The Assessment of Impaired Visual Functioning Due to Cataract

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Abstract

The aim of this study was to investigate the relationship between objective and subjective measures of visual function in patients booked for cataract surgery. Visual acuity is the traditional objective measure of vision and yet this clinical measure can be difficult to equate with patients' symptoms. One hundred subjects who were booked for first eye cataract surgery were recruited from the Royal Victorian Eye & Ear Hospital. Snellens visual acuity was recorded. Subjective visual function was assessed by a questionnaire related to performance of everyday tasks. Results show no straightforward relationship between self-reported visual functioning and visual acuity. No correlation was found between visual acuity in the eye to be operated on (worse eye) and the visual functioning questionnaire. However, a moderate correlation (*rho= -0.403, p= 0.0001*) was found between visual acuity in the better eye and visual functioning. Visual functioning is more closely related to visual acuity in the better eye but cannot be fully explained by it. In assessing the timing of cataract surgery, self-reported visual functioning may be a more important indicator than visual acuity alone.

Key Words:
Cataract, visual acuity, visual functioning.

Introduction

Cataract is the most common cause of blindness and visual impairment in the elderly population, with 95% of the population over 65 years of age having lens opacities[1]. In 1996, 11% of Australia's population were over 65 years old. By 2042 this is expected to double to 22%[2]. With the advances of cataract rehabilitation of the last decades, cataracts are being operated on at ever earlier stages, with the number of operations performed doubling in the last 10 years[2] and cataract surgery now being the second most common major surgical procedure performed[3]. The advances in technology, together with the aging of the population are resulting in an ever increasing strain on the health care budget.

Opacities form in the lens as part of the normal aging process[1]. It is not until these opacities interfere with vision and have an impact on everyday activities that surgical intervention is required. Judging the most appropriate time for surgery is important for the patient so that lifestyle can be maintained while unnecessary surgery is avoided.

The symptoms of cataract are essentially a disturbance, then a diminution and finally a failing of vision[1]. Visual disturbances are varied and include myopic shift, possible astigmatism change, monocular diplopia, polyopia, colour vision change, reduced field of vision and disabling glare[4]. In the clinical setting impaired vision due to cataract is traditionally measured by visual acuity. The limitations of visual acuity as a measure of visual function are well known. Visual acuity uses high contrast black letters on a white background in a well lighted environment at a standard distance. This can be difficult to translate

into functioning in the 'real' world where objects are of different shapes, sizes, contrast and colour. A measure of visual acuity does not necessarily reflect a patient's visual functioning or the symptoms associated with cataract. Indeed it can be difficult to equate a patient's symptoms with the objective measure of visual acuity. Numerous studies[5-11] have shown no straightforward relationship between visual acuity and a patient's symptoms. Although finding a linear trend with visual functioning decreasing as acuity decreases, correlations between the two have been only in the poor to moderate range.

Functional impairment due to cataract may be evaluated by the use of questionnaires. In 1981, Bernth-Petersen[5] devised a Visual Functioning Index. In 1992, Mangione et al[10] developed the Activities of Daily Vision Scale and in 1994 Steinberg et al[11] produced the VF 14. Questions are asked about everyday activities such as reading, driving and watching television, resulting in a score which gives a level or grade of functional disability.

This study aimed to further investigate the relationship between objective and subjective measures of visual function in patients booked for cataract surgery.

Method

Subjects

The subjects were 100 patients, 41 males and 59 females ranging in age from 48 years to 91 years with a mean age of 74 years. All were attending the outpatients department, Royal Victorian Eye & Ear Hospital and had been booked for cataract surgery. Subjects were excluded if they had a previous intraocular lens, myopia greater than 5 dioptres, were booked for a simultaneous ocular procedure or did not have enough English skills to complete the questionnaire.

