Assessment of macular thickness is important for the diagnosis, treatment, and follow-up of various ocular diseases. Therefore, looking into normal reference values of ocular parameters can provide a basis for recognition of abnormalities and an understanding of pathological states of disease. Recently, the spectral domain optical coherence tomography has enabled to reliably detect changes of macula and measure total retina and retinal nerve fiber layer (RNFL) thickness. Spectralis HRA + OCT (Heidelberg Engineering, Heidelberg, Germany) provides more accurate information by using tracking system to compensate eye movement and averaging multiple B-scans. Several previous studies on normal range of macular thickness by SD-OCT have been reported. However, normative values of the RNFL thickness has not been analyzed particularly in Korean. The purpose of this study was to determine the normal range of RNFL thickness in healthy Korean by SD-OCT and to discover the relationship of RNFL with age, gender, and variations of ocular parameters.

Methods

The study was analysis included randomly selected 218 eyes of 125 normal Korean (96 males and 122 females, age 20 to 76 years). Evidence of glaucomatous damage, family history of glaucoma, any ocular surgery history and all other eye diseases were excluded. All subjects were examined by slit lamp inspection, Goldman applanation tonometry, ultrasonography for axial length, and auto-refractive keratometer. Peripapillary RNFL was imaged with Spectralis HRA + OCT. RNFL thickness was measured around the optic nerve head and divided into 4 segments (Temporal, Nasal, Superior, Inferior, Figure 1). Statistical analysis was performed using SPSS PASW 17 statistics program and Pearson correlation. P values less than 0.05 were considered to be statistically significant. Description of results includes mean and standard deviation.

As age increased, mean RNFL thickness decreased significantly (r=0.169, P=0.012, Figure 2) with a decay of 0.25 µm/year. The topographical distribution of RNFL thickness among four segments was investigated in a similar age in all groups. RNFL thickness was observed to decrease significantly with age in 3 segments except nasal area (Figure 3). Superior (r=0.332, P<0.01), inferior (r=0.371, P<0.01), temporal (r=0.251, P<0.01), nasal (r=0.008, P=0.908).

Conclusions

This study determined normal ranges of RNFL thickness determined by Spectralis HRA-OCT and age-related differences for normal healthy Korean. As age increased, mean RNFL thickness decreased significantly. Although effect of aging on total RNFL thickness is small, this age-related decline should be taken into account when establishing normal limits. RNFL thickness was significantly related to axial length, as RNFL was thinner in longer eyes. It might be more stretched and then thinner peripapillary RNFL in longer eyes. The results indicate considerable variation of RNFL thickness among subjects, even same age groups. Determination of the borderline value between normal and glaucomatous eyes is clinically important for detection of early glaucomatous change. Reduction of RNFL thickness due to damage of retinal ganglion cells precedes the optic disc change, therefore continuous retinal nerve fiber exam has greater importance. We found Spectralis HRA + OCT could be applicable to clinical parameters for early diagnosis and exam of progression in Korean glaucoma patients.

References