

臺北醫學大學 50 週年慶

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Optical Coherence Tomography (OCT) in the Diagnosis of Glaucoma

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Introduction

- Definition of Glaucoma



Early diagnosis is critical to prevent permanent structural damage and irreversible vision loss.

Diagnosis and Monitoring of Glaucoma

Subjective method (Traditional)

Structural damage: optic nerve head and RNFL examination

Visual function: measurements of VF.

Objective Method

quantitative measurements with optical imaging

Structural analysis with imaging , computer-based devices

1. Confocal scanning laser ophthalmoscopy (CSLO)
2. Scanning laser polarimetry (SLT)
3. Optical coherence tomography (OCT)

- objective and quantitative measurements
- highly reproducible
- good agreement with clinical estimates of optic disc and visual function.

Ocular Image in Taiwan

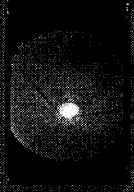
Stratus (Time-Domain) OCT	24	(55.8%)
RTVue (Fourier-Domain) OCT	13	(30.2%)
HRT	2	(4.7%)
GDx	4	(9.3%)
Total	43	(100%)

Data from distributed companies of Taiwan (2009)

Clinical Application of OCT for Glaucoma

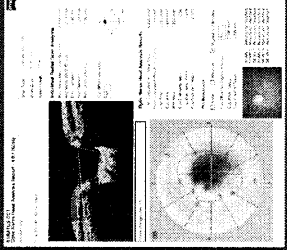
1. Stratus (Time-Domain) OCT The third-generation instrument.
Stratus™ OCT (Carl Zeiss Meditec, Dublin, CA).
2. RTVue (Fourier-Domain) OCT (Optovue Inc. Fremont, CA).

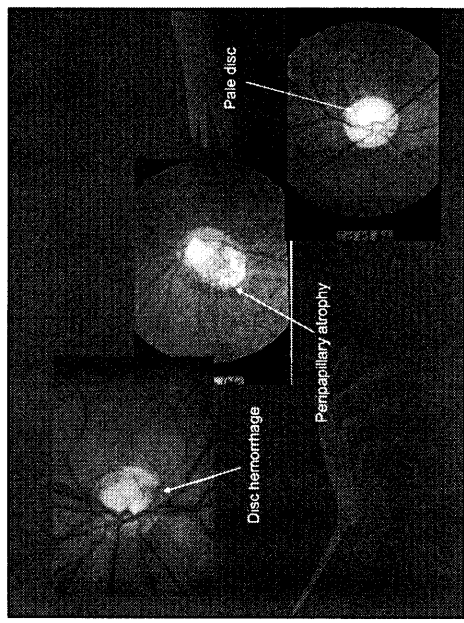


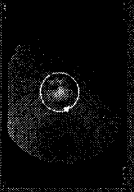


OCT Parameter: (1) ONH --- Optic Nerve Head Scan

It was difficult to standardize ONH parameters. (Am J Ophthalmol 2006; 142:375-380)

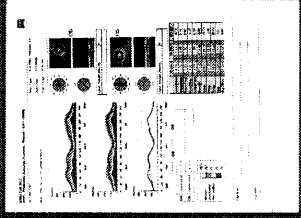


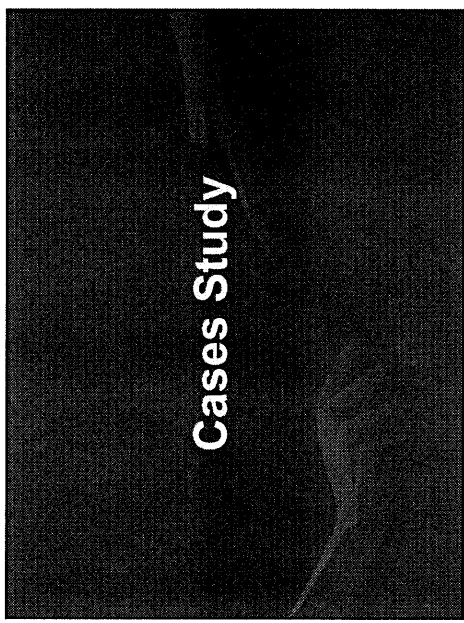




OCT Parameter: (2) RNFL --- Circumpapillary OCT scan

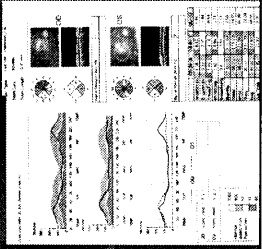
Average RNFL had the best discriminating ability. (Invest Ophthalmol Vis Sci 2007; 48:3138-3145)

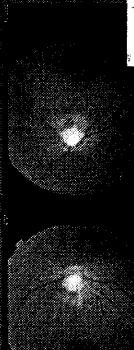




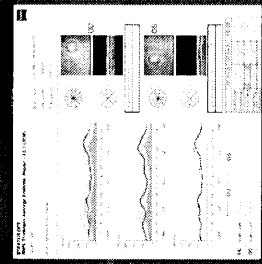


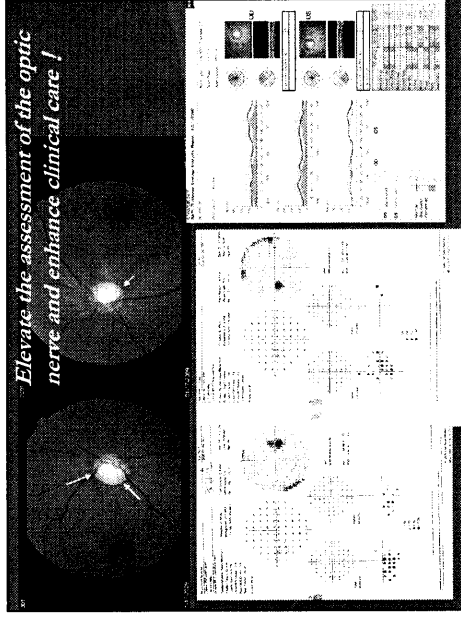
OCT can demonstrate the structural damage preceding the measurable visual field loss !





