The New England College of Optometry

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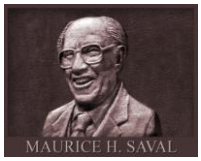
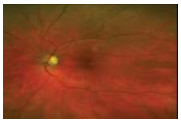
Professor Simon Barnard

2012
The Hadassah College of Optometry – The New England College of Optometry Optometric Symposium



Optical coherence tomography and wide field non-mydriatic retinal screening in primary care optometric practice





Professor Simon Barnard
PhD BSc FCOptom FAAO DipCLP DipClinOptom DipTh(IP)

Look forward: Optometry in 10 years time

- Automated objective refraction
- **Automated** subjective refraction
- Optometrists will no longer be the only professions refracting
  - Dispensing opticians
  - Unregistered sellers of spectacles

- Optometrists need to look outside the box
- Or be squeezed into a corner

"All or Nothing" philosophy

- Whoever examines the eyes should be able to do all that is necessary to carry out the routine examinations necessary to determine the health status of the eye
- Responsibility to patients
- Optometry has an important role but unless the profession takes up the challenge it will be pushed squeezed by Medicine and de-regulation

A choice

Revolutionary technology

- In the last decade there have been two simultaneous revolutions in diagnostic technology for primary care optometry practise
  - The Optomap wide field laser scanning ophthalmoscope
  - Optical Coherence Tomography (OCT

Two questions

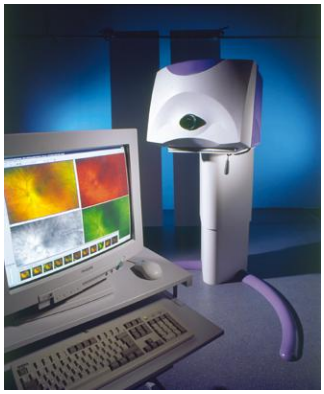
What is Optomap?

What is OCT?

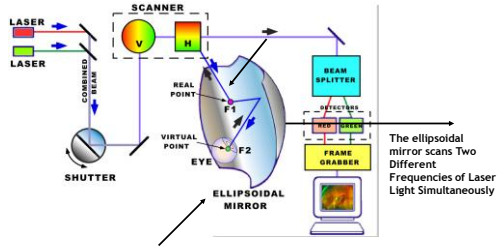
Together they are the dream team

Optomap

- Laser scanning ophthalmoscope
- Up to 200 degree field
- Pupils as small as 2 mm
- Retina and choroid imaged separately



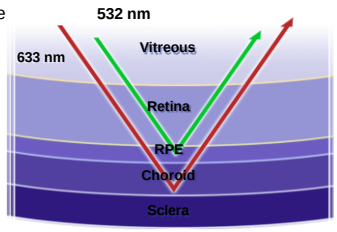
The Technology



Red and Green Lasers capture different layers of the retina The scanning laser light is focused through one point while the patient's eye is positioned to be coincident with the other focal point.

Dual-Frequency Laser Imaging

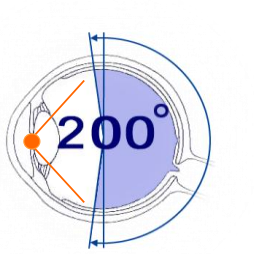
- Dual frequency lasers – Red laser scans down to the choroid (wavelength 633nm) and green laser (wavelength 532nm) scans down to the retinal pigment epithelium (RPE)
- Class 1 cold laser with FDA approval
- Image eye from the inside in a ¼ second



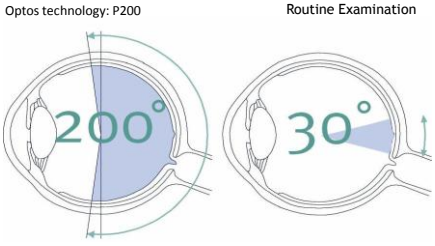
Virtual Point™ Technology

LASER SCANNING OPTHALMOSCOPE

- Can view the majority of the retina at one time (up to 200 degrees)
- Virtually place a scan point posterior to the iris plane



