

Disorganization of retinal inner layers is associated with reduced contrast sensitivity in retinal vein occlusion

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Disclosures

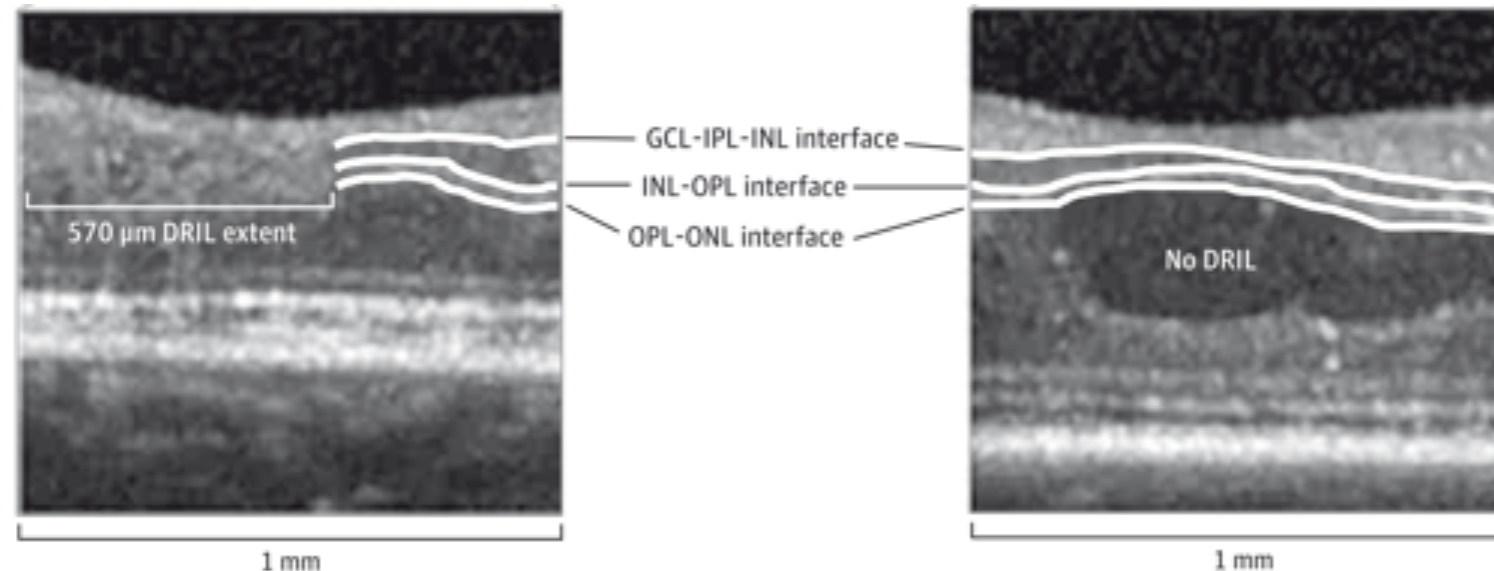
- No relevant disclosures

Summary

In a prospective observational cohort study of 58 visits from 31 patients with retinal vein occlusion with a history of macular edema, disorganization of the retinal inner layers (DRIL) was found to be significantly associated with worse contrast sensitivity as assessed by a novel quick contrast sensitivity function (qCSF) method.