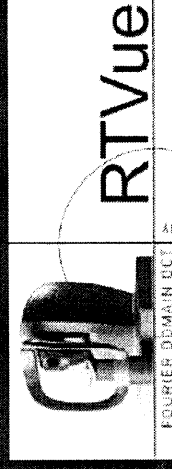
Excellent correspondence between structural (OCT) and functional (VF) analysis !





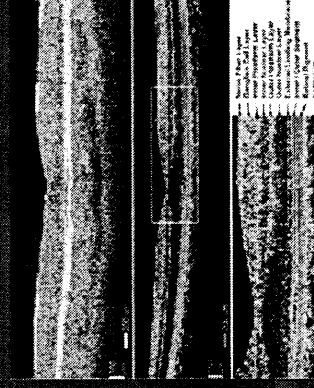
RTVue, the first Fourier-Domain OCT

approved by the FDA, October 2006



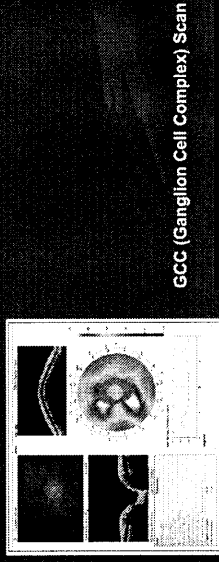
Speed / Resolution

- **High-speed Acquisition**
400 A scan/sec (Stratus OCT)
26000 A scans/sec (RTVue)
- **Improved Image Quality**
10 micron depth resolution (Stratus OCT)
5 micron resolution (RTVue)

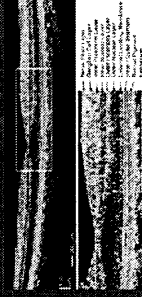


Review of Ophthalmology, July 2007 P85-86

Nerve Head Map Scan (NHM4)



GCC (Ganglion Cell Complex) Scan



The Ganglion Cell Complex (GCC) Analysis: Direct Ganglion Cell Assessment with the RTVue

- GCC:**
1. Nerve Fiber Layer (NFL): ganglion cell axon
 2. Ganglion Cell Layer (GCL): ganglion cell body
 3. Inner Plexiform Layer (IPL): ganglion cell dendrites

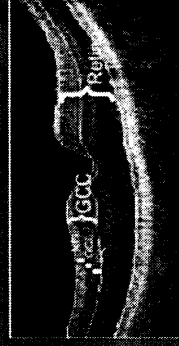
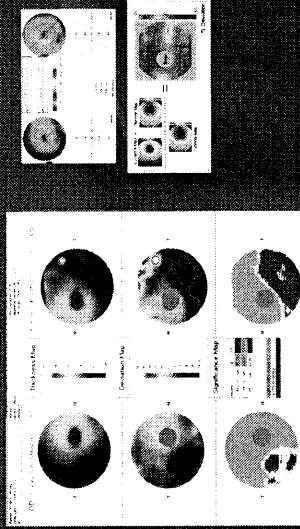


Image courtesy of Mike Sinal, PhD

GCC Analysis:

Thickness Map, Deviation Map, and Significant Map

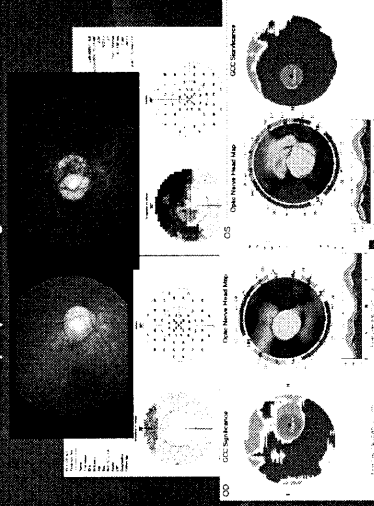


Cases Study

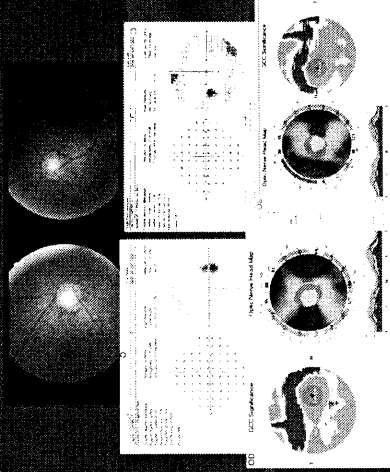
Experience 1 : Structural measures of RTVue were consistent with each other and with functional findings.



Experience 2 : NHM scan and GCC scan can disclose pre-perimetric glaucoma.



Experience 3 : The GCC analysis detected earlier damage compared to RNFL analysis.



In Summary

OCT

- offering the ability to perform structural imaging of optic disc and RNFL.
- Allowing structure-function correlation and facilitates glaucoma diagnosis and monitoring.
- Integrating the imaging information in conjunction with disc photography and standard automated perimetry.
- a valuable tool for identifying the presence of glaucoma, or confirming the absence of glaucoma
- eliminating the need for frequently repeating VF test

