AMERICAN ACADEMY™
OF OPHTHALMOLOGY

Fast Visual Field Progression Is Associated with Depressive Symptoms in Patients with Glaucoma

Alberto Diniz-Filho, MD, PhD,[1,2] *Ricardo Y. Abe, MD,*[1] *Hyong Jin Cho, MD, PhD,*[3] *Saif Baig, BSc,*[1] *Carolina P.B. Gracitelli, MD,*[1,4] *Felipe A. Medeiros, MD, PhD*[1]

Purpose: To evaluate the association between the rates of progressive visual field loss and the occurrence of depressive symptoms in patients with glaucoma followed over time.

Design: Prospective observational cohort study.

Participants: The study included 204 eyes of 102 patients with glaucomatous visual field defects on standard automated perimetry (SAP).

Methods: All patients had Geriatric Depression Scale (GDS) questionnaires and visual field tests obtained over a mean follow-up time of 2.2±0.6 years. Change in depressive symptoms was assessed by calculating the difference between GDS scores at the last follow-up visit from those at baseline. Rates of visual field loss were assessed by SAP. An integrated binocular visual field was estimated from the monocular SAP tests, and rates of change in mean sensitivity (MS) over time were obtained from linear mixed models. Regression models were used to investigate the association between progressive visual field loss and changes in depressive symptoms, adjusting for potentially confounding clinical and socioeconomic variables.

Main Outcome Measures: The association between rates of change in binocular SAP MS and change in GDS questionnaire scores.

Results: There was a significant correlation between change in the GDS scores during follow-up and change in binocular SAP sensitivity. Each 1 decibel (dB)/year change in binocular SAP MS was associated with a change of 2.0 units in the GDS scores during the follow-up period ($P = 0.025$). In a multivariable model adjusting for baseline disease severity, change in visual acuity, age, gender, race, Montreal Cognitive Assessment score, education, income, and comorbidity index, each 1 dB/year change in binocular SAP MS was associated with a change of 3.0 units in the GDS score ($P = 0.019$).

Conclusions: Faster visual field progression was associated with the occurrence of depressive symptoms in patients with glaucoma. *Ophthalmology 2016;■:1–6* © *2016 by the American Academy of Ophthalmology.*

Supplemental material is available at www.aaojournal.org.

Glaucoma is a progressive optic neuropathy and one of the leading causes of visual impairment and decrease in vision-related quality of life.[1–3] Because of its chronic nature, its potential for causing irreversible blindness, and the inherent side effects of the treatment, glaucoma often can impose a psychologic burden to patients.[3–6] The prevalence of depressive symptoms among patients with glaucoma varies from 6% to 16% in different studies and has been reported to be higher than in patients without the disease.[7–12]

Several previous studies have shown a relationship between the severity of visual field loss and the occurrence of depressive symptoms in patients with glaucoma.[7–16] These studies have used a cross-sectional design and suggested that worse disease severity was associated with higher prevalence of depressive symptoms.[11,12,14–17] However, the cross-sectional design may impose limitations to the study of this association, because it does not allow an assessment of how visual field changes over time would affect patients' well-being and how they might be associated with depressive symptoms. In previous studies, we have shown that the rate of visual field loss was associated with decline in self-reported quality of life as measured by the 25-item National Eye Institute Visual Function Questionnaire.[18–21] The 25-item National Eye Institute Visual Function Questionnaire measures several aspects of quality of life, including the ability to perform everyday tasks such as reading and driving.[22] It is likely that a patient with a fast rate of visual field loss experiences greater difficulty with activities of daily living, potentially leading to depressive symptoms, compared with a subject whose disease has been progressing slowly. In fact, a study by Kiely et al[23] suggests that functional impairment in physical or social domains explains much of the longitudinal association between sensory loss and depressive symptoms.

http://dx.doi.org/10.1016/j.ophtha.2015.12.014
ISSN 0161-6420/15

In this study, we investigated the relationship between the rate of visual field loss and the occurrence of depressive symptoms in a cohort of patients with glaucoma followed over time.

Methods

Participants from this study were included in a prospective longitudinal study designed to evaluate functional impairment in glaucoma conducted at the Laboratory of Performance and Visual Function of the University of California San Diego. The institutional review board at the University of California San Diego approved the methods, and written informed consent was obtained from all participants. The study adhered to the laws of the Health Insurance Portability and Accountability Act, and all study methods complied with the Declaration of Helsinki guidelines for human subject research.

All participants underwent a comprehensive ophthalmologic examination, including review of medical history, visual acuity, slit-lamp biomicroscopy, intraocular pressure measurement using Goldmann applanation tonometry, corneal pachymetry, gonioscopy, dilated fundoscopy examination using a 78-diopter lens, stereoscopic optic disc photography, and standard automated perimetry (SAP) using the 24-2 Swedish Interactive Threshold Algorithm Standard of the Humphrey Field Analyzer II, model 750 (Carl Zeiss Meditec, Inc, Dublin, CA). Only subjects with open angles on gonioscopy were included. Patients with coexisting retinal disease, uveitis, or nonglaucomatous optic disc neuropathy were excluded from the study.

Glaucoma was defined by the presence of 2 or more consecutive abnormal SAP test results at baseline, defined as a pattern standard deviation with $P < 0.05$ and/or glaucoma hemifield test results outside normal limits, and evidence of glaucomatous optic neuropathy based on masked assessment of stereophotographs. A subject was considered to have glaucoma if damage was present in at least 1 eye.

The presence of depressive symptoms was evaluated with the Geriatric Depression Scale (GDS) questionnaire. For inclusion in the study, subjects were required to have completed a baseline and a follow-up GDS questionnaire over a minimum period of 1 year. In addition, they were required to have had at least 3 visual fields during the corresponding period. Data for this study were obtained during the period extending from March 2011 to April 2015. During follow-up, each patient was treated at the discretion of the attending ophthalmologist.

Monocular and Binocular Visual Fields

Monocular SAP was performed using the 24-2 Swedish Interactive Threshold Algorithm Standard test at all visits during the follow-up period. Only reliable tests ($\leq$33% fixation losses and $\leq$15% false-positives) were included. In addition, visual fields were reviewed and excluded in the presence of artifacts, such as eyelid or rim artifacts, fatigue effects, inattention, or inappropriate fixation. Visual fields also were reviewed for the presence of abnormalities that could indicate diseases other than glaucoma, such as homonymous hemianopia. To evaluate binocular visual field (BVF) loss, sensitivities of the monocular SAP threshold sensitivities of the right and left eyes were used to calculate an integrated BVF. The sensitivity for each point of the BVF was estimated using the binocular summation model described by Nelson-Quigg et al.[24] Evaluation of rates of visual field change was performed using the mean sensitivity (MS) of the BVF. The MS was calculated as the average of the BVF threshold sensitivities for the integrated field.

Geriatric Depression Scale

The GDS questionnaire is a self-reported tool that has been validated for screening depression in the elderly and is used commonly as part of a geriatric assessment.[25] The 15-item GDS consists of 15 dichotomous (yes/no) questions about depressive symptoms in the past week (Fig 1, available at www.aaojournal.org). One point is assigned to each answer, and the cumulative score is rated on a scoring grid, so possible scores range from 0 to 15. Scores >5 are suggestive of depression, and scores $\geq$10 almost always are indicative of depression. A more detailed scoring also can be used to stage depression: from 5 to 8 is indicative of mild depression, from 9 to 11 is indicative of moderate depression, and from 12 to 15 is indicative of severe depression. We obtained an estimate of the change in the occurrence of depressive symptoms by subtracting the final GDS score from the baseline GDS score. Therefore, an increase in the scores indicated increased incidence of depressive symptoms during follow-up.

Demographic, Clinical, and Socioeconomic Variables

Socioeconomic and clinical questionnaires also were administered to patients at the time of the baseline GDS. These questionnaires contained a survey about demographics, history of ocular and medical conditions, degree of education, and income level. Because depressive symptoms can have multiple causes and several factors might contribute to depression, these factors were included as potential confounding factors in the analysis of the relationship between change in GDS scores and progressive field loss. Variables were categorized for inclusion in the multivariable models as degree of education (at least graduate school degree [yes/no]), income (<$25 000/year [yes/no]), use of antidepressants (yes/no), and use of topical nonselective beta-blockers (yes/no). For comorbidities, we investigated the presence or history of the following conditions: diabetes mellitus, arthritis, autoimmune diseases, high blood pressure, heart disease, asthma, stroke, and cancers. A simple summation score was used to create a comorbidity index.[19] All subjects also completed the Montreal Cognitive Assessment (MoCA) test. The MoCA test is a 30-point cognitive screening tool developed to detect mild cognitive impairment. Change in visual acuity during follow-up was calculated as the difference between the logarithm of the minimum angle of resolution (logMAR) visual acuity at the last follow-up visit and baseline visit for each eye. The eye with better visual acuity at baseline was considered as the better eye for the purpose of analysis of change in visual acuity.

Statistical Analysis

Rates of visual field loss from SAP were obtained by linear mixed models.[26–28] A univariable linear regression model then was used initially to evaluate the relationship between change in GDS scores and rates of visual field loss. Subsequently, the relationship was studied after adjustment for potentially confounding factors, such as visual acuity, age, gender, race, disease severity, use of antidepressants, use of topical nonselective beta-blockers, presence of comorbidities, degree of cognitive impairment, and socioeconomic variables.