Analysis of axial length, retinal nerve fiber layer, macular area and estimated retinal ganglion cell count in myopic preperimetric glaucomatous eyes: an observational study

CURRENT STATUS: UNDER REVIEW

BMC Ophthalmology BMC Series

Teresa Rolle
Clinica Oculistica dell'Universita di Torino

teresa.rolle@unito.it*Corresponding Author*
ORCiD: https://orcid.org/0000-0002-5825-0905

Beatrice Bonetti
Clinica Oculistica dell'Universita di Torino

Alberto Mazzucco
Clinica Oculistica dell'Universita di Torino

Laura Dallorto
Clinica Oculistica dell'Universita di Torino

DOI:
10.21203/rs.3.rs-21024/v1

SUBJECT AREAS
Ophthalmology

KEYWORDS
ganglion cells, glaucoma, myopia, optical coherence tomography

Abstract

BACKGROUND: The aim of the study is to evaluate the diagnostic ability of OCT parameters and retinal ganglion cells (RGCs) count in identify glaucomatous disease in myopic preperimetric eyes.

METHODS: This was a cross-sectional observational study. The study group consisted of 154 eyes: 36 healthy, 64 preperimetric (PPG), and 54 primary openangle glaucoma (POAG) eyes. Each group was divided into three subgroups based on axial length: emmetropic, myopic with axial length (AL) <25 mm, and myopic with AL>25 mm, to analyze the effect of myopia. The RGCs count was obtained using a model described later. As regard the influence of myopia on OCT parameters and RGC count, we performed Pearson's correlation. The Area Under Receiver Operator Characteristics Curves (AUROC curves) evaluated which parameter had the best sensitivity and specificity in identifying glaucoma in myopic eyes.

RESULTS: In Pearson's test, all Ganglion Cell Complex (GCC) thicknesses showed the weakest and less significant correlation with AL in all groups. All the AUROCs were statistically significant, and above 0.5. Inferior GCC and Global Loss Volume (GLV) showed the highest AUCs in all myopic group and the best diagnostic ability in distinguishing healthy from glaucomatous eyes. RGCcount showed good AUROC in all groups, with sensitivities of about 83% in myopic eyes, and specificity over 91% in all groups.

CONCLUSIONS: GCC is the parameter less influenced by the AL, and the inferior GCC and the GLV have the best diagnostic performance. The RGCcount has good sensitivity and specificity, so it can be used as a complementary test in the diagnosis of glaucoma in myopic preperimetric eyes.

Background

Myopia and glaucoma are two of the commonest causes of impaired vision in the world population. Myopia is projected to affect 5 billion people in the world by 2050(1), and glaucoma is a leading cause of blindness and irreversible visual impairment, affecting more than 100 million people worldwide (2,3) . Myopic eyes have an increased risk of glaucoma (4). The link between myopia and glaucoma seems to be the greater deformability of the lamina cribrosa in myopic eyes. Myopic changes include longer axial lengths and vitreous chamber depths together with alterations in connective tissue which

might contribute to a higher susceptibility to glaucomatous optic disc changes (5).

With the ophthalmoscopic evaluation alone, it may be hard to tell apart myopia from glaucoma for a combination of reasons (6). The use of structural imaging or visual field testing in glaucoma is fraught with multiple potential pitfalls in myopia, such as the presence of posterior staphylomas or macular atrophy. Thus, myopic eyes may be falsely overdiagnosed with glaucoma if care is not taken to distinguish between glaucomatous and myopic pathology(7).

Recently, measurements of structural and functional tests were combined into empirical formulas for the estimation of RGCs (8–11). These estimates seem to perform better than functional and structural parameters considered separately, both for staging and monitoring the disease (9–13).

The aim of this cross-sectional observational study is to test whether Retinal Nerve Fiber Layer (RNFL) and Ganglionar Cell Complex (GCC) thicknesses are thinner in myopic PPG than emmetropic PPG and myopic healthy eyes, and whether this thickness reduction corresponds to a decrease in the estimated retinal ganglion cells (RGCs) number, so the RGCs count could be useful to identify early glaucomatous disease in myopic eyes. Another purpose of the study was to evaluate and compare the diagnostic ability of OCT parameters and RGC count in emmetropes and myopes.

Methods

This cross-sectional observational study was conducted at the Glaucoma Center of the Eye Clinic, Department of Surgical Sciences, University of Torino, Italy. The methods were applied in accordance to the tenets of the Declaration of Helsinki; informed consent was obtained from all subjects and the Ethics Committee (University & General Hospital San Giovanni Battista of Torino) gave approval.

To be included in the study, participants had to meet the following criteria: age between 18 and 80 years, best-corrected visual acuity (BCVA) greater than or equal to 20/30, spherical equivalent between +1.00D and -1.00 D for emmetropic subjects, and between -3.00D and -7.00D for myopic subjects, and open angle on gonioscopy. Subjects with ocular surgery, retinal or macular pathology, or systemic or neurologic conditions that could produce visual field defects, were excluded.

All subjects underwent a comprehensive ophthalmic examination consisting of: BCVA, ultrasound pachymetry, slit-lamp biomicroscopy of anterior and posterior segment, Goldmann applanation

tonometry (GAT), diurnal tonometric curve, gonioscopy, peripapillary, and macular imaging using Fourier Domain-OCT (FD-OCT RTVue-100 software version A4, 5, 0, 59; Optovue, Fremont, CA, USA), and measurement of axial lenght with low-coherence interferometry system (Aladdin biometer, Topcon). Standard Automated Perimery was performed with Swedish Interactive Threshold Algorithm (SITA) Standard strategy, program 24-2 of the Humphrey Field Analyzer (HFA; Carl Zeiss Meditec, Jena, Germany). Fixation losses less than or equal to 20%, false positives and false negatives less than or equal to 33% were established as the reliability criteria. The study included three groups of subjects: preperimetric glaucomatous (PPG), glaucomatous, and a control group recruited from the healthy population. The latter were required to have no family history of glaucoma, highest daily IOP less than 21 mm Hg, a normal visual field (VF) test and a normal optic nerve head (ONH) appearance. Patients affected by PPG had the highest daily IOP greater than 21 mm Hg, normal VF test, and ONH changes (cup–disc ratio alteration, disc hemorrhages, rim notching, diffused or localized RNFL defects). Primary open-angle glaucoma (POAG) was diagnosed based on the presence of highest daily IOP greater than 21 mm Hg, abnormal VF according to Hodapp-Parrish-Anderson criteria for diagnosing glaucomatous damage (14), and glaucomatous optic disc changes. Optic nerve head appearance was evaluated by slit-lamp biomicroscopy of the posterior segment using a 78-D lens. Each group was further divided into three subgroups based on axial length: emmetropic, myopic with AL<25 mm and myopic with AL>25 mm, in order to analyze the effect of mild and moderate myopia.

FD-OCT RTVue-100

The Glaucoma Protocol of FD-OCT RTVue-100 was used to acquire RNFL thickness measurements. The same operator repeated all scans three times. The RNFL thicknesses used for the analysis derived from the scan with the highest signal strength index (SSI). This scan was used to calculate RNFL thicknesses. Scans with motion artifacts and with signal strength index less than 45 were excluded.

Estimate of Retinal and Macular Ganglion Cell Count

The estimated of RGC count was obtained by applying the model developed and described in detail by Medeiros et al (9–11,15) based on the empirical formulas processed by Harwerth et al (8). We described this formula in detail in our previous article (Rolle et al.). (16)

Statistical analysis

The collection, processing and statistical analysis of the results were carried out through the Microsoft Excel 2016 worksheets and the SPSS statistical program for Windows, version 19.0, SPSS Inc, Chicago, IL. We used the analysis of variance (ANOVA) and χ2 test to assess the comparability of the groups for continuous and dichotomic variables respectively.

For each of the three groups (healthy, PPG and POAG) the Pearson's linear correlation coefficient was calculated to evaluate how the measured parameters are influenced by the AL increasing. Then, each group was further subdivided into 3 subgroups (emmetropes, myopic eyes with AL<25 mm and myopic eyes with AL>25 mm) to analyze the effects of mild and moderate axial myopia by the Mann-Whitney U test. (Figure 1)

To investigate the ability of OCT parameters and RGCcount to diagnose glaucoma, we calculated areas under the receiver operating characteristic (AUROC). We compare these AUROCs between subgroups with different axial length (emmetropes, all myopic eyes, and myopes with AL<25mm and >25mm) using the method described by DeLong et al (17). The same method is used to compare the best OCT parameters and RGCs count with all the other parameters. For the calculation of AUROC and for all the comparisons between AUROCs we used a statistical software package (MedCalc v. 12.0; MedCalc Statistical software, Marakierke, Belgium).

For all statistical analysis, a p value <0.05 was considered statistically significant.