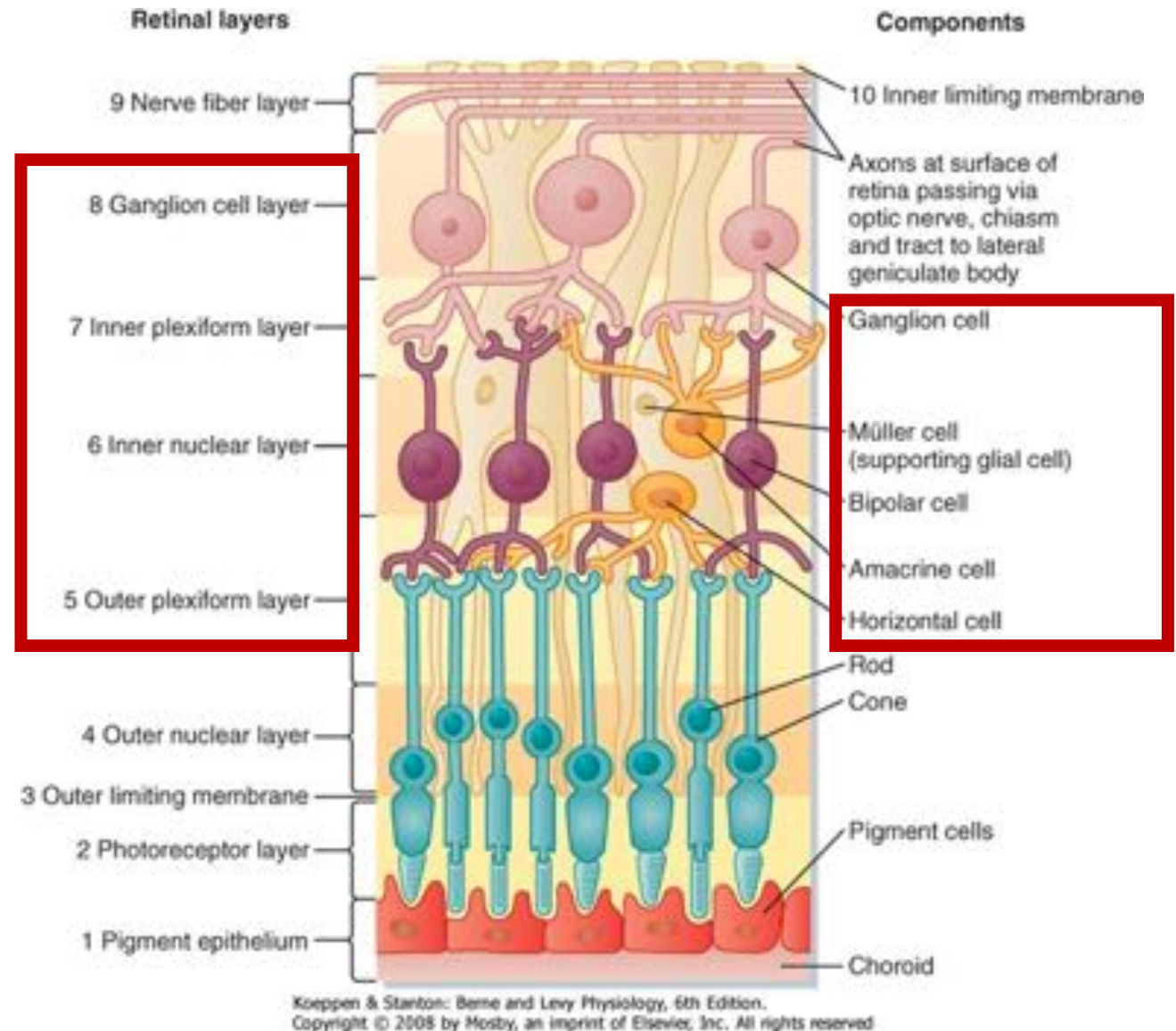
Disorganization of retinal inner layers (DRIL)

- Lack of distinguishable boundaries between the ganglion cell-inner plexiform layer complex, inner nuclear layer, and outer plexiform layer
- Prognostic marker for worse visual acuity in diabetic macular edema (DME) and retinal vein occlusion (RVO)



Inner retinal layers

- Ganglion cells
 - M cells more sensitive to low-contrast stimuli
- Bipolar cells
 - Center-surround receptive field activated by contrast
- Horizontal cells
 - Lateral inhibition enhances contrast at light-dark borders



