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Enhanced Depth Imaging Optical Coherence Tomography in Uveitis: An Intravital and Interobserver Reproducibility Study

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Abstract

Purpose—To determine the intravital and interobserver reproducibility of subfoveal choroidal thickness (SFCT) measurements in patients with non-infectious uveitis.

Design—Reliability analysis.

Methods—Two consecutive enhanced depth imaging optical coherence tomography (EDI-OCT) scans were obtained at a single clinic visit for 97 uveitic eyes from patients 16 years of age with non-infectious anterior ($n = 10$), intermediate ($n = 11$), posterior ($n = 26$), and panuveitis ($n = 13$) at the National Eye Institute. SFCT was manually measured by two ophthalmologists using manufacturer's software. Intravital and interobserver reproducibility of SFCT measurements were assessed by using the Bland-Altman method to determine the estimate of bias (mean difference in SFCT measurements), 95% limits of agreement, and coefficients of repeatability. The reproducibility of these measurements was also compared between groups by anatomical location and clinical activity.

Results—Of 97 eyes, 65 (67.0%) were clinically quiet, 18 (18.6%) were minimally active, and 14 (14.4%) were active at the time the scans were obtained. Manual SFCT measurements were reproducible within $32.4 \pm 3.8 \mu\text{m}$ between sessions for the same observer and $51.4 \pm 8.5 \mu\text{m}$ between observers for the same session. Coefficients of repeatability did not differ significantly by anatomical location or disease activity.

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Conclusions—Manual SFCT measurements obtained by EDI-OCT are reproducible in uveitis patients, with coefficients of repeatability that are nearly comparable to those published for normal eyes. This study provides guidance for using manual SFCT measurements in clinical practice, but further studies are still needed to determine its utility in clinical trials.

Introduction

Uveitis constitutes a group of inflammatory eye diseases that can cause permanent damage to intraocular structures and lead to significant visual impairment. In order to better visualize and monitor posterior segment disease, various imaging modalities have been developed, including spectral domain optical coherence tomography (SD-OCT). This non-invasive imaging technique simultaneously measures multiple wavelengths of reflected light and acquires up to 40,000 axial scans (A-scans) per second, allowing for enhanced resolution and reduced motion artifact.¹ However, the focus of the resultant images is generally limited to the level of the retina, or the zero-delay point. Adequate visualization posterior to the retina is constrained by the presence of pigmented cells, the scattering of light along the image path, and decreasing sensitivity with increasing distance from the zero-delay point.² Thus, standard SD-OCT is not well suited for visualizing pathology involving deeper structures, such as the choroid.

Spaide and colleagues have described a different technique called enhanced depth imaging OCT (EDI-OCT).² In this method, the instrument's objective is placed close to the eye, obtaining an inverted image while localizing the zero-delay point closer to the choroid. EDI-OCT thereby enhances visualization of choroidal vascular structures and better defines the sclerochoroidal border, allowing for measurements of choroidal thickness. Several studies have examined the repeatability of manual subfoveal choroidal thickness (SFCT) measurements in healthy eyes using the Bland-Altman method.³ Collectively, these studies have shown that SFCT measurements are reproducible between observers with an interobserver variability of approximately 30 μm .⁴⁻⁶

Clinically significant changes in choroidal thickness have been reported in Vogt-Koyanagi-Harada (VKH) syndrome,⁷⁻¹¹ Behçet's disease,¹²⁻¹⁴ sarcoidosis,^{15, 16} birdshot chorioretinopathy,^{17, 18} idiopathic panuveitis,¹⁹ sympathetic ophthalmia,²⁰ and posterior scleritis.²¹ Although prior studies have assessed the reproducibility of manual choroidal thickness measurements in normal eyes, no such studies have been conducted in uveitic eyes. Yet, dramatic changes in retinal architecture and significant increases in choroidal thickness can adversely affect the reliability of these measurements in uveitic eyes. Thus, it is important to validate the use of EDI-OCT in uveitis patients, especially in the context of a multi-provider practice and for its potential utilization in clinical trials. The aims of this study are to determine the intravisit and interobserver reproducibility of manual SFCT measurements and to compare the reproducibility of these measurements between groups by anatomical location and disease activity in patients with non-infectious uveitis.

