P5 A Review and Case Study for Retinal Layer Thickness Analysis in OCT Images for Multiple Sclerosis Detection

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Optical coherence tomography (OCT) is increasingly recognised as a valuable, non-invasive biomarker of neuroaxonal injury in multiple sclerosis (MS), particularly when analysis focuses on specific retinal layers rather than overall retinal thickness. This presentation offers a concise review of the OCT-MS literature and a focused case study using the Johns Hopkins University retinal OCT dataset to examine whether OCT-derived measures can distinguish healthy controls from individuals with MS. The study adopts a quantitative, observational, cross-sectional design using 35 right-eye OCT scans, comprising 14 healthy controls and 21 participants with MS. Labelled retinal images and computer-generated outputs were analysed to measure total retinal thickness, the thickness of its different layers, variations between the centre and outer areas, and the accuracy of the computer-based measurements. Logistic regression was also used to explore whether these measurements could distinguish between participant groups (He et al., 2018).

Previous research suggests that specific layer measurements, including the retinal nerve fibre layer and ganglion cell-related layers, may reveal MS-related neuroaxonal damage more clearly than total retinal thickness (Petzold et al., 2017; Petzold et al., 2010). Consistent with this literature, the case study findings suggest that automated OCT analysis can reliably capture overall retinal structure, with strongest performance at stable outer boundaries and reduced precision in more complex inner layers. Band 2 emerged as a more informative discriminator between healthy controls and MS than total retinal thickness, this suggests that MS may affect particular nerve layers in the retina rather than causing widespread changes across the entire retina.

Identifying these patterns may support earlier detection of MS-related nerve damage, monitoring of disease progression, and evaluation of treatment effectiveness. However, OCT should complement, rather than replace, other clinical assessments. The presentation concludes with an accessible discussion of OCT's clinical value, segmentation challenges, retinal thickness definitions, and the potential contribution of band-specific analysis to future MS research and biomarker development.

Keywords
Multiple Sclerosis, Optical Coherence Tomography, Retinal Layer Thickness, Segmentation, Biomarkers, Case Study

References

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