Results

The study group consisted of 154 eyes: 36 healthy, 64 PPG, and 54 POAG eyes. Demographic characteristics of the study population are illustrated in Table 1.

The ANOVA and χ^2 test showed that the groups are comparable for age, sex, and refraction. Glaucomatous eyes have significantly worse VF MD and PSD than healthy and PPG eyes ($P < 0.0001$). RNFLavg and RGC number reduce with the progression of glaucomatous damage, as demonstrated in previous studies (16,18).

As regard the influence of myopia on OCT parameters and RGC count, we performed the Pearson's correlation of axial length with RGC (Table 3). Almost all parameters have a moderate significant

negative correlation with axial length, except GCC thicknesses in healthy group. RGC count in healthy group shows the strongest negative correlation with AL, and all GCC thicknesses the weakest and less significant in all groups.

To better evaluate the influence of myopia, we subdivided each group in three subgroups, basing on refractive error emmetropic eyes with defect between +1.00 sf and -1.00 sf, and myopic eyes with defect between -3.00 sf and -7.00 sf, and in these latter eyes axial length superior or inferior to 25 mm. This cut-off was chosen because it is two standard deviations from the reference average of the main normative databases (19).

In Table 4.a-b-c we resumed the results of Mann-Whitney U Test between PPG and healthy subgroups. In comparisons between healthy subgroups with different axial length (Table 4.c) we can merely evaluate the influence of myopia on OCT parameters. In all comparisons the MD is not statistically significant, a sign that there is no influence of any myopic damage on the functional aspect. In all the subgroups we can observe a difference between emmetropes and myopes for both macular and papillary OCT parameters, a sign of an influence of myopia on the structural aspect.

In Table 5 we compared emmetropic PPG eyes and all myopic PPG eyes with no distinguishing about axial length, and the difference is statistically significant for all parameters.

The AUCs of MD, OCT parameters and RGCcount of emmetropes, myopes with AL<25mm, myopes with AL>25mm and all myopes subjects are summarized in Tables 6.a-d and Fig. 1-4; Tables 6.a-d also shows SE, IC95%, and sensitivity and specificity of every parameters.

All the AUROCs are statistically significant, and above 0.5. Inferior GCC and Global Loss Volume (GLV) show the highest AUCs in all myopic groups and the best diagnostic ability in distinguishing healthy from glaucomatous eyes. Both GCCinf and GLV have sensibility >95% in all groups, except GLV sensitivity in all myopes' group (92.59%). We compare AUROC of GCCinf and GLV with AUROCs of all others parameters (Table 7) using the method of DeLong (17) to test for statistical significance. GCCinf and GLV show significant differences with MD in all comparison, with all RNFL parameters in high myopic group and in myopic group without considering AL, and only with RNFLsup if considering mild myopes group. This is probably due to the fact that the other OCT parameters also have very

good AUCs and elevated sensibility and specificity.

Table 8 shows the results of the comparisons of AUROCs of MD, OCT parameters and RGCcount between groups with different axial length. All comparisons between emmetropes and myopes eyes shows statistically significant difference for all GCC parameters and GLV.

RGCcount shows very good AUC curves in all groups, with sensitivities of about 73% in emmetropic eyes, and 83% in myopic eyes, and very high specificity (over 91% in all groups, 100% in emmetropes eyes). RGCcount has the ability to identify healthy with certainty, and with good safety those with glaucoma, more in emmetropes than in myopes (but the difference of RGCcount AUROCs between groups is not statistically significant).

RNFLavg and MD are used in the formula of RGCcount of Medeiros et al (9) to calculate the RGC number. We compared the diagnostic performance of both parameters with that of RGCcount (see Table 9) to assess whether the retinal ganglion cell count adds more diagnostic information than the respective parameters from which it is derived. RGCcount performs significantly better than MD in all groups, and almost the same than RNFLavg with no statistical significant differences.

Discussion

Patients with high myopia has a sixfold increased odds to develop glaucomatous disease (20), and in this case the early diagnosis is mandatory and needs tests with high sensitivity and specificity (21). The evaluation of peripapillary RNFL is used in common clinical practice to detect the presence of glaucomatous damage (22), but in high myopia its interpretation is made difficult by the frequent presence of optic nerve tilt. Shin et al (23) showed that optic disc tilt reduce RNFL diagnostic ability in detecting glaucoma, while it doesn’t influence ganglion cell-inner plexiform layer (GCIPL) thickness, which is more reliable in the evaluation of glaucoma in high myopia.

In our study all the OCT parameters and RGCs count are correlated to the increase in axial length with a moderate significant negative correlation, except GCC thicknesses that seem to be the less correlated to axial length increase because they have the weakest and less significant correlation in all groups (Table 3). This is this is in agreement with the results of many studies: Shoji et al (24) have shown that GCC parameters are not significantly affected by high myopia, while RNFL measurements

have a decreased ability to detect glaucoma in myopic subjects;

Considering the results of the comparisons among subgroups (Tables 4.a-b-c and 5) there are statistically significant results for almost all the parameters in comparison between healthy and PPG, both among the myopes and emmetropes. So we could support, according to the studies of Tan et al (25) and Kim et al (26), that the RNFL and GCC parameters are complementary in the evaluation of glaucomatous damage also in myopic eyes.

As regards diagnostic ability of OCT parameters, in our study all parameters has an AUROC > 0.5 (Table 6), and all curves are statistical significant, with high values of sensibility and specificity. While RNFLinf and FLV showed the best AUROCs in emmetropes, GCCinf and GLV showed the best AUROCs in all myopic group. This is in agreement with many studies that demonstrated that GCC thickness have a glaucoma detection ability as effective as that of RNFL parameters (24–30).

In the comparison between GCCinf and GLV and all other parameters, there was a statistical difference with almost all RNFL parameters, especially in high myopes (Table 7). The study of Seol et al (31) showed that inferotemporal GCIPL has a significantly better diagnostic ability than RNFL parameters, and this is in agreement with our results, and also than average GCIPL parameters, while in our study GCCinf and GLV have a better AUROC than other GCC parameters, but non statistically significant.

In Table 8 the results of the comparison of AUROC of every parameters between different subgroups are illustrated: in all the comparisons with emmetropes there is a statistical significant difference between emmetropes and myopes for GCC parameters, which show better diagnostic abilities in myopes. This means that GCC parameters are more useful to differentiate glaucomatous from healthy eyes in myopic than emmetropic eyes.

However we must take into account some limitations of GCC in the evaluation of glaucoma in myopic eyes. In the eyes in which the head of the optic nerve is deformed and therefore difficult to evaluate, we may assume that the macular region is less distorted, but this is not always true. The studies by Kim et al (32, 33) have suggested that the outline of the entire posterior pole determines the possible configuration of the optic nerve head. So, the presence of irregularities in macular region could

invalidate the evaluation of GCC in myopia. Another bias is due to the high axial length which causes a false positive GCC thinning (34). This is because a greater axial length determines a streching of the globe with an increase in the distance between the optic nerve and the macula and consequent false thinning of macular region(35, 36). Furthermore, the presence of macular degeneration can cause GCC thinning (for retinal atrophy) or thickening (for intraretinal fluid due to myopic CNV or to macular retinoschisis) that are independent from glaucoma (37).

To our knowledge, no previous studies have reported on use of RGCs count in identify glaucoma in myopic eyes and its diagnostic ability. There are many studies about RGCcount in non-myopic eyes demonstrating that a combined measure of structural and functional parameters performs better than the single OCT and perimetry parameters (13, 15). We wanted to evaluate if the diagnostic ability of the RGC was superior to those of the single parameters used in its calculation formula (MD and RNFLavg) also in myopic groups: both in mild and high myopes, AUROCs of RGCcount are significantly better than those of MD, and approximately similar to those of RNFLavg without statistically significant differences (Table 9). In all groups, both myopes and emmetropes, RGCcount shows very good AUROCs (between 0.873 in emmetropes and 0.929 in mild myopes), with sensitivity $> 70\%$ and specificity $> 90\%$.

Based on the results of our study, RGCs count seems to be complementary to OCT parameters in the detection of glaucomatous damage in the myopia, also if GCC parameters show better diagnostic ability. Since the glaucomatous damage in the myopia is more early to be detected at macular level, it could be useful to evaluate the number of macular ganglion cells, as already done by Rolle et al (16), also in myopic subjects. This could be analysed in a further study.

The limitation of this study is that, despite of a good number of the total sample, the subdivision in different subgroups makes the number of each subgroup reduced. However, this is also found in other studies (31, 38, 39). To validate the results obtained it would be indicated to use an even larger cohort of investigation.

Another limitation is related to the fact that the sample of myopic eyes does not perfectly correspond to what we find in clinical practice, because it does not include all the eyes with perimetric alterations

(enlarged blind spot, general reduction of sensitivity and superotemporal peripheral defects), which also are very frequent in myopic eyes.

