DESCRIPTION OF CLINICAL FEATURES OF MYOPIC PATIENTS WITH PRIMARY OPEN-ANGLE GLAUCOMA

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This cross-sectional study analyzed 100 eyes from 50 myopic patients diagnosed with primary open-angle glaucoma (POAG) at Hanoi Opthalmology Hospital (2024 – 2025) to describe their clinical characteristics and evaluate the association between myopia severity and glaucomatous damage. Comprehensive eye examinations included refraction, intraocular pressure (IOP), visual field testing, and optical coherence tomography (OCT). Patients were grouped based on the degree of myopia. Results showed that average retinal nerve fiber layer (RNFL) thickness declined significantly with increasing myopia ($p < 0.001$), with a moderate inverse correlation ($r = -0.48$). Visual field loss, indicated by mean deviation (MD), was more severe in patients with high myopia ($p = 0.002$), despite most having normal IOP. Common optic disc features included tilted discs (60%) and peripapillary atrophy (82%), which often interfered with OCT interpretation in highly myopic eyes. These structural and functional alterations underscore the challenges in diagnosing glaucoma in myopic patients. Interpreting imaging and functional results considering myopia severity may improve diagnostic accuracy and facilitate timely intervention.

Keywords: Primary open-angle glaucoma, myopia, RNFL, OCT, visual field.

I. INTRODUCTION

Primary open-angle glaucoma (POAG) is a chronic, progressive optic neuropathy characterized by retinal ganglion cell damage and retinal nerve fiber layer (RNFL) thinning, resulting in irreversible optic disc cupping and visual field loss. Myopia, particularly moderate to high degrees, not only increases the risk of developing POAG but also poses significant diagnostic challenges due to the unique anatomical changes of the myopic eyeball.

Glaucoma is one of the leading causes of irreversible blindness worldwide, necessitating timely diagnosis and lifelong monitoring.[1,2] Patients with myopia and POAG often exhibit distinctive clinical features compared to non-myopic glaucoma patients, which complicates both diagnosis and disease monitoring.

Numerous studies have demonstrated a strong association between myopia and increased risk of POAG. According to the Blue Mountains Eye Study (Australia), the risk of developing glaucoma is doubled in individuals with mild myopia and rises by four to six times in those with high myopia (≥ -6.00 diopters).[3,4] This increased susceptibility is believed to stem from anatomical changes in the myopic eye, including axial elongation, thinning of the RNFL, and alterations in the optic disc structure, making the eye more vulnerable to intraocular pressure (IOP)-related damage. Furthermore, modern diagnostic tools such as optical coherence tomography (OCT) and visual field testing may

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yield inaccurate results when standard criteria for non-myopic eyes are applied to myopic patients. Given these challenges, we conducted a study titled "Clinical Characteristics of Myopic Patients with Primary Open-Angle Glaucoma" to describe the typical clinical features of this patient population. The aim is to facilitate more effective detection, diagnosis, and monitoring of POAG in myopic eyes.

II. MATERIALS AND METHODS

1. Subjects

This study was conducted at Hanoi Ophthalmology Hospital on patients with myopia diagnosed with POAG from 2024 to 2025.

The diagnosis of POAG was based on gonioscopic confirmation of an open angle, characteristic optic nerve head changes, and visual field defects consistent with the Hodapp-Parrish-Anderson criteria[5]. Included patients had myopia of -1.00 diopter (D) or greater and no history of secondary glaucoma or other ocular diseases.

2. Methods

This was a descriptive cross-sectional study. All eligible patients were purposively selected from 2024 to 2025. Each patient underwent a comprehensive ophthalmic examination, followed by structural and functional assessments of the retina and optic disc, as outlined in Figure 1.