Benefits Of Optomap®



- 0.25 second
- Digital record
- No dilation required
- Scan the periphery

- Manual
- No record
- Dilation required

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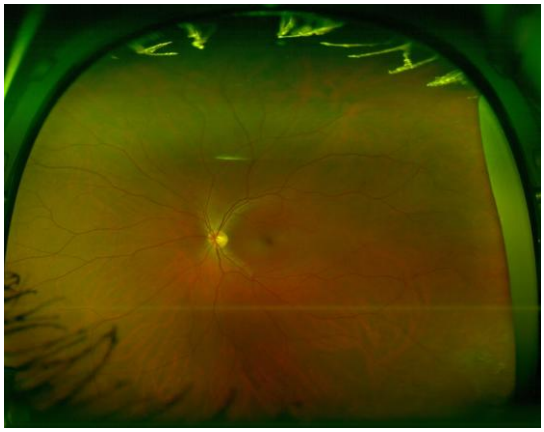
Direct opthalmoscope

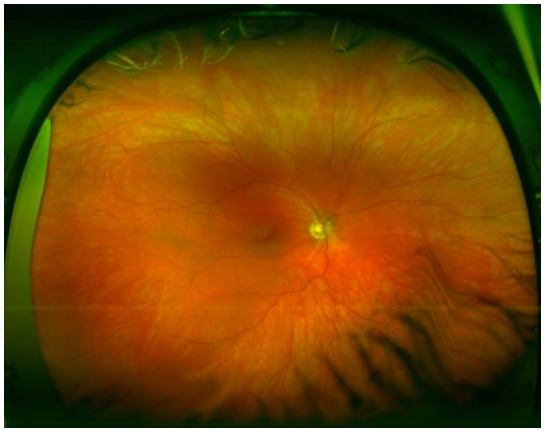
Aliases

"The guessing tube" or the "blind stick"

Head set indirdect opthalmoscope

Or fundus camera





Next generation

- Small
- Neat
- Plus autofluorescence

Daytona

Designed to meet the need for more exacting clinical imaging capabilities and standards at practices that are clinically managing a patient base with advanced ocular disease.

Ultra-Widefield Captures:
- Up to 200° Ultra-High Resolution

Diagnosis, analysis, documentation and therapy of diseases like Glaucoma, AMD, Drusen, etc.

Green Laser: 532nm
Red Laser. 633nm

Capture modes: **opto**map® *plus* , *af*

Daytona

Features

- 200 degree widefield retinal imaging – Colour and AutoFluorescence (AF)
- Aimed at Optometrists and General Ophthalmologists
- Small footprint, desktop
- Improved image quality
- Improved user and patient interaction – improved ease of use
- 'Plug 'n' play' – no complex installation, minimal user training (<1hr)

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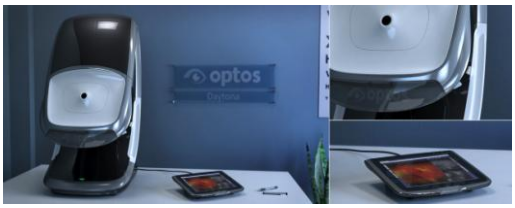
The Result – A 'Game Changer'

Daytona • **- Revolutionising Eyecare Globally**



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Daytona

What Colour Will You Choose?

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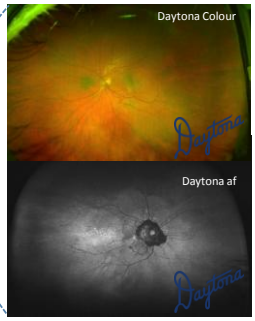
Image Performance

Clinically Superior Capabilities

Daytona Image Quality Compared to 200Dx



- Brighter in Periphery
- Better Detail in Central Pole
- Addition of AutoFluorescence (AF) capability

