Correlation between visual function and visual ability in patients with uveitis

A M Gardiner, R A Armstrong, M C M Dunne, P I Murray

Aim: To investigate the correlation between tests of visual function and perceived visual ability recorded with a quality of life questionnaire for patients with uveitis.

Methods: 132 patients with various types of uveitis were studied. High (monocular and binocular) and low (binocular) contrast logMAR letter acuities were recorded using a Bailey-Lovie chart. Contrast sensitivity (binocular) was determined using a Pelli-Robson chart. Vision related quality of life was assessed using the Vision Specific Quality of Life (VQOL) questionnaire.

Results: VQOL declined with reduced performance on the following tests: binocular high contrast visual acuity (p = 0.0011), high contrast visual acuity of the better eye (p = 0.0012), contrast sensitivity (p = 0.003), binocular low contrast visual acuity (p = 0.0065), and high contrast visual acuity of the worse eye (p = 0.015). Stepwise multiple regression analysis revealed binocular high contrast visual acuity (p < 0.01) to be the only visual function adequate to predict VQOL. The age of the patient was also significantly associated with perceived visual ability (p < 0.001).

Conclusions: Binocular high contrast visual acuity is a good measure of how uveitis patients perform in real life situations. Vision quality of life is worst in younger patients with poor binocular visual acuity.
A total of 132 patients were included in the study comprising 75 females and 57 males aged between 18 and 83 years (median 43 years). There were 81 patients with panuveitis, 34 with anterior uveitis, 13 with intermediate uveitis, and four with posterior uveitis classified according to the International Uveitis Study Group classification. The associated diseases/syndromes are shown in Table 1. Unilateral involvement was found in 50 patients and bilateral in 82, giving a total of 214 eyes.

### Table 1: Associated diseases/syndromes in 132 uveitis patients

<table>
<thead>
<tr>
<th>Associated syndromes</th>
<th>No of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuchs’ heterochromic cyclitis</td>
<td>19</td>
</tr>
<tr>
<td>Sarcoidosis</td>
<td>13</td>
</tr>
<tr>
<td>Behcet’s syndrome</td>
<td>10</td>
</tr>
<tr>
<td>Herpesvirus (herpes simplex type 1, varicella zoster)</td>
<td>9</td>
</tr>
<tr>
<td>Sclerouveitis</td>
<td>8</td>
</tr>
<tr>
<td>HLA-B27</td>
<td>7</td>
</tr>
<tr>
<td>Vogt-Koyanagi-Harada syndrome</td>
<td>3</td>
</tr>
<tr>
<td>Demyelination</td>
<td>2</td>
</tr>
<tr>
<td>Toxoplasmias</td>
<td>2</td>
</tr>
<tr>
<td>Systemic lupus erythematosus</td>
<td></td>
</tr>
</tbody>
</table>

All patients were tested using their distance refractive correction if necessary. If the current treatments of the uveitis required dilatation of one or both pupils, then the tests were carried out under these conditions. The effects of pupil size, accommodation, and illumination on retinal image quality are well recognised, but we were assessing the patient under “real life” conditions.

### Tests of visual function

Photopic lighting conditions were provided by two fluorescent strip lamps that were used to illuminate the test charts. All tests were carried out in the same room and in the same order by one examiner (AMG). The order of the tests of visual function was as follows:

1. Monocular high contrast visual acuity (VA worse eye/better eye)
2. Binocular high contrast visual acuity (HCVA binocular)
3. Binocular low contrast visual acuity (LCVA binocular)
4. Contrast sensitivity (CS)
5. Vision Specific Quality of Life (VQOL) questionnaire.

### High and low contrast visual acuity

High contrast (monocular and binocular) and low contrast (binocular) distance visual acuity was measured with an externally illuminated Bailey-Lovie chart positioned at a distance of 3 metres from the observer. The test distance was altered to 1 metre if a patient had very low vision. A Minolta spot photometer was used to ensure that chart luminance fell within the recommended range. To avoid familiarisation with the letters on the chart, two versions of the Bailey-Lovie charts were used.

### Contrast sensitivity

Contrast sensitivity was measured using a Pelli-Robson chart. The chart was viewed binocularly, at a distance of 1 metre from the observer. The measurement procedure has been described previously. Patients were encouraged to guess if they could not see the letters, so the test was truly forced choice.

### Vision Specific Quality of Life Questionnaire

Vision related quality of life (perceived visual ability) was assessed using the core module (VCM1) of the Vision Specific Quality of Life (VQOL) questionnaire. The VCM1 consists of 10 items that ask the patient general questions about the global quality of their vision and any concerns, anxieties, or problems they experience with regard to their visual impairment. Issues included embarrassment, anger, depression, loneliness, fear of deterioration in vision, safety in the home, safety outside the home, coping with everyday life, inability to do preferred activities, and life interference. The patients completed the VQOL questionnaire unless their eyesight was too poor to enable them to read it. If this was the case, the examiner administered the questionnaire. All patients were given the same instructions and the past month was used as the time frame for the questions. Each question had equal weighting: 0 indicating no problem and 5 indicating extreme problems. The final score was recorded as the arithmetic mean.

