Imaging individual retinal cells in early stage dry AMD

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Age-Related Macular Degeneration (AMD)

• One of the leading causes of blindness worldwide
• Approx. 11 million people in U.S. alone, with a global prevalence of 170 million.
• Affects central vision – blind spot in the center

http://www.retinaexperts.com/macular-degeneration.html
Age-Related Macular Degeneration (AMD)

- Two types of AMD: wet and dry
- Dry AMD: most common form (85-90%)
- “Hallmark” = drusen (lipoprotein deposits)
Age-Related Macular Degeneration (AMD)

Human donor eyes

Confocal images from immunohistochemistry preparation

- We can achieve histology like images using our AO-OCT system

We use AO to correct for all of the aberrations of the eye, and combine this with OCT and SLO to enable full 3D rendering of the retina with axial and lateral resolutions of a few micrometers.
Purpose: To observe structural changes of individual cells overlying the drusen including the rate of change

We can do this in living eyes and monitor over time as AMD progresses
Imaging protocol

- Image over dilated pupil
- All the images were taken within the central 4 degrees from the fovea
Cone photoreceptors are intact over the smaller drusen (yellow arrows) but the OS is absent over the larger deposits (red arrows).
Results

7 Subjects
Measurements

Normal

AMD
Results

- 7 subjects (56–73 yrs)
- 49 drusen

\[ p = 0.005 \]

\[ \Delta, p = 0.01 \]
Take Home Message

• Increased drusen height causes disarray of overlying cones and shortens segment lengths (OS>IS)
• The OSL became shorter at a faster rate compared to the ISL

Future Direction

• Sensitivity of individual cells over druse of different height/size
• Compare different types of drusen
• Create predictable models of visual prognosis for drusen of various sizes and height, types