Baseline OCT Predictors Associated with Three-Year Change in Dark Adaptation in Age- related Macular Degeneration

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Summary

- Status of age-related macular degeneration (AMD) and baseline AMD stage associated with significant changes in rod intercept time (RIT) at 3 years

- Baseline OCT predictors of change in RIT at 3 years include:
  - **Hyperreflective foci**
  - **Atrophy**

- Developing new subretinal drusenoid deposits (SDD) at 3 years associated with significant impairments in RIT

Background

- Dark Adaptation (DA) has been recognized as functional measure for AMD

- Limited evidence that certain OCT features are associated with DA

- Limited knowledge about DA progression over time

Purpose

- To assess the relationship between baseline OCT features and three-year changes in DA, in a cohort of patients with AMD and a control group
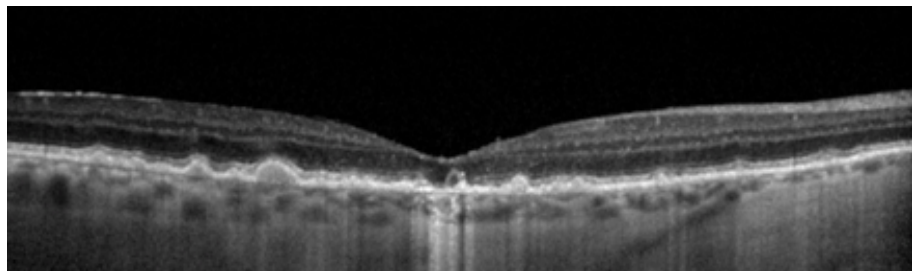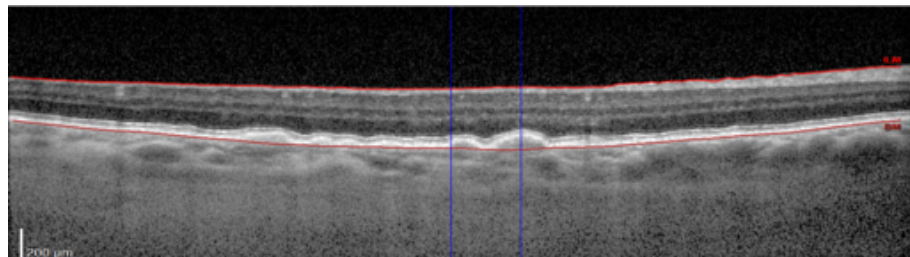
Methods

- Prospective longitudinal study recruited patients with AMD and control subjects age >50 years

- Complete ophthalmic examination and multimodal imaging

- AMD classification using color fundus photographs and AREDS grading by two graders and one senior grader
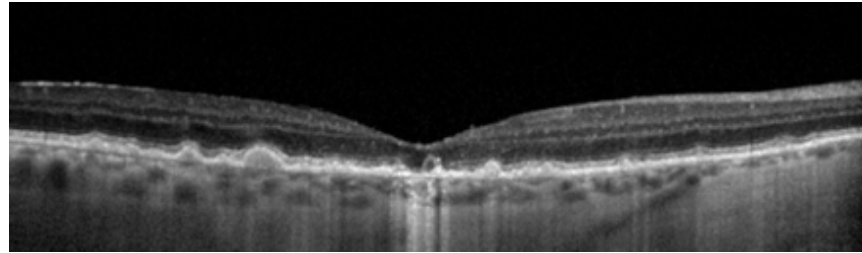
Methods

- **Spectral Domain OCT (Heidelberg)**
  - High Resolution Volume 20x20
  - 97 scans, 15 frames

- **We evaluated OCT for the following:**
  - Classic drusen
  - Reticular drusen
  - Ellipsoid disruption
  - Atrophy
  - Subretinal fluid
  - Intraretinal fluid
  - Hyperreflective foci
  - Outer retinal tubulations
 - CNV / fibrosis
  - PED

