CORRELATION BETWEEN BRUCH'S MEMBRANE OPENING IN OPTICAL COHERENCE TOMOGRAPHY AND OPTIC CUP TO DISC RATIO BY ULTRAWIDE-FIELD IMAGING

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Introduction

Glaucoma, a progressive optic neuropathy, is a serious ocular disease characterized by high intraocular pressure (IOP) and visual field defects that may eventually lead to blindness.
The vertical cup-to-disc ratio (VCDR) is frequently used to detect glaucoma as part of the optic disc assessment. The VCDR reflects the neuroretinal rim health and shows the cup's diameter as a fraction of the disc's diameter along the vertical meridian. Although VCDR has limits, mostly because of its correlation with optic disc size, it is especially significant since glaucomatous damage especially affects the superior and inferior neuroretinal rim.
Previously, spectral domain optical coherence tomography (SD-OCT) assessment of the neuroretinal rim employed a parameter called "Bruch's Membrane Opening-Horizontal Rim Width" (BMO-HRW), which is defined as the distance between BMO and internal limiting membrane (ILM) on the horizontal plane. More recently, the Spectralis OCT (Heidelberg Engineering, Germany) developed a new parameter called "Bruch's Membrane Opening–Minimum Rim Width" (BMO-MRW) with Glaucoma Module Premium Edition (GMPE), which is calculated as the minimum distance between the BMO and nearest point on the ILM
The Optos fundus camera is a confocal scanning laser ophthalmoscope-based system with an ellipsoidal mirror that allows imaging of up to 200° of the retina. With this technology, no contact lenses or pupillary dilatation are needed. With cooperative patients, the field can be extended to reach the ora serrata.
This study is directed to finding out if there is a strong correlation between BMO-MRW measured by OCT and VCDR as measured by Optos annotation tool.

Aim of the Work

The aim of the work was to study the correlation between Bruch's membrane opening minimum rim width in OCT and optic cup to disc ratio by ultrawide field imaging.

Subjects and Methods

This retrospective cross-sectional study will be conducted on 50 eyes of glaucomatous patients and 50 eyes of normal subjects.

Inclusion criteria

•Patients who underwent imaging by SD-OCT and Optos ultrawide field imaging.

Exclusion criteria

- Patients with optic atrophy.
- Patients with dense media opacity.
- Patients with congenital optic disc anomalies as myopic patients with titled optic discs, etc.

Records were reviewed for the following data:

- History taking & full ophthalmic examination:
  •Any relevant medical or surgical history was noted.
  •Any positive examination findings were recorded, including VCDR.
- SD-OCT measurement of BMO-MRW by Heidelberg Spectralis OCT using Glaucoma Module Premium Edition software.
- Ultrawide field imaging of the optic disc by (Optos, Dunfermline, UK) to determine vertical cup to disc ratio using the annotation tool in the software.

Results

Table 1 shows the correlation found between VCDR both measured by Optos and clinically observed with both BMO-MRW and RNFL thickness at 3.5 mm diameter circle in normal eyes.
For the Optos measured VCDR, it negatively correlated with BMO-MRW different sectors with a P value of 0.009for temporal sector, 0.002for temporal superior sector, >0.001for nasal superior, nasal and nasal inferior sectors. The temporal inferior sector negatively correlated well with the measured VCDR with a P value of 0.003. The global thickness as well negatively correlated with the measured VCDR with a P value of >0.001. All the sectors' correlations were statistically significant.
Concerning the observed VCDR, it negatively correlated with BMO-MRW with a P value of <0.001for all the measured sectors, being statistically significant.

Table 1: Correlation between Optos measured and observed VCDR with BMO MRW and RNFL 3.5 in normal group (n = 50)

		Optos Measured VCDR		Observed VCDR	
		R	P	r_s	P
BMO MRW	Temporal	-0.366*	0.009*	-0.525	<0.001*
	Temporal superior	-0.424*	0.002*	-0.509	<0.001*
	Nasal superior	-0.639*	<0.001*	-0.705	<0.001*
	Nasal	-0.622*	0.001*<	-0.770	<0.001*
	Nasal inferior	-0.544*	0.001*<	-0.664	<0.001*
	Temporal inferior	-0.412*	0.003*	-0.642	<0.001*
	Global	-0.576*	0.001*<	-0.723	<0.001*
RNFL 3.5	Temporal	0.422*	0.002*	0.395	0.004*
	Temporal superior	0.321*	0.023*	0.241	0.091
	Nasal superior	-0.126	0.383	-0.035	0.808
	Nasal	0.157	0.275	0.196	0.172
	Nasal inferior	-0.084	0.561	0.097	0.504
	Temporal inferior	0.189	0.190	0.207	0.149
	Global	0.218	0.129	0.291	0.040*

Table 2 shows the correlation found between VCDR both measured by Optos and clinically observed with both BMO-MRW and RNFL thickness at 3.5 mm diameter circle in glaucomatous eyes.
For the Optos measured VCDR, it had a statistically significant negative correlation with all BMO-MRW sectors except the temporal sector.
Concerning the clinically observed VCDR, it also had a statistically significant negative correlation with all BMO-MRW sectors.

Table 2: Correlation between Optos measured and observed VCDR with BMO MRW and RNFL 3.5 in glaucomatous group (n = 50)

		Optos Measured VCDR		Observed VCDR	
		R	P	r_s	P
BMO MRW	Temporal	-0.234	0.101	-0.623*	<0.001*
	Temporal superior	-0.501*	<0.001*	-0.529*	<0.001*
	Nasal superior	-0.507*	0.001*<	-0.522*	<0.001*
	Nasal	-0.534*	0.001*<	-0.519*	<0.001*
	Nasal inferior	-0.405*	0.004*	-0.386*	0.006*
	Temporal inferior	-0.326*	0.021*	-0.479*	<0.001*
	Global	-0.513*	0.001*<	-0.597*	<0.001*
RNFL 3.5	Temporal	-0.343*	0.015*	-0.379*	0.007*
	Temporal superior	-0.297*	0.036*	-0.319*	0.024*
	Nasal superior	-0.175	0.223	-0.259	0.069
	Nasal	-0.319*	0.024*	-0.403*	0.004*
	Nasal inferior	-0.045	0.758	-0.144	0.319
	Temporal inferior	-0.145	0.316	-0.196	0.173
	Global	-0.357*	0.011*	-0.417*	0.003*

Conclusion

- OCT paraemters such as RNFL thickness and BMO-MRW were found to be useful tools in studying the neuroretinal rim.
- Optos measured VCDR was found to be similar to the clinically observed VCDR.
- A statistically significant correlation was found between BMO-MRW by OCT and Optos measured VCDR.
- Based on our results, Optos can be used for assessment of the optic disc and VCDR.