A strength is represented by the use of preperimetric eyes, since comparing only eyes diagnosed with both functionally and structurally established glaucoma with healthy would lead to overestimate the performance of the test, as reported by Medeiros et al (40).

Conclusions

In conclusion, in the OCT analysis of myopic eyes RNFL is the parameter most influenced by the axial length, while the GCC, in particular the inferior, and the GLV are the two OCT parameters with better diagnostic performance. The RGCcount appears to have good sensitivity and specificity, but not higher than the OCT parameters, so it can be used as a complementary test in the diagnosis of glaucoma in myopic eyes.

Identifying the presence of glaucoma in a myopic eye is one of the current diagnostic challenges in ophthalmology, and we must interpret all the instrumental data considering the influence of myopia. Current OCTs analyze the thicknesses of retinal nerve fibers and ganglion cells using a normative database that includes emmetropic subjects. Our study agrees with other works affirming that the OCT parameters are affected, although to varying degrees, by the axial length. Therefore to increase the reliability of the OCT in the diagnosis it would be appropriate to insert myopic eyes in the normative databases of the instruments and develop algorithms that take into account the axial length to analyze the thicknesses detected with OCT.

Abbreviations

AL

Axial Length

BVCA

Best Corrected Visual Acuity

FD

Fourier-Domain

FLV

Focal Loss Volume

GCC

Ganglion Cell Complex

GLV

Global Loss Volume

IOP

Intra-Ocular Pressure

MD

Mean Deviation

OCT

Optical Coherence Tomography

ONH

Optic Nerve Head

POAG

Primary Open Angle Glaucoma

PPG

Preperimetric Glaucoma

PSD

Pattern Standard Deviation

RGC

Retinal Ganglion Cell

RNFL

Retinal Nerve Fiber Layer

VF

Visual Field

Declarations

ETHICS APPROVAL AND CONSENT TO PARTECIPATE

This study followed the tenets of the Declaration of Helsinki and approved by the ethics committee of the University & General Hospital San Giovanni Battista of Torino. Informed written consent was obtained from all participants.

COMPETING INTERESTING

The authors declare that they have no competing interests

FUNDING

This study was not supported by any research grants.

AVAILABILITY OF DATA AND MATERIALS

The data have not been placed in any online data storage. The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

AUTHORS' CONTRIBUTION

Study concept and design (TR, BB, AM); collection, management, analysis, and interpretation of data (BB, AM); preparation, review, or approval of the manuscript (TR, BB, AM, LD). All authors read and approved the final manuscript.

References

1. Holden BA, Fricke TR, Wilson DA, et al. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. Ophthalmology. 2016;123(5):1036–42.
2. Tham Y-C, Li X, Wong TY, et al. Global Prevalence of Glaucoma and Projections of Glaucoma Burden through 2040. Ophthalmology. 2014;121(11):2081–90.
3. Bourne RRA, Taylor HR, Flaxman SR, et al. Number of People Blind or Visually Impaired by Glaucoma Worldwide and in World Regions 1990–2010: A Meta-Analysis. PLoS ONE. 2016;11(10):e0162229.
4. Rudnicka AR, Mt-Isa S, Owen CG, et al. Variations in Primary Open-Angle Glaucoma Prevalence by Age, Gender, and Race: A Bayesian Meta-Analysis. Invest Ophthalmol Vis Sci. 2006;47(10):4254–61.
5. Marcus MW, de Vries MM, Montolio FGJ, et al. Myopia as a Risk Factor for Open-Angle Glaucoma: A Systematic Review and Meta-Analysis. Ophthalmology. 2011;118(10):1989–94.e2.
6. Tan NYQ, Sng CCA, Jonas JB, et al. Glaucoma in myopia: diagnostic dilemmas. Br J Ophthalmol. 2019;103(10):1347–55.
7. Leung CK-S, Yu M, Weinreb RN, et al. Retinal Nerve Fiber Layer Imaging with Spectral-Domain Optical Coherence Tomography: Interpreting the RNFL Maps in Healthy Myopic Eyes. Invest Ophthalmol Vis Sci. 2012;53(11):7194–200.
8. Harwerth RS, Wheat JL, Fredette MJ, et al. Linking Structure and Function in

Glaucoma. Prog Retin Eye Res. 2010;29(4):249–71.

9. Medeiros FA, Lisboa R, Weinreb RN, et al. A Combined Index of Structure and Function for Staging Glaucomatous Damage. Arch Ophthalmol. 2012;130(9):1107–16.

10. Medeiros FA, Zangwill LM, Bowd C, et al. The structure and function relationship in glaucoma: implications for detection of progression and measurement of rates of change. Invest Ophthalmol Vis Sci. 2012;53(11):6939–46.

11. Medeiros FA, Zangwill LM, Anderson DR, et al. Estimating the rate of retinal ganglion cell loss in glaucoma. Am J Ophthalmol. 2012;154(5):814–24.e1.

12. Marvasti AH, Tatham AJ, Zangwill LM, et al. The Relationship between Visual Field Index and Estimated Number of Retinal Ganglion Cells in Glaucoma. *PLoS ONE*. 2013;8(10).

13. Medeiros FA, Lisboa R, Weinreb RN, et al. Retinal Ganglion Cell Count Estimates Associated with Early Development of Visual Field Defects in Glaucoma. Ophthalmology. 2013;120(4):736–44.

14. Hodapp E. Parrish RKII. Anderson D. Clinical Decisions in Glaucoma. St. Louis: Mosby–Year Book Medical Publishers; 1993.

15. Zhang C, Tatham AJ, Weinreb RN, et al. Relationship between Ganglion Cell Layer Thickness and Estimated Retinal Ganglion Cell Counts in the Glaucomatous Macula. Ophthalmology. 2014;121(12):2371–9.

16. Rolle T, Dallorto L, Bonetti B. Retinal and Macular Ganglion Cell Count Estimated With Optical Coherence Tomography RTVUE-100 as a Candidate Biomarker for Glaucoma. Invest Ophthalmol Vis Sci. 2016;57(13):5772–9.

17. DeLong ER, DeLong DM, Clarke-Pearson DL. Comparing the areas under two or more correlated receiver operating characteristic curves: a nonparametric approach. Biometrics. 1988;44(3):837–45.

18. Esporcatte BLB, Kara-José AC, Melo LAS, et al. The Estimates of Retinal Ganglion Cell Counts Performed Better than Isolated Structure and Functional Tests for Glaucoma Diagnosis. J Ophthalmol. 2017;2017:2724312.
19. Budenz DL, Anderson DR, Varma R, et al. Determinants of Normal Retinal Nerve Fiber Layer Thickness Measured by Stratus OCT. Ophthalmology. 2007;114(6):1046–52.
20. Pan C-W, Cheung CY, Aung T, et al. Differential Associations of Myopia with Major Age-related Eye Diseases. Ophthalmology. 2013;120(2):284–91.
21. Nakanishi H, Akagi T, Hangai M, et al. Sensitivity and specificity for detecting early glaucoma in eyes with high myopia from normative database of macular ganglion cell complex thickness obtained from normal non-myopic or highly myopic Asian eyes. Graefes Arch Clin Exp Ophthalmol. 2015;253(7):1143–52.
22. Medeiros FA, Zangwill LM, Bowd C, et al. Evaluation of retinal nerve fiber layer, optic nerve head, and macular thickness measurements for glaucoma detection using optical coherence tomography. Am J Ophthalmol. 2005;139(1):44–55.
23. Shin H-Y, Park H-YL, Park CK. The effect of myopic optic disc tilt on measurement of spectral-domain optical coherence tomography parameters. Br J Ophthalmol. 2015;99(1):69–74.
24. Shoji T, Sato H, Ishida M, et al. Assessment of Glaucomatous Changes in Subjects with High Myopia Using Spectral Domain Optical Coherence Tomography. Invest Ophthalmol Vis Sci. 2011;52(2):1098–102.
25. Tan O, Chopra V, Lu AT-H, et al. Detection of macular ganglion cell loss in glaucoma by Fourier-domain optical coherence tomography. Ophthalmology. 2009;116(12):2305–14.e1-2.
26. Kim NR, Lee ES, Seong GJ, et al. Comparing the ganglion cell complex and retinal nerve fibre layer measurements by Fourier domain OCT to detect glaucoma in high

myopia. Br J Ophthalmol. 2011;95(8):1115–21.

27. Rao HL, Babu JG, Addepalli UK, et al. Retinal nerve fiber layer and macular inner retina measurements by spectral domain optical coherence tomograph in Indian eyes with early glaucoma. Eye Lond Engl. 2012;26(1):133–9.

28. Seong M, Sung KR, Choi EH, et al. Macular and Peripapillary Retinal Nerve Fiber Layer Measurements by Spectral Domain Optical Coherence Tomography in Normal-Tension Glaucoma. Invest Ophthalmol Vis Sci. 2010;51(3):1446–52.

