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ABSTRACT

TITLE: Smoothed and Resolved Thresholding (SmaRT-) Display: A New OCTA Display Technique to Resolve the Low Flow Ambiguity

ABSTRACT BODY:
Purpose: OCT angiography (OCTA) provides clinicians with a new perspective on ocular vasculature. However, OCTA is fundamentally different from OCT, and its complex processing steps generate new artifacts that are not present in OCT. The “thresholding” step in OCTA, which removes (makes black) regions of low OCT signal, results in an ambiguity between areas of low OCT signal and areas of low blood flow. In this study we present a new OCTA display technique, SmaRT-Display OCTA, which obviates this ambiguity.
Methods: We propose a mapping scheme based on the hue-saturation-value (HSV) colorspace wherein the OCT signal is mapped to a sigmoidal curve in the value coordinate, the unthresholded OCTA signal is mapped to the saturation coordinate, and the hue coordinate is fixed at red.
Results: SmaRT-Display removes low flow ambiguities in both cross-sectional and en face views.
Conclusions: SmaRT-Display has the potential to reduce misinterpretation of OCTA images and is a first step in expanding the standards of how OCTA data can be presented.

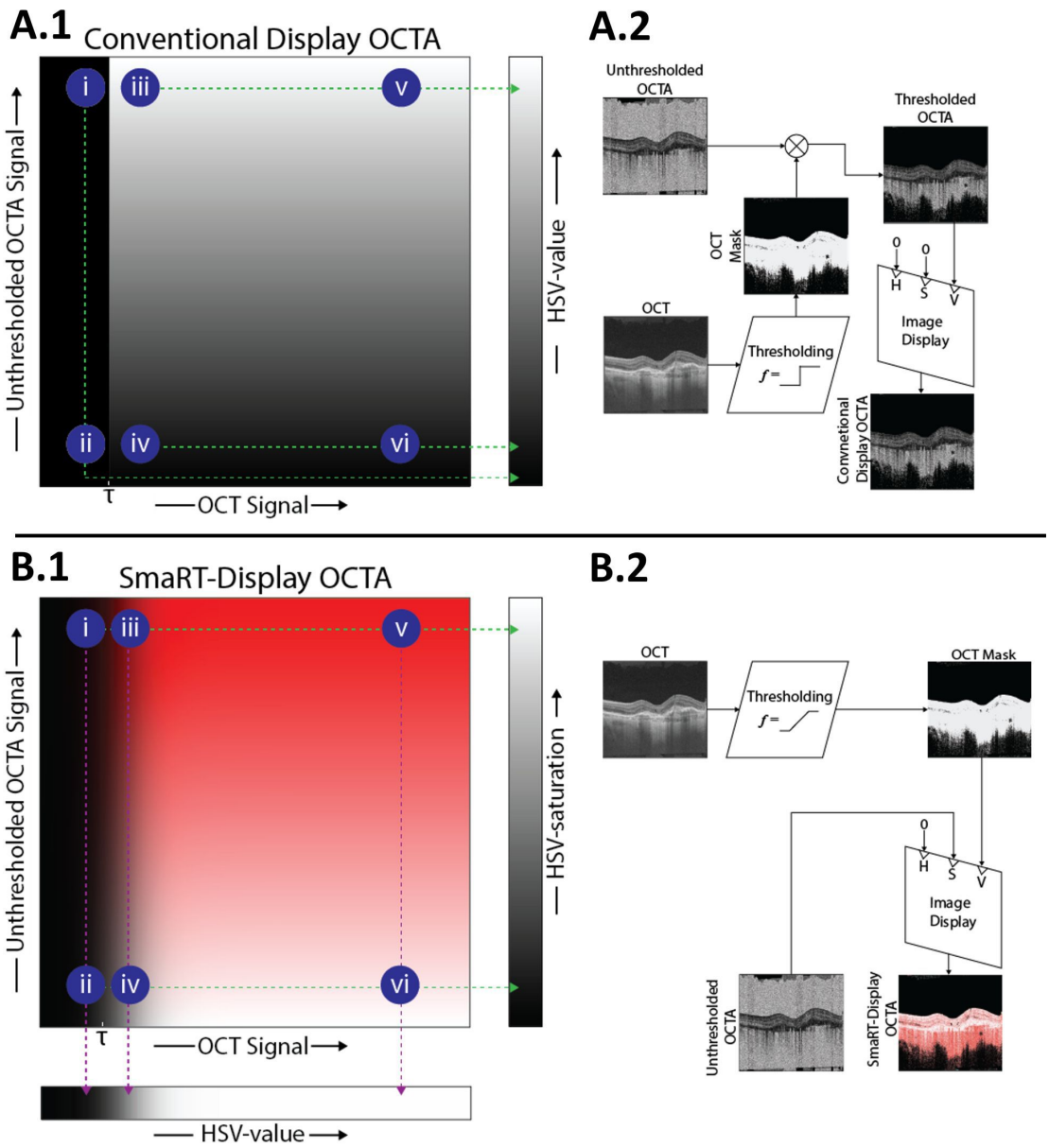

Figure 1: Conventional display vs. SmaRT-Display OCTA. (A.1) In the conventional display OCTA, i and ii, which are below the threshold tau, are mapped to same value; this value is essentially indistinguishable from the value to which iv and vi are mapped; finally, iii and v are mapped to the same value. These non-invertible mappings induce ambiguities. (B.1) Using SmaRT-Display, the mappings to the display color space are invertible. (A.2, B.2) Signal flow graphs for the conventional display and SmaRT-Display schemes, respectively.

