Central Corneal Thickness and Retinal Nerve Fiber Layer Thickness in Healthy Subjects

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Introduction:
Central corneal thickness (CCT) has been shown to be a key risk factor in the development of glaucoma.1,2
It has been speculated that the corneal properties may be used as surrogate measures of other ocular properties that might be related to glaucoma.
Numerous studies have investigated the relationship between CCT and the retinal nerve fiber layer (RNFL) thickness in glaucoma subjects. However, the contribution of the fundamental ocular properties cannot be distinguished from the effect of the disease on the RNFL.
The purpose of this study was to determine the relationship in healthy subjects between CCT and RNFL thickness as measured by optical coherence tomography, confocal scanning laser ophthalmoscopy and scanning laser polarimetry.

Methods:
One hundred ninety healthy subjects were retrospectively selected from the Advanced Imaging in Glaucoma Study (AIGS). The AIGS is a multi-center study designed to develop advanced imaging technologies that can improve the detection and management of glaucoma.
Inclusion criteria:
• No history of ocular pathology, surgery other than uncomplicated cataract surgery or trauma.
• Best-corrected visual acuity ≥ 20/40.
• Spherical equivalent between -7.0 D to +3.0 D.
• IOP ≤ 21 mmHg.
• CCT > 500 µm.
• Normal and reliable Swedish interactive thresholding algorithm (SITA) standard 24-2 perimeter (Carl Zeiss Meditec, Dublin, CA).
Imaging – Good quality scans were obtained by:
• StratusOCT (Carl Zeiss Meditec, Dublin, CA) (Fast RNFL scanning mode)
• HRT II (Heidelberg Engineering, Heidelberg, Germany)
• GDx-VCC (Carl Zeiss Meditec, Dublin, CA).
Table 1. RNFL thickness measured by three imaging devices and the relationship with central corneal thickness

<table>
<thead>
<tr>
<th>Method</th>
<th>Mean ± SD (µm)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>StratusOCT</td>
<td>80.5 ± 11.9</td>
<td>0.017</td>
</tr>
<tr>
<td>HRT II</td>
<td>79.6 ± 12.1</td>
<td>0.010</td>
</tr>
<tr>
<td>GDx-VCC</td>
<td>79.7 ± 12.4</td>
<td>0.011</td>
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</tbody>
</table>

The high variability among the sites might be due to the small sample size in some sites and because the overall trend was weakly distributed around a zero slope.
The wide range of CCT and the finding of a slope of approximately zero through the different imaging modalities enhance the validity of our findings.

Discussion:
No statistically significant relationship was observed between CCT and RNFL thickness as measured by three imaging modalities in healthy eyes.
The high variability among the sites might be due to the small sample size in some sites and because the overall trend was weakly distributed around a zero slope.
The wide range of CCT and the finding of a slope of approximately zero through the different imaging modalities enhance the validity of our findings.
In the light of these findings, the relationship that was reported in previous studies might be due to the effect of corneal thickness on the accuracy of intracocular pressure measurements or due to an effect on other ocular structures such as the lamina cribrosa.

Conclusion:
No significant relationship was observed between RNFL thickness and CCT in healthy eyes.

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