Methods

A reliability analysis was conducted using 97 uveitic eyes of 60 participants with non-infectious anterior ($n = 10$), intermediate ($n = 11$), posterior ($n = 26$), and panuveitis ($n = 13$), who were seen at the National Eye Institute (NEI) from June 2012 to March 2015. This reproducibility study was conducted under a clinical research protocol registered in the National Clinical Trials database (<http://www.clinicaltrials.gov>; NCT00708955), which was prospectively approved by the National Institutes of Health (NIH) Institutional Review Board, was in compliance with the Health Insurance Portability and Accountability Act, and was in adherence to the tenets of the Declaration of Helsinki. All participants provided informed consent. At the time of participation, no uveitic eyes included in the study had evidence of end-stage disease with extensive chorioretinal atrophy on examination. Axial lengths were also obtained to ensure that SFCT measurements in this study would not be affected by extreme myopia or hyperopia.

Scan Acquisition and Analysis

Two separate but consecutive EDI-OCT sessions were conducted on the Heidelberg Spectralis ophthalmic imaging system (Heidelberg Engineering, Heidelberg, Germany) by experienced ophthalmic photographers at a single clinic visit for all patients, except for seven who were scanned only once and therefore only had measurements to compare between observers. Each EDI-OCT session consisted of a $30^\circ \times 5^\circ$ volume scan composed of 13 sections, each comprising 25 averaged B-scans centered on the fovea, obtained using the device's automatic averaging and eye tracking features. The second EDI-OCT session was performed in reference to the first EDI-OCT session using the device's AutoRescan feature. The horizontal section running directly through the center of the fovea was selected for manual measurements. Two ophthalmologists experienced with reading EDI-OCT images used the manufacturer's proprietary software to place calipers directly beneath the fovea to measure SFCT. SFCT was defined as the vertical distance from just outside the hyperreflective line corresponding to the outer border of the retinal pigment epithelium to the hyporeflexive line corresponding to the inner scleral border (Fig. 1). Each observer was masked to the other observer's readings. Only gradable images were included in the analysis; those with an indistinguishable scleral border ($n = 4$) or extremely poor image quality ($n = 18$) were excluded.

To assess intraobserver reproducibility, one observer re-measured SFCT using the first EDI-OCT session for a random sample of 20 right eyes (5 anterior, 5 intermediate, 5 posterior, and 5 panuveitis, all with varying levels of activity) approximately one month after all sets of measurements were completed, while remaining masked to the original measurements.

Statistical Analysis

Intraobserver, intravisit, and interobserver reproducibility of manual SFCT measurements was assessed by the Bland-Altman method.³ Scatterplots were generated using MedCalc for Windows, version 15.4 (MedCalc Software, Ostend, Belgium), where the difference in SFCT measurements was plotted against the mean value. Intraobserver reproducibility was defined as the reproducibility of SFCT measurements made by a single observer for one

EDI-OCT session at two different time points. Intravisit reproducibility was defined as the reproducibility of SFCT measurements made by a single observer for same-day EDI-OCT sessions. Interobserver reproducibility was defined as the reproducibility of SFCT measurements made by observers 1 and 2 for the same EDI-OCT session. The average agreement, or bias, was estimated for each comparison by calculating the mean difference in SFCT measurements. This was reported with 95% confidence intervals (CIs), which were computed as ± 1.96 times the standard error (SE) of the differences. The coefficient of repeatability (CR) was also calculated for each comparison by multiplying the standard deviation (SD) of the differences by 1.96. The upper and lower 95% limits of agreement for each Bland-Altman plot were computed by adding or subtracting the CR value to or from the mean difference in SFCT, respectively. Specifically, the difference in SFCT measurements between sessions or observers was expected to be less than the respective CR for 95% of the corresponding observation pairs. The 95% CIs of the upper and lower limits of agreement, a measurement of the precision of the limits of agreement themselves, were computed as ± 1.96 times the SE of the respective limit, which was approximated as $((3s^2)/n)$, where s was the SD of the differences in SFCT and n the sample size.³