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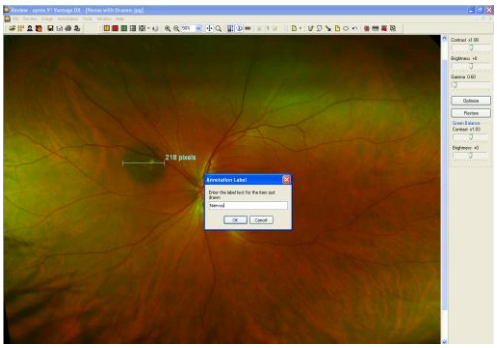
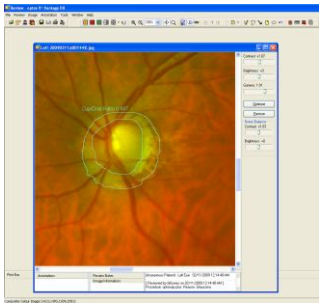
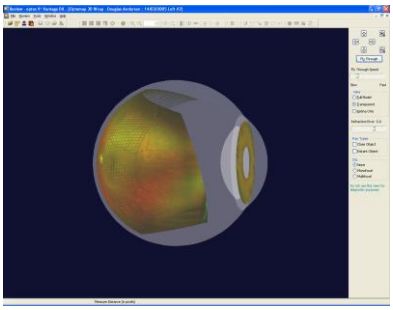
Measurements and Annotations



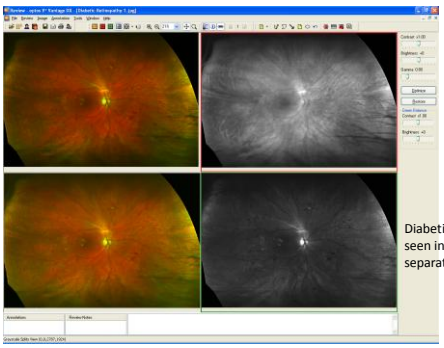
Measuring Cup/Disc Ratio for Glaucoma



3D Wrap – Interactive Imagery



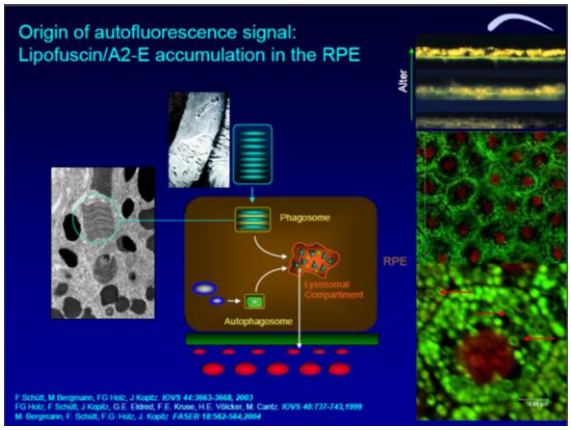
Viewing Image as full colour as well as red/green separations

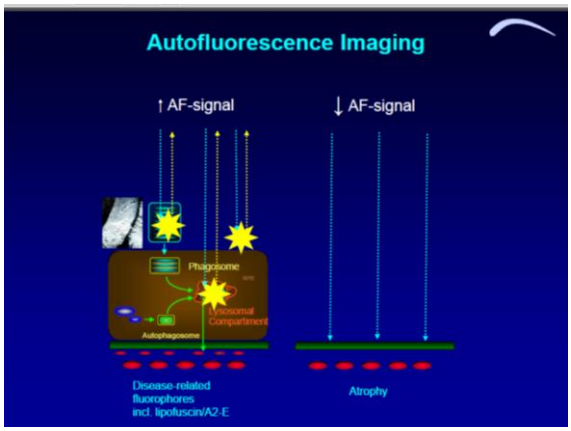


Diabetic Haems seen in green separation

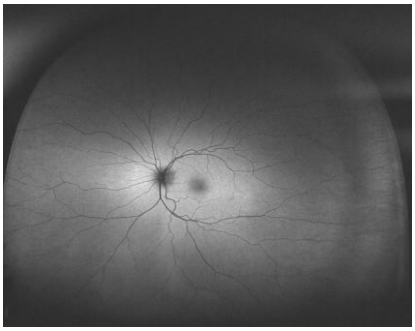
Autofluorescence

•Fundus Autofluorescence (FAF) allows topographic mapping of lipofuscin distribution in the RPE cell monolayer as well as other fluophores that occur with disease in the outer retina and the subneurosensory space
•Excessive accumulation of lipofuscin granules, mostly at RPE level cause autofluorescence





