

Correlation of macular thickness metrics between 200 kHz and 100 kHz SS-OCT scans



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PURPOSE

As swept-source optical coherence tomography (SS-OCT) evolves, so do the laser acquisition components. Faster laser speeds allow for shorter scan acquisition times, but one trade-off is a reduction of signal that may influence image quality.

The purpose of this study was to evaluate images from both the 100 kHz and 200 kHz scanning speeds of a dual-laser SS-OCT system to verify if there were any significant differences in macular thickness measurements.

METHODS

- Subjects were scanned multiple times with the PLEX[®] Elite 9000 (ZEISS, Dublin, CA) SS-OCT device at both 100 kHz and 200 kHz speeds.
- A sample of patients from two retinal clinics, predominantly representing eyes with macular degeneration or diabetic retinopathy, were imaged using the Angio 6 x 6 mm scan pattern.
- Macula thickness measurements were made utilizing the internal limiting membrane (ILM) and retinal pigment epithelium (RPE) as the anterior and posterior layer boundaries.
- Mean thickness and SDs were determined for the regions of the standard ETDRS target centered at the fovea.
- Linear regression and Bland-Altman plots were used to evaluate the macular thickness values for the two speeds on the first scan taken, and paired t-tests were used to determine P values.

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Dual-laser SS-OCT provides equivalent macular thickness measurements at 100 kHz and 200 kHz scan speeds

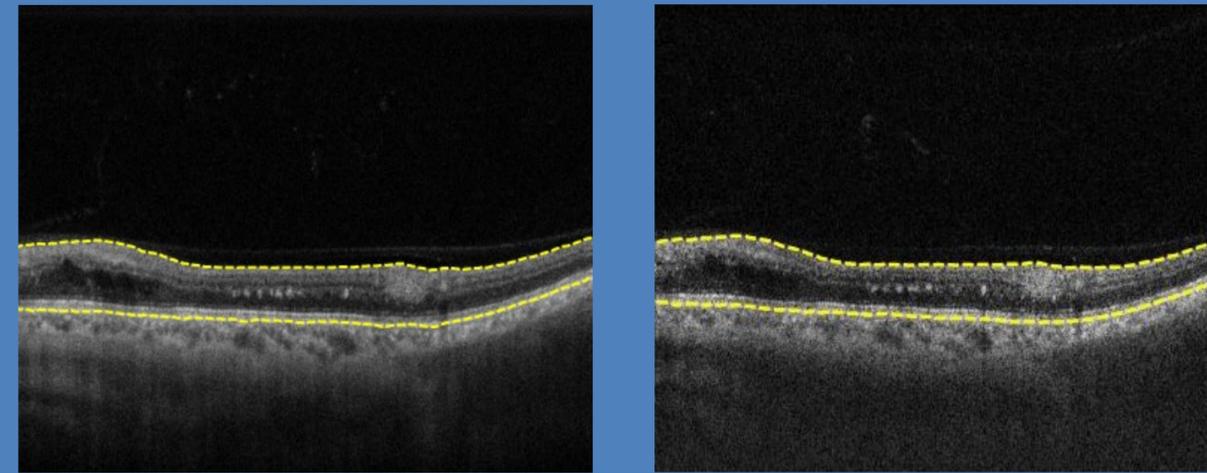


Figure 1a & b: B-scan examples of the macular thickness displayed for the 100 kHz speed (a) and 200 kHz speed (b) for a patient with diabetic edema

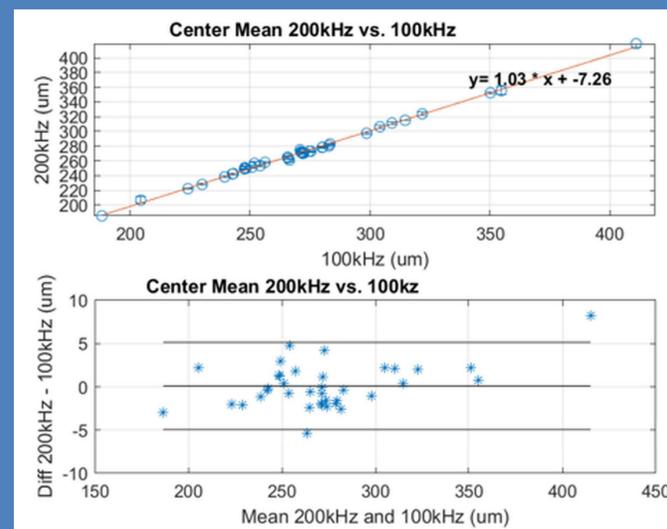


Figure 2: Linear regression and Bland-Altman plots displaying results of the Central region measurements for the two speeds

RESULTS

- Macular thicknesses of 37 diseased eyes from 24 subjects were measured. The **mean differences** between the macular thickness measurements for the 100 kHz and 200 kHz scanning speeds (see Figure 1a & b) **were less than one micron in most ETDRS regions.**
- **No statistical difference was found** in any of the regions as shown in Table 1 below. Regression and Bland-Altman plots for the Central ETDRS region are shown in Figure 2.

CONCLUSIONS

- This study demonstrated that capturing SS-OCT images with the faster scanning speed did not create any significant differences for the measurement of macular thickness in diseased retinas.
- The faster 200 kHz scan speed should be appreciated by both technicians and patients since scan times are shorter and will not have an impact on clinical decisions.

| ETDRS Sector | Mean difference (microns) | 95 % confidence interval of mean difference | P value |
|---------------------|---------------------------|---|----------|
| CENTRAL | -0.36 | [-0.618, 1.133] | p = 0.46 |
| Z_INNERTEMP | -0.63 | [-1.059, 1.148] | p = 0.74 |
| Z_INNERSUP | -0.40 | [-0.606, 1.006] | p = 0.62 |
| Z_INNERNASAL | 1.20 | [-2.772, 0.258] | p = 0.10 |
| Z_INNERINF | 0.27 | [-1.368, 0.812] | p = 0.61 |
| Z_OUTERTEMP | 0.31 | [-1.193, 0.579] | p = 0.49 |
| Z_OUTERSUP | 0.23 | [-0.496, 0.946] | p = 0.53 |
| Z_OUTERNASAL | 0.34 | [-1.236, 0.562] | p = 0.45 |
| Z_OUTERINF | 0.004 | [-0.745, 0.736] | p = 0.99 |

Difference is: 200 kHz – 100 kHz

Table 1: Mean differences, confidence intervals and P values for the nine ETDRS regions used to evaluate the macular thickness. No sector showed significant difference between scan speeds.