Mean SFCT was compared between groups by anatomical location and clinical activity using one-way analysis of variance on SPSS 20 (IBM Corp., Armonk, NY), where a two-tailed P -value of less than 0.05 was considered statistically significant. Anatomical location of uveitis and activity were determined according to Standardization of Uveitis Nomenclature criteria.^{22, 23} For the purposes of this study, eyes were categorized as active if the anterior chamber (AC) cell score was 1+, if the vitreous haze score was 0.5+, or if there was any activity on fluorescein angiography (FA) or other imaging modality warranting escalation of treatment. Eyes were considered minimally active if the AC cell score was 0.5+ in the absence of vitreous haze or if there was minimal activity on FA or other imaging modality that did not require changes in treatment. Otherwise, eyes were considered clinically quiet. The reproducibility of these measurements was also assessed by anatomical location and disease activity using the Bland-Altman method,³ as described above.

Results

A total of 97 uveitic eyes from 60 participants, with a mean age of 43.6 years (range, 16-72 years), was included in the study. Thirty-eight participants were female. Twenty-six participants were non-Hispanic white, 16 were non-Hispanic black, 13 were Hispanic/Latino, and five were Asian. Ten participants had non-infectious anterior uveitis, 11 had non-infectious intermediate uveitis, 26 had non-infectious posterior uveitis, and 13 had non-infectious panuveitis. Fifty-one participants (76.7%) had bilateral disease, but some of these patients had eyes that were excluded from our analysis due to extremely poor image quality, an indistinguishable scleral border, or end-stage disease, including phthisis. At the time that EDI-OCT scans were obtained, twenty-seven participants were on systemic corticosteroid therapy, 31 were on steroid-sparing immunosuppressive therapy, and 10 were on biologic therapy. Of 49 right uveitic eyes, 34 (69.4%) were clinically quiet, nine (18.4%) were minimally active, and six (12.2%) were active. Of 48 left uveitic eyes, 31 (64.6%) were clinically quiet, nine (18.8%) were minimally active, and eight (16.7%) were active. Mean axial length was 24.16 ± 1.54 mm and 24.17 ± 1.51 mm for the right and left eyes,

respectively. Mean SFCT was $278 \pm 81 \mu\text{m}$ and $287 \pm 118 \mu\text{m}$ for the right and left eyes, respectively.

Mean differences in intraobserver, intravisit, and interobserver SFCT measurements were close to zero, with the exception of two sets of interobserver measurements (Table 1). The estimates of bias between observers for the first and second EDI-OCT sessions for the right eye were statistically significant at $-8.92 \mu\text{m}$ ($P = 0.007$) and $-10.3 \mu\text{m}$ ($P = 0.011$), respectively. All others were non-significant.

Because the 95% limits of agreement depend on certain assumptions of the data,³ scatterplots of the difference against the average of SFCT measurements were generated (Fig. 2). In all plots, the mean and SD of SFCT measurements appeared relatively constant throughout the range of measurements. The 95% limits of agreement along with their 95% CIs are summarized in Table 2. Overall, intravisit CR was $32.4 \pm 3.8 \mu\text{m}$, and interobserver CR was $51.4 \pm 8.5 \mu\text{m}$. Intraobserver CR for one observer using a random sample of 20 right eyes was $37.3 \mu\text{m}$.