Autofluoreszenz – normal expectation



Auto-Fluorescence 1

Causes for a reduced FAF signal

Reduction in RPE lipofuscin density
- RPE atrophy (e.g. geographic atrophy)
- Hereditary retinal dystrophies (e.g. RPE65 mutations)

Increased RPE melanin content, e.g. RPE hypertrophy

Absorption from extracellular material/cells/fluid anterior to the RPE
- •Intraretinal fluid (e.g. macular edema)
- •Migrated melanin-containing cells
- •Crystalline drusen, or other crystal-like deposits
- •Fresh Intra-and subretinal hemorrhages
- •Fibrosis, scar tissue, borders of laser scarsd
- •Retinal vessels
- •Luteal pigment (lutein and zexanthin)
- •Media opacities (vitreous, lens, anterior chamber, cornea)

Causes for an increased FAF signal

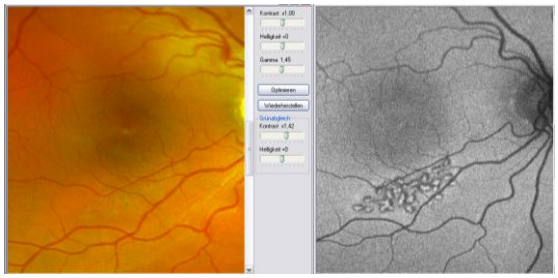
Reduction in RPE lipofuscin density

- RPE atrophy (e.g. geographic atrophy)
- Hereditary retinal dystrophies (e.g. RPE65 mutations)

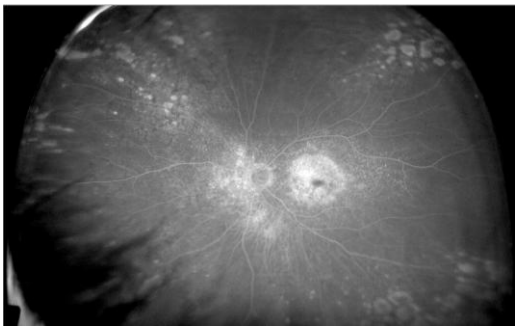
Increased RPE melanin content, e.g. RPE hypertrophy

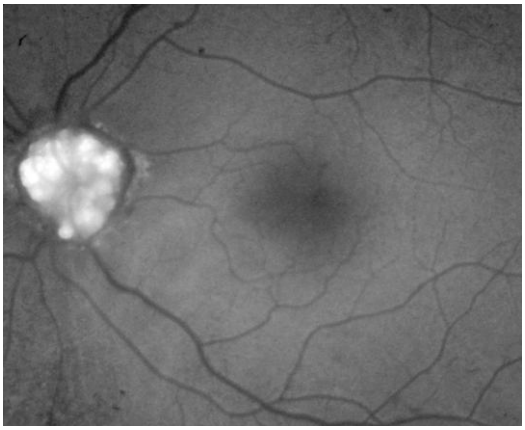
Absorption from extracellular material/cells/fluid anterior to the RPE

