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# Assessment of OCT image layer segmentation results using a common platform system compared to OEM software

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## Background

In order to fulfill recruitment goals, large clinical trials must necessarily use images from numerous sites utilizing different imaging vendor systems. For OCT images, limitations in image segmentation with original equipment manufacturer (OEM) software and differences between the algorithms used by the different OEM software can introduce bias that can negatively affect study data. Analyzing all OCT images in a single software platform with enhanced segmentation capability is faster, and can reduce errors and improve accuracy, particularly in diseased eyes. We performed a validation study comparing the analyses of OCT images using a third-party segmentation software with the OEM segmentation software of two leading OCT system manufacturers.

## Methods

A total of 131 eyes from a population of 67 subjects with neovascular AMD were imaged twice, once with a Spectralis OCT device (Heidelberg Engineering – Heidelberg, Germany) and once with a Cirrus OCT (Carl Zeiss Meditec – Dublin, CA). Segmentation was performed using the OEM software that came with each camera as well as with the Orion (Voxeleron - Austin, TX) OCT segmentation software. The central subfield thickness (CST) was calculated (measured from the ILM to Bruch's membrane for Spectralis images and from ILM to "RPE Fit" layer which approximates Bruch's membrane on the Cirrus software [1]) in each of the following cases:

1. Cirrus OEM software on Cirrus OCT image
2. Spectralis OEM software on Spectralis OCT image
3. Orion software on Cirrus OCT image
4. Orion software on Spectralis OCT image

The CSTs for all eyes were compared against each using the Pearson correlation coefficient to measure agreement. Furthermore, an expert manually segmented 15 eyes randomly selected from the dataset and a comparison was made to an expert-labeled "ground truth" segmentation.

## Results

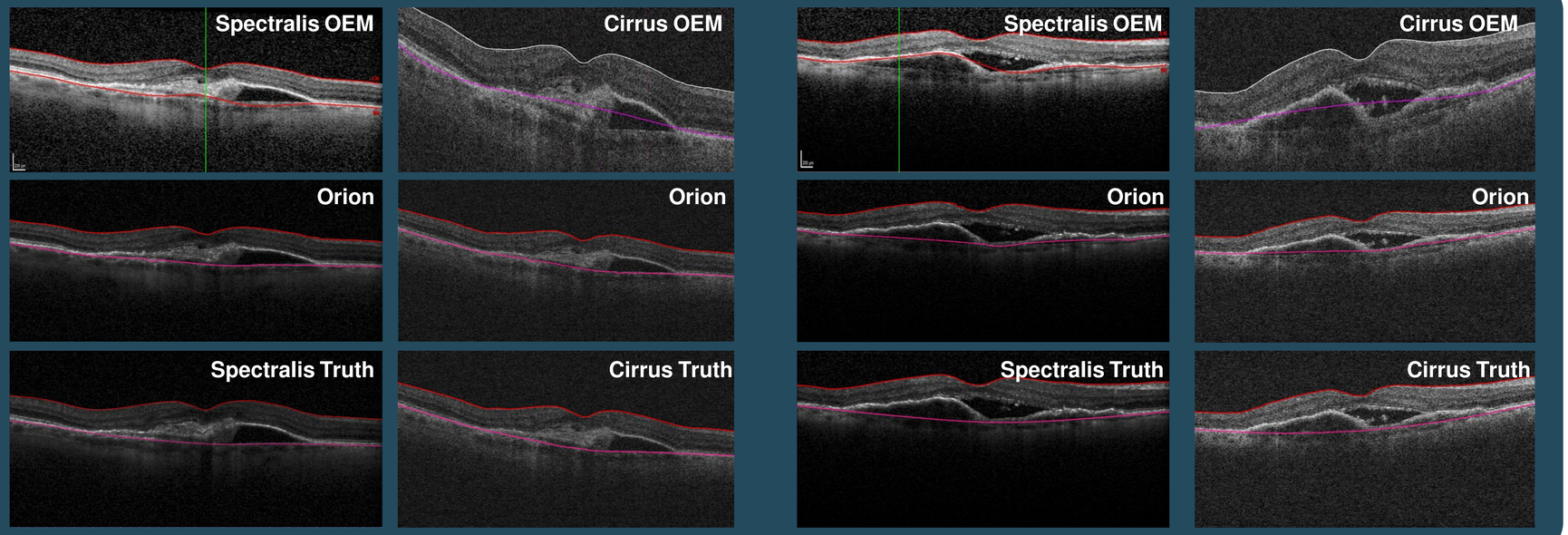


Figure 1. Two examples from two different eyes with pathology illustrating failures/inconsistencies in the OEM software segmentations as compared to Orion.

| | CirrusOrion | CirrusOem | Spectralis Orion | SpectralisOem |
|---|---|---|---|---|
| CirrusOrion | 1 | 0.82 | 0.83 | 0.74 |
| CirrusOem | 0.82 | 1 | 0.77 | 0.65 |
| SpectralisOrion | 0.83 | 0.77 | 1 | 0.75 |
| SpectralisOem | 0.74 | 0.65 | 0.75 | 1 |

Table 1. Table 1. Pearson correlation coefficients comparing each of the pairs of observations. Of particular note is that, while the correlation between the Spectralis OEM and Cirrus OEM software is strong (red) the correlation between Orion's results for the Spectralis and Cirrus is very strong (green). Furthermore, Orion results correlate better with their respective OEM results than the OEM results correlate with each other.

| | Cirrus Truth | Spectralis Truth |
|---|---|---|
| CirrusOrion | 33.0 | 34.1 |
| CirrusOem | 53.5 | 54.7 |
| SpectralisOrion | 38.3 | 33.8 |
| SpectralisOem | 76.3 | 74.3 |
| CirrusTruth | 0 | 18.2 |
| SpectralisTruth | 18.2 | 0 |

Table 2. Root mean-squared errors (in microns) comparing CST observations for the 15-eye dataset against the expert ground truth. Of note here is that the Orion results are much closer to the ground truth (bold italics) than the OEM results. Also, the Orion results are better across devices than the devices themselves (bold).

## Conclusions

**Using a common platform software to analyze OCT images from multiple system manufacturers provides for a reduction in variability of automated outputs as well as a more streamlined workflow for reading centers tasked with evaluating images across multiple sites in large clinical trials.**

[1] Ho J, Adhi M, Baumal C, Liu J, Fujimoto JG, Duker JS, Waheed NK. Agreement and reproducibility of retinal pigment epithelial detachment volumetric measurements through optical coherence tomography. Retina. 2015 Mar;35(3):467-72..

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