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<th>The Association Between Clinical Parameters And Glaucoma-specific Quality Of Life In Chinese Primary Open-angle Glaucoma Patients</th>
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A B S T R A C T

Objective: To investigate the association between clinical measurements and glaucoma-specific quality of life in Chinese glaucoma patients.

Design: Cross-sectional study.

Setting: An academic hospital in Hong Kong.

Patients: A Chinese translation of the Glaucoma Quality of Life–15 questionnaire was completed by 51 consecutive patients with bilateral primary open-angle glaucoma. The binocular means of several clinical measurements were correlated with Glaucoma Quality of Life–15 findings using Pearson’s correlation coefficient and linear regression. The measurements were the visual field index and pattern standard deviation from the Humphrey Field Analyzer, Snellen best-corrected visual acuity, presenting intra-ocular pressure, current intra-ocular pressure, average retinal nerve fibre layer thickness via optical coherence tomography, and the number of topical anti-glaucoma medications being used.

Results: In these patients, there was a significant correlation and linear relationship between a poorer Glaucoma Quality of Life–15 score and a lower visual field index ($r=0.3$, $r^2=0.1$, $P=0.01$) and visual acuity ($r=0.3$, $r^2=0.1$, $P=0.03$). A thinner retinal nerve fibre layer also correlated with a poorer Glaucoma Quality of Life–15 score, but did not attain statistical significance ($r=0.3$, $P=0.07$). There were no statistically significant correlations for the other clinical parameters with the Glaucoma Quality of Life–15 scores (all $P$ values being $>0.7$). The three most problematic activities affecting quality of life were “adjusting to bright lights”, “going from a light to a dark room or vice versa”, and “seeing at night”.

Conclusion: For Chinese primary open-angle glaucoma patients, binocular visual field index and visual acuity correlated linearly with glaucoma-specific quality of life, and activities involving dark adaptation were the most problematic.

ORIGINIAL ARTICLE

The association between clinical parameters and glaucoma-specific quality of life in Chinese primary open-angle glaucoma patients

Jacky WY Lee *, Catherine WS Chan, Jonathan CH Chan, Q Li, Jimmy SM Lai

Introduction

In clinical practice, much time is spent on measuring the clinical parameters of glaucoma including the intra-ocular pressure (IOP), visual acuity (VA), visual field, and retinal nerve fibre layer (RNFL) thickness. What is often neglected is the quality of life (QOL) of patients and how well they live with their disease on a day-to-day basis. Glaucoma affects 80 million people worldwide.1 It is a chronic and irreversible disease with a heavy burden on visual function and vision, besides being one of the most important constituents affecting QOL.2-4

Recourse to QOL questionnaires in glaucoma can be broadly divided into general health–related, vision-specific, or glaucoma-specific.5 Quality-of-life assessment in glaucoma patients is as important

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as the clinical parameters used to measure glaucoma progression, because it reflects the impact of the ocular disease on the patient as a whole and may also be an indicator of whether the disease is advancing.\(^4\)\(^6\)\(^9\)

Using generic QOL assessments, glaucoma was found to have deleterious impact as other systemic chronic diseases like osteoporosis, diabetes, or dementia.\(^10\) However, such generic tests do not address the end points of glaucoma, such as visual impairment and visual field constriction, for which reason their robustness and specificity are limited.\(^10\) There are approximately 18 different patient-reported QOL assessments specific to glaucoma. Among these, the Glaucoma Quality of Life–15 Questionnaire (GQL-15) and the Vision and Quality of Life Index have been found most satisfactory in terms of content, validity, and reliability.\(^11\) Thus, the aim of this study was to investigate the correlations between clinical parameters and glaucoma-specific QOL in Chinese patients with bilateral primary open-angle glaucoma (POAG).

**Methods**

For this cross-sectional study, consecutive patients with bilateral POAG were recruited from an academic hospital in Hong Kong. The diagnosis of POAG was based on an open angle on gonioscopy, a presenting IOP of $<$ 21 mm Hg, and either a glaucomatous visual field loss on at least two Humphrey visual field tracings using the 24-2 SITA fast protocol (Humphrey Instruments, Inc, Zeiss Humphrey, San Leandro [CA], US) or RNFL thinning on Spectralis Optical Coherence Tomography (Heidelberg Engineering, Carlsbad [CA], US). Patients were excluded if they had unilateral disease, concomitant ocular diseases that significantly affected their vision (amblyopia, mature cataract affecting the accuracy of glaucoma investigations). Patients were also excluded if they had other corneal or retinal pathologies, or if they were unable to yield reliable visual field results. Their IOPs were determined using Goldmann applanation tonometry.