To determine whether the reliability of SFCT measurements was adversely affected by location or activity of uveitis, mean SFCT and CR of these measurements were compared between groups by anatomical location and clinical activity. Due to lower numbers of eyes in certain groups, measurements in eyes with anterior and intermediate uveitis and those in eyes with posterior and panuveitis were grouped together. Measurements in eyes with any level of activity (i.e., minimally active, active) were also grouped together given that disease activity was well represented across all anatomic locations. Although no statistically significant difference was detected between the different anatomical locations of uveitis, a general trend of increasing SFCT towards the posterior segment was observed (Fig. 3A). Notably, intravisit and interobserver reproducibility was unaffected by anatomical location (data not shown). Similarly, a non-significant trend of increasing SFCT with uveitic activity was observed (Fig. 3B); intravisit and interobserver reproducibility also did not differ significantly by clinical activity (data not shown).

Discussion

The choroid is a vascular structure located most posteriorly in the uveal tract and has multiple physiological functions, including the supply of oxygen and nutrients to the outer retina and the removal of its waste products,²⁴ but it has also been implicated in the pathophysiology of a number of uveitides, including VKH syndrome,⁷⁻¹¹ Behçet's disease,¹²⁻¹⁴ and birdshot chorioretinopathy.^{17, 18} With the introduction of EDI-OCT, better clinical characterization of these diseases has been possible, but despite improved visualization of choroidal structures and good repeatability of choroidal thickness measurements in normal eyes, it has become apparent that challenges in distinguishing the sclerochoroidal border continue to exist and contribute to the variability seen between observers' measurements.⁴ This becomes an important consideration when implementing EDI-OCT in a multi-provider practice, clinical research, and above all, clinical trials. Additionally, the effect of factors affecting reproducibility, such as image quality and anatomic variation, can be amplified in ocular pathology. Therefore, an EDI-OCT

reproducibility study using uveitic eyes is needed to appropriately interpret changes in choroidal thickness measurements in patients with uveitis. Although some studies have attempted their own reproducibility analyses, Pearson's correlation coefficients or intraclass correlation coefficients have only been used to measure variability in small subsets of uveitic eyes.^{10, 12, 13, 18} Unfortunately, these coefficients measure the strength of any possible relationship that can exist between two variables, and high values do not necessarily indicate agreement.²⁵ The Bland-Altman method, however, assesses agreement between two methods of measurement and provides clinically useful information, such as the distribution of the mean difference between measurements, estimates of bias between observers, and coefficients of repeatability in units of measurement.^{3, 25} To our knowledge, no study to date has examined the true reproducibility of choroidal thickness measurements in uveitic eyes.

The current study determined that SFCT measurements were reproducible within 32.4 ± 3.8 μm between sessions for the same observer and 51.4 ± 8.5 μm between observers for the same EDI-OCT session. Given the potentially dramatic changes in retinal architecture, significant alterations in choroidal thickness, and reductions in image quality seen with uveitic eyes, we expected to observe CR values that were greater than those previously reported in normal eyes. However, our results were relatively comparable to the values determined by Rahman et al., where intravisit CR was approximately 34 μm (95% CI, 32-36 μm) and interobserver CR was approximately 32 μm (95% CI, 30-34 μm).⁴ Interestingly, intravisit and interobserver CRs were very similar in that study, even though intraobserver CR for observer 1 was approximately 23 μm (95% CI, 19-26 μm). Although not specifically reported by Shao et al.⁵ or Karaca et al.,⁶ interobserver CRs in those studies were also similar to the CR observed by Rahman et al.⁴ and were approximately 25.7 μm and 31.0 μm , respectively. However, Karaca et al. showed Bland-Altman plots with an intravisit CR of approximately 17.4 μm , or 13.6 μm less than the corresponding interobserver CR.⁶ In the present study, interobserver CR was approximately 19 μm greater than intravisit CR. Although no longer very comparable to interobserver CRs published for normal eyes,⁴⁻⁶ the difference in intravisit and interobserver CRs was similar to that reported by Karaca et al.⁶ In addition to scan quality and anatomic changes secondary to intraocular inflammation, the variability seen in SFCT measurements may be attributed to the inherent subjectivity associated with each observer, including changes in image contrast to better delineate the sclerochoroidal border as well as differences in the exact placement of calipers on the EDI-OCT image. Even slight changes in caliper placement can lead to differences of up to tens of microns between measurements, adding to measurement variability. This can also apply to intraobserver measurements made in this and other previously published studies^{4, 5} and may in particular account for a large proportion of intravisit variability.