DRIL and contrast sensitivity

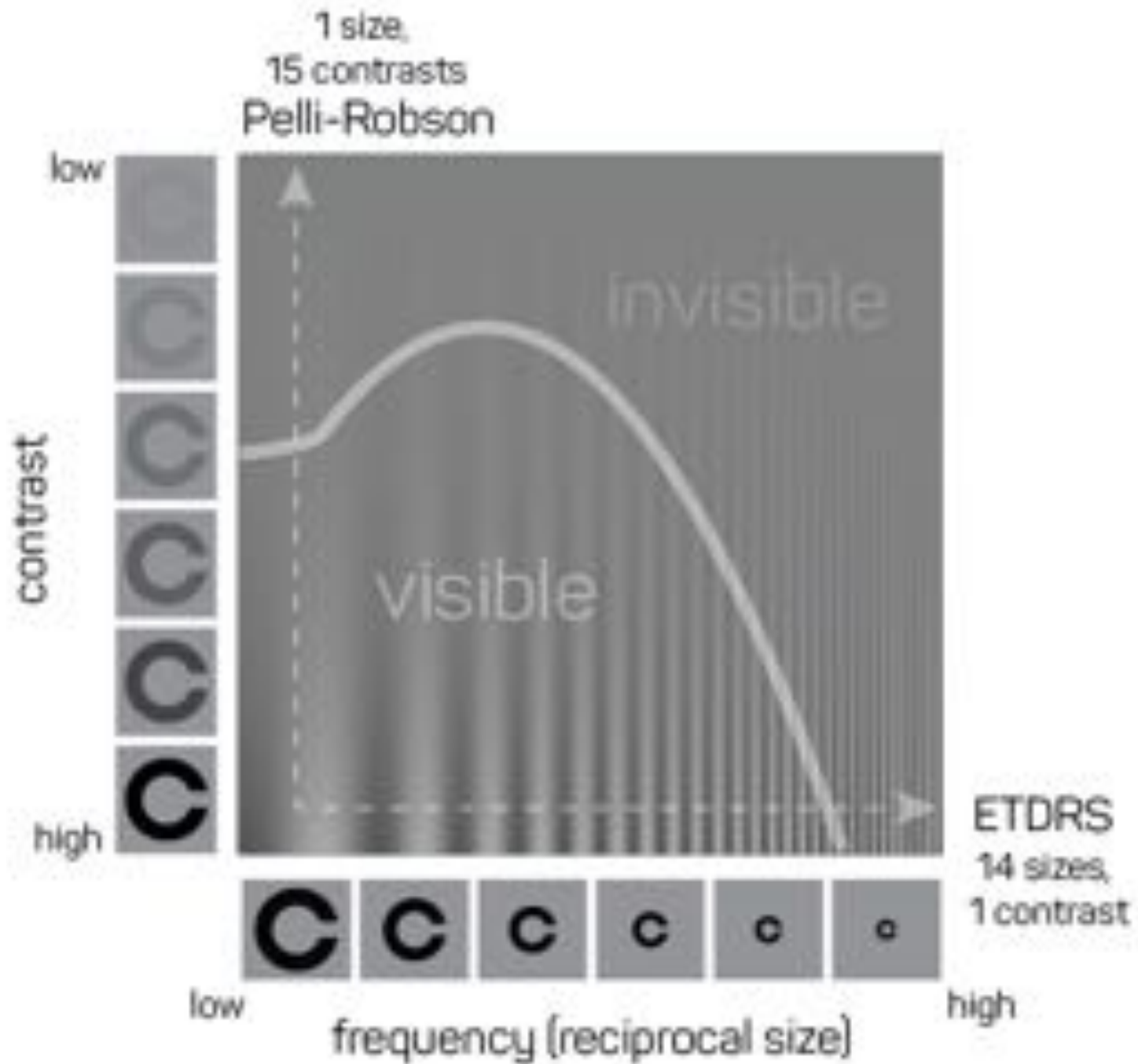
- Contrast sensitivity important for patients' visual functioning
- DRIL associated with reduced contrast sensitivity in DME (only one previous study)
- No previous studies assessing contrast sensitivity in retinal vein occlusion with macular edema