Methods

- Dark Adaptation: AdaptDX (MacuLogix Inc.)
  - Extended protocol (20 minutes)
  - 15 min rest between the two eyes
  - Excluded eyes with fixation error >30%

- Rod Intercept time (RIT) measurements done at
  - Baseline exam
  - 3-year exam

- Multilevel mixed level models for the inclusion of 2 eyes of the same patient

Test Eye: Right
Test Date: 04-16-2015 11:49
Age at Test: 78
Protocol: Extended Test
Pupil Size: 6.00 mm
Spherical Correction: +4.0
Cylindrical Correction: -2.0 x 108°
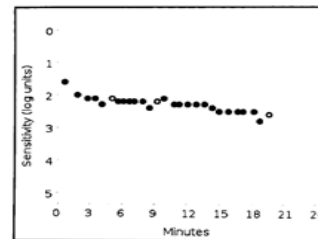
Rod Intercept is > 20.0 minutes.
Fixation Error Rate is 11%.

Results
Characterization of DA

Baseline AMD stage		n	Baseline			3 years			
			RIT mean ± SD	RIT abnormal n (%)	RIT > 20 min n (%)	RIT mean ± SD	RIT abnormal n (%)	RIT > 20 min n (%)	RIT change in minutes Mean ± SD
	Control	13	5.4 ± 3.1	3 (23)	0 (0)	6.1 ± 2.7	5 (38)	0 (0)	0.7 ± 2.4
	Early AMD	3	5.7 ± 4.1	1 (33)	0 (0)	7.5 ± 3.5	1 (33)	0 (0)	1.8 ± 2.0
	Intermediate AMD	26	14.2 ± 2.5	22 (85)	11 (42)	16.6 ± 5.3	24 (92)	16 (62)	2.4 ± 4.2

RIT at 3 Years

	Beta coefficient	P-value
AMD stage baseline	**4.83**	**<0.001**
Phakic baseline	4.61	0.123
Gender	-1.21	0.618
RIT baseline	0.81	**<0.001**
Ellipsoid zone disruption	**4.63**	**0.007**
SDD	**5.90**	**<0.001**
SDD >2 ETDRS fields	**5.38**	**0.004**
Classic drusen	**7.70**	**<0.001**
Hyper reflective Foci	4.11	0.067
Atrophy	2.69	0.393

Accounting for age

Baseline Predictors of RIT Change

Only patients that at baseline reached RIT within 20 minutes (n= 31 eyes)

Accounting for age

	Beta coefficient	P-value
AMD stage baseline	**1.69**	**0.026**
Phakic baseline	0.11	0.977
Gender	-0.76	0.605
DA baseline	-0.096	0.567
Ellipsoid zone disruption	0.49	0.757
SDD	1.26	0.405
SDD > 2 ETDRS fields	2.88	0.480
Classic drusen	2.16	0.153
Hyper reflective Foci	**3.96**	**0.018**
Atrophy	-0.39	0.927

Subgroup Analysis—Eyes RIT >20 Baseline Baseline OCT predictors

Accounting for age

	Beta coefficient	P-value
Ellipsoid zone disruption	-0.029	0.787
SDD	NA	NA
SDD > 2 ETDRS fields	-0.035	0.676
Classic drusen	NA	NA
Hyper reflective Foci	**0.124**	**0.024**
Atrophy	**0.178**	**0.004**

Discussion
Subretinal Drusenoid Deposits

- Of those with SDD **at baseline** (n= 23), **48% (n=11) had DA more than 20** (i.e. unable to reach RIT during 20 minutes of testing). At 3 years, this number increased to 65% (n= 15). No significant worsening of RIT

- Of the 19 eyes without SDD at baseline, **only 3 developed SDD at 3 years. Significant association between developing SDD and RIT change** (p=0.042)

Summary

- Baseline AMD stage and AMD vs controls associated with significant changes in RIT at 3 years
- Baseline OCT predictors of change in RIT at 3 years include:
  - **Hyperreflective foci**
  - **Atrophy**
- Developing new SDD at 3 years associated with significant impairments in RIT

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