The differences in CR values between sessions and observers can be partly explained by the estimate of bias, or the mean difference in SFCT measurements. With a perfectly reproducible technique, the mean difference in measurements is zero. In this study, mean differences of intravisit SFCT measurements were close to zero, with their 95% CIs including zero (Table 2). Mean differences in interobserver SFCT measurements for the left eye were also close to zero and were not statistically significant (Table 1). However, mean differences in interobserver SFCT measurements for the right eye were significant at nearly

10 μm for both EDI-OCT sessions. Interestingly, the direction of bias was consistent in both sessions for both eyes, though not statistically significant for the left eye. Of note, the true significance of these estimates of bias depends entirely on their clinical context and full range of measurements.²⁶ A difference of 10 μm is rather minimal when comparing changes of >100 μm in patients with VKH.¹⁰ Furthermore, this bias has already been accounted in the higher interobserver CR value reported in this study.

Although mean SFCT was not statistically different between groups by anatomical location or disease activity, we observed a general trend of increasing thickness with posterior-segment involvement and clinically active intraocular inflammation (Fig. 3). Despite a previous report of diminished reproducibility in thicker choroids,²⁷ the reproducibility of SFCT measurements in this study was not significantly affected by anatomical location or activity of uveitis. Mean differences were also negligible between sessions for the same observer and generally consistent in direction and magnitude between observers for the same EDI-OCT session (data not shown). Based on these findings, the same aforementioned considerations can apply to all forms of non-infectious uveitis, regardless of anatomical classification or activity.

This EDI-OCT reproducibility study has several limitations. Firstly, SFCT was manually measured, which introduced a source of variability to the study. Unfortunately, there was no commercially available software that could be used to measure choroidal thickness at the time of the study. However, choroidal thickness is normally measured manually in clinical practice, and this study provides reproducibility parameters for the practicing clinician. Secondly, only SFCT was measured by our readers, but variability in measurements may change by location across the choroid. This is of particular clinical interest when measuring the relative thickness of atrophic choroidal lesions in birdshot chorioretinopathy¹⁷ or the thickness of a choroidal granuloma in sarcoidosis.¹⁶ Visualization of the sclerochoroidal border may not be adequate in these uveitic eyes, where the presence of lesions may alter the amount of light that can penetrate the choroid. However, other reproducibility studies have solely used SFCT as the basis of comparison,^{4, 5} and presumably, if scans are obtained in reference to a single EDI-OCT scan, choroidal thickness at corresponding locations can be determined with good reproducibility.

Before measurements of choroidal thickness can be used in clinical trials, better characterization of the choroid and its changes with disease progression and treatment response is needed. Some have already reported that mean choroidal thickness can significantly increase during the acute stage of VKH syndrome compared to the convalescent phase or to normal, age-matched control subjects⁷ and that markedly thickened choroids can significantly reduce with corticosteroid treatment.⁸ Others have shown that EDI-OCT can be used to detect not only recurrences in VKH, but also subclinical inflammation in the absence of overt intraocular inflammation detected on clinical examination.²⁸ While the prospects of using EDI-OCT in the management of VKH syndrome and other uveitides are promising, there is still much research to be done before new standards in clinical care can be implemented.