Purpose

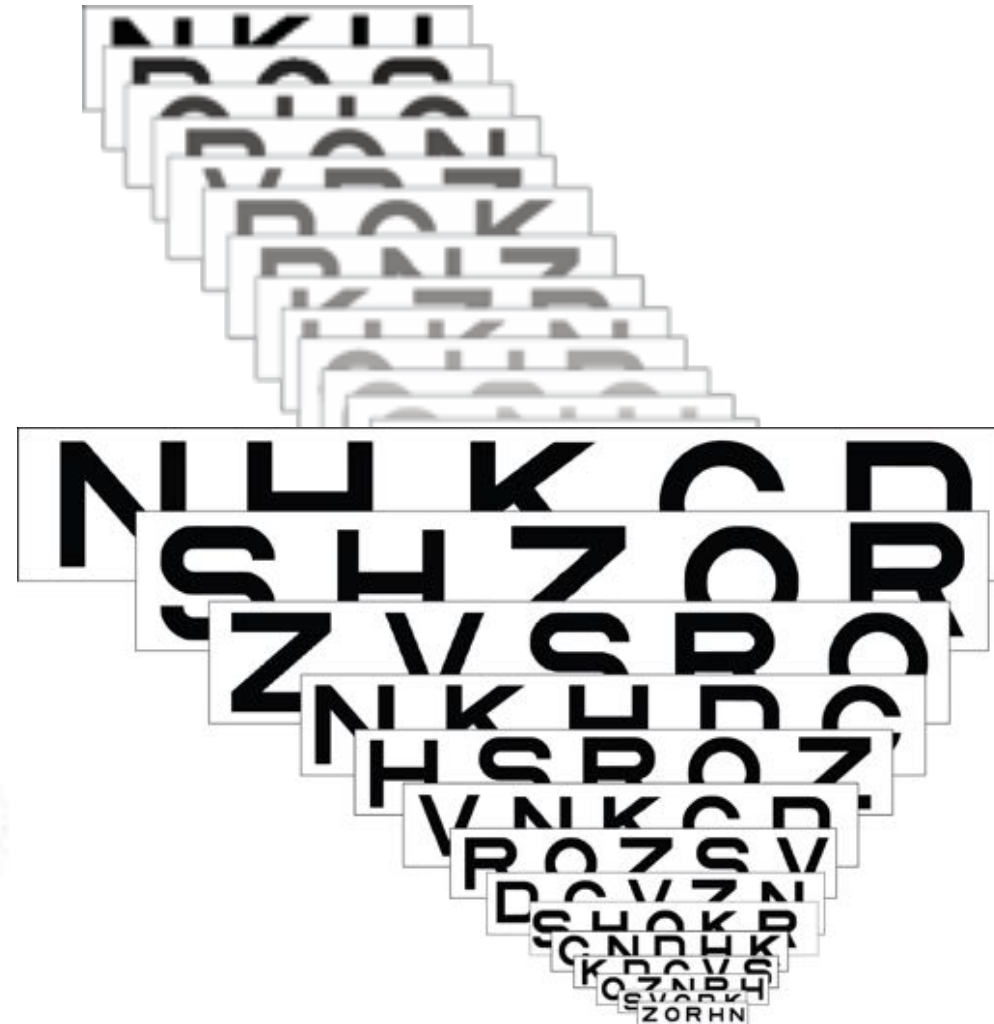
To determine if DRIL is associated with reduced contrast sensitivity in patients with RVO with a history of macular edema

Study design

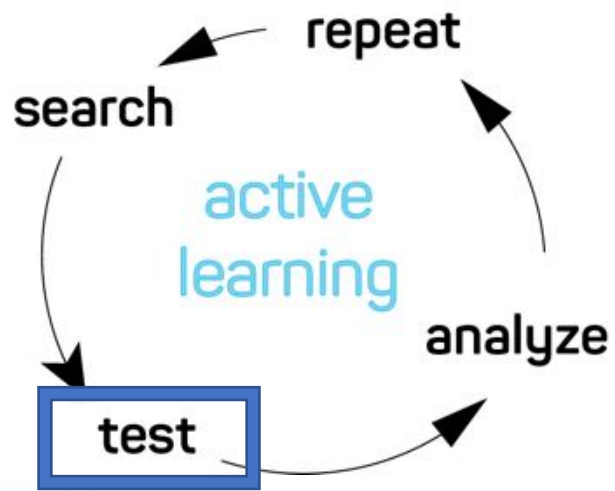
- Prospective, observational, cohort study at single institution
- Included patients with a diagnosis of RVO with a history of macular edema
- Excluded eyes with diabetic retinopathy, other vitreoretinal disease, or ocular surgery within 6 months
- Best-corrected visual acuity and lens status recorded
- Spectral-domain OCT at every visit
- Contrast sensitivity testing with novel quick contrast sensitivity function (qCSF) method



Relative to the $14+15=29$
size-contrast combinations
used by ETDRS and Pelli-
Robson testing....



qCSF



tests patients with an intelligent sampling algorithm...

