## DISCLOSURES

<table>
<thead>
<tr>
<th>Commercial Interest</th>
<th>Nature of Relevant Financial Relationship (Include all those that apply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: Company ‘X’</td>
<td>Honorarium, salary, etc.</td>
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<tr>
<td>Allergan, Iridex, Alimera,</td>
<td>Honorarium</td>
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<td>Speaking, consulting</td>
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<td>Glaukos, Lumenis, New World Medical</td>
<td>Honorarium</td>
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<td>Endo Optiks, Transcend, Tear Science</td>
<td>Honorarium</td>
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<td>Consulting</td>
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A progressive disease characterized by retinal ganglion cell and axonal deterioration accompanied by visual functional loss.
Optic nerve photography is the gold standard

- Preperimetric POAG development is common
  - Ocular Hypertension Treatment Study:
    - 69 photographic endpoints versus 44 visual field endpoints
- Normative databases may be inapplicable
- Photos are ubiquitous and backward compatible
- No additional hardware required
- Only technology to identify disc hemorrhages and peripapillary atrophy

SD-OCT technology is better than TD-OCT

Compared to TD-OCT, SD-OCT shows better repeatability, better ability to detect progression and better agreement with visual fields.

Optic Nerve Complex
RNFL Thickness Map
Deviation Map
Corroboration

- Structure-Function
Corroboration

- Structure-Structure
Progression
Glaucoma damage in the macula
Why scan the macula in glaucoma?

- Standard 24-2 visual fields sample central vision sparsely (every 6 degrees)
- The macula contains 1/3 of retinal ganglion cells
- Ganglion cell analysis has been shown to successfully identify glaucoma
- Central vision is affected early in glaucoma, and central loss (within 3 degrees of fixation) occurs in up to 50% of moderate glaucoma patients
- Non-glaucomatous macular pathology may be uncovered

Pitfalls in Imaging

- Imaging may be helpful, but extrapolation of data allows for the introduction of artifacts
- Understanding how OCT data is processed will help identify artifacts
- Common artifact patterns can be identified and accounted for
“Make things as simple as possible, but not simpler.”

A. Einstein
Read the raw data
Traction affects OCT
Segmentation Error
Segmentation Error
RNFL thickness is never zero
Be sure to compare photographs to OCT
ONH segmentation failure
Vertical saccades can cause apparent cupping
Photo reveals less cupping
RNFL abnormally thick
The tilted disc
Types of RNFL Loss

- Glaucoma can develop with either focal or diffuse field loss
- The same goes for RNFL loss
Case: Bilateral, progressive glaucoma
Visual Fields
SD-OCT Circle Scan

Classification OD: Outside Normal Limits
Classification OS: Outside Normal Limits

Warning: Classification results valid for Caucasian eyes only.
### ONH and RNFL OU Analysis: Optic Disc Cube 200x200

<table>
<thead>
<tr>
<th>Metric</th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average RNFL Thickness</td>
<td>73 μm</td>
<td>69 μm</td>
</tr>
<tr>
<td>RNFL Symmetry</td>
<td>58%</td>
<td></td>
</tr>
<tr>
<td>Rim Area</td>
<td>0.73 mm²</td>
<td>0.70 mm²</td>
</tr>
<tr>
<td>Disc Area</td>
<td>2.60 mm²</td>
<td>2.30 mm²</td>
</tr>
<tr>
<td>Average C/D Ratio</td>
<td>0.85</td>
<td>0.84</td>
</tr>
<tr>
<td>Vertical C/D Ratio</td>
<td>0.89</td>
<td>0.83</td>
</tr>
<tr>
<td>Cup Volume</td>
<td>1.126 mm³</td>
<td>0.816 mm³</td>
</tr>
</tbody>
</table>

**RNFL Thickness**

![RNFL Thickness Map](image)

**RNFL Deviation Map**

![RNFL Deviation Map](image)
Structure-structure
Heidelberg Posterior Pole Analysis

OD

OS

OD - OS Asymmetry

OS - OD Asymmetry

Hemisphere Asymmetry

Hemisphere Asymmetry
Progression: $-4.0 \pm 1.3 \%$/year (95% confidence)

Significant at $P < 0.1\%$
Structural progression

Average RNFL Thickness
Rate of change: -2.74 +/- 5.15 μm/Year

Average Cup-to-Disc Ratio
Rate of change: 0.00 +/- 0.01 /Year

Superior RNFL Thickness
Rate of change: -2.00 +/- 6.50 μm/Year

Inferior RNFL Thickness
Rate of change: -3.35 +/- 5.41 μm/Year

RNFL/ONH Summary OD
- RNFL Thickness Map Progression
- RNFL Thickness Profiles Progression
- Average RNFL Thickness Progression
- Average Cup-to-Disc Progression

Possible loss | Likely loss | Possible Increase
Is an abnormal OCT alone enough to diagnose glaucoma?
35 YO woman, IOP 16 mmHg, CCT 540 microns OU
Visual Field Testing

Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 1/11
False POS Errors: 0 %
False NEG Errors: 0 %
Test Duration: 03:06

Fovea: 37 dB

Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Fast

Pupil Diameter: 3.4 mm
Visual Acuity: RX: -7.00 DS DC X Age: 43

Total Deviation

GHT
Within normal limits
VFI 99%
MD -1.79 dB P < 10%
PSD 1.46 dB

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Spectral Domain OCT

RNFL and ONH: Optic Disc Cube 200x200

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<thead>
<tr>
<th></th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average RNFL Thickness</td>
<td>71 μm</td>
<td>84 μm</td>
</tr>
<tr>
<td>RNFL Symmetry</td>
<td>70%</td>
<td></td>
</tr>
<tr>
<td>Rim Area</td>
<td>0.79 mm²</td>
<td>0.86 mm²</td>
</tr>
<tr>
<td>Disc Area</td>
<td>1.67 mm²</td>
<td>1.62 mm²</td>
</tr>
<tr>
<td>Average C/D Ratio</td>
<td>0.71</td>
<td>0.67</td>
</tr>
<tr>
<td>Vertical C/D Ratio</td>
<td>0.74</td>
<td>0.62</td>
</tr>
<tr>
<td>Cup Volume</td>
<td>0.310 mm³</td>
<td>0.320 mm³</td>
</tr>
</tbody>
</table>

Disc Center: [-0.69, 0.00] mm (OD)  (0.09, -0.09) mm (OS)

Neuro-retinal Rim Thickness

RNFL Thickness

OD  ---  OS
6 months later...
1 year later

In this particular case, OCT abnormality was present prior to optic disc hemorrhage and appearance of visual field defect.
Imaging Summary

- Photography remains an essential aspect of imaging
  - However, early glaucomatous changes may not be detectable with photographs (or visual fields)
- SD-OCT is an emerging comprehensive platform
  - Early glaucoma diagnosis
  - Detection and characterization of progression
  - Macular analysis can support glaucoma diagnosis