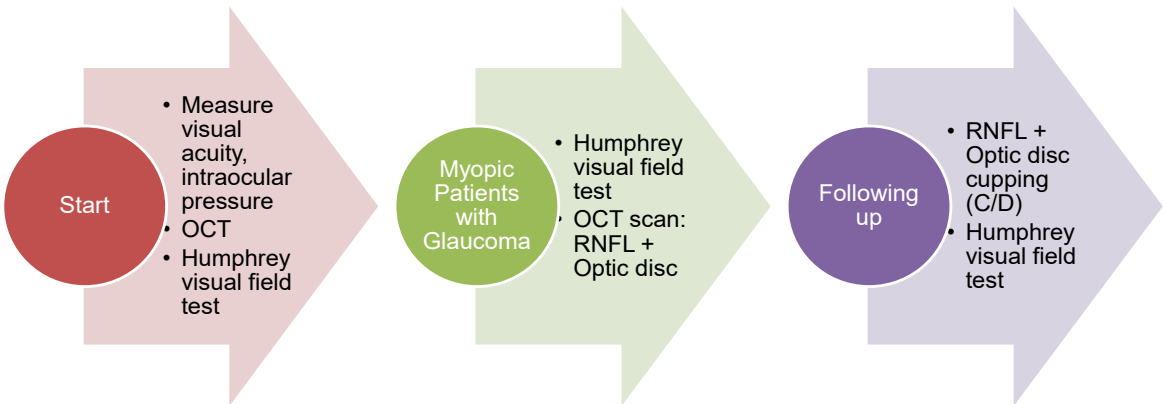

Figure 1. Study protocol

Visual acuity, intraocular pressure (IOP) by Icare Tonometer, and visual field (VF) testing using the Humphrey Field Analyzer were performed. The optic nerve head morphology was evaluated using optic disc cube scans obtained by OCT Cirrus HD-OCT 5000. Parameters assessed included vertical cup-to-disc ratio (C/D), neuroretinal rim configuration, disc tilting, and presence of peripapillary atrophy (PPA). OCT scans with signal strength below 6/10 were excluded from analysis.

Data Collection and Analysis

Collected variables included age, gender, visual acuity, objective refraction, and IOP. Retinal nerve fiber layer (RNFL) thickness was measured globally and in the superior and inferior quadrants. Visual field parameters included test duration, mean deviation (MD), pattern standard deviation (PSD), and the visual field index (VFI) were obtained.

All data were analyzed using SPSS version 23. A p-value < 0.05 was considered statistically significant.

3. Reasearch ethics

The study adhered to the principles outlined in the Declaration of Helsinki for biomedical

research and received approval from the Institutional Review Board of Hanoi Medical University (IRB-VN01331) under approval number 1331/GCN-HMUIRB dated April 28, 2025. All patients and their families were fully informed about the study objectives and procedures. Participation was voluntary, and patients were allowed to withdraw from the study at any time.

III. RESULTS

During the study period, the research team collected and analyzed the following clinical characteristics of the study participants:

Table 1. Demographic and Baseline Characteristics of Study Subjects

Variable	Mean ± SD or Count
Mean age (years)	48.6 ± 8.7
Gender (female/male)	28/22
(diopters)	-5.3 ± 2.1
Axial length (mm)	26.1 ± 1.4

Following the study procedures, a correlation between intraocular pressure (IOP) and structural/functional damage was observed, as presented in Table 2.

Table 2. Intraocular Pressure and Damage Parameters

Variable	Mean ± SD
Mean IOP (mmHg)	17.3 ± 2.8
Mean cup-to-disc ratio (C/D)	0.68 ± 0.13
Mean RNFL thickness (μm)	77.5 ± 10.7
MD (Mean Deviation HVF, dB)	-4.9 ± 2.1

Distribution by degree of myopia:

- Mild myopia (-1.00D to < -3.00D): 20 eyes (20%).
- Moderate myopia (-3.00D to -6.00D): 40 eyes (40%).
- High myopia (> -6.00D): 40 eyes (40%).

The research team analyzed the relationships between IOP, RNFL thickness, and MD across different levels of myopia. The results are shown in Table 3.

Table 3. Comparison Across Myopia Levels

Parameter	Mild Myopia (n = 20)	Moderate Myopia (n = 40)	High Myopia (n = 40)	p-value
IOP (mmHg)	17.0 ± 2.5	17.4 ± 2.7	17.6 ± 2.9	0.45
RNFL (m)	83.1 ± 9.2	78.0 ± 8.7	72.4 ± 9.5	< 0.001
MD HVF (dB)	-3.5 ± 1.8	-4.8 ± 2.0	-5.6 ± 2.1	0.002

Based on Table 3, RNFL thickness and MD values showed statistically significant differences among the myopia groups ($p < 0.05$). A moderate inverse correlation was found between the degree of myopia and RNFL thickness ($r = -0.48$, $p < 0.001$). No statistically significant difference in IOP was observed across the groups ($p > 0.05$).