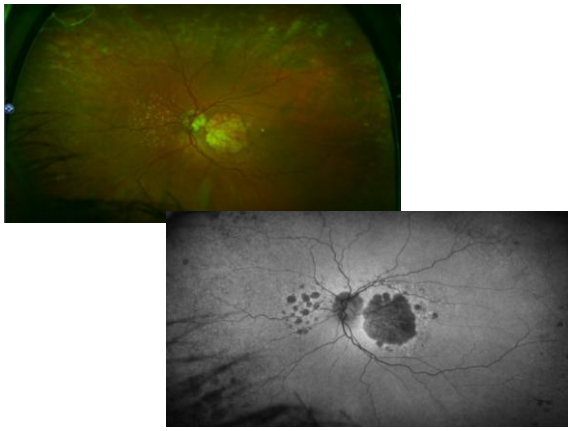
- Intraretinal fluid (e.g. macular edema)
- Migrated melanin-containing cells
- Crystalline drusen, or other crystal-like deposits
- Fresh Intra-and subretinal hemorrhages
- Fibrosis, scar tissue, borders of laser scarsd
- Retinal vessels
- Luteal pigment (lutein and zexanthin)
- Media opacities (vitreous, lens, anterior chamber, cornea)



AMD







Optical Coherence Tomography

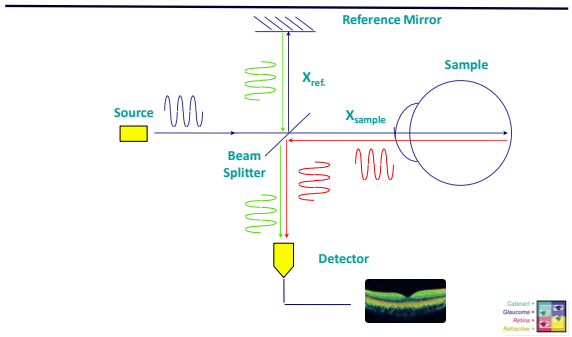
Non-contact technique for high-resolution cross-sectional optical imaging of ocular structures

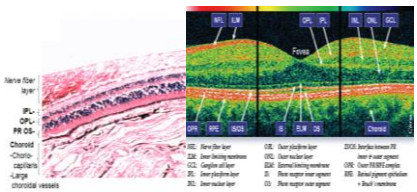
• Analogous to ultrasound, except that OCT measures delay and intensity of back-reflected infrared light rather than acoustic waves

•The velocity of light is extremely high, so direct measurement of optical 'echoes' cannot be made electronically as in ultrasound

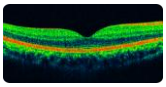
•The technique to measure the back reflected light time delay is based on Michelson interferometry

Michelson Interferometer





- Optical Coherence Tomography
  - Allows a cross sectional view through a structure
  - Can image what previously could only be seen on a histology slide
  - Technology used in other disciplines e.g. Radiology
  - Also used in Art Conservation

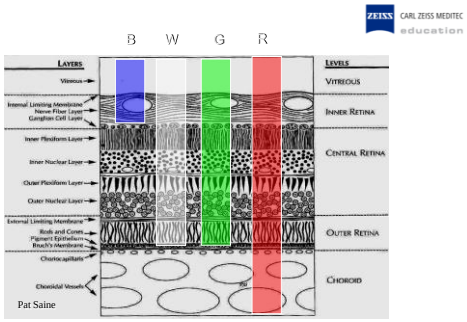


- ***O***ptical - Meaning light
- ***C***oherence - Meaning beam type
- ***T***omography - Meaning slice as opposed to topography (Shape)
- ***OCT*** = Slice of the eye using a controlled beam of light

How does it work?

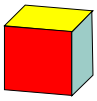
- Tissue is irradiated by the light
- Each tissue type has different reflectivity
- Returned signals are coloured by the software according to the reflectivity of the tissue
- Some wavelengths penetrate deeper than others

Light Absorption by the Retina

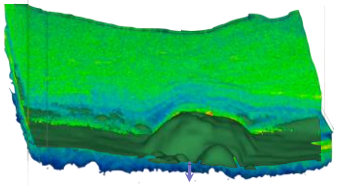


Looking at a Cube

- Axial Depth Scans
- B Scan = A cross sectional tomograph
  - Can be achieved by putting together a series of A scans
- C Scan = *En Face*
  - Going down through the layers



In 3D



C Scan

Zeiss *Stratus*

Zeiss *Cirrus*

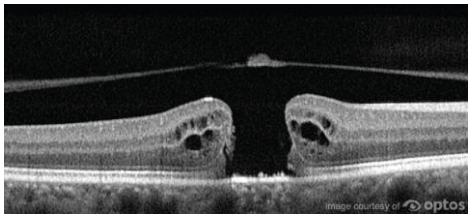
What Colour?