EDI-OCT provides non-invasive, in vivo, cross-sectional information of the choroid, previously unavailable to clinicians by traditional methods of ultrasonography or FA and indocyanine green angiography. Just as they were shown to be reproducible in normal eyes, this study demonstrated that manual SFCT measurements obtained by EDI-OCT were reproducible in uveitic eyes, with an intravisit CR of $32.4 \pm 3.8 \mu\text{m}$ and an interobserver CR of $51.4 \pm 8.5 \mu\text{m}$. Interobserver CR was somewhat larger than the corresponding CR in normal eyes, but this was expected, since the presence of uveitic lesions and other intraocular inflammatory sequelae was known to adversely affect image quality and thus measurement variability between different observers. Furthermore, neither intravisit nor interobserver reproducibility was limited by anatomical location or disease activity. Although this study provides guidance for using manual SFCT measurements in clinical practice, further studies are still needed to support its application in specific uveitis subtypes and to substantiate its future role in clinical trials.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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FIGURE 1.

Measurement of subfoveal choroidal thickness by enhanced depth imaging optical coherence tomography in uveitis patients. Subfoveal choroidal thickness (*double-headed arrow*) is defined as the vertical distance from just outside the hyperreflective line corresponding to the outer border of the retinal pigment epithelium to the hyporefective line corresponding to the inner scleral border. Bars represent 200 μm in length.

FIGURE 2.

Representative scatterplots showing intraobserver, intravisit, and interobserver reproducibility of subfoveal choroidal thickness measurements using enhanced depth imaging optical coherence tomography for the right eye in uveitis patients. Mean subfoveal choroidal thickness (SFCT) is plotted against the difference in SFCT measurements at two different time points of measurement by a single observer (top left), between two sessions of enhanced depth imaging optical coherence tomography (EDI-OCT) for the same observer (top right and bottom left, respectively), and between two observers for the first EDI-OCT session (bottom right). The mean difference is denoted by a solid line, whereas the ideal mean difference of zero is shown by a dotted line. The upper and lower 95% limits of agreement are indicated by dashed lines, which correspond to two standard deviations (SD) from the mean difference. In all plots, the mean and SD of SFCT measurements appear relatively constant throughout the range of measurements.

FIGURE 3.

Boxplots showing mean subfoveal choroidal thickness measurements obtained by enhanced depth imaging optical coherence tomography for the right eye in uveitis patients, subcategorized by anatomical location and uveitic activity. Due to lower numbers of eyes in certain groups, measurements of eyes with anterior and intermediate uveitis and those of eyes with posterior and panuveitis are grouped together. Given similar representation of disease activity across all anatomic locations, measurements for eyes with any level of activity (i.e., minimally active, active) are also grouped together. (Left) Although no statistically significant difference is detected between groups by anatomical location of uveitis, a general trend of increasing subfoveal choroidal thickness (SFCT) towards the

posterior segment is observed. (Right) Similarly, there is a non-significant trend of increasing SFCT with uveitic activity.

TABLE 1

Summary of Intraobserver, Intravisit, and Interobserver Comparisons of Subfoveal Choroidal Thickness Measurements using Enhanced Depth Imaging Optical Coherence Tomography in Uveitis Patients

Type of Comparison	<i>n</i>	Mean (SD) Difference (μm)	<i>P</i> -value
<i>Intraobserver^a</i>			
OBS 2, SESS 1, OD – OBS 2, SESS 1', OD	20	–1.5 (19.0)	0.728
<i>Intravisit</i>			
OBS 1, SESS 1, OD – OBS 1, SESS 2, OD	42	+1.0 (15.2)	0.673
OBS 1, SESS 1, OS – OBS 1, SESS 2, OS	41	+2.7 (16.0)	0.293
OBS 2, SESS 1, OD – OBS 2, SESS 2, OD	42	–0.7 (15.6)	0.768
OBS 2, SESS 1, OS – OBS 2, SESS 2, OS	41	–1.3 (19.4)	0.672
<i>Interobserver</i>			
OBS 1, SESS 1, OD – OBS 2, SESS 1, OD	49	–8.9 (22.0)	0.007
OBS 1, SESS 1, OS – OBS 2, SESS 1, OS	48	–4.0 (32.3)	0.390
OBS 1, SESS 2, OD – OBS 2, SESS 2, OD	42	–10.3 (25.2)	0.011
OBS 1, SESS 2, OS – OBS 2, SESS 2, OS	41	–6.1 (25.5)	0.135

Abbreviations: OBS, observer; SESS, session; OD, oculus dexter (right eye); OS, oculus sinister (left eye); SD, standard deviation.