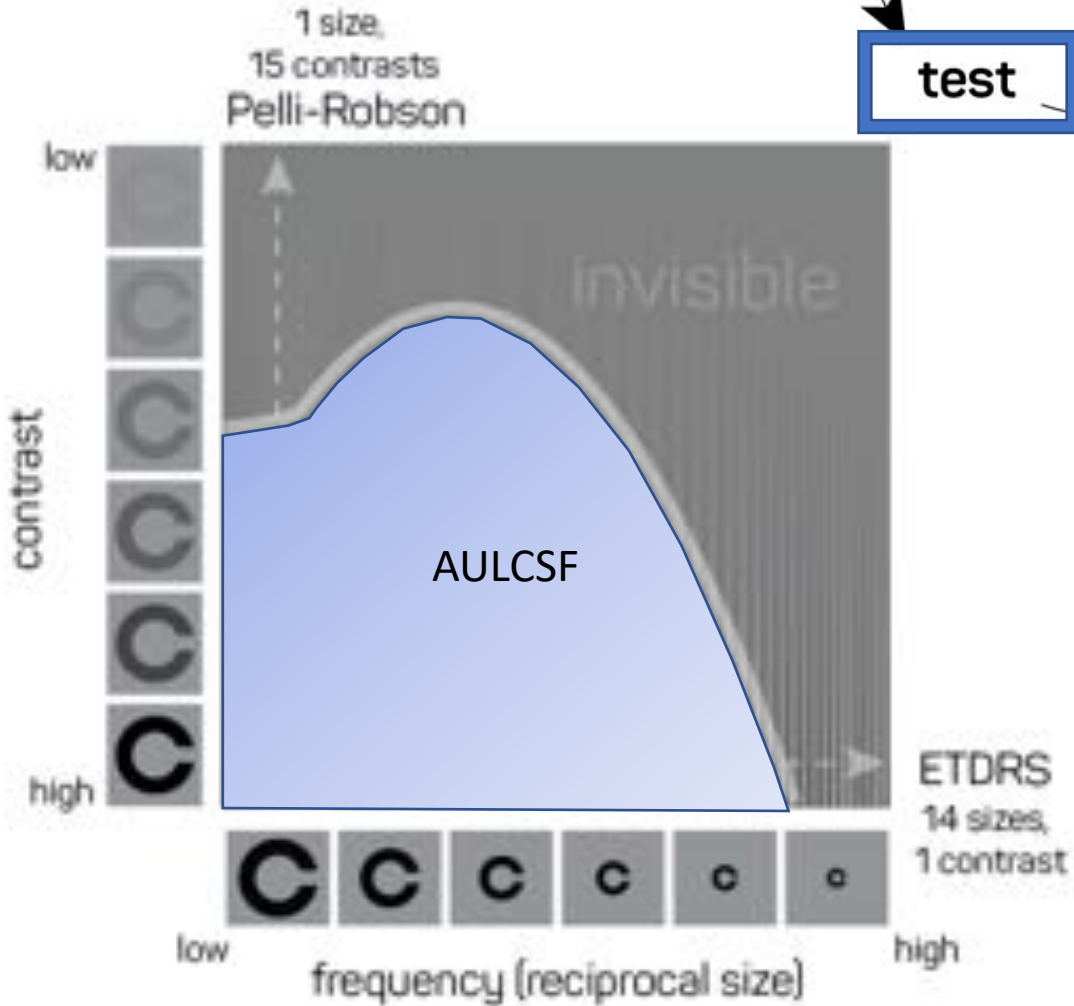
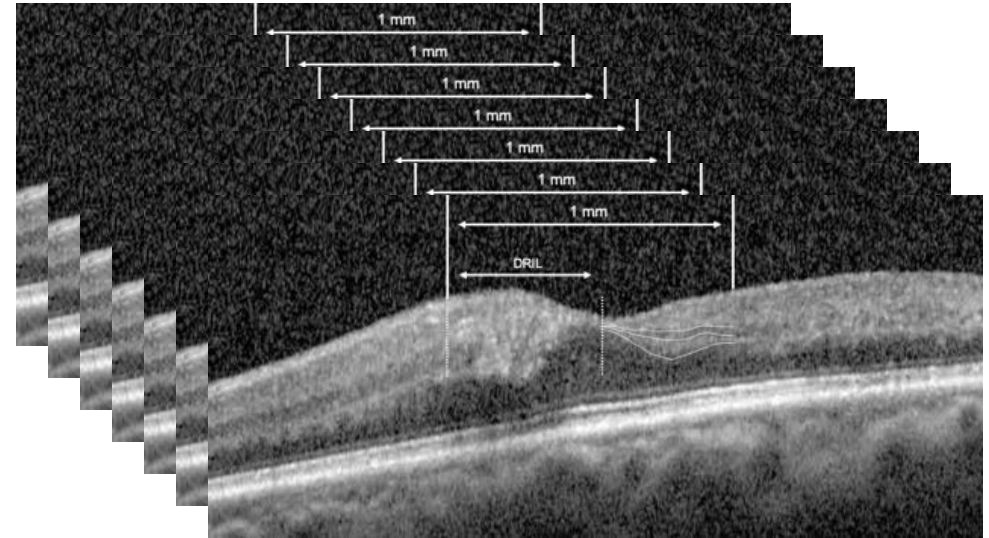