Apparatus

The questionnaire chosen to assess impairment of visual functioning was the VF 14, an Index of Functional Impairment In Patients with Cataract, developed by the Cataract Patient Outcome Research Team[11] in 1994. Questions relate to everyday activities including seeing steps, writing cheques, playing table games, taking part in sports, cooking, reading small print, doing fine handiwork, reading a newspaper or a book, daytime driving, night driving, reading traffic signs, reading large print and recognising people. Subjects were asked to rate the degree of difficulty they had with each activity because of their vision, with 0 being inability to do the activity and 4 no difficulty at all with the activity. A score out of 100 resulted, with 0 being inability to do any of the activities because of vision and 100 being able to do all the activities without difficulty. Subjects were also asked about their overall satisfaction with their vision and a Satisfaction Score between 1 and 4 was given, with 1 being very dissatisfied with vision and 4 very satisfied with vision. Visual acuity was measured on the Snellen chart, a standard instrument used in the clinical setting.

Procedure

Patients attending clinics for their pre-operative assessment were invited to participate. Informed consent was obtained and the subject was interviewed. Interviews took up to ten minutes to complete. The most recent recording of Snellens visual acuity using the patient's current glasses was taken from the medical records. Demographic details, ocular comorbidity and cataract type when available, were also gained from patient records.

Characteristics	% of Participants
Gender	
Male	41
Female	59
Country of Birth	
Australia	51
Other	49
Ocular Comorbidity(29%)	
ARMD	11
Glaucoma	10
Diabetic Retinopathy	2
Other	6
Cataract Type	
Cortical	8
Nuclear	25
PSC	14
Mixed	20

Table 1 *Demographic and Ocular details*

Design and Analysis

In this study there were 3 variables, the VF 14 questionnaire measured on a 100 point scale, visual acuity converted into a scale of 1 to 10 and Satisfaction Score measured on a 4 point scale. Each of the variables was treated as ordinal data and the correlation coefficient used was Spearman's Rho with p values set at 0.05.

Results

Demographic and ocular details are shown in Table 1.

Visual acuity in the eye to be operated on ranged from 6/9 to PL (perception of light) with a median acuity of 6/24. Visual acuity in the

Table 2 *Distribution of Visual Acuity in Worse and Better Eyes.*

	Worse eye (Eye Booked for Cataract Surgery)	Better eye (Eye Not Booked for cataract surgery)
Visual Acuity	**N = 100**	**N = 100**
6/4		2
6/5		8
6/6		16
6/9	17	25
6/12	17	26
6/18	16	11
6/24	12	5
6/36	16	4
6/60	7	1
less than 6/60	15	2

better eye ranged from 6/4 to less than 6/60 with a median acuity of 6/9 (Table 2).

The VF 14 scores ranged from 13 to 100 with a mean of 71 (Table 3). The Satisfaction Scores are shown in Table 4.

Table 3 *Distribution of VF 14 scores pre-op.*

VF 14	Nº.
0-10	0
11-20	2
21-30	0
31-40	4
41-50	10
51-60	12
61-70	17
71-80	19
81-90	21
91-100	15

Satisfaction and VF 14 Scores

Using Spearman's Rho a statistically significant relationship was found between Satisfaction Scores and VF 14 scores (*rho = 0.631, p = 0.001*).

Visual Acuity and VF 14

Using Spearman's Rho no relationship was found between visual acuity in the eye to be operated on (worse eye) and the VF 14 (*rho = -0.123, p = 0.2215*). However, a statistically significant relationship was found between visual acuity in the better eye and the VF 14 (*rho = -0.403, p = 0.0001*).

Table 4 *Distribution of Satisfaction Scores pre-op.*

Satisfaction Score	Nº. of subjects
1 (very dissatisfied)	28
2 (dissatisfied)	55
3 (satisfied)	17
4 (very satisfied)	0

Visual Acuity and Satisfaction Score

Using Spearman's Rho no statistically significant relationship was found between visual acuity in the worse eye and the Satisfaction Score (*rho = -0.136, p = 0.1768*). However, a statistically significant relationship was found between visual acuity in the better eye and the Satisfaction Score (*rho = -0.244, p = 0.0152*).