^aIntraobserver measurements were performed on a random selection of 20 eyes (40 measurements), whereas interobserver measurements were made using almost 50 eyes (nearly 100 measurements in total).

Mean differences in intraobserver, intravisit, and interobserver subfoveal choroidal thickness measurements using enhanced depth imaging optical coherence tomography in uveitis patients are close to zero, with the exception of two sets of interobserver measurements.

TABLE 2

Summary of 95% Limits of Agreement and Coefficients of Repeatability between Sessions and Observers for Subfoveal Choroidal Thickness Measurements using Enhanced Depth Imaging Optical Coherence Tomography in Uveitis Patients

Type of Comparison	<i>n</i>	Estimate of Bias (μm)	95% CI (μm)	Lower Limit of Agreement (μm)	95% CI (μm)	Upper Limit of Agreement (μm)	95% CI (μm)	Coefficient of Repeatability (μm)
<i>Intraobserver^a</i>								
OBS 2, SESS 1, OD – OBS 2, SESS 1', OD	20	-1.5	-10.4 to 7.4	-38.8	-54.2 to -23.3	+35.8	+20.3 to +51.2	37.3
<i>Intravisit</i>								
OBS 1, SESS 1, OD – OBS 1, SESS 2, OD	42	+1.0	-3.8 to +5.8	-28.8	-37.0 to -20.7	+30.8	+22.7 to +39.0	29.8
OBS 1, SESS 1, OS – OBS 1, SESS 2, OS	41	+2.7	-2.4 to +7.7	-28.7	-37.3 to -20.0	+34.0	+25.3 to +42.7	31.3
OBS 2, SESS 1, OD – OBS 2, SESS 2, OD	42	-0.7	-5.6 to +4.1	-31.2	-39.6 to -22.9	+29.8	+21.4 to +38.2	30.5
OBS 2, SESS 1, OS – OBS 2, SESS 2, OS	41	-1.3	-7.4 to +4.8	-39.4	-49.9 to -28.8	+36.8	+26.2 to +47.3	38.1
<i>Interobserver</i>								
OBS 1, SESS 1, OD – OBS 2, SESS 1, OD	49	-8.9	-15.2 to -2.6	-52.0	-62.9 to -41.1	+34.2	+23.3 to +45.0	43.1
OBS 1, SESS 1, OS – OBS 2, SESS 1, OS	48	-4.0	-13.4 to +5.3	-67.4	-83.5 to -51.2	+59.3	+43.1 to +75.4	63.3
OBS 1, SESS 2, OD – OBS 2, SESS 2, OD	42	-10.3	-18.1 to -2.5	-59.6	-73.1 to -46.1	+39.0	+25.5 to +52.5	49.3
OBS 1, SESS 2, OS – OBS 2, SESS 2, OS	41	-6.1	-14.1 to +2.0	-56.0	-69.9 to -42.2	+43.9	+30.0 to +57.8	50.0

Abbreviations: CI, confidence interval; OBS, observer; SESS, session; OD, oculus dexter (right eye); OS, oculus sinister (left eye); SD, standard deviation.

^aIntraobserver measurements were performed on a random selection of 20 eyes (40 measurements), whereas interobserver measurements were made using almost 50 eyes (nearly 100 measurements in total).

Overall, the intraobserver coefficient of repeatability (CR) was 37.3 μm, the intravisit CR was 32.4 ± 3.8 μm, and the interobserver CR was 51.4 ± 8.5 μm for manual subfoveal choroidal thickness measurements using enhanced depth imaging optical coherence tomography in uveitis patients.