Image grading

- Seven OCT B-scans analyzed for each scan (foveal and 3 adjacent scans above and below spaced 120 μm apart)
- Central 1 mm of each scan assessed for presence and extent of DRIL
- Scans also assessed for intraretinal fluid (IRF), subretinal fluid (SRF), epiretinal membrane (ERM), hyper-reflective foci, ellipsoid zone (EZ) disruption, and external limiting membrane (ELM) disruption
- Central macular thickness (CMT) and central foveal thickness (CFT) recorded



Statistical analysis

- Mixed-effect univariable and multivariable linear regressions performed for logMAR best-corrected visual acuity (BCVA) and the area under the log contrast sensitivity function (AULCSF)
- Backwards elimination procedure used for multivariable regressions

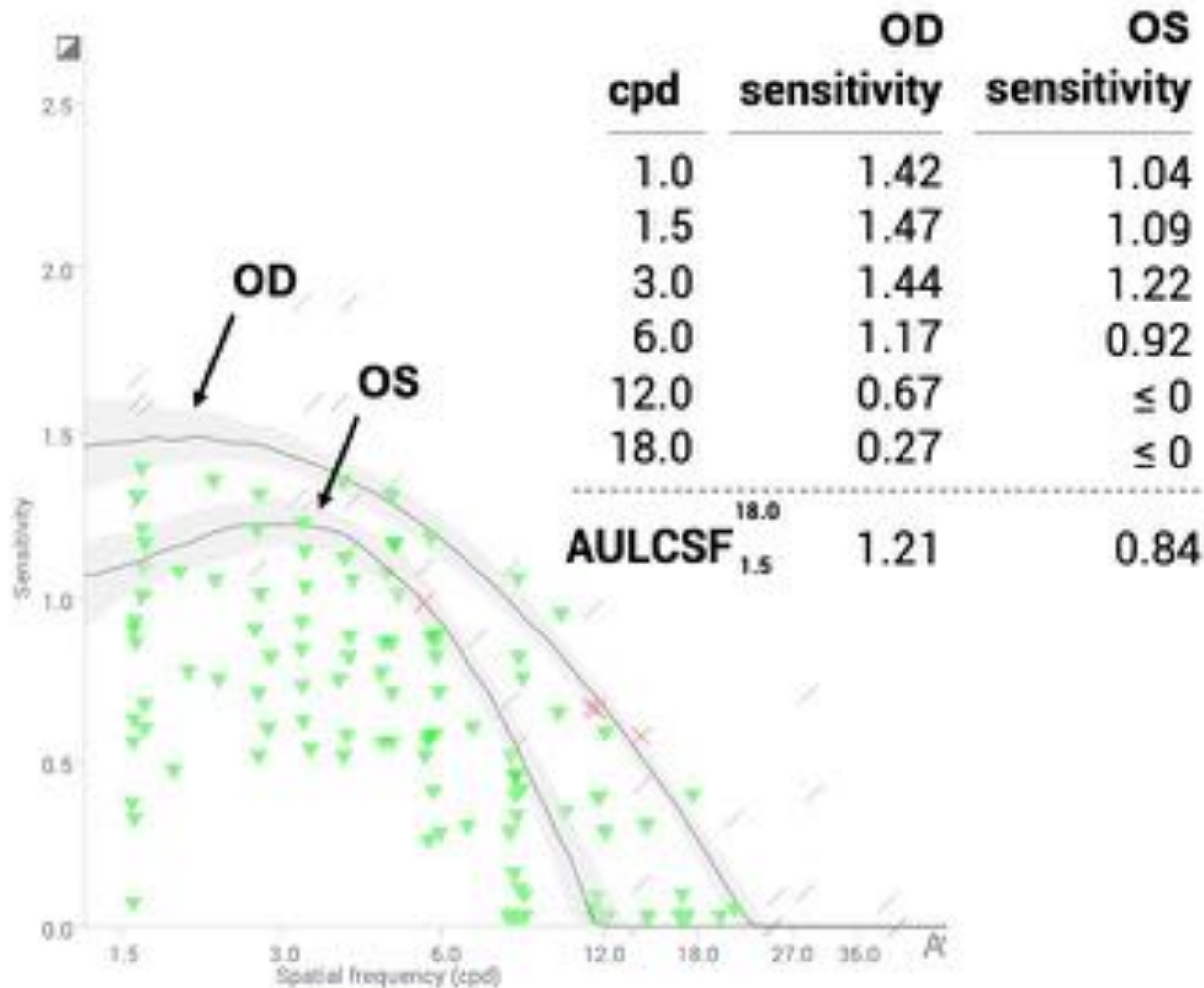
Results

- 58 visits of 31 patients
- 50% for BRVO, 50% for CRVO
- Average age 63.9 ± 10.5 years (range 35 – 80)
- Average # of visits 1.9 ± 1.2 (range 1 – 6)
- No phakic patients had nuclear sclerosis recorded as worse than 2+
- All patients except two receiving anti-VEGF therapy
- 69% of scans showed presence of DRIL

Imaging characteristics

	No DRIL	DRIL