29. Garas A, Vargha P, Holló G. Diagnostic accuracy of nerve fibre layer, macular thickness and optic disc measurements made with the RTVue-100 optical coherence tomograph to detect glaucoma. Eye Lond Engl. 2011;25(1):57–65.

30. Schulze A, Lamparter J, Pfeiffer N, et al. Diagnostic ability of retinal ganglion cell complex, retinal nerve fiber layer, and optic nerve head measurements by Fourier-domain optical coherence tomography. Graefes Arch Clin Exp Ophthalmol. 2011;249(7):1039–45.

31. Seol BR, Jeoung JW, Park KH. Glaucoma Detection Ability of Macular Ganglion Cell-Inner Plexiform Layer Thickness in Myopic Preperimetric Glaucoma. Invest Ophthalmol Vis Sci. 2015;56(13):8306–13.

32. Kim YC, Moon J-S, Park H-YL, et al. Three Dimensional Evaluation of Posterior Pole and Optic Nerve Head in Tilted Disc. Sci Rep. 2018;8(1):1121.

33. Kim YC, Jung Y, Park HL, et al. The Location of the Deepest Point of the Eyeball Determines the Optic Disc Configuration. Sci Rep. 2017;7(1):5881.

34. Kim KE, Jeoung JW, Park KH, et al. Diagnostic classification of macular ganglion cell and retinal nerve fiber layer analysis: differentiation of false-positives from glaucoma. Ophthalmology. 2015;122(3):502–10.

35. Song WK, Lee SC, Lee ES, et al. Macular Thickness Variations with Sex, Age, and Axial

Length in Healthy Subjects: A Spectral Domain–Optical Coherence Tomography Study. Invest Ophthalmol Vis Sci. 2010;51(8):3913–8.

36. Qiu K, Wang G, Zhang R, et al. Influence of optic disc-fovea distance on macular thickness measurements with OCT in healthy myopic eyes. Sci Rep. 2018;8(1):5233.

37. Benhamou N, Massin P, Haouchine B, et al. Macular retinoschisis in highly myopic eyes. Am J Ophthalmol. 2002;133(6):794–800.

38. Xu X-Y, Xiao H, Luo J-Y, et al. Evaluation of spectral domain optical coherence tomography parameters in discriminating preperimetric glaucoma from high myopia. Int J Ophthalmol. 2019;12(1):58–65.

39. Leung CK-S, Mohamed S, Leung KS, et al. Retinal Nerve Fiber Layer Measurements in Myopia: An Optical Coherence Tomography Study. Invest Ophthalmol Vis Sci. 2006;47(12):5171–6.

40. Medeiros FA, Ng D, Zangwill LM, et al. The Effects of Study Design and Spectrum Bias on the Evaluation of Diagnostic Accuracy of Confocal Scanning Laser Ophthalmoscopy in Glaucoma. Invest Ophthalmol Vis Sci. 2007;48(1):214–22.

Tables

TABLE 1. Comparison of the Demographic and Clinical Characteristics of Healthy Eyes, PPG, and POAG Eyes.

PARAMETERS	HEALTHY	PPG	POAG	P
EYES (n)	36	64	54	
AGE (y)	55.51 (7.72)	56.00 (7.28)	59.93 (7.28)	
SEX (M/F)	16/20	15/39	22/32	
REFRACTION (D)	-2.53 (2.45)	-2.49 (2.65)	-3.24 (2.74)	
AXIAL LENGHT (mm)	24.18 (1.16)	24.28 (2.19)	24.99 (2.75)	
MD (dB)	-0.48 (0.83)	-0.59 (1.64)	-6.50 (6.74)	
PSD (dB)	1.63 (0.37)	1.75 (0.96)	6.30 (3.63)	
RNFLavg (μ)	108.22 (10.90)	93.70 (9.95)	80.24 (13.2)	
GCCavg (μ)	97.11 (6.46)	85.52 (7.32)	75.19 (10.95)	
estimated total RGC count (n)	1140520.81 (138535.47)	958579.68 (150472.40)	616463.06 (226325.70)	

The parameters are expressed as mean and SD; MD: Mean deviation of SAP; PSD: pattern standard deviation of SAP. RNFL: Retinal Nerve Fiber Layer; GCC: Ganglion Cell Complex; RGC: Retinal Ganglion Cell.

* P-value for ANOVA, significant for $p<0.05$

† P-value for $\chi 2$ test, significant for $p<0.05$

TABLE 2. Comparison of the Demographic and Clinical Characteristics of Emmetropic.Eyes. Myopes with AL<25mm and M AL>25mm.

PARAMETERS	EMMETROPES	MYOPES AL<25mm	MYOPES AL>25 mm
EYES (n)	50	51	53
AGE (y)	58.92 (8.67)	57.94 (10.76)	57.89 (11.36)
SEX (M/F)	18/32	16/35	19/34
REFRACTION (D)	0.64 (0.34)	-3.62 (0.43)	-5.24 (1.10)
AXIAL LENGHT (mm)	22.82 (0.80)	24.41 (0.61)	26.23 (1.30)
MD (dB)	-2.16 (4.43)	-2.18 (5.37)	-3.50 (5.30)
PSD (dB)	2.77 (2.23)	3.39 (3.42)	3.76 (3.67)
RNFLavg (µ)	96.43 (14.06)	95.23 (16.66)	86.02 (13.58)
GCCavg (µ)	87.63 (7.70)	85.12 (14.50)	81.59 (11.87)
estimated total RGC count (n)	941639.43 (259924.16)	918347.12 (279783.75)	786566.29 (260723.37)

The parameters are expressed as mean and SD; MD: Mean deviation of SAP; PSD: pattern standard deviation of SAP. RNFL: Retinal Nerve Fiber Layer; GCC: Ganglion Cell Complex; RGC: Retinal Ganglion Cell.

* P-values for ANOVA, significant for $p<0.05$

† *P-values for* χ^2 *test*, significant for $p<0.05$

TABLE 3. Pearson's correlation between OCT parameters and RGC count and axial lenght

PARAMETERS	Healthy	PPG	POAG
	R (p)	R (p)	R (p)
MD (dB)	-0.28 **(0.05)**	-0.07 (0.56)	-0.34 **(0.01)**
RNFLavg (µm)	-0.46 **(0.002)**	-0.33 **(0.003)**	-0.3 **(0.01)**
RNFLsup (µm)	-0.31 **(0.03)**	-0.28 **(0.01)**	-0.3 **(0.03)**
RNFLinf (µm)	-0.55 **(<.001)**	-0.31 **(0.007)**	-0.3 **(0.01)**
GCCavg (µm)	0.07 (0.3)	-0.29 **(0.01)**	-0.15 (0.1)
GCCsup (µm)	0.1 (0.3)	-0.23 **(0.03)**	-0.04 (0.4)
GCCinf (µm)	0.045 (0.4)	-0.31 **(0.006)**	-0.24 **(0.04)**
FLV %	0.44 **(0.004)**	0.43 **(<.001)**	0.57 **(<.001)**
GLV %	0.22 (0.1)	0.48 **(<.001)**	0.26 **(0.03)**
RGCcount (n)	-0.58 **(<.001)**	-0.3 **(<.001)**	-0.32 **(0.007)**

P-values significant for p <0.05

Table 4.a P-values for Mann-Whitney U Test between PPG eyes with different axial length

PARAMETERS	PPG emmetropic (N=22)	PPG with AL<25mm (N=21)	PPG with AL>25mm (N=21)	PPG emmetropic vs PPG with AL<25 mm	PPG emmetropic vs PPG with AL>25 mm	PPG with AL<25 mm vs PPG with AL>25 mm
				P-values		
MD (dB)	-0.98 (1.52)	0.18 (1.26)	-0.94 (1.89)	0.12	0.6	0.07
RNFL avg (µm)	97.17 (10.82)	95.0 (8.05)	88.68 (9.07)	0.4	**0.009**	**0.02**
RNFL sup (µm)	98.01 (11.01)	93.52(8.78)	90.30 (12.07)	0.11	**0.02**	0.21
RNFL inf (µm)	96.31 (11.84)	96.66(10.66)	87.06 (11.22)	0.96	**0.02**	**0.008**
GCC avg (µm)	88.20 (6.68)	86.73(4.60)	81.52 (8.64)	0.28	**0.005**	**0.005**
GCC sup (µm)	88.99 (7.31)	87.86 (5.11)	82.82 (8.16)	0.29	**0.005**	**0.007**
GCC inf (µm)	87.40 (7.04)	85.66(5.02)	80.22 (9.91)	0.3	**0.01**	**0.03**
FLV %	1.68 (2.22)	2.41 (2.74)	4.50 (4.67)	0.06	**0.01**	0.2
GLV %	9.59 (5.71)	12.29(4.68)	18.07 (7.16)	0.08	**<.001**	**0.005**
RGC count (n)	1002394.31 (189401.24)	986664.15(91736.86)	884594.19 (128656.99)	0.96	**0.05**	**0.007**

The parameters are expressed as mean and SD. There is no difference between emmetropic and mild myopic PPG, while all the parameters analyzed are statistically significant in comparison between emmetropes and high myopic PPG, and between mild and high myopic PPG. P-values significant for p <0.05.

