

Retinal pigment epithelial elevation analysis using low-cost OCT



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PURPOSE

Localized elevation in the retina pigment epithelium (RPE) can indicate the presence of drusen that accumulate between the RPE and Bruch's membrane. The purpose of this study is to demonstrate a new method to evaluate RPE elevation in low-cost OCT scans where the Bruch's membrane cannot be delineated.

METHODS

- Our method first segments the RPE boundary in each fast B-scan of the OCT volume.
- The axial motion in the volumetric data is corrected by removing discontinuities due to motion along the slow scanned axis by co-aligning the adjacent fast B-scans. Next, the correction parameters are used to remove the curvature in RPE surface along the slow B-scan.
- Subsequently a smooth surface is fitted to the segmented RPE layer, named RPE-fit surface. The RPE elevation map is created by measuring the difference between the RPE-fit and RPE surfaces. In order to evaluate this method, we collected OCT scans from 17 patients (one eye per patient) with retinal pathology under an IRB-approved study.
- Each eye was scanned twice using a prototype OCT device which had a macula scan pattern with 128x512 A-scans (covering an area of 7x5.8 mm). The RPE elevation map from the 2nd scan was registered to that of the 1st scan for each eye.
- The RPE elevation volumes (in cubic micrometers) were averaged over central 3-mm and 5-mm zones. Regression and Bland-Altman plots were derived to evaluate the repeatability of the method.

CONCLUSIONS

We presented a method to visualize and quantify the RPE elevation as a result of drusen between the RPE and Bruch's membrane. Our method essentially eliminates need for correcting the retina curvature and delineation of Bruch's membrane which can be difficult in low-cost OCT scans in diseased eyes.

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RESULTS

Figure 1: RPE elevation maps from two consecutive scans (A-B). The second scan is registered to the first scan (C). The overlay shows the 3-mm and 5-mm zones where the averaged RPE elevation volumes were compared.

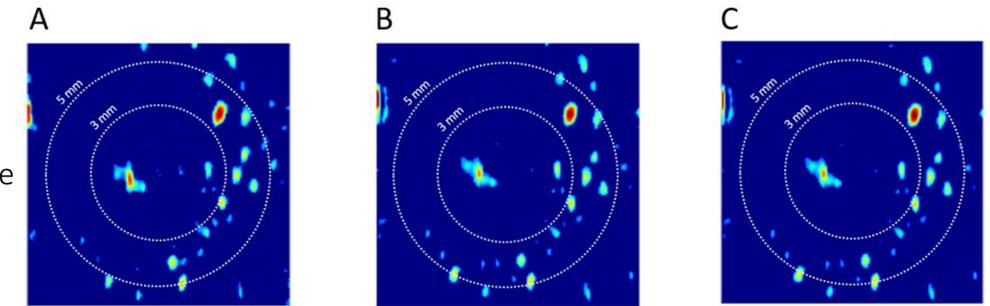


Figure 2: Regression and Bland-Altman plots comparing the RPE elevation volume in the central 3-mm and 5-mm zones. As is evident, there is a good agreement ($R^2=0.99$) between the two measurements.