logMAR VA	0.093 ± 0.091 (~20/25)	0.28 ± 0.18 (~20/40)
AULCSF	1.0 ± 0.28	0.73 ± 0.30
DRIL extent (μm)	0	381 ± 271
CMT (μm)	294 ± 42	389 ± 150
CFT (μm)	219 ± 47	322 ± 182

Contrast sensitivity function



- OD – normal
- OS – RVO with macular edema and DRIL on OCT
- Spatial frequencies of 3 and 6 cycles per degree (cpd) more significantly affected in DRIL

Independent predictors of worse BCVA

- Larger DRIL extent ($p = 0.004$)
- Increased central foveal thickness ($p = 0.002$)
- 2+ nuclear sclerosis ($p = 0.001$)

Independent predictors of worse AULCSF

- Larger DRIL extent ($p = <0.001$)
- Increased central macular thickness ($p = 0.007$)
- Decreased central foveal thickness ($p = 0.024$)
- 2+ nuclear sclerosis ($p = 0.001$)

Conclusions

- DRIL is independently associated with worse visual acuity and contrast sensitivity in eyes with RVO with history of macular edema
- DRIL is an important structural imaging biomarker correlating with visual function
- The quick contrast sensitivity function has potential as endpoint in clinical trials
- Future directions – OCTA correlation, impact of anti-VEGF therapy

Thank you!

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