Table 4 b. Mann-Whitney U Test between PPG and healthy eyes with the same axial length.

PARAMETERS	PPG emmetropic (N=22)	PPG with AL<25 mm (N=21)	PPG with AL>25mm (N=21)	Healthy emmetropic (N=13)	Healthy with AL<25mm (N=12)	Healthy with AL>25 mm (N=11)	PPG emmetropic vs healthy emmetropic	P AL< hea AL
								P
MD (dB)	-0.98 (1.52)	-0.94 (1.89)	0.18 (1.26)	-0.12 (0.85)	-0.64 (0.79)	-0.73 (0.76)	0.06	
RNFL avg (µm)	97.17 (10.82)	88.68 (9.07)	95.09 (8.05)	109.76 (9.79)	114.54 (10.61)	100.15 (7.59)	**0.006**	
RNFL sup (µm)	98.01 (11.01)	90.30 (12.07)	93.52 (8.78)	106.45 (9.32)	113.45 (13.76)	101.04 (10.04)	0.06	
RNFL inf (µm)	96.31 (11.84)	87.06 (11.22)	96.66 (10.66)	113.08 (11.48)	115.62 (9.26)	99.30 (7.78)	**0.004**	
GCC avg (µm)	88.20 (6.68)	81.52 (8.64)	86.73 (4.60)	92.70 (4.37)	102.24 (6.68)	96.75 (4.12)	0.07	
GCC sup (µm)	88.99 (7.31)	82.82 (8.16)	87.86 (5.11)	91.66 (4.96)	100.96 (7.20)	96.86 (5.37)	0.29	
GCC inf (µm)	87.40 (7.04)	80.22 (9.91)	85.66 (5.02)	93.74 (4.05)	103.60 (6.56)	96.62 (3.73)	**0.02**	
FLV %	1.68 (2.22)	4.50 (4.67)	2.41 (2.74)	0.20 (0.22)	0.34 (0.46)	1.00 (1.09)	**0.001**	
GLV %	9.59 (5.71)	18.07 (7.16)	12.29 (4.68)	4.69 (2.76)	1.57 (1.50)	4.99 (2.21)	**0.006**	
RGC count (n)	1002394.31 (189401.24)	1183055.86 (125256.44)	986664.15 (91736.86)	884594.19 (128656.99)	1191809.55 (129243.34)	1034300.79 (109779.01)	**0.006**	

The parameters are expressed as mean and SD. RNFLavg and RGCs count are significant in all comparisons, while GCCavg is not significant in the comparison between PPG and healthy emmetropes. P-values significant for p<0.05.

Table 4.c P-value for Mann-Whitney U Test between healthy eyes with different axial lenght

PARAMETERS	Healthy emmetropic (N=13)	Healthy with AL<25mm (N=12)	Healthy with AL>25 mm (N=11)	Healthy emmetropic vs healthy with AL<25mm	Healthy emmetropic vs healthy with AL>25mm	Healthy with AL<25mm vs healthy with AL>25 mm
				P- values		
MD (dB)	-0.12 (0.85)	-0.64 (0.79)	-0.73 (0.76)	0.11	0.12	0.83
RNFL avg (µm)	109.76 (9.79)	114.54 (10.61)	100.15 (7.59)	0.31	**0.04**	**0.003**
RNFL sup (µm)	106.45 (9.32)	113.45 (13.76)	101.04 (10.04)	0.18	0.12	**0.003**
RNFL inf (µm)	113.08 (11.48)	115.62 (9.26)	99.30 (7.78)	0.81	**0.01**	**0.02**
GCC avg (µm)	92.70 (4.37)	102.24 (6.68)	96.75 (4.12)	**<.001**	0.05	**0.03**
GCC sup (µm)	91.66 (4.96)	100.96 (7.20)	96.86 (5.37)	**0.004**	0.06	0.13
GCC inf (µm)	93.74 (4.05)	103.60 (6.56)	96.62 (3.73)	**<.001**	0.09	**0.005**
FLV %	0.20 (0.22)	0.34 (0.46)	1.00 (1.09)	0.60	**0.04**	**0.05**
GLV %	4.69 (2.76)	1.57 (1.50)	4.99 (2.21)	**0.005**	0.68	**<.001**
RGC count (n)	1183055.86 (125256.44)	1191809.55 (129243.34)	1034300.79 (109779.01)	0.76	**0.01**	**0.007**

The parameters are expressed as mean and SD. P-values significant for p<0.05.

TABLE 5 Mann – Whitney U Test between subgroups

PARAMETERS	Emmetropic PPG	Myopic* PPG	Healthy myopes†	Non-highly myopic‡	Highly myopic§	Emmetropic PPG vs Myopic* PPG
MD (dB)	-0.98 (1.52)	-0.38 (1.69)	-0.69 (0.76)	-2.12 (6.09)	-3.58 (5.16)	**0.04**
RNFL avg (μm)	97.17 (10.82)	91.89 (9.07)	107.66 (11.68)	94.69 (13.23)	86.46 (13.87)	**0.03**
RNFL sup (μm)	98.01 (11.01)	91.91 (10.55)	107.51 (13.44)	95.05 (13.26)	88.15 (15.30)	**0.02**
RNFL inf (μm)	96.31 (11.84)	91.86 (11.85)	107.81 (11.82)	94.31 (14.57)	84.78 (14.88)	0.17
GCC avg (μm)	88.20 (6.68)	84.12 (7.32)	99.61 (6.16)	84.77 (8.88)	81.61 (11.78)	**0.01**
GCC sup (μm)	88.99 (7.31)	85.34 (7.19)	99.00 (6.59)	86.15 (8.62)	83.43 (11.79)	**0.02**
GCC inf (μm)	87.40 (7.04)	82.94 (8.24)	100.26 (6.37)	83.41 (10.58)	79.78 (13.14)	**0.03**
FLV %	1.68 (2.22)	3.46 (3.93)	0.66 (0.87)	4.22 (3.74)	5.96 (5.39)	**0.002**
GLV %	9.59 (5.71)	15.18 (6.65)	3.21 (2.53)	15.19 (7.85)	18.39 (10.28)	**0.008**
RGC count (n)	1002394.31 (189401.24)	935629.17 (121851.31)	1116479.27 (142484.24)	910940.59 (226819.93)	784036.59 (253833.31)	**<.001**

The parameters are expressed as mean and SD. P-values significant for p<0.05.

** Myopes with preperimetric glaucoma, without distinction for axial length*

† Healthy myopic eyes with no distinction for axial length

‡ Healthy and PPG eyes with AL<25mm

§Healthy and PPG eyes with AL>25mm

TABLE 6.a ROC curves in emmetropic eyes

	AUC (CI95%)	CUT OFF	p	%SENS (95%CI)	
MD (dB)	0.807 (0.670 to	-0.35	**<.001**	83.78 (68.0 - 93.8)	6

	0.905)				
RNFL avg (µm)	0.877 (0.754 to 0.953)	99.6	**<.001**	78.38 (61.8 - 90.2)	8
RNFL sup (µm)	0.798 (0.659 to 0.899)	102.54	**<.001**	81.08 (64.8 - 92.0)	6
RNFL inf (µm)	**0.88** (0.756 to 0.955)	103.51	**<.001**	81.08 (64.8 - 92.0)	8
GCC avg (µm)	0.748 (0.606 to 0.860)	85.02	**<.001**	48.65 (31.9 - 65.6)	1
GCC sup (µm)	0.673 (0.524 to 0.800)	84.63	**0.04**	38.89 (23.1 - 56.5)	1
GCC inf (µm)	0.801 (0.663 to 0.902)	87.53	**<.001**	56.76 (39.5 - 72.9)	1
FLV %	**0.897** (0.777 to 0.966)	0.315	**<.001**	83.78 (68.0 - 93.8)	8
GLV %	0.818 (0.682 to 0.914)	9.069	**<.001**	54.05 (36.9 - 70.5)	1
RGC count (n)	0.873 (0.749 to 0.950)	1013639.86	**<.001**	72.97 (55.9 - 86.2)	1
TABLE 6.b ROC curves in all myopic eyes					
MD (dB)	0.636 (0.536 to 0.728)	-2.51	**0.008**	50.62 (39.3 - 61.9)	1
RNFL avg (µm)	0.899 (0.824 to 0.949)	95.56	**<.001**	80.25 (69.9 - 88.3)	8
RNFL sup (µm)	0.87 (0.789 to 0.928)	90.48	**<.001**	66.67 (55.3 - 76.8)	9
RNFL inf (µm)	0.885 (0.808 to 0.939)	97.07	**<.001**	75.31 (64.5 - 84.2)	8
GCC avg (µm)	0.981 (0.933 to 0.998)	93.19	**<.001**	97.53 (91.4 - 99.7)	9
GCC sup (µm)	0.953 (0.893 to 0.985)	91.01	**<.001**	90.12 (81.5 - 95.6)	9
GCC inf (µm)	**0.987** (0.942 to 0.999)	92.27	**<.001**	97.53 (91.4 - 99.7)	9
FLV %	0.917 (0.846 to 0.962)	0.806	**<.001**	90.12 (81.5 - 95.6)	8
GLV %	**0.987** (0.941 to 0.999)	8.658	**<.001**	92.59 (84.6 - 97.2)	1
RGC count (n)	0.895 (0.820 to 0.947)	935606.84	**<.001**	70.37 (59.2 - 80.0)	9

