Comparison of macular thickness analysis between clinical SD-OCT and a low-cost OCT system

Simon Bello, PhD; Homayoun Bagherinia, PhD; Conor Leahy, PhD; Taylor Shagam
Carl Zeiss Meditec Inc., Dublin, CA, USA

Poster #3530580

PURPOSE

Macular Thickness Analysis (MTA) is a widely used tool for diagnosing and monitoring patients with ocular pathologies. The robustness of MTA is directly connected to the quality of the optical coherence tomography (OCT) system used to image the eye, which can be limited in low-cost devices. In this study we statistically compare the performance of MTA between a commercial OCT device and a low-cost OCT prototype.

METHODS

- A Low-cost OCT prototype system (ZEISS, Dublin, CA) and a CIRRUS™ HD-OCT 5000 (ZEISS, Dublin, CA) were used to image 70 eyes with a range of ocular pathologies.
  - wAMD= 23 eyes, dAMD= 7 eyes, DME=22 eyes, RVO=8 eyes, other= 10 eyes.
- MTA was calculated as ILM-RPE, generating a thickness map with FOV of 5.78x5.78mm (512x512 pixels).
- Maps for the same eye acquired using the two systems were registered to each other.
  - ETDRS grid was centered using the foveal location, manually selected on the CIRRUS scan (Figure 1).
  - The ETDRS grid consists of three concentric circles with radii of 0.5, 1.5 and 2.89mm.
- A linear regression and Bland-Altman analysis were used to compare the two groups.
  - R^2, slope and intercept of the regression analysis, mean difference and 95% limits are reported for each of the 9 sectors of the ETDRS grid.

CONCLUSIONS

This study demonstrates the ability of our low-cost OCT prototype to accurately measure macular thickness with similar performance to that of a commercial OCT system. The small differences in thickness measurements are likely not clinically significant and could be compensated. This technology could be useful for monitoring patients with chronic diseases in a cost-efficient way.

Email: simon.bello@zeiss.com

Disclosures: SB(E), HB (E), CL (E), TS(E): Carl Zeiss Meditec, Inc.

RESULTS

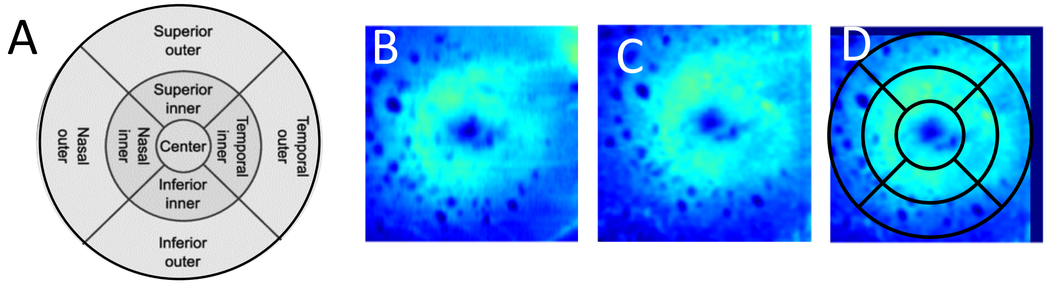

Figure 1.
a) ETDRS grid sectors.
b) CIRRUS thickness map.
c) Low-cost OCT prototype thickness map.
d) Low-cost OCT map (c) registered to CIRRUS map (b) with ETDRS overlay.

A total of 70 eyes from 43 subjects were imaged during this study. The Low-cost OCT prototype measured macular thickness slightly higher than the CIRRUS, with mean differences ranging between 4 and 7 microns depending on the retinal sector. R^2 values varied between 0.90 and 0.98.

ETDRS sector	R^2	Regression slope and intercept	Mean difference (um)	95% upper/lower limits (um)
Central	0.90	0.93x + 25.5	6.6	+29/-15
Inner Inferior	0.97	0.99x + 9.17	5.7	+14/-2.4
Inner Nasal	0.98	1.01x +1.40	5.1	+12/-1.7
Inner Superior	0.98	1.00x+ 4.45	5.3	+14/-3.1
Inner Temporal	0.97	0.98x + 11.7	5.0	+15/-4.6
Outer Inferior	0.93	1.01x +1.90	5.3	+17/-6.8
Outer Nasal	0.95	1.01x + 2.22	4.4	+14/-4.7
Outer Superior	0.96	0.98x + 13.4	7.0	+18/-3.9
Outer Temporal	0.95	1.03x -4.41	5.6	+20/-8.3

***Table 1**. Statistical comparison between OCT systems for each sector of the ETDRS grid.*

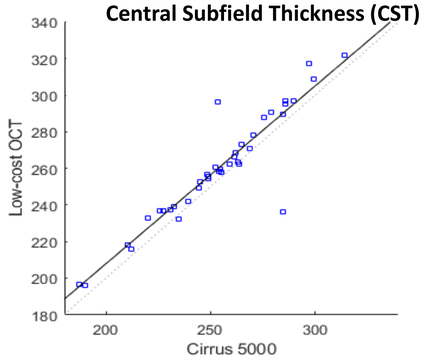

***Figure 2**. Linear Regression of the CST values measured by both OCT systems.*

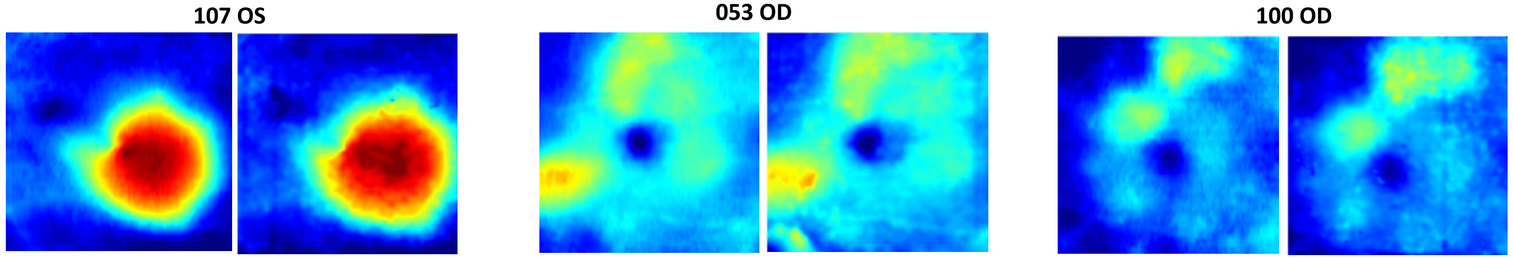

***Figure 3**. Thickness maps comparison of subjects 107,53 and 100 as measured by CIRRUS (left) and our Low-Cost OCT prototype (right).*