Evaluation of Central Retinal Thickness and Subfoveal Choroidal Thickness in Normal Eyes

Ohjae Kim¹, Dongwon Lee¹, Judy E. Kim², Taegon Lee¹, Chulgu Kim¹
¹Ophthamology, Kim’s Eye Hospital, Seoul, Republic of Korea; ²Ophthamology, Medical College of Wisconsin, Milwaukee, WI USA.

Purpose
To determine central retinal thickness and subfoveal choroidal thickness using optical coherence tomography (OCT) and to evaluate association between both thickness and age, gender and axial length.

Background
There have been many reports about retinal thickness and choroidal thickness measured by OCT. But clear and accurate visualization of the choroid using OCT is still difficult, especially the images with acceptable quality to visualize choriocapillary interface. We would like to know how to examine the choroid with 840 nm wavelengths without depth enhancement. We examined the incident of the OCT images with acceptable quality to visualize choriocapillary interface of all subjects, only adjusting image brightness and contrast with Image J software.

Methods
A retrospective analysis was performed.

OCT exam and axial length measurement were performed on 151 eyes of 151 healthy volunteers at Medical College of Wisconsin Eye Institute between February 2010 and October 2010.

Axial Length measurement
The IOL master (Carl Zeiss Meditec) was used to measure the eye length to compensate axial scale factor of the SD-OCT images.

SD-OCT Images
All subjects with undilated pupils were examined using high-resolution spectral domain optical coherence tomography (SD-OCT) images of the macula were acquired (Bioptigen, Research Triangle Park, N/C).

High-density line scans (1000A scans/B scan, 100 repeated B scans) were acquired through the foveal center. Lines scans were registered and averaged to reduce speckle noise in the image. We used Image J software (Image J, Bethesda, Maryland, USA) for image processing, central retinal thickness and subfoveal choroidal thickness measurement. Raw OCT images were enhanced digitally to improve the visibility of the choriocapillary boundary. We carried out postprocessing procedures subjectively including adjustments to brightness and contrast, despeckling and noise removal, B-scan registration. Two independent examiners manually measured the central retinal thickness and subfoveal choroidal thickness.

Statistical analysis
Statistical analysis using pared t-test and Pearson correlation (SPSS, version 17, Chicago) were performed to evaluate the correlation between subfoveal choroidal thickness and age, axial length, and gender.

Results

Central Retinal Thickness and Subfoveal Choroidal Thickness Measured by SD-OCT

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<tr>
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<th>Male (n=57)</th>
<th>Female (n=94)</th>
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<tr>
<td>Mean CRT</td>
<td>213.89±14.64μm</td>
<td>214.76±13.03μm</td>
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<tr>
<td>Mean SFCT</td>
<td>252.74±31.96μm</td>
<td>253.22±36.28μm</td>
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mean overall SFCT and CRT (n=151)

CRT: 214.43±13.63μm (range, 149.73μm to 335.27μm)
SFCT: 252.97±35.03μm (range, 126.94μm to 372.14μm)

Fig. 3. Scatterplot of Age and Central Retinal Thickness
Subfoveal Choroidal Thickness of all subjects shows a significant negative correlation (p<0.001, R²=0.222)

Fig. 4. Scatterplot of Axial length and Subfoveal Choroidal Thickness of all subjects shows a significant negative correlation (p=0.002, R²=0.180)

Conclusions
Increasing age (Pearson correlation 0.145, R²=0.0211, p=0.075) were not correlated with central retinal thickness.
1. Increasing axial length (Pearson correlation -0.088, R²=0.0078, p=0.282) were also not correlated with central retinal thickness.
2. Increasing age (R=0.222, p<0.01) were correlated with decreasing choroidal thickness.
3. Increasing axial length (R=-0.180, p<0.01) were also correlated with decreasing choroidal thickness.
4. Central retinal thickness and subfoveal choroidal thickness showed no significant difference by gender.
5. Central retinal thickness and subfoveal choroidal thickness have no relationship between them in our study (Pearson correlation -0.139, R²=0.0192, p=0.090).

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Reference