Area under receiver operating characteristic curve values with 95%CIs, cut off, sensibility and

specificity and their CI95% describing glaucomatous diagnostic capabilities of OCT parameters and RGCcount in emmetropic (6.a) and all myopic eyes (6.b). P-values significant for p<0.05.

TABLE 6.c ROC curves in myopic eyes with AL<25 mm

	AUC (CI95%)	CUT OFF	p	%SENS (95%CI)	
MD (dB)	0.528 (0.383 to 0.669)	-2.78	0.72	38.46 (23.4 - 55.4)	1
RNFL avg (µm)	0.951 (0.851 to 0.992)	99.15	**<.001**	82.05 (66.5 - 92.5)	1
RNFL sup (µm)	0.912 (0.799 to 0.973)	108.33	**<.001**	94.87 (82.7 - 99.4)	7
RNFL inf (µm)	0.949 (0.848 to 0.991)	102.09	**<.001**	84.62 (69.5 - 94.1)	1
GCC avg (µm)	0.995 (0.920 to 1.000)	93.19	**<.001**	97.44 (86.5 - 99.9)	1
GCC sup (µm)	0.951 (0.851 to 0.992)	93.12	**<.001**	89.74 (75.8 - 97.1)	1
GCC inf (µm)	**0.998** (0.926 to 1.000)	92.27	**<.001**	97.44 (86.5 - 99.9)	1
FLV %	0.949 (0.848 to 0.991)	0.799	**<.001**	89.74 (75.8 - 97.1)	9
GLV %	**0.996** (0.922 to 1.000)	4.001	**<.001**	97.44 (86.5 - 99.9)	8
RGC count (n)	0.929 (0.822 to 0.982)	1054836.71	**<.001**	84.62 (69.5 - 94.1)	9

TABLE 6.d ROC curves in myopic eyes with AL>25 mm

MD (dB)	0.733 (0.593 to 0.845)	-2.09	**<.001**	64.29 (48.0 - 78.4)	1
RNFL avg (µm)	0.883 (0.765 to 0.955)	87.37	**<.001**	66.67 (50.5 - 80.4)	1
RNFL sup (µm)	0.859 (0.736 to 0.939)	90.48	**<.001**	78.57 (63.2 - 89.7)	9
RNFL inf (µm)	0.872 (0.752 to 0.948)	86.29	**<.001**	71.43 (55.4 - 84.3)	1
GCC avg (µm)	0.974 (0.888 to 0.998)	89.89	**<.001**	92.86 (80.5 - 98.5)	1

GCC sup (µm)	0.963 (0.872 to 0.996)	89.07	**<.001**	88.1 (74.4 - 96.0)	1
GCC inf (µm)	**0.976** (0.891 to 0.999)	89.52	**<.001**	95.24 (83.8 - 99.4)	1
FLV %	0.9 (0.787 to 0.966)	3.408	**<.001**	71.43 (55.4 - 84.3)	1
GLV %	**0.998** (0.929 to 1.000)	8.658	**<.001**	97.62 (87.4 - 99.9)	1
RGC count (n)	0.905 (0.792 to 0.968)	933043.19	**<.001**	83.33 (68.6 - 93.0)	9

Area under receiver operating characteristic curve values with 95%CIs, cut off, sensibility and specificity and their CI95% describing glaucomatous diagnostic capabilities of OCT parameters and RGCcount in myopes with AL<25 mm eyes (6.c) and myopes with AL>25 mm eyes (6.d). P-values significant for p<0.05.

TABLE 7 Comparisons of AUROCs between GCCinf and GLV and all other parameters in myopes subgroups.

	MYOPES WITH AL<25mm				MYOPES WITH AL>25mm					
	GCCinf		GLV		GCCinf		GLV		GCCinf	
	Difference between areas (SE)	p	Difference between areas (SE)	p	Difference between areas (SE)	p	Difference between areas (SE)	p	Difference between areas (SE)	
MD (dB)	0.5 (0.08)	**<.001**	0.5 (0.08)	**<.001**	0.2 (0.07)	**<.001**	0.3 (0.07)	**<.001**	0.351 (0.05)	**<.**
RNFL avg (µm)	0.05 (0.03)	0.1	0.05 (0.03)	0.09	0.09 (0.04)	**0.03**	0.1 (0.05)	**0.01**	0.09 (0.03)	**0.**
RNFL sup (µm)	0.09 (0.05)	**0.05**	0.08 (0.04)	**0.04**	0.11 (0.05)	**0.02**	0.14 (0.05)	**0.005**	0.1 (0.03)	**<.**
RNFL inf (µm)	0.05 (0.03)	0.08	0.05 (0.03)	0.07	0.1 (0.04)	**0.01**	0.13 (0.01)	**0.007**	0.1 (0.03)	**0.**
GCC avg (µm)	0.003 (0.007)	0.6	0.001 (0.007)	0.9	0.002 (0.003)	0.4	0.02 (0.02)	0.2	0.006 (0.005)	0
GCC sup (µm)	0.05 (0.03)	0.1	0.05 (0.03)	0.1	0.01 (0.01)	0.3	0.03 (0.02)	0.1	0.03 (0.02)	**0.**
GCC inf (µm)	///	///	0.002 (0.004)	0.6	///	///	0.02 (0.02)	0.3	///	/
FLV %	0.05 (0.03)	0.09	0.05 (0.03)	0.1	0.08 (0.05)	0.1	0.1 (0.05)	**0.03**	0.07 (0.03)	**0.**
GLV %	0.002 (0.004)	0.6	///	///	0.02 (0.02)	0.2	///	///	0.0005 (0.009)	0.
RGC count (n)	0.07 (0.04)	0.07	0.07 (0.04)	0.07	0.07 (0.05)	0.1	0.09 (0.04)	**0.03**	0.09 (0.03)	**0.**

P-values significant for p<0.05

TABLE 8 Comparison of AUROCs of all OCT parameters between between subgroups with different axial length.

	Emmetropes vs Myopes		Emmetropes vs Myopes with AL<25mm		Emmetropes vs Myopes with al>25mm		Myopes wi Myopes v
	Difference between areas (SE)	p	Difference between areas (SE)	p	Difference between areas (SE)	p	Difference between areas (SE)
MD (dB)	0.171 (0.0814)	**0.04**	0.279 (0.103)	**0.006**	0.074 (0.095)	0.44	-0.205 (.10
RNFL avg (µm)	-0.022 (0.0762)	0.72	-0.074 (0.0702)	0.22	-0.006 (0.0797)	0.12	00.068 (0.0551)
RNFL sup (µm)	-0.072 (0.0762)	0.34	-0.114 (0.0802)	0.15	-0.061 (0.0841)	0.47	0.053 (0.0664)
RNFL inf (µm)	-0.005 (0.0635)	0.94	-0.069 (0.0606)	0.25	0.008 (0.0721)	0.91	0.077 (0.0558)
GCC avg (µm)	-0.233 (0.0737)	**0.002**	-0.247 (0.073)	**<.001**	-0.226 (0.076)	**0.003**	0.021 (0.0231)
GCC sup (µm)	-0.28 (0.0845)	**0.01**	-0.278 (0.087)	**0.001**	-0.29 (0.0859)	**<.001**	-0.012 (0.0378)
GCC inf (µm)	-0.186 (0.0632)	**0.003**	-0.197 (0.0626)	**0.002**	-0.175 (0.0662)	**0.008**	0.022 (0.0221)
FLV %	-0.02 (0.0545)	0.71	-0.052 (0.0554)	0.34	-0.003 (0.0635)	0.96	0.049 (0.0537)
GLV %	-0.169 (0.0658)	**0.01**	-0.178 (0.0655)	**0.007**	-0.18 (0.0654)	**0.006**	-0.002 (0.00599)
RGC count (n)	-0.022 (0.0588)	0.71	-0.056 (0.0617)	0.36	-0.032 (0.0648)	0.62	0.024 (0.0568)

P-values significant for p<0.05

TABLE 9 Comparison of AUROCs between RGCcount and OCT parameters, in all myopes groups.

