Assessing different combinations of B-scan repetitions to improve detection of flow in optical coherence tomography angiography

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PURPOSE

Retinal optical coherence tomography angiography (OCTA) is based on a comparison between successive B-scans taken in the same location. The amount of blood motion is related to the time interval between frames. We examine the effect of varying these time intervals.

METHODS

- High resolution retinal OCTA scans usually are comprised of sets of 4 repeated B-scans, which may be arranged in 3 pairs and processed and averaged to create flow B-scans.
- B-scans in each of these pairs were separated by a time interval Δt approximately 3.2 msec. We used adjacent and non-adjacent pair combinations to vary time intervals.
- 3x3mm OCTA scans acquired on 17 eyes with PLEX® Elite 9000 (ZEISS, Dublin, CA).
- Scans were processed using a custom angiography algorithm allowing selection of the repetitions combined to produce the flow signal.
- As a baseline, pairs of sequential scans were used, namely scans 1-2, 2-3 and 3-4, and the results averaged to get flow B-scans (Method 1)
- In addition, new flow B-scans were created by averaging results from scans 1-3, 2-4, and 1-4, with time intervals 2Δt , 2Δt and 3Δt, respectively (Method 2).
- Vessel density was calculated for the 4 zones of the inner ETDRS ring.

CONCLUSIONS

Using B-scan pairs with **longer time intervals** may result in **increased sensitivity** to flow and better visualization of vascular structure, although the amount of noise in the flow volume may increase slightly.

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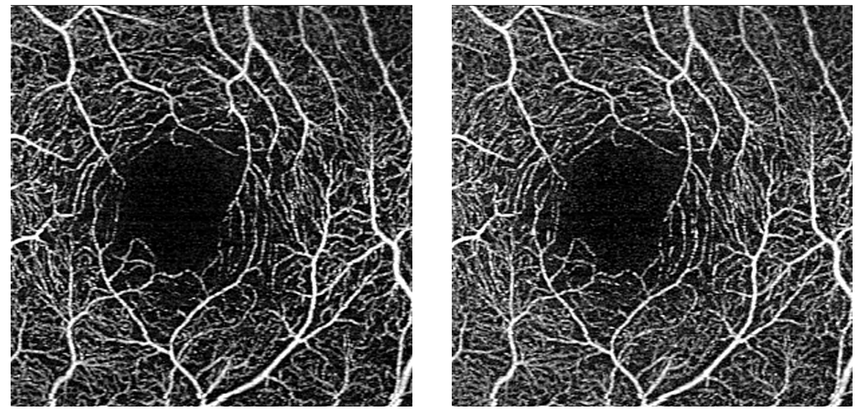
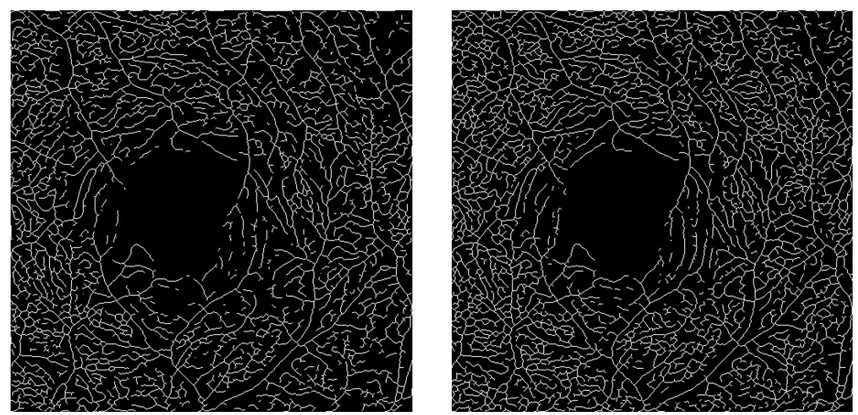
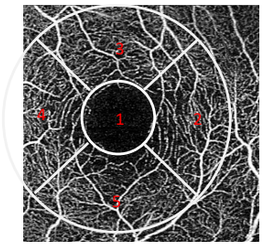
RESULTS

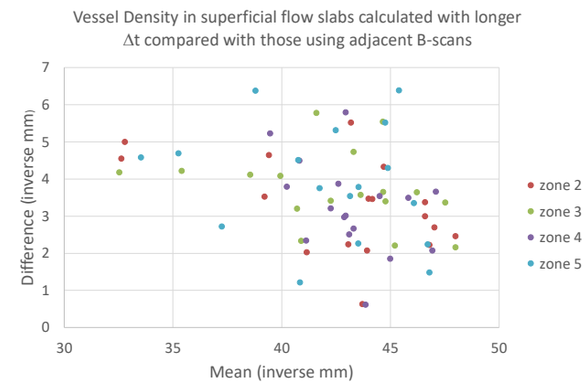


Above left: 3x3mm flow superficial en face projection using adjacent B-scans to form pairs (Method 1). Above right: New pair definitions providing larger values of Δt from the same data (Method 2) result in better detection of capillaries. Below: Corresponding skeletonized vessel diagrams showing more capillaries and better vessel continuity when using longer Δt (lower right image).





A sample ETDRS grid showing the zones compared in this analysis. Zone 1 was excluded.



Bland-Altman plot of vessel density for 17 eyes. Positive difference (Method 2-Method 1) shows Method 2 results in greater measured vessel density.