

# OCTA cube averaging for identification of vascular abnormalities in diabetic retinopathy using swept-source OCT

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## PURPOSE

Optical coherence tomography angiography (OCTA) can image vascular conditions such as an enlarged and irregular foveal avascular zone (FAZ), microaneurysms (MA), vessel caliber, capillary non-perfusion and ischemia in diabetic retinopathy (DR). This study investigated the use of averaging multiple OCT cubes to improve image quality and compared averaged to single images in detection of these entities using swept-source OCT (SS-OCT).

## METHODS

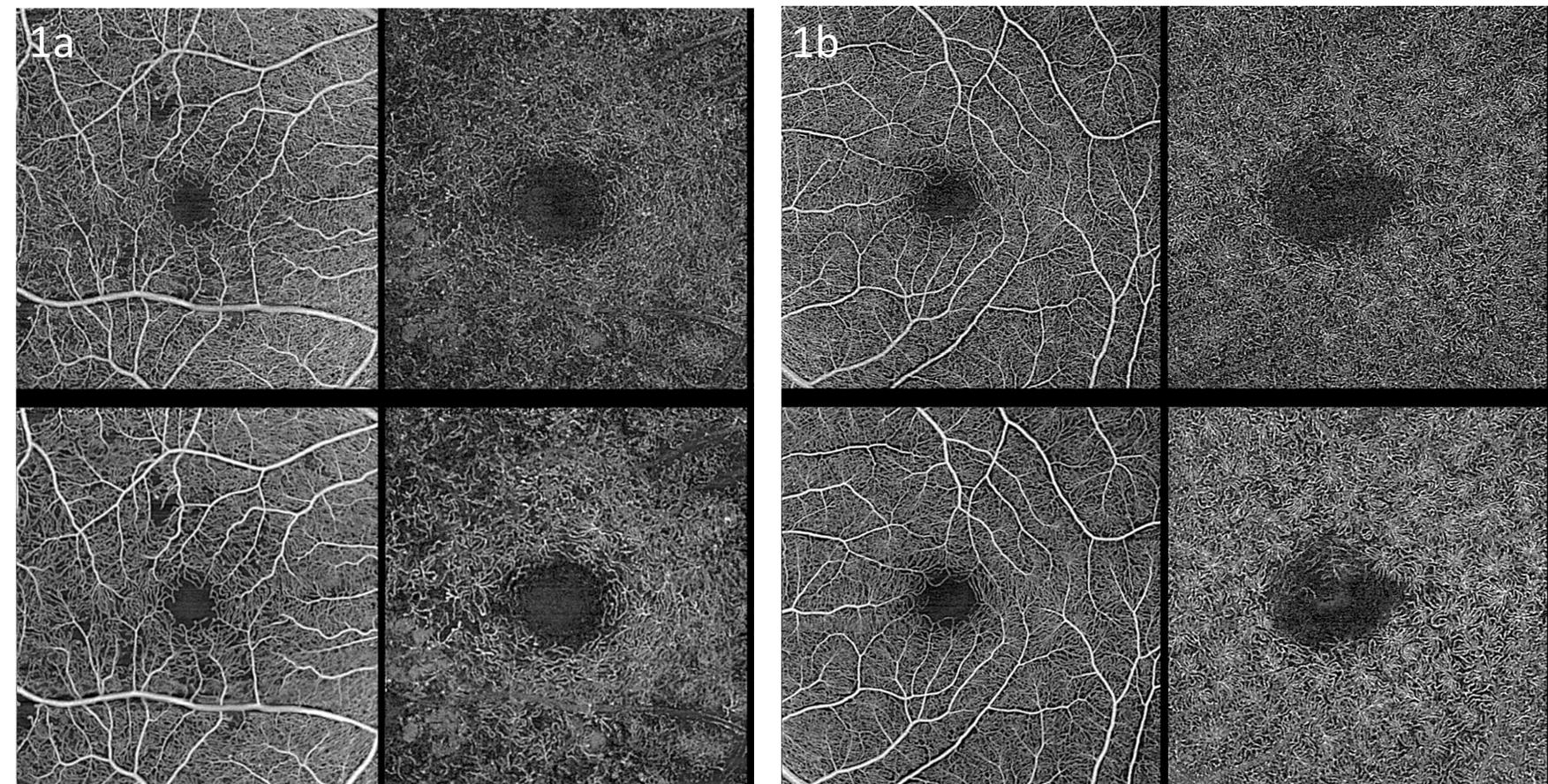
- Patients diagnosed as having diabetic retinopathy were imaged with the PLEX<sup>®</sup> Elite 9000 (ZEISS, Dublin, CA) SS-OCT.
- Four to seven Angio 6 x 6 mm images were acquired on each patient. Single images were topographically analyzed using quality maps and the image of better quality was chosen as the reference for registration.
- Averaged images were created by registering the remaining frames to the reference image, both laterally and axially.
- Vascular abnormalities were then identified in both the single and averaged images for each eye (Table 1).

**Table 1:** Comparison between single and image-averaged scans

Image Observations (14 eyes)	Seen in Single Scan Only	Seen in Averaged Scan Only	Seen in Both Scans
Irregular FAZ	0	0	7
Enlarged FAZ	0	0	8
Microaneurysms	0	2	7
Area of non-perfusion	0	1	9
<b>Note: Not all abnormalities seen in all eyes</b>			

## RESULTS

- Fourteen eyes of 12 patients (mean age: 63.9 years, SD: 14.4, range 39-91) with DR of varying severity were included in this study.
- With few exceptions, the same vascular abnormalities were found in both the single and image-averaged scans (Table 1).
- Two eyes showed MAs and one had a better-defined area of non-perfusion in the image-averaged scan.
- The image quality of the small blood vessels was superior with the averaged scans, particularly in the deep vessel layer (Figure 1).



**Figure 1a:** Superficial and deep slabs of single scan (top) and image-averaged (6x) scan (bottom). Note areas of ischemia, MAs and FAZ similarities between the two slabs with improved resolution of vessels in the image-averaged slabs in the superficial (left) and deep layer (right). **1b:** Example of enlarged and irregular FAZ and enhanced resolution of deep layer vessels in the image-averaged (4x) example on the right.

## CONCLUSIONS

- In this study, most DR vascular abnormalities were recognized with both single and image-averaged scans.
- Image quality was found to be improved with averaging, but did not make a significant difference in identification of abnormalities.
- Both the superficial and deep vascular layers were enhanced with the image-averaged scans.