	EMMETROPES		MYOPES WITH AL<25mm		MYOPES WITH AL>25mm		ALL
	RGCcount						
	Difference between areas (SE)	p	Difference between areas (SE)	p	Difference between areas (SE)	p	Differen betwe areas (S
MD (dB)	0.0665 (0.0476)	0.16	0.402 (0.0792)	**<.001**	0.172 (0.07)	**0.008**	0.2 (0.0
RNFL avg (µm)	0.00416 (0.0463)	0.93	0.0214 (0.354)	0.55	0.0216 (0.0497)	0.66	0.003 (0.028
RNFL sup (µm)	0.0716 (0.0558)	0.2	0.0171 (0.0414)	0.7	0.0455 (0.0532)	0.39	0.025 (0.033
RNFL inf (µm)	0.0107 (0.0496)	0.83	0.0192 (0.309)	0.53	0.0325 (0.0525)	0.54	0.01((0.03
GCC avg (µm)	0.125 (0.0704)	0.08	0.0652 (0.0375)	0.08	0.693 (0.0476)	0.42	0.086 (0.033
GCC sup (µm)	0.197 (0.0821)	**0.02**	0.0214 (0.0451)	0.64	0.0584 (0.0489)	0.23	0.05 (0.037
GCC inf (µm)	0.0748 (0.0618)	0.23	0.0684 (0.0382)	0.73	0.07 (0.05)	0.13	0.091 (0.032
FLV %	0.0278 (0.0731)	0.7	0.0192 (0.0502)	0.7	0.00433 (0.0555)	0.94	0.021 (0.038
GLV %	0.0603 (0.0705)	0.39	0.0662 (0.0369)	0.07	0.09 (0.04)	0.03	0.091 (0.031

P-values significant for p<0.05

Figures

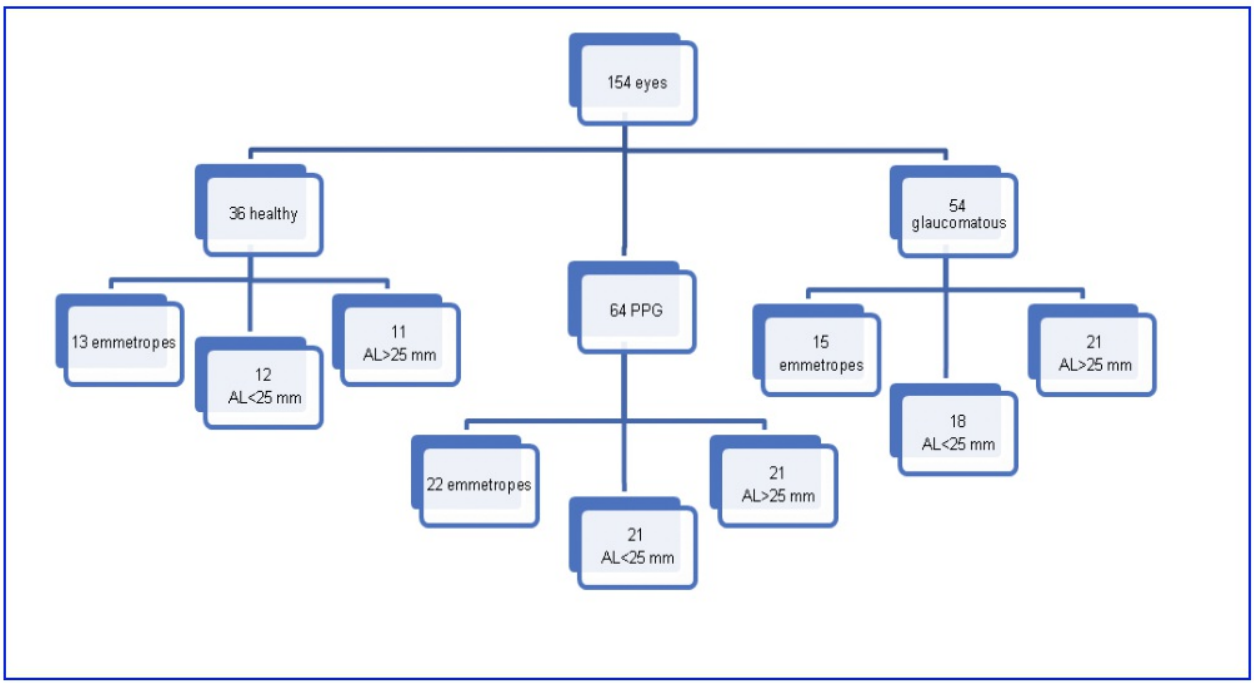

Figure 1

Graphical representation of the subdivision of the study sample into subgroups

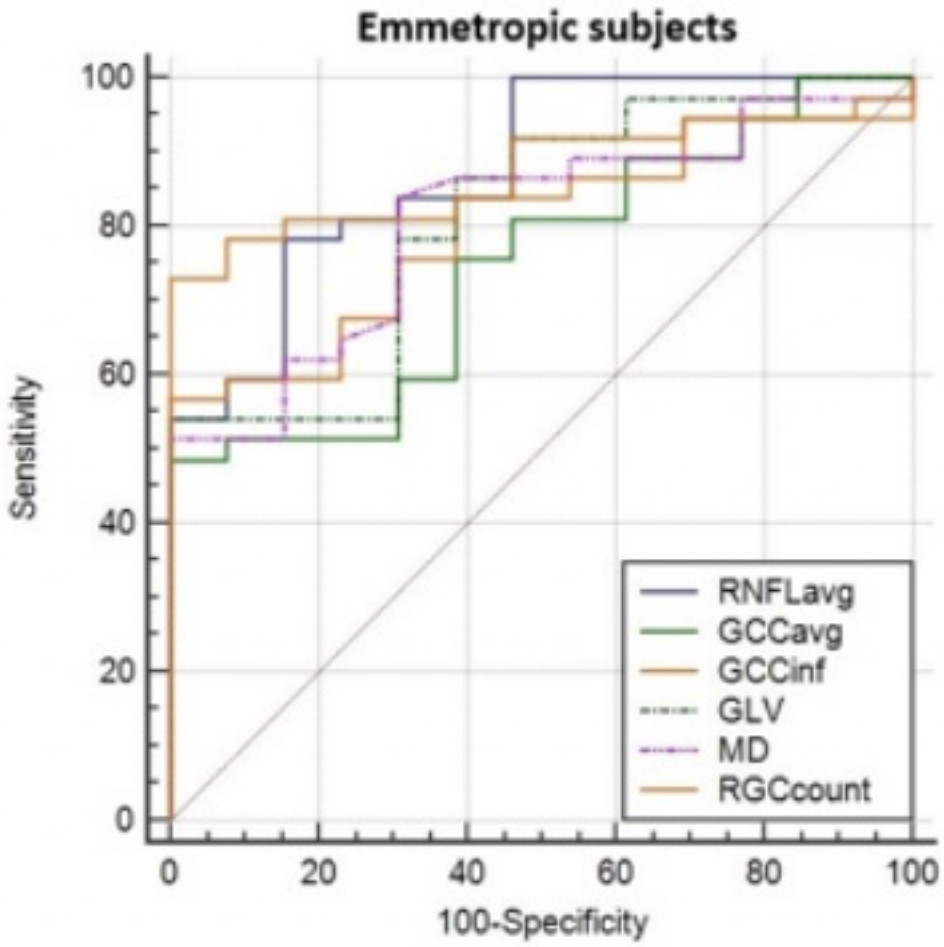

Figure 2

AUROC of RNFLavg, GCCinf, GLV, RGCcount and MD in emmetropic eyes (Fig. 2), myopes with AL<25 mm (Fig 3), myopes with AL>25mm (Fig. 4) and all myopic eyes with no distinction in axial length (Fig 5)

