Histologic Correlation of OCT with Diseased Retina in Humans

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Purpose
Direct correlation of ocular coherence tomography (OCT) data with histology of the retina has been lacking, particularly in human retinal disease. This study is designed to refine understanding of both normal and pathological OCT data with high performance histological methods.

Methods
A Heidelberg Spectralis OCT system was used to obtain retinal scans from collected normal human globes as well as globes from patients who suffered from retinitis pigmentosa (RP), wet, and dry age-macular degeneration (AMD) and geographic atrophy (GA). The globes were resected postmortem, fixed in 10% formaldehyde, 2.5% glutaraldehyde, anterior segment removed and mounted in normal saline in a spectrophotometer chamber. OCT imaging was then performed on regions of interest and data saved with landmarks. The globes were then removed, portions corresponding to regions imaged by OCT were punched out, dehydrated, embedded in eponate and histologically analyzed with computational molecular phenotyping and ultrastructural analysis.

Results
While some data exists in the literature, a high performance correlation of OCT data with human histology has not to our knowledge been previously performed. Normal retinal tissues revealed the presence of retinal nerve fiber layer, Müller cell structure and representation in pigmented bone spicules complete with pigment granules derived from the RPE in mid-stage and advanced RP. Additionally, AMD findings of localized atrophy, sub-RPE drusen in AMD and pigment epithelial detachments along with interface alterations between the RPE and retina and sub-retinal deposits are described.

Conclusions
OCT has proven invaluable in the clinic to diagnose and track disease progression. Defining precise understanding of OCT correlates with the histology of retinal structure and function in retinal degenerative diseases will assist the definition of windows of opportunity for various vision rescue strategies.

Abbreviations

References

ICD: Intraocular Coach OCT: Optical Coherence Tomography OCTN: Optic Nerve VONL: Vestibulo-Ocular Neuroepithelium VONL: Vestibulo-Ocular Neuroepithelium


