Retinal imaging in Mouse Models for Retinal Disease

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Purpose:

Spectral domain OCT (SD-OCT) devices are ideally suited to analyze changes of retinal pigment epithelium integrity even in small animals because of the real-time tracking of eye movements. Purpose was to investigate the possibility to analyze changes of retinal pigment epithelium (RPE) integrity as well as the influence of sodium idodate ($NaIO_3$) on morphology in a mouse model of RPE degeneration mimicking dry age-related Maculardegeneration (AMD).

Methods:

In total 20 six weeks old male C57BL/6 mice (Charles River WIGA, Sulzfeld, Germany) received a single i.v. injection of sterile 1% sodium iodate ($NaIO_3$) in saline (15, 25, or 35 mg/ kg; Sigma-Aldrich, Buchs SG, Switzerland). Retinal structural changes will be assessed at BL, day 3, 7, 14, 21, and 28 and compared with controls (i.v. injection of sterile 0.9% NaCl).

BL6 mice were anesthetized and eyes dilatated before OCT image acquisition. By applying 1% hydroxypropyl methylcellulose on the eye, refractive power of the air-cornea-interface was effectively negated. A conventional contact lens (focal length = 9 mm) was used to reduce the risk of corneal dehydration and edema and act as collimator. The laminar organization of the murine retina was determined by SD-OCT (Spectralis™HRA+OCT, Heidelberg Engineering, Heidelberg, Germany) and simultaneously imaging with red free (513 nm), infrared (830 nm) and autofluorescence (488 nm) modes was done. Finally, results were compared to light microscopy studies (H&E-staining) at the latest time point.

Results:

$NaIO_3$ – induced changes in the outer retinal cell layer and the RPE layer of murine eyes were visualized by SD-OCT. The application of the toxin led to a time-depend damage of the outer retinal cell layer and the RPE. First changes were detectable in the OCT images after 7 days and increased over time. The age-matched controls showed none of these effects and the reflection layers were clearly distinguishable. The degeneration could be correlated to morphological changes.

Discussion:

With SD-OCT it is possible to analyze structural changes of retinal pigment epithelium integrity even in small animals because the real-time tracking of eye movements. SD-OCT allows also monitoring of dynamic changes in individual animals with non-invasive longitudinal study design. In our opinion SD-OCT has the potential to complement the existing *in vivo* methods in vision research by providing histology-analog structural details of retinal integrity.