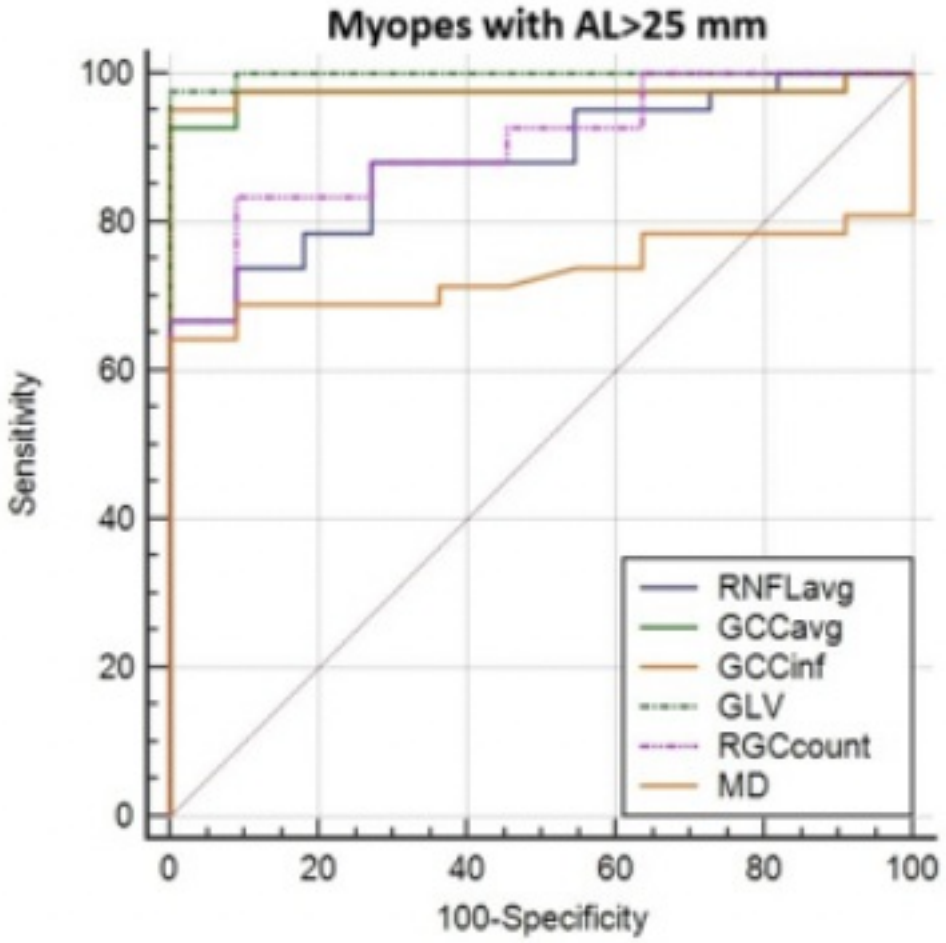

Figure 3

AUROC of RNFLavg, GCCinf, GLV, RGCcount and MD in emmetropic eyes (Fig. 2), myopes with AL<25 mm (Fig 3), myopes with AL>25mm (Fig. 4) and all myopic eyes with no distinction in axial length (Fig 5)

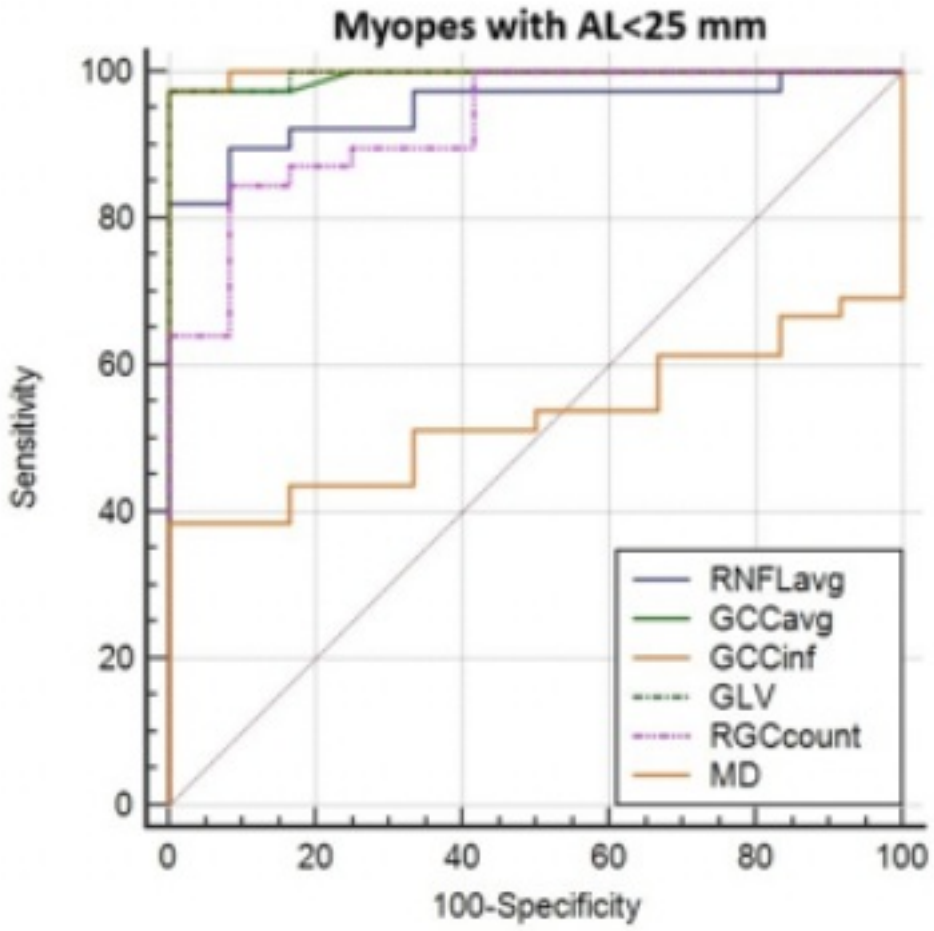

Figure 4

AUROC of RNFLavg, GCCinf, GLV, RGCcount and MD in emmetropic eyes (Fig. 2), myopes with AL<25 mm (Fig 3), myopes with AL>25mm (Fig. 4) and all myopic eyes with no distinction in axial length (Fig 5)

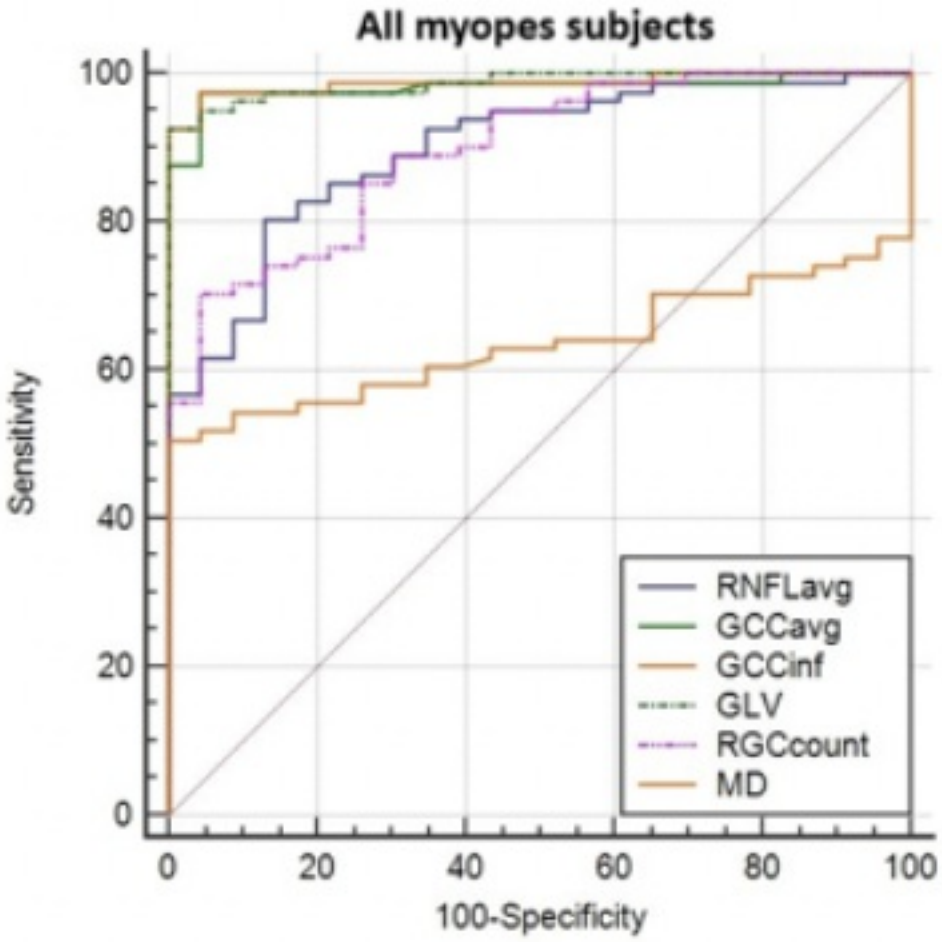

Figure 5

AUROC of RNFLavg, GCCinf, GLV, RGCcount and MD in emmetropic eyes (Fig. 2), myopes with AL<25 mm (Fig 3), myopes with AL>25mm (Fig. 4) and all myopic eyes with no distinction in axial length (Fig 5)