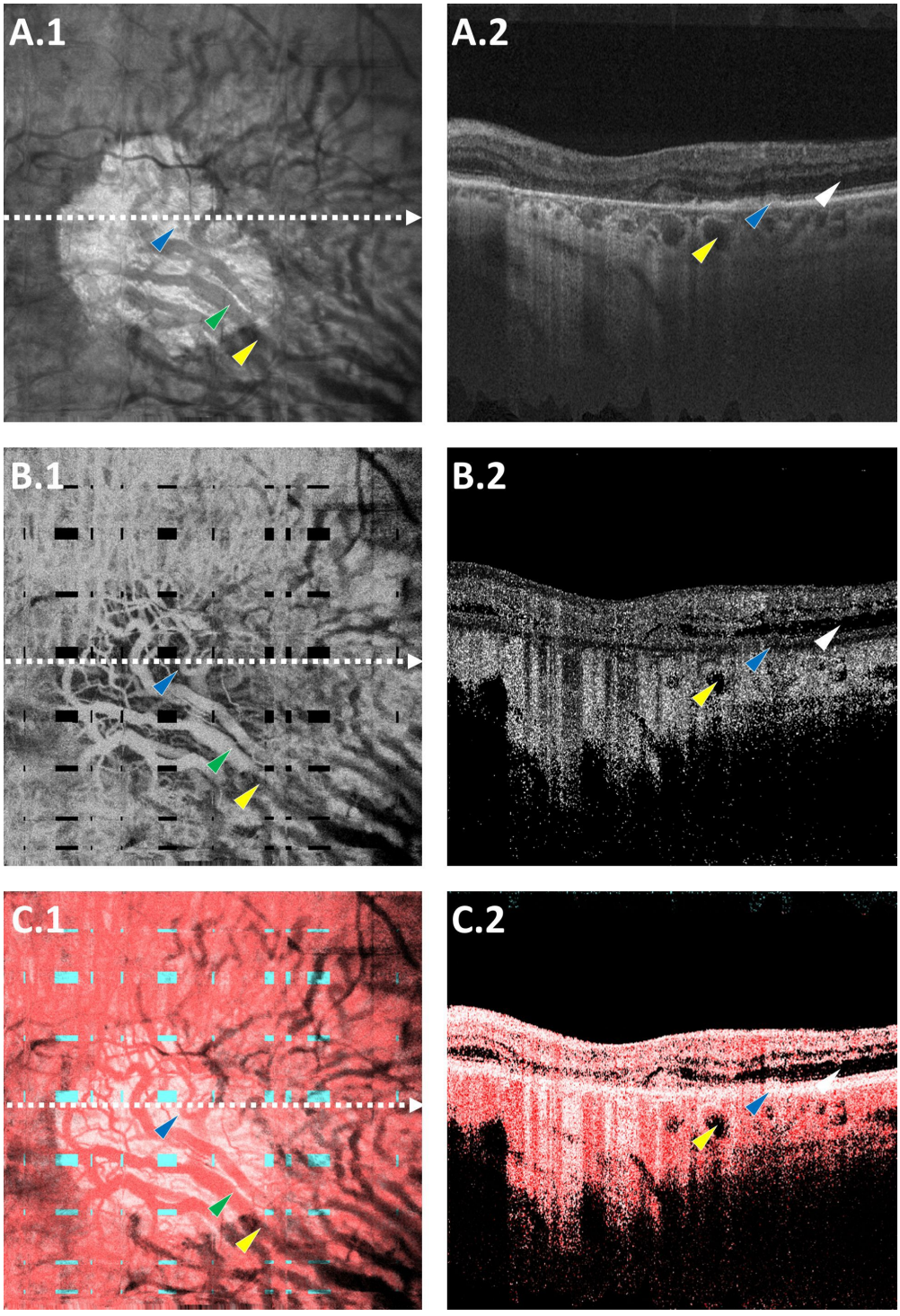

Figure 2: (A) OCT, (B) conventional display OCTA, and (C) SmaRT-Display OCTA from an eye with geographic atrophy. First column: en face projections of 110um slab; the black (teal) rectangles in B.1 (C.1) are motion artifacts. Second column: B-scans from dashed white lines in first column. Blue arrows point to areas of low flow with OCT signal above the threshold (en face: intervascular stroma; B-scan: retinal pigment epithelium). Green arrows point to area of high flow with OCT signal above the threshold (en face: choroidal vessel in region of atrophy). Yellow arrows point to areas of high flow with OCT signal below the threshold (en face and B-scan: choroidal vessels outside region of atrophy). White arrows point to area of low flow with OCT signal below the threshold (B-scan: outer nuclear layer).

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AWARDS:

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