The GQL-15 questionnaire is glaucoma-specific, and assesses patient-perceived visual disability in 15 daily tasks responded to in writing. The tasks addressed four aspects of visual disability: (1) central and near vision; (2) peripheral vision; (3) dark adaptation and glare; and (4) outdoor mobility. A 5-point rating scale for the level of difficulty of each task can yield a total score of 0 to 75. Higher scores signify a lower QOL. The GQL-15 was translated into traditional Chinese text and distributed to participating patients. For illiterate patients, the items were read out to them in Cantonese dialect. The questionnaire was translated from English to Chinese by an investigator who was fluent in both English and Chinese. The translated questionnaire was checked for discrepancies by a second investigator and a consensus was reached to develop a draft Chinese questionnaire. A third investigator then back-translated the draft Chinese questionnaire into English; the back-translated draft and the original version were then compared. Discrepancies were amended and gave rise to the final Chinese version. The questionnaire was then tested on five POAG patients of varying gender and age. Patients were asked to complete the questionnaire, and offer their own interpretation of its contents and whether any alternative wording should be used.

The D'Agostino-Pearson omnibus test was used to test for normality. Nearly half of the parameters passed the normality testing. The means of several clinical parameters were calculated for the two eyes and correlated with the GQL-15 using Pearson's correlation coefficient and linear regression analysis. The selected parameters were the visual field index (VFI) and pattern standard deviation (PSD) from the Humphrey Field Analyzer, the Snellen best-corrected VA, the presenting IOP, current IOP, average RNFL thickness via optical coherence tomography, as well as the number of topical anti-glaucoma medications being used. \(t\) Tests were used to test for differences
between the mean GQL-15 scores between males and females. Data were expressed as mean ± standard deviation (SD). Any P value of <0.05 was accepted as statistically significant.

Our institutional review board granted ethics approval for the study and informed consent was obtained from each patient prior to the start of the study.

**Results**

Fifty-one patients with bilateral POAG were recruited, all of whom were Chinese. Their mean (± SD) age was 65.8 ± 12.1 years and the male-to-female ratio was 1:1.1.

The means of their clinical parameters for both eyes are shown in the Table. Their mean GQL-15 score was 26.0 ± 11.6 (out of 75). The three most problematic activities reported for all patients belonged to: item 4 “adjusting to bright lights” (mean score, 2.3 ± 1.3); item 6 “going from a light to a dark room or vice versa” (mean score, 2.3 ± 1.3); and item 2 “seeing at night” (mean score, 2.2 ± 1.2).

There was a moderately significant correlation between a lower VFI and a poorer GQL-15 score (r=0.3, P=0.01; Fig 1). Likewise, a poorer VA correlated significantly with a poorer GQL-15 score (r=0.3, P=0.03; Fig 2). These two correlations seemed to follow a linear pattern such that linear regression analysis showed a weak linear relationship between a poorer GQL-15 score and a lower VFI (r²=0.1, P=0.01) and a poorer VA (r²=0.1, P=0.03).

A thinner RNFL appeared to be associated with a poorer GQL-15 score but the correlation did not attain statistical significance (r=0.3, P=0.07). In terms of pressure control, a higher presenting IOP showed a trend towards correlation with a poorer GQL-15 score (r=0.2) as did a lower current IOP (r=0.2) and a greater number of anti-glaucoma eye drops used (r=0.1). However, none of these correlations reached statistical significance (all P>0.7). On comparing GQL-15 scores between male and female glaucoma patients, no significant difference was found (P=0.3, t test).

**Discussion**

Various studies have associated QOL with visual field impairment.8,12 Odberg et al13 simply categorised visual field defects into “normal”, “having a restricted scotoma”, or “having a field defect large enough to be of visual significance”, and found a weak-to-moderate correlation between such visual field defects and subjective visual disabilities. The Collaborative Initial Glaucoma Treatment Study later found that at the time of diagnosis, patients’ visual fields correlated only modestly with a health-related QOL questionnaire and that of VFIs; mean deviation (MD) showed better correlation with QOL than PSD, corrected pattern SD, or short-term fluctuation.14 Nelson et al6 found that the GQL-15 scores, and especially the subsets pertaining to glare, correlated significantly with MD, even for patients with mild disease. Furthermore, those with moderate and severe visual field loss had
similar GQL-15 scores, suggesting a threshold for
disability may be reached up to a certain level of
glaucoma severity or represent adaptation to loss of
visual function. Similarly, Goldberg et al have
found that the GQL-15 scores correlated with VA,
MD, the number of binocular points of <10 dB, and
that QOL tended to decrease with disease severity.
Whilst MD is commonly correlated with QOL in
glaucoma patients, it has the drawback of not being
specific enough to represent the limitations caused
by glaucoma alone, since it may also be affected by
global defects like cataract. On the other hand, using
PSD eliminates the factor of global defects, though
it is not sensitive in advanced glaucoma, where the
total field is globally depressed.

