Retinal neurodegeneration on optical coherence tomography and cerebral atrophy

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\textbf{HIGHLIGHTS}

- Cerebral atrophy and retinal neuronal damage have been linked to cognitive decline.
- Retinal neuronal damage is reflected by RNFL and GC-IPL thinning.
- GC-IPL thinning was associated with occipital and temporal lobe grey matter loss.
- No association was found with regional white matter volumes.

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\textbf{ABSTRACT}

Neurodegeneration in dementia is mainly evaluated by assessing cerebral atrophy, while retinal neurodegeneration can be quantified \textit{in vivo} using optical coherence tomography (OCT). We examined the association of retinal nerve fibre layer (RNFL) and ganglion cell-inner plexiform layer (GC–IPL) thinning with global and regional cerebral atrophy on magnetic resonance imaging (MRI).

Malay participants aged 60–80 years from the Epidemiology of Dementia in Singapore Study underwent comprehensive examinations, including 3-Tesla cranial MRI. RNFL and GC-IPL thicknesses were obtained from spectral domain-OCT; and cerebral grey and white matter volumes were obtained from MRI scans using a validated segmentation tool. Linear regression models were constructed with adjustment for age and sex; and additionally for vascular risk factors and MRI markers including intracranial volume.

164 participants without glaucoma with gradable quality MRI and OCT scans were included for analysis. GC-IPL thinning was associated with reduction in total brain volume in the occipital (mean change in GC-IPL per standard deviation (SD) decrease in occipital lobe volume: \(-1.77 \mu m, 95\% \text{ CI} -6.55 \text{ to } 0.01 \mu m\)) and temporal lobes (mean change in GC-IPL per SD decrease in temporal lobe volume: \(-3.45 \mu m, 95\% \text{ CI} -5.40 \text{ to } -1.49 \mu m\)) in multivariate adjusted models. In particular, GC-IPL thinning was primarily associated with grey matter volume, whereas no association was found with white matter changes.

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