zhang JH, Zou HD, Fu HQ, Fei XF, Xu WQ. Impact of monocular or binocular cataract surgery on Vision health related quality of life. *Journal of Shanghai Jiao Tong University* 2012;32(11):1501-1505.

21 Pager CK. Expectations and outcomes in cataract surgery: a prospective test of 2 models of satisfaction. *Arch Ophthalmol* 2004;122(12):1788-1792.

22 Garcia-Gutierrez S, Quintana JM, Aguire U, Barrio I, Hayas CL, Gonzalez N. Impact of clinical and patient-reported outcomes on patient satisfaction with cataract extraction. *Health Expect* 2014;17(6):765-775.

23 Pager CK. Randomised controlled trial of preoperative information to improve satisfaction with cataract surgery. *Br J Ophthalmol* 2005;89(1):10-13.

24 Tipotsch-Maca SM, Varsits RM, Ginzel C, Vecsei-Marlovits PV. Effect of a multimedia-assisted informed consent procedure on the information gain, satisfaction, and anxiety of cataract surgery patients. *J Cataract Refract Surg* 2016;42(1):110-116.

25 Chen LX. Analysis of postoperative patients' satisfaction of phacoemulsification. *Chinese Journal of Ocular Trauma & Occupational Eye Disease* 2007;29(5):333-335.

26 Chen ZY, Lin XC, Qu B, Gao WY, Zuo YJ, Peng WY, Jin L, Yu MB, Lamoureux E. Preoperative expectations and postoperative outcomes of visual functioning among cataract patients in urban Southern China. *PLoS One* 2017;12(1):e0169844.

27 Mokashi A, Leatherbarrow B, Kincey J, Slater R, Hillier V, Mayer S. Patient communication during cataract surgery. *Eye (Lond)* 2004;18(2):147-151.