Baseline FD-OCT Risk Factors for Glaucomatous Visual Field Conversion in the Advanced Imaging for Glaucoma Study

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Goal

- **To use Fourier-domain OCT to guide the initial treatment of patient at risk for losing visual field from primary open-angle glaucoma**

Advanced Imaging for Glaucoma Study
(NIH Bioengineering Research Partnership Completed 2013)

PG	**GSPPG** **513 eyes** (305 participants)	Normal

median follow-up of **52 months** at 6 months interval

458 eyes
Did not convert

55 eyes converted
to perimetric glaucoma
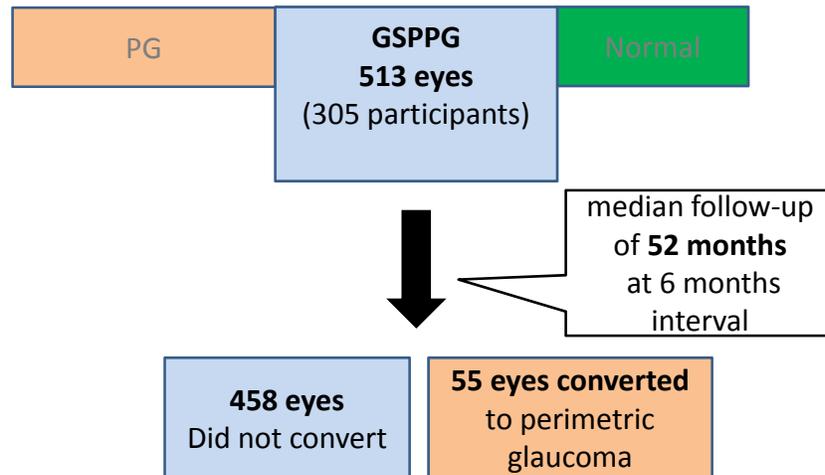
Glaucoma Suspect & Pre-Perimetric Glaucoma (GSPPG) Group

ONH/NFL Defect
379

34

48

5

Ocular Hypertension
173

PG in Fellow Eye
90

15
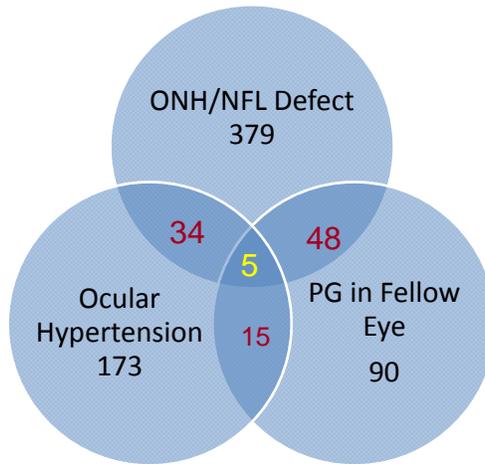
Fourier-Domain Optical Coherence Tomography

ONH scan (NFL)
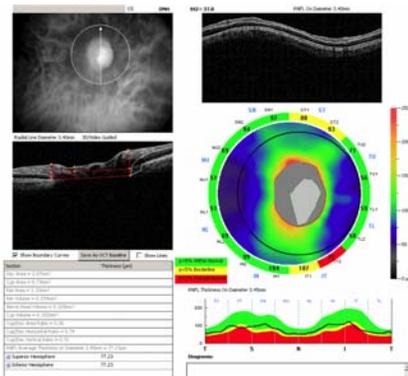
GCC scan (macula)

Nerve fiber layer thickness map
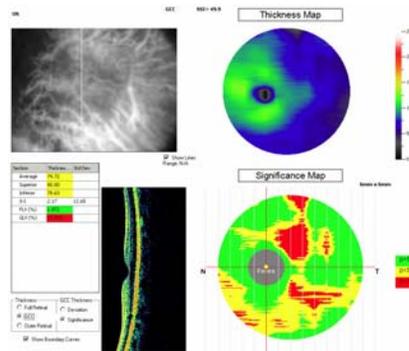
Ganglion cell complex thickness map

RTVue-XR (Optovue, Inc.)

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Visual Field Conversion Defined

Baseline normal or borderline → **Follow-up abnormal x3**
PSD (p<0.05) or GHT (p<0.01)
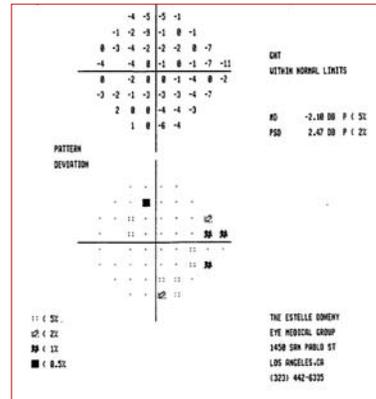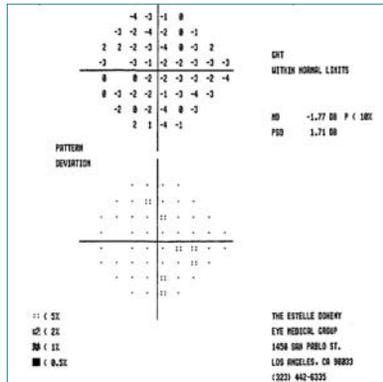
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HFA II SITA 24-2 full threshold

Baseline Variables Predicting Conversion
(p<0.05)

