

Sensitivity of a combined OCT index in glaucomatous eyes



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PURPOSE

Glaucoma is often assessed with optical coherence tomography (OCT) and perimetry to provide clinicians several quantitative parameters that aid in diagnosis.

The OCT Early Glaucoma Diagnostic Structural Index (EGDSI), was previously proposed and validated providing a combined structural index for the detection of early glaucoma^{1,2}.

In this retrospective clinical study, we compared the sensitivity of EGDSI to individual OCT summary parameters in a cohort with a range of glaucoma severity.

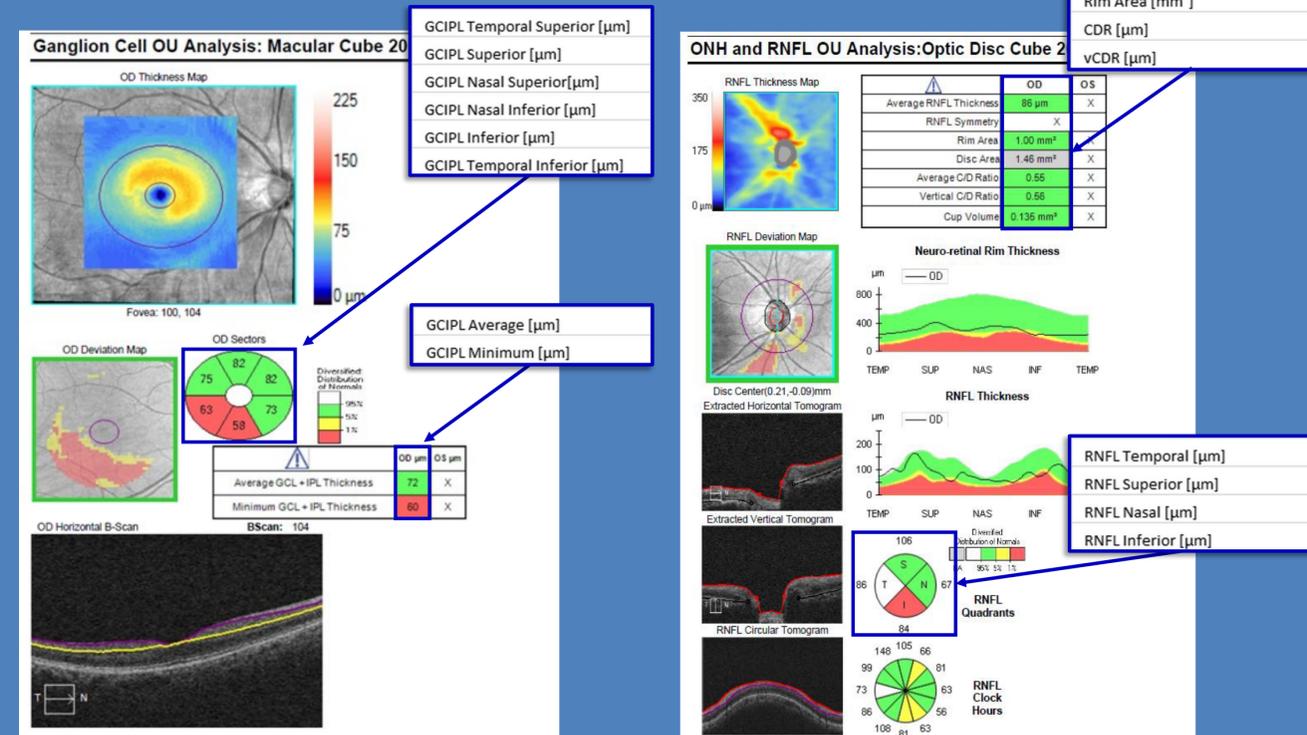
METHODS

- Retrospective OCT and visual field (VF) data were analyzed from a previous study including 74 eyes of 74 glaucoma subjects, using CIRRUS™ HD-OCT (ZEISS, Dublin, CA), HFA™ II-i (ZEISS, Dublin, CA)³.
- At each visit, Optic Disc 200x200 and Macula 200x200 cube scans and SITA Standard 24-2 VFs were acquired. Sixteen OCT summary parameters [Rim Area, Cup-to-Disc area Ratio (CDR), vertical diameter CDR (vCDR), Average and four Quadrant RNFL thicknesses, Average, Minimum, and six Sectoral GCIPL thicknesses] were extracted for comparison and to calculate EGDSI from the last qualified visit data as previously described^{1,2}.
- A VF mean deviation (MD) cutoff of -4 dB was used to separate early and non-early glaucoma as done previously².
- Sensitivity at specificities of 95% and 99% were determined for EGDSI and component OCT parameters based on cut-off values from the CIRRUS reference database. McNemar's test was used to compare individual results to the EGDSI.

RESULTS

Mean ± standard deviation (SD) age was 63.6±10.1 (range: 35.7 to 79.6) years. Mean ± SD VF MD was -3.9±4.1 (range: -18.2 to 1.2) dB. Sensitivities for EGDSI were 81.1% and 67.6% for 95 and 99% specificity, respectively (see Table 1). The best individual parameters were: a) GCIPL Minimum (70.3% and 54.1%); b) RNFL Inferior (64.9% 54.1%); and c) Rim Area (56.8% and 36.5%). Comparable sensitivities were seen in the split cohorts, though values for EGDSI and GCIPL Minimum became more comparable in non-early glaucoma.

The Early Glaucoma Diagnostic Structural Index (EGDSI) is as sensitive as individual parameters for the detection of glaucoma



EGDSI: 0.6814

CONCLUSION

The combined EGDSI shows improved sensitivity in early glaucoma and comparable sensitivity in non-early glaucoma eyes in this study. As such, the EGDSI may be a useful aid for the detection of glaucoma in a clinical range of disease severity.

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Cohort	Parameter	N	Sensitivity at 95% Specificity [%]	p-value	Sensitivity at 99% Specificity [%]	p-value
All	EGDSI	74	81.1 [70.3, 89.3]	1.000	67.6 [55.7, 78.0]	1.000
All	GCIPL Average [µm]	74	58.1 [46.1, 69.5]	<0.001	36.5 [25.6, 48.5]	<0.001
All	GCIPL Minimum [µm]	74	70.3 [58.5, 80.3]	0.078	54.1 [42.1, 65.7]	0.027
All	GCIPL Temporal Superior [µm]	74	51.4 [39.4, 63.1]	<0.001	35.1 [24.4, 47.1]	<0.001
All	GCIPL Superior [µm]	74	40.5 [29.3, 52.6]	<0.001	24.3 [15.1, 35.7]	<0.001
All	GCIPL Nasal Superior [µm]	74	31.1 [20.8, 42.9]	<0.001	20.3 [11.8, 31.2]	<0.001
All	GCIPL Nasal Inferior [µm]	74	33.8 [23.2, 45.7]	<0.001	20.3 [11.8, 31.2]	<0.001
All	GCIPL Inferior [µm]	74	56.8 [44.7, 68.2]	<0.001	48.6 [36.9, 60.6]	0.006
All	GCIPL Temporal Inferior [µm]	74	58.1 [46.1, 69.5]	<0.001	47.3 [35.6, 59.3]	0.002
All	RNFL Average [µm]	74	54.1 [42.1, 65.7]	<0.001	33.8 [23.2, 45.7]	<0.001
All	RNFL Temporal [µm]	74	9.5 [3.9, 18.5]	<0.001	6.8 [2.2, 15.1]	<0.001
All	RNFL Superior [µm]	74	51.4 [39.4, 63.1]	<0.001	37.8 [26.8, 49.9]	<0.001
All	RNFL Nasal [µm]	74	4.1 [0.8, 11.4]	<0.001	0.0 [0.0, 4.9]	<0.001
All	RNFL Inferior [µm]	74	64.9 [52.9, 75.6]	0.002	54.1 [42.1, 65.7]	0.027
All	Rim Area [mm ²]	74	56.8 [44.7, 68.2]	<0.001	36.5 [25.6, 48.5]	<0.001
All	CDR [µm]	74	50.0 [38.1, 61.9]	<0.001	32.4 [22.0, 44.3]	<0.001
All	vCDR [µm]	74	51.4 [39.4, 63.1]	<0.001	31.1 [20.8, 42.9]	<0.001
Early	EGDSI	49	75.5 [61.1, 86.7]	1.000	59.2 [44.2, 73.0]	1.000
Early	GCIPL Average [µm]	49	44.9 [30.7, 59.8]	<0.001	20.4 [10.2, 34.3]	<0.001
Early	GCIPL Minimum [µm]	49	53.1 [38.3, 67.5]	0.008	36.7 [23.4, 51.7]	0.008
Early	GCIPL Temporal Superior [µm]	49	44.9 [30.7, 59.8]	<0.001	22.4 [11.8, 36.6]	<0.001
Early	GCIPL Superior [µm]	49	26.5 [14.9, 41.1]	<0.001	14.3 [5.9, 27.2]	<0.001
Early	GCIPL Nasal Superior [µm]	49	22.4 [11.8, 36.6]	<0.001	10.2 [3.4, 22.2]	<0.001
Early	GCIPL Nasal Inferior [µm]	49	22.4 [11.8, 36.6]	<0.001	10.2 [3.4, 22.2]	<0.001
Early	GCIPL Inferior [µm]	49	42.9 [28.8, 57.8]	<0.001	32.7 [19.9, 47.5]	0.004
Early	GCIPL Temporal Inferior [µm]	49	42.9 [28.8, 57.8]	<0.001	32.7 [19.9, 47.5]	0.003
Early	RNFL Average [µm]	49	44.9 [30.7, 59.8]	<0.001	24.5 [13.3, 38.9]	<0.001
Early	RNFL Temporal [µm]	49	6.1 [1.3, 16.9]	<0.001	4.1 [0.5, 14.0]	<0.001
Early	RNFL Superior [µm]	49	40.8 [27.0, 55.8]	<0.001	28.6 [16.6, 43.3]	<0.001
Early	RNFL Nasal [µm]	49	4.1 [0.5, 14.0]	<0.001	0.0 [0.0, 7.3]	<0.001
Early	RNFL Inferior [µm]	49	51.0 [36.3, 65.6]	<0.001	34.7 [21.7, 49.6]	0.002
Early	Rim Area [mm ²]	49	51.0 [36.3, 65.6]	0.004	22.4 [11.8, 36.6]	<0.001
Early	CDR [µm]	49	42.9 [28.8, 57.8]	<0.001	18.4 [8.8, 32.0]	<0.001
Early	vCDR [µm]	49	44.9 [30.7, 59.8]	<0.001	18.4 [8.8, 32.0]	<0.001
Non-Early	EGDSI	25	84.0 [63.9, 95.5]	1.000	76.0 [54.9, 90.6]	1.000
Non-Early	GCIPL Average [µm]	25	76.0 [54.9, 90.6]	0.453	68.0 [46.5, 85.1]	0.453
Non-Early	GCIPL Minimum [µm]	25	92.0 [74.0, 99.0]	0.250	80.0 [59.3, 93.2]	0.625
Non-Early	GCIPL Temporal Superior [µm]	25	56.0 [34.9, 75.6]	0.021	52.0 [31.3, 72.2]	0.039
Non-Early	GCIPL Superior [µm]	25	64.0 [42.5, 82.0]	0.109	44.0 [24.4, 65.1]	0.012
Non-Early	GCIPL Nasal Superior [µm]	25	52.0 [31.3, 72.2]	0.012	44.0 [24.4, 65.1]	0.012
Non-Early	GCIPL Nasal Inferior [µm]	25	52.0 [31.3, 72.2]	0.022	40.0 [21.1, 61.3]	0.013
Non-Early	GCIPL Inferior [µm]	25	76.0 [54.9, 90.6]	0.453	72.0 [50.6, 87.9]	0.687
Non-Early	GCIPL Temporal Inferior [µm]	25	80.0 [59.3, 93.2]	0.625	68.0 [46.5, 85.1]	0.375
Non-Early	RNFL Average [µm]	25	64.0 [42.5, 82.0]	0.070	44.0 [24.4, 65.1]	0.012
Non-Early	RNFL Temporal [µm]	25	16.0 [4.5, 36.1]	<0.001	12.0 [2.5, 31.2]	<0.001
Non-Early	RNFL Superior [µm]	25	64.0 [42.5, 82.0]	0.109	56.0 [34.9, 75.6]	0.109
Non-Early	RNFL Nasal [µm]	25	4.0 [0.1, 20.4]	<0.001	0.0 [0.0, 13.7]	<0.001
Non-Early	RNFL Inferior [µm]	25	84.0 [63.9, 95.5]	1.000	80.0 [59.3, 93.2]	0.625
Non-Early	Rim Area [mm ²]	25	56.0 [34.9, 75.6]	0.008	56.0 [34.9, 75.6]	0.031
Non-Early	CDR [µm]	25	56.0 [34.9, 75.6]	0.008	52.0 [31.3, 72.2]	0.016
Non-Early	vCDR [µm]	25	56.0 [34.9, 75.6]	0.008	48.0 [27.8, 68.7]	0.008

Table 1: Summary of sensitivities for all, early, and non-early glaucoma eyes

References

- Mwanza et al. *IOVS* 2013; 54(13)
- Mwanza et al. *TVST* 2018; 7(2)
- Durbin et al. *IOVS* 2020; 61(9): Abstract PB00106