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Methods for Reducing Artifacts in OCT Retinal Nerve Fiber Layer Probability/Deviation Maps

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Purpose
Retinal nerve fiber layer (RNFL) probability/deviation maps based upon optical coherence tomography (OCT) scans often show artifacts that can be confused with glaucoma-like arcuate defects. Methods for reducing these artifacts were explored using a widefield OCT scan.

Methods
398 healthy eyes had widefield (9mm x 12mm) fdOCT scans taken as part of a reference database study by an OCT device manufacturer (data provided by Topcon, Inc.). Based on RNFL thickness, RNFL probability maps were generated with 4 methods: A. no adjustment of widefield scans centered on the disc; B. adjustment for fovea-to-disc distance (F-Dd) by cropping the widefield scan into two 6mm x 6mm images centered on the macula and disc, which was co-registered based on the F-Dd; C. adjustment for fovea-to-disc angle (F-Da) by rotating scan to match average F-Da of all eyes; and D. adjustment for both F-Da and F-Dd. The probability maps, based on age-related means and standard deviations for all 398 eyes, were assessed for the presence of the following glaucoma-like artifacts (Fig. 1): 1. arcuates originating in the superior and inferior temporal regions of the disc; 2. arcuates close to fixation; 3. arcuates originating near 6 o'clock or 12 o'clock. For each type, RNFL probability maps generated by methods B, C and D, were compared to the unadjusted version (A). Derived circumpapillary scans and RNFL profiles were inspected for vessel position and variations in anatomy

Results
Of the 398 eyes, before adjustment (method A), 115, 49, and 52 had type 1, 2, and 3 artifacts, respectively (Table 1). Methods B, C, and D all reduced or eliminated artifacts in comparison to method A. Method D performed the best, reducing or completely eliminating type 1, 2, and 3 artifacts in 54, 34, and 6 eyes, respectively (Table 1). Eyes in which type 1 and 3 artifacts persisted after adjustment using method D were observed to have more extreme deviations in blood vessel location in comparison to the average population.

Conclusions
Method D, which adjusted for both the distance and angle between the disc and fovea, reduced and/or eliminated the largest number of artifacts. However, these simple adjustments will not eliminate

artifacts due to other anatomical differences such as the location of major blood vessels and variations in foveal anatomy.

Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.

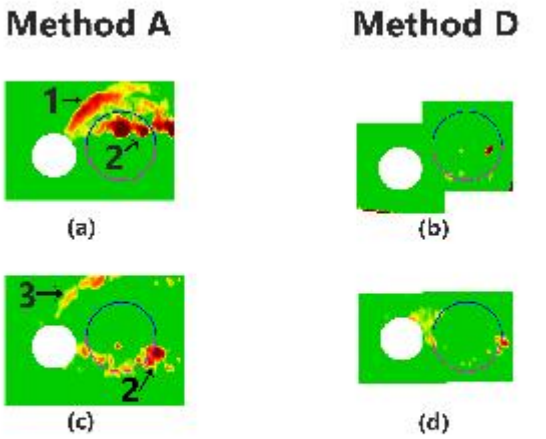

Fig1: (a) Type 1 and Type 2 artifact (b) Corrected (c) Type 2 and Type 3 artifact (d) Corrected

ARTIFACT	Method A	Method B	Method C	Method D
1	115	- 35	- 36	- 54
2	49	- 30	- 23	- 34
3	52	- 3	- 5	- 6

Table 1: Number of artifacts of each category and effects of four correction methods