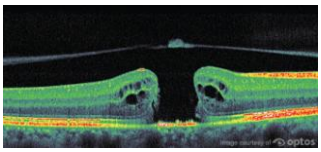
- Reflections from retina are interpreted and colour coded on the strength of the reflection
  - **Warm Colours** are highly reflective and dense e.g., Drusen
  - **Cooler colours** indicate less dense matter e.g., Inner Nuclear Layer
  - **Black** indicates space or fluid e.g., serous fluid or cystic spaces

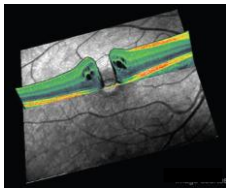
Optometrists

Only 3 common conditions to worry about

- Cataract
- Age related macula degeneration
- The glaucomas - 50% of cases are undetected (including in Israel)

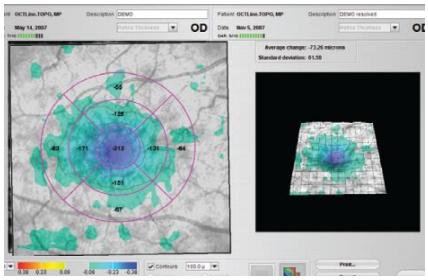






- **Change Over Time Analysis**

  Ability to track **retinal thickness** change over time and **optic nerve head analysis**. OCT images automatically registered to the SLO images



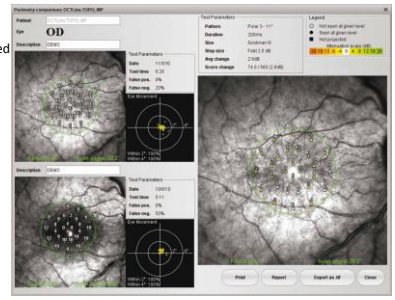
optos

- **Microperimetry**

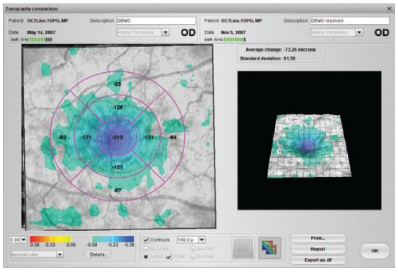
  Unique **Microperimetry** module, providing the ability to test and quantifiably monitor changes overtime of the patient's retinal function in a selected location of the retina

OptosOCT SLO
Retina Glaucoma Cornea Analysis

Microperimetry – **unique** ability to test and quantifiably monitor changes of the patient's retinal function in a selected location on the retina

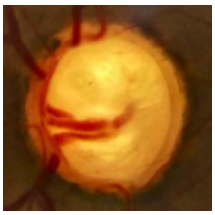


- The Microperimetry test runs simultaneously with the SLO and provides real-time tracking of retinal motion and patient fixation during the exam
- Multiple Microperimetry exams can be stored and compared automatically over time, displaying progression or regression of the retinal function within a specific area of the fundus



Change Over Time Analysis

Glaucoma/optic nerve



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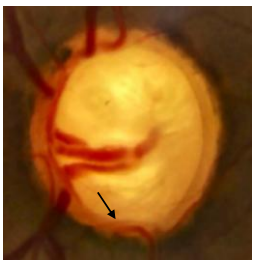


Case A . LE

Sita full

R & L 17 mmHg

Case B. LE

Sita Full

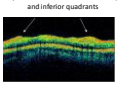
R. & L. 25 mmHg

