OPTIC DISC EVALUATION BY OPTICAL COHERENCE TOMOGRAPHY AND OPTICAL COHERENCE TOMOGRAPHY ANGIOGRAPHY IN PRIMARY OPEN ANGLE GLAUCOMA

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INTRODUCTION

Glaucoma is a major cause of irreversible visual morbidity worldwide. Primary open angle glaucoma (POAG) is the most common type of glaucoma. Glaucomatous optic neuropathy is characterized by a progressive degeneration of RGC and their axons resulting in a characteristic appearance of the optic disc resulting in cupping of the optic nerve head and visual field loss. Vascular dysregulation with reduced perfusion of the optic nerve head is considered the risk factors for the development and progression of glaucoma. It is generally asymptomatic until late in the disease when the central vision is affected. Therefore early detection and appropriate treatment is essential. Glaucoma diagnosis requires frequent longitudinal monitoring and detection of progressive damage over time. OCT and OCTA have become the gold standard for detecting early structural and vascular glaucomatous damage, with high reproducibility and reliability to improve our understanding of the pathophysiology of glaucoma and detection of glaucomatous progression.

AIM OF THE WORK

The aim of the work was to evaluate optic disc by optical coherence tomography and optical coherence tomography angiography in primary open angle glaucoma.

SUBJECTS AND METHODS

SUBJECTS: This study was carried out on patients attending the glaucoma service in the Ophthalmology Outpatient Clinic of Alexandria Main University Hospital. The study included 40 subjects and were divided into 2 groups:
* Group A includes 20 patient with POAG   *Group B includes 20 normal subjects.
Exclusion criteria
1. Other retinal vascular disease   2. Media opacity
3. Congenital optic disc anomalies.
4. Previous surgical interventions like history of retinal surgery
METHODS: After giving informed consent, all cases were subjected to:
A) **Thorough history taking.**
B) **Full ophthalmic examination including:**
1. Best corrected visual acuity.   2. Anterior segment examination by slit lamp
3. Fundus examination by high plus auxiliary lens with the slit lamp.
4. IOP measurement using Goldman's Applanation Tonometer.
C) **Investigations**
1. Visual field testing, by Humphrey visual field analyser (HFA)
2. Fundus photography: Heidelberg Engineering
3. OCT and OCT angiography: Zeiss Cirrus HD OCT, Zeiss AngioPlex OCT Angiography.

RESULTS

Table 1: RNFL thickness and OCT's ONH parameters of the studied cases.

RNFL's and ONH's OCT parameters	Group A (n=29)	Group B (n=28)	Test of sig.	p
Average RNFL thickness (µm)				
Min. – Max.	50.0 – 99.0	84.0 – 111.0	t= 8.968*	<0.001*
Mean ± SD.	73.62 ± 11.82	96.43 ± 6.80		
Rim area (mm²)				
Min. – Max.	0.33 – 1.35	1.10 – 1.81	U= 47.50*	<0.001*
Mean ± SD.	0.91 ± 0.28	1.40 ± 0.18		
Disc area (mm²)				
Min. – Max.	1.50 – 2.70	1.50 – 2.22	t= 1.700	0.095
Mean ± SD.	1.98 ± 0.30	1.87 ± 0.20		
Average C/D ratio				
Min. – Max.	0.47 – 0.92	0.26 – 0.60	t= 9.335*	<0.001*
Mean ± SD.	0.72 ± 0.12	0.47 ± 0.09		
Vertical C/D ratio				
Min. – Max.	0.42 – 0.89	0.22 – 0.54	t= 11.037*	<0.001*
Mean ± SD.	0.71 ± 0.10	0.44 ± 0.08		
Cup volume (mm²)				
Min. – Max.	0.07 – 1.41	0.01 – 0.22	U= 112.0*	<0.001*
Mean ± SD.	0.46 ± 0.30	0.12 ± 0.06		

SD: Standard deviation   **t:** Student t-test
U: Mann Whitney test   **Test of sig:** Test of significance.
p: p value for comparing between the two studied groups
*: Statistically significant at p ≤ 0.05   **Group A**: POAG   **Group B**: Control

Table 2: OCTA's ONH parameters of the studied cases.

ONH's OCTA parameters	Group A (n=29)	Group B (n=28)	t	p
Perfusion (%)				
Min. – Max.	34.30 – 47.40	42.70 – 49.60	5.478*	<0.001*
Mean ± SD.	41.90 ± 3.58	45.90 ± 1.60		
Flux index				
Min. – Max.	0.27 – 0.46	0.38 – 0.47	7.666*	<0.001*
Mean ± SD.	0.36 ± 0.05	0.44 ± 0.03		

SD: Standard deviation   **t:** Student t-test
p: p value for comparing between the two studied groups
*: Statistically significant at p ≤ 0.05   **Group A**: POAG   **Group B**: Control
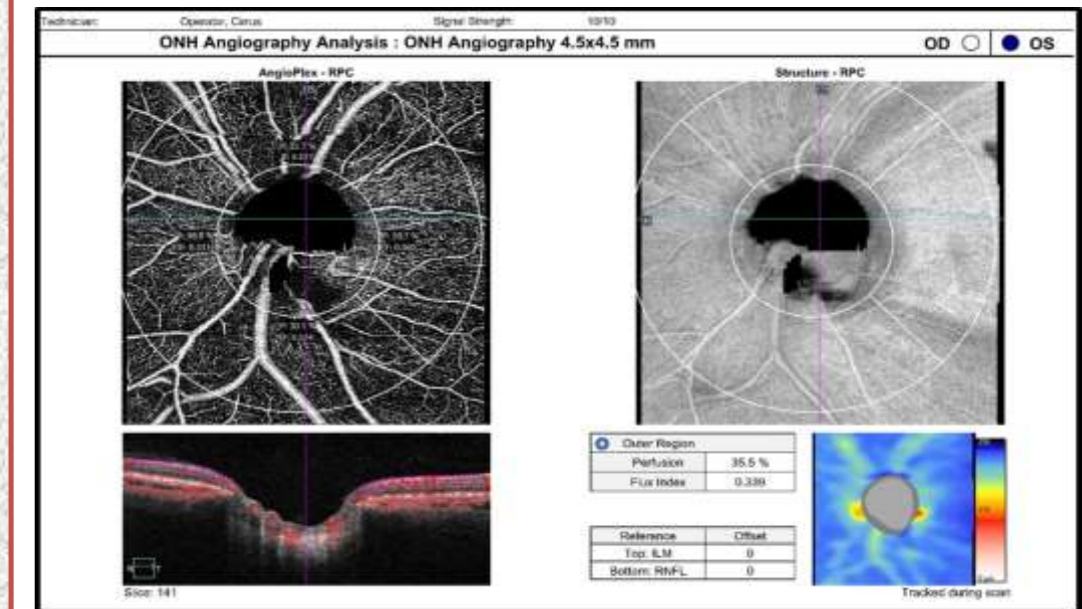
Figure: Cirrus HD-OCTA's ONH Angiography analysis of a glaucomatous eye derived from ONH Angiography (4.5×4.5) of the left eye.

CONCLUSION

In POAG, there was a significant reduction of ONH perfusion detected by OCTA and reduction of RNFL thickness with enlargement of C/D ratio and consequent thinning of the neuroretinal rim compared to normal controls. Functional glaucomatous damage detected by visual field testing and structural glaucomatous damage detected by OCT for ONH, RNFL were significantly correlated reduced ONH perfusion detected by OCTA.