Diurnal Variation of Retinal Thickness Measured by Optical Coherence Tomography in Normal Adults

We read with interest the article by Jo et al. in the August 2011 issue describing the diurnal variation of retinal thickness in normal subjects measured by time-domain (TD) and spectral-domain (SD) optical coherence tomography (OCT). The authors concluded that the diurnal variation in the retinal thickness observed with TD-OCT was caused by limitations in the repeatability of the OCT device rather than by actual variation of retinal thickness.

Although this was a well-designed study, one limitation was that the retinal thickness was assessed at only two time points, which provides limited information on the pattern of diurnal change. A difference between two time points is less compelling than if the retinal thickness measurements differ across several additional points during the day. We would like to highlight two other studies in normal subjects that provide additional evidence to support the findings of Jo et al. A significant strength of both of the additional studies is that the retinal thickness was measured at five time points during a single day, thus providing more comprehensive and robust data for the analysis of diurnal variation compared with the two points that were used in the present study. In addition, in both studies, the examination sequence (five OCT scans during the day) was repeated on a separate day to confirm the consistency of the results.

In a study of 12 normal individuals, sequential SD-OCT scans were performed with the Spectralis OCT (Heidelberg Engineering, Heidelberg, Germany). The authors found no significant variation in the macular thickness over the five time points during the day, with a maximum amplitude (the difference between the maximum and minimum retinal thickness) of 0.9 μm. This result is comparable to the difference of 0.8 μm reported by Jo et al. for central macular thickness measured with the Cirrus OCT (Carl Zeiss Meditec, Dublin, CA). In addition, this study used the tracking function of the Spectralis OCT to reduce the chance of a small displacement of the foveal B-scan position between sequential OCT scans and to ensure that the same point on the retina was measured for all OCT scans. We feel that this is a useful and important advantage, conferred by the tracking function of the Spectralis OCT.

In another study, Chakraborty et al.1 used an optical biomarker instead of OCT to measure retinal thickness. They also reported no significant diurnal variation in retinal thickness (mean amplitude, 8 μm) over the 2 days of examination.

Another interesting point that merits discussion is that, in Jo et al., in the sectors that showed a significant difference in retinal thickness on TD-OCT, the mean difference ranged from 2.5 to 3.5 μm. Although this difference may be statistically significant, it is unlikely to be of clinical relevance. In addition, the coefficient of repeatability of Stratus OCT retinal thickness in normal individuals has been reported to be approximately 17 μm, which is much greater than the difference between the two time points in this study.

Jo et al. also cited earlier studies that have reported diurnal variation in retinal thickness in patients with macular diseases. In these studies, various versions of TD-OCT were used to perform the OCT scans. Although it is certainly possible that the diurnal variation in retinal thickness may be due to the underlying disease process, it is also possible that at least part of it is due to motion artifact resulting from poor fixation as a result of the underlying disease process. It would be interesting to know whether a similar degree of diurnal change in retinal thickness in diseased eyes would be observed with tracking-capable SD-OCT devices.

In summary, in confirming this finding using SD-OCT with tracking, we agree with Jo et al. that there does not appear to be significant diurnal variation in retinal thickness in normal individuals.

Colin S. H. Tan, Wei Kiong Ngo, Milton C. Chew, Kelvin Z. Li, Louis W. Lim, Srinivas R. Sadda

1Department of Ophthalmology, Tan Tock Seng Hospital, Singapore; the 2National Healthcare Group Eye Institute, Singapore; and the 3Department of Ophthalmology, University of Southern California Keck School of Medicine, Doheny Eye Institute, Los Angeles, California.

E-mail: colintan_eye@yahoo.com.sg

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Author Response: Diurnal Variation of Retinal Thickness Measured by Optical Coherence Tomography in Normal Adults

We thank Tan et al. for their comments on our article. We were trying to observe the diurnal variation using results based on two examinations per day: one in the morning and another in the evening. We believe that the method we used is the...