### Statistical analysis

Pearson’s correlation coefficients ($r$) between the quality of life score and each visual function test were calculated and a hypothesis test conducted to assess significance. The coefficient of determination ($r^2$) was used to determine the percentage of the variance of quality of life score, which can be attributed to its linear regression on each visual variable. Individual correlations can be misleading because of intercorrelations between the variables. Hence, a stepwise multiple
regression was performed by the forward method to identify which variables influenced quality of life score and their order of importance. We do not believe the data depart that much from normality to invalidate the tests used.

RESULTS

The range of scores obtained for each visual function test is shown in Table 4. VQOL score and HCVA (better eye) exhibit the highest and lowest variabilities respectively. In addition, HCVA (worse eye) exhibited a higher variability than HCVA (better eye).

A linear regression plot of HCVA (binocular) against VQOL score is shown in Figure 1. The data show a wide scatter but the regression of HCVA (binocular) on VQOL is statistically significant \( r = 0.28, p = 0.0011 \), suggesting that VQOL declined with reduced performance for HCVA (binocular); the regression accounting for 8% of the variance in VQOL. The correlation coefficients for the data as a whole are shown in Table 5. VQOL also declined with reduced performance for HCVA (worse eye) \( r = 0.21, p = 0.0015 \); HCVA (better eye) \( r = 0.28, p = 0.0012 \); HCVA (binocular) \( r = 0.28, p = 0.0011 \); LCVA (binocular) \( r = 0.24, p = 0.0065 \); CS (binocular) \( r = 0.24, p = 0.0005 \). In addition, since low CS scores represent poor test performance, CS was the only visual function to exhibit an inverse relation with VQOL \( r = 0.24, p = 0.005 \).

The results of the stepwise multiple regression analysis by the forward method are shown in Table 6. Only two X variables, HCVA (binocular) and age were selected as significantly related to VQOL; the two variables accounting for 15% of the variance in VQOL. In addition, extrapolating from the regression formula \( VQOL = 2.34 + 1.57VA \) (binocular) \( r = 0.24, p = 0.0011 \) suggests that quality of life is particularly poor in younger patients with reduced binocular visual acuity.

DISCUSSION

Uveitis can be a distressing and visually disabling disease. This study was designed to investigate the correlation between tests of visual function and perceived visual ability recorded with a quality of life questionnaire. We hoped to identify how uveitis affected the patient in the “real world” setting.

Regression analysis showed that all of the tests of visual function exhibited a statistically significant correlation with VQOL. Nevertheless, stepwise regression analysis revealed that HCVA (binocular) exerted the greatest influence on VQOL. Age was also statistically significantly associated with quality of life, with young people being more affected. This might be because visual deterioration in youth has the greatest impact on working life.

The correlation between perceived visual ability and visual function will, to some extent, be specific to the cause of reduced vision and the type of visual function affected by the disease. Previous studies, investigating the relation between visual function and quality of life, have also reported that HCVA had the highest correlation. Other studies, however, disagree. A study on patients with central field loss showed that LCVA was the best predictor of perceived visual ability. Binocular measurements of CS were most highly correlated with perceived visual disability in cataract patients.

Perceived visual ability is not solely dependent on visual variables alone. Emotional or psychological factors also contribute to how well a patient believes he/she can see. Support for this comes from the observation that none of the visual functions tested in this study could account for more than 8% of the variance in VQOL.

A study on the psychological aspects of visual impairment, stated that a subjective perception of visual impairment is much more meaningful than objective measurements of vision. People create their own perceptions and often see the same situation very differently. Deterioration in the self reported quality of life of patients can be a result of anxiety that may occur prior to the stage where real difficulties are experienced.

A recent study showed that uveitis was associated with markedly reduced visual functioning using the NEI VFQ-25.
questionnaire. General health status (using a SF-36 questionnaire) was also significantly lower in uveitis patients than in the general population.

The predominant cause of visual loss in our uveitis patients was macular pathology, particularly cystoid macular oedema, which is in agreement with other studies.

It is clear from this study that uveitis has devastating effects on visual acuity and that this visual impairment interferes with the perceived visual ability of these patients, particularly in the younger patient. As most individuals with uveitis are of working age, employment, family, and social pressures may intensify the stress caused by visual impairment.

Adequate support from family, friends, clinicians and special organisations is essential in managing visual impairment. Some uveitis patients who suffer severe visual loss in one or both eyes are eligible for blind or partial sight registration. Others, however, do not meet the criteria necessary for registration and yet these individuals may have a very poor perceived visual ability. Therefore, it is imperative that clinicians thoroughly examine the effects of uveitis on both visual functions and perceived visual ability when considering the management, treatment, and support of this group of patients.

ACKNOWLEDGEMENTS

This study was supported by a seedling grant from City Hospital NHS, Birmingham. We are grateful to Mr NA Frost for his assistance with the Vision Specific Quality of Life (VQOL) questionnaire.

Authors’ affiliations

A M Gardiner, P A Armstrong, M C M Dunne, Vision Sciences, Aston University, Birmingham, UK

A M Gardiner, P I Murray, Academic Unit of Ophthalmology, University of Birmingham, Birmingham, UK

REFERENCES


www.bjophthalmol.com