Discussion

Satisfaction Scores & VF 14

This present study found a strong correlation between the two subjective methods of assessing visual function, the Satisfaction Score and the VF 14 scores. This agrees with Mangione et al[10] who also found a high correlation of 0.70 using the Activities of Daily Vision questionnaire. Steinberg et al[11] found a moderate correlation of 0.34 using the VF 14 questionnaire. A good correlation between the two subjective methods of assessing visual function would be expected.

Visual Acuity and Visual Functioning (VF 14)

This study found no statistically significant relationship between visual acuity in the eye to be operated on and visual functioning as measured by the VF 14. This would suggest the ability of subjects to perform daily living tasks is not determined by the vision in the worse eye and it is not until the vision in the other eye becomes impaired that these activities are affected. This finding agrees with Steinberg et al[11] who also found no correlation (*r = -0.08*) between vision in the worse eye and visual functioning as measured by the same questionnaire. In contrast Elliott et al[8] found a statistically significant relationship between vision in the worse eye and reading vision (*r =0.46*) and mobility (*r = 0.52*).

This present study demonstrated that vision in the better eye is significantly correlated with visual functioning (*r = -0.403*), that is, as visual acuity becomes worse so does the subjective reporting of visual functioning. Although the correlation is statistically significant it is only of moderate strength, suggesting that some subjects function well in spite of poor acuity, while others with good acuity have poor functioning.

These findings agree with Steinberg et al[11] who found a correlation of *-0.27* between vision in the better eye and visual functioning. Bernth-Petersen[5] also found a positive relationship between visual acuity in the better eye and reading vision.

Elliott et al[8] found a moderate correlation between vision in the better eye and reading ability (*r = 0.42*) but no significant relationship between vision in the better eye and mobility.

Other studies have compared visual functioning with binocular visual acuity as this presents a more normal state for the patient. Lundstrom et al[9] and Mangione et al[10] found weak but significant relationships between binocular vision and visual functioning (*r = 0.2825 and r = 0.37 respectively*). These studies suggest that binocular visual acuity equates with better eye visual acuity. A blurred image in one eye may well affect visual comfort rather than visual acuity and some patients report clearer vision if one eye is closed.

Visual Acuity and Satisfaction Score

This study found no relationship between vision in the eye to be operated on and Satisfaction Score but did find a statistically significant but weak correlation (*r = -0.244*) between vision in the better eye and Satisfaction Score. This suggests that some people with poor acuity are satisfied with their vision, while others with good acuity are not. Steinberg et al[11] found a similar non-significant relationship with vision in the worse eye, but also found no relationship between vision in the better eye and satisfaction (*r = -0.01*).

Conclusion

This study demonstrated that there is indeed a relationship between visual acuity and subjective visual functioning but the relationship is not straightforward. Satisfaction with vision and visual functioning are more dependent on acuity in the better eye but the relationship is only a moderate one. Poor visual acuity can be reflected by poor visual functioning, but not in all cases. Likewise, not all patients with good acuity function well. When assessing the need for cataract surgery in the absence of lens induced disease, the patient's visual functioning and their satisfaction with vision may be more important indicators than a measure of visual acuity alone. A patient's satisfaction with the outcomes of cataract surgery depend on the level of pre-operative impairment. If there is very little pre-operative impairment, outcomes are likely to be disappointing. Schein et al[12] linked poor outcomes of cataract surgery with a pre-operative VF 14 score of 90 or greater. Patients need to understand the reason for their surgery and the likely outcomes, in order to make an informed decision regarding the need for such surgery and whether the likely benefits outweigh the potential risks, costs and inconvenience of surgery.

These 100 subjects will be interviewed 3 months following cataract surgery and outcomes will be measured by Satisfaction Scores and VF 14 as well as the traditional measure of visual acuity.

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