Thus in this study, we utilised the VFI, which is
a percentage summarising the overall visual field
status compared to age-adjusted visual fields. The
VFI emphasises the importance of the central field.
It is less affected by media opacities (cataracts), and
is more accurate than MD for monitoring glaucoma
progression. Few studies have used VFI to correlate
with QOL in glaucoma. Sawada et al reported that
VFI correlated with QOL via the 25-item National
Eye Institute Visual Function Questionnaire (NEI
VFQ-25) and that the correlation was better than
with MD. Our study found a statistically significant
correlation between the reduction in mean binocular
VFI and a poorer GQL-15 score and that VFI was a
better indicator of glaucoma-specific QOL than
RNFL thickness, IOP, or PSD on visual field. We chose
to use PSD rather than MD in our analysis because
the latter could be affected by any global obstruction
to vision like cataract, whereas PSD is more specific
for inter-field variability. However, the two clinical
parameters that achieved a significant correlation
with the GQL-15 score were binocular VFI and VA,
and both parameters were also associated with the
GQL-15 score in a linear manner.

Intra-ocular pressure control did not correlate
significantly with QOL although a higher IOP on
presentation seemed to produce a lower QOL score,
and interestingly a lower current IOP seemed to
 correlate with a poorer QOL. This unique finding may
indicate that those with a lower current IOP have had
glaucoma for longer or have more advanced disease
warranting more aggressive pressure reduction.
Furthermore, those using more anti-glaucoma eye
drops seemed to have a lower QOL score, but these
correlations were weak and did not reach statistical
significance.

Patient perceptions of disease and methods
of coping are heavily influenced by culture and
ethnicity. Thus, Singapore Chinese glaucoma patients
were more accepting of their daily disabilities than
corresponding American Caucasians. Literature
pertaining to Chinese glaucoma patients is sparse.
Wu et al found that Chinese glaucoma patients
were particularly concerned about the uncertainties
of treatment, the prognosis, and passing on of the
disease to family members. Lin and Yang reported a
correlation with MD and the Medical Outcomes
Study Short-Form 36 Health Survey and the NEI
VFQ-25. Whilst clinical data provide evidence of
structural and functional damage of the optic
nerve, they do not address the impact of disease
on patients. The correlation of objective clinical
measurements to QOL is particularly useful, because
it gives ophthalmologists in a busy clinical setting an
overall impression of glaucoma-specific QOL. This
can enable them to recommend environmental and
lifestyle modifications to minimise obstacles and
maximise the period of independence. Our study
found that in Chinese glaucoma patients, the most
problematic aspects of coping were “adjusting to
bright lights”, “going from a light to a dark room
or vice versa”, and “seeing at night”. Interestingly,
all these activities belong to the realm of dark
adaptation. Hence, environmental modifications can
potentially help to reduce glare. Furthermore, an
estimation of QOL from clinical parameters can allow
ophthalmologists to more readily identify patients
with a poorer QOL needing more psychosocial
support. Interestingly, it has been reported that
POAG itself is associated with anxiety, depression,
and hypochondriasis and a low GQL-15 score has
also been identified as a predictor for depression.

One limitation of our study was that it was
cross-sectional and looked at POAG patients with
varying degrees of severity. A longitudinal study
would have provided additional information about
the changes in QOL throughout different stages
of the disease. A second limitation was that the
population received heterogeneous treatments
(lasers and surgeries). However, as the aim of this
study did not involve evaluating the side-effects of
glaucoma treatments and since the GQL-15 too
did not target treatment side-effects, we did not
consider it necessary to exclude those who had
undergone such treatments previously. Rather,
we opted to include a more heterogeneous POAG
population to make the results more generalisable
and representative. A third limitation was that no
single test is perfect; the GQL-15 mainly focuses on
visual activities, which is only one aspect of QOL.
Conceivably, such a questionnaire only reflects
patient confidence to perform certain tasks rather
than the actual difficulties experienced. Nevertheless,
it has been shown that patients’ loss of confidence
often precedes their perceptions of difficulty.

To the best of our knowledge, this is one of the
few studies reporting a significant correlation and a
linear relationship between VFI and the glaucoma-
specific GQL-15 score in the Chinese POAG
patients. This study also identified dark adaptation
as the most challenging visual issue pertinent to
Chinese POAG patients.

Declaration
No conflicts of interest were declared by the authors.

References