Detection of Photoreceptor Disruption After Commotio Retinae Using Adaptive Optics Scanning Laser Ophthalmoscopy

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Introduction:
• Commotio Retinae is a transient opacification of the retina due to outer retinal disruption occurring in a contrecoup fashion after blunt trauma injury.1
• Histological studies in animals and humans after ocular blunt trauma have revealed that disruption occurs at the level of the photoreceptor outer segments and retinal pigment epithelium (RPE).2,3
• Recent reports using optical coherence tomography (OCT) have shown detectable disruption at the level of photoreceptor inner segment/outer segment junction and RPE4,5 and that these changes may be reversible over time with restoration of normal outer retinal architecture.6
• However, resolution of existing OCT technology may not be sensitive enough to detect photoreceptor disruption.
• Adaptive optics (AO) imaging systems enable cellular-resolution imaging of the human retina, and there is a growing number of cases where deficits have been visible on AO images but not on OCT.
• Here we present a case of subclinical photoreceptor disruption after severe head trauma as seen by adaptive optics scanning ophthalmoscope (AOSO) images and not apparent clinically or on spectral domain-OCT (SD-OCT).

Case Presentation:
A 41-year-old male presented with a 2-year history of a stable, well defined, crescent-shaped, purple scotoma nasal to central fixation (OD) that developed after an industrial accident in which he experienced significant head and body trauma. He underwent complete ophthalmic exam, OCT, and a naso-temporal diplopia. He was referred for further evaluation of the visual field.

Absence of Visible Pathology on SD-OCT Imaging
The Spectralis SD-OCT done at the initial clinical exam showed no abnormalities. Further imaging with the Cirrus HD-OCT and the Biograph SD-OCT revealed a subtle area of hyperreflectivity located just temporal to the fovea between the inner segment/outer segment photoreceptor junction layer (IS/OS) and RPE. Macular volume scans showed normal retinal thickness.

AOOS Images Reveal Photoreceptor Disruption
• AOSO enabled direct visualization of photoreceptor disruption as a result of head trauma not apparent clinically or by other standard imaging modalities, including SD-OCT.
• Restoration of outer retinal appearance in SD-OCT has been reported after commotio retinae7, suggesting recovery of outer retinal structure. Our data demonstrate photoreceptor disruption may still exist. SD-OCT axial resolution is likely not sensitive enough to reveal the full extent of photoreceptor disruption that may occur after ocular or head trauma.
• Certain SD-OCT systems may be more sensitive than others in detecting subtle abnormalities associated with photoreceptor pathology. Further correlation of SD-OCT with AOSO images of the photoreceptor mosaic may identify certain features in SD-OCT images indicative of photoreceptor disruption.

• Patients with traumatic brain injury often report visual symptoms. AOSO imaging may be of value to help differentiate retinal versus cortical contributions to vision loss in these patients.

References:

Microscopy and Humphrey Visual Field
• Microscopy (Opiq Spectral OCT/SD-Oplik Health, Inc, Miami, FL) and Humphrey visual field 10-2 testing revealed a normal nonspecific area of functional visual loss near fixation in the right eye.

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