		Unit	Hazard Ratio	p	AROC
	Age (years)	10	1.45	0.012	0.604
VF	Mean Deviation (db)	-1	1.57	<.001	0.652
	Pattern Standard Deviation (db)	1	2.25	<.001	0.683
	VFI (%)	-5	1.46	0.011	0.705
FD-OCT					
Disc	Rim Area (mm²)	-0.05	1.08	0.010	0.646
	C/D Ratio, Vertical	0.1	1.44	0.016	0.657
	C/D Ratio, Area	0.1	1.27	0.024	0.623
NFL	Overall (µm)	-10	1.58	0.001	0.662
	Inferior Quadrant (µm)	-10	1.41	0.001	0.653
	NFL Superior Quadrant (µm)	-10	1.29	0.038	0.635
GCC	Overall (µm)	-10	2.04	<.001	0.684
	Inferior Hemisphere (µm)	-10	2.15	<.001	0.693
	Superior Hemisphere (µm)	-10	1.70	0.004	0.643
	GLV %	1	1.09	<.001	0.701
	FLV %	1	1.49	<.001	**0.753**

Univariate Cox regression

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Non-Significant Variables

- Demographic:
  - Gender
  - Race
- Ocular
  - Axial length
  - Central corneal thickness
  - IOP
- FD-OCT:
  - Horizontal cup to disc ratio

Ganglion Cell Complex-Focal Loss Volume is the Best Single Predictor of Conversion

Kaplan-Meier

GCC FLV **borderline or abnormal**

GCC FLV **normal**

41%

10%

Log-rank test p<0.001

Conversion Probability

Years of follow-up
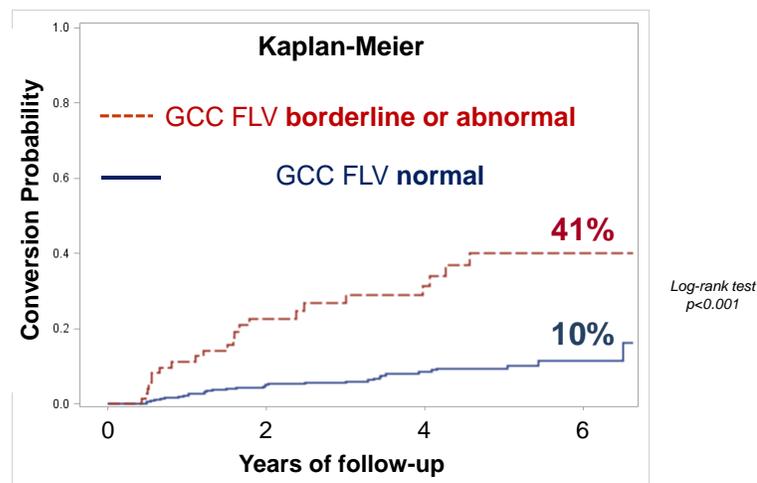
Glaucoma Structural Conversion Index (GSCI)

	Unit	Coeff.	Hazard Ratio	p
Age	10 years older	0.33	1.39	0.041
VF PSD	1 db higher	0.81	2.26	<.0001
NFL Inferior	10 μm thinner	0.31	1.25	0.046
GCC FLV	1% higher	0.22	1.36	<.0001

Multivariate Cox regression

AROC = 0.783 better than GCC FLV (p<0.001)

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GSCI Survival Curves
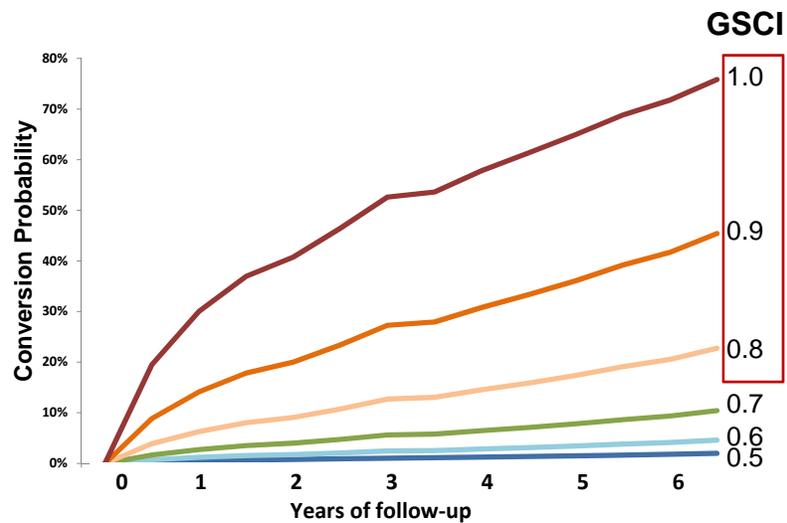
Treatment may be warranted at GSCI > 0.8

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GSCI Predicts Actual Conversion Rate over Study Period

GSPPG Quartile	GSCI Range	Actual Conversion Rate
0% - 25%	0.33 – 0.62	3.6%
25%-50%	0.62 - 0.72	4.4%
50%-75%	0.72 - 0.84	8.9%
75%-100%	0.84 - 0.99	29.7%

Highest quartile has highly elevated risk of VF conversion

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Conclusion

- FD-OCT measurements at baseline visit are statistically significant predictors of future VF conversion in the AIGS
- GCC FLV is the best single anatomic parameter that predicts conversion – 4 x risk if not normal
- The Glaucoma Structural Diagnostic Index (GSDI) identified the quartile with highly elevated risk for conversion
- FD-OCT may be useful in the initial risk assessment and treatment decision for patients at risk for glaucomatous visual field loss

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