Regarding visual field damage patterns:

- Arcuate defects were observed in 68 eyes (68%).
- Mild diffuse defects in 22 eyes (22%).
- Atypical patterns in 10 eyes (10%).

The severity of visual field loss was higher in the high myopia group (MD: -5.6 ± 2.1dB, $p < 0.05$). Peripapillary atrophy (PPA) was present in 82 eyes (82%), and tilted optic discs were noted in 60 eyes (60%). Inferotemporal RNFL thinning was markedly present in 72 eyes (72%). Notably, segmentation or measurement errors in OCT were more frequent among patients with high myopia, accounting for 30% of this group.

IV. DISCUSSION

The findings from this study, based on 100 eyes of 50 patients, revealed typical clinical features and a notable correlation between the degree of myopia and the extent of optic nerve damage in patients with primary open-angle glaucoma (POAG).[6,7] The results demonstrated a progressive decrease in peripapillary retinal nerve fiber layer (RNFL) thickness with increasing myopia, with statistically significant differences ($p < 0.001$). Specifically, the average RNFL thickness in the high myopia group was 72.4 ± 9.5μm, markedly thinner than in the mild myopia group (83.1 ± 9.2μm). This aligns with previous studies suggesting that high myopia leads to thinning of the RNFL due to axial elongation and structural alterations of the optic disc.[8-10]

Furthermore, a moderate negative correlation ($r = -0.48$, $p < 0.001$) was observed between refractive error and RNFL thickness, indicating that myopia may be an independent factor influencing RNFL. This highlights the importance of cautiously interpreting OCT images in myopic patients to avoid misdiagnosis.

Visual field analysis also reflected a decline in visual function with increasing myopia. The mean deviation (MD) in high myopia was -5.6 ± 2.1dB, significantly worse than in mild myopia (-3.5 ± 1.8dB), with $p = 0.002$. The predominant defect pattern was arcuate scotoma (68%), which is characteristic of glaucoma. However, approximately 10% of eyes, particularly in the high myopia group, exhibited atypical defects.[11,12] This presents a challenge in visual field assessment, as some defects may stem from refractive or anatomical changes rather than true glaucomatous damage.

The mean intraocular pressure in this study was 17.3 ± 2.8mmHg, within the normal range, with no significant difference among the myopia subgroups ($p = 0.45$). Thus, most patients in this study may be categorized as having normal-tension glaucoma, which is commonly observed in Asian populations and myopic individuals.

Anatomical features such as tilted optic discs and peripapillary atrophy (PPA) were also highly prevalent, observed in 60% and 82% of eyes, respectively. These features complicate the evaluation of glaucomatous damage and contribute to false-positive OCT warnings, especially in the high myopia group.

Our findings emphasize the need for a cautious approach to diagnosing glaucoma in myopic patients. Clinicians should not rely solely on RNFL thickness and MD but must also consider refractive status and anatomical characteristics.[13,14] Longitudinal follow-up, inter-eye comparison, and detailed assessment of optic disc morphology are essential for accurate and early diagnosis. Moreover, early detection of RNFL and visual field defects in highly myopic patients is critical, given their

higher risk of progression and the potential for delayed recognition due to atypical clinical presentations.

V. CONCLUSION

Myopic patients with primary open-angle glaucoma exhibit several distinctive clinical features, including thinner retinal nerve fiber layers (RNFL), more vulnerable visual fields, and abnormal optic disc morphology-especially in those with high myopia. These characteristics pose significant diagnostic challenges and may lead to misinterpretation if standard diagnostic criteria are applied indiscriminately. Therefore, a comprehensive evaluation that integrates multiple clinical parameters is essential. Additionally, imaging indices should be adjusted according to the degree of myopia to improve diagnostic accuracy and enhance treatment outcomes.

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