

Repeatability of swept-source optical coherence tomography angiography (SS-OCTA) metrics in healthy and glaucomatous eyes



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PURPOSE

- To evaluate the intra-visit variability of quantitative measurements of SS-OCTA metrics

METHODS

- One eye each from subjects with glaucoma and healthy controls were prospectively recruited from four sites
- If two eyes were eligible, one eye per subject was designated randomly as the study eye
- Each eye was imaged using the Angio 6x6 mm scan centered on the macula and centered on the optic disc on PLEX[®]Elite 9000 (ZEISS, Dublin, CA)
 - Scans were repeated at each location on each device 3 times per visit
 - The subjects were expected to complete 3 visits within one month
- Data were processed on the Advanced Imaging Network Hub using the algorithms (see Figure 1):
 - “Peripapillary Nerve Fiber Layer Microvasculature Density v0.9”, which quantifies microcirculation (with large vessels removed) in the radial peripapillary capillary layer, summarizing data over an annulus centered at the optic disc and
 - “Superficial and GCIPL analysis v0.5”, which quantifies microcirculation in the superficial slab, summarizing data over the ETDRS grid centered on the macula
- Perfusion density (PD) is defined as the total area of perfused microvasculature per unit area
- Vessel density (VD) is defined as the length of perfused microvasculature per unit area

Group	Age Mean ± SD [years]	Visual Field MD Average ± SD [dB]	Average FI []	FI CV [%]	Average PD []	PD CV [%]
Healthy	55.6 ± 10.2	-0.38 ± 1.17	0.39	2.4%	0.56	1.2%
Glaucoma	59.9 ± 9.9	-8.39 ± 10.16	0.34	2.8%	0.53	1.8%
All	57.5 ± 10.2	-4.02 ± 7.89	0.37	2.5%	0.55	1.5%

Table 1. Summary of optic disc-centered OCTA metrics

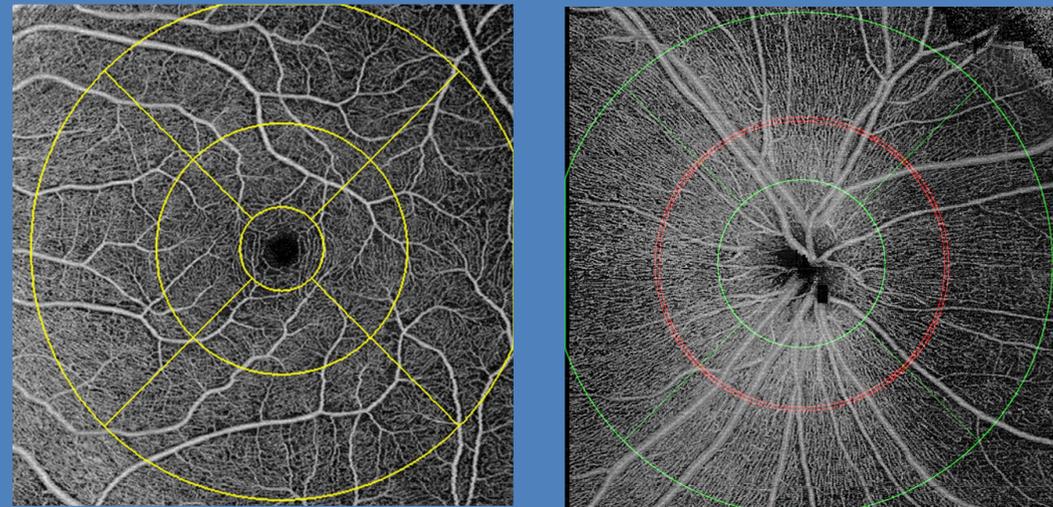


Figure 1. Examples of grid overlay on a macula-centered (left, yellow lines) and optic disc-centered (right, green lines) angiography en face maps

Group	Age Mean ± SD [years]	Visual Field MD Average ± SD [dB]	Average VD [mm / mm ²]		VD CV [%]		Average PD []		PD CV [%]	
			Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring
Healthy	55.1 ± 10.1	-0.35 ± 1.14	17.1	18.2	11.0%	7.7%	0.36	0.40	11.3%	7.9%
Glaucoma	60.7 ± 12.0	-7.74 ± 9.84	15.2	14.8	11.3%	9.1%	0.32	0.33	11.2%	8.9%
All	57.7 ± 11.2	-3.77 ± 7.63	16.2	16.6	11.1%	8.3%	0.34	0.37	11.3%	8.3%

Table 2. Summary of macula-centered OCTA metrics

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GB, KT, GL, GW, HI, RZ, EE – None



- Flux index (FI) is defined as the total weighted area of perfused microvasculature per unit area in a region of measurement
 - The weight is the normalized flow intensity corresponding to each pixel
- Intra-visit variability was determined by averaging the within-subject variance across visits for all eyes
- The square root of this variance is the repeatability standard deviation

RESULTS

- 35 eyes (mean age 57.5, SD 10.2 years) were qualified with optic disc-centered scans (19 healthy eyes and 16 eyes with glaucoma)
- 43 eyes (mean age 57.7, SD 11.2 years) were qualified with macula-centered scans (23 healthy eyes and 20 eyes with glaucoma)
- Table 1 shows the mean and coefficient of variance (CV) for legacy segmentation for disc-centered PD and FI measurements, which ranged from 1.2% to 2.8%
- Table 2 shows the mean and CV for macula-centered VD and PD measurements, which ranged from 7.7% to 11.3%

CONCLUSIONS

- Coefficients of intra-visit variation are acceptable for both macula-centered and optic disc-centered SS-OCTA metrics, with optic disc-centered metrics showing excellent intra-visit variation
- These parameters may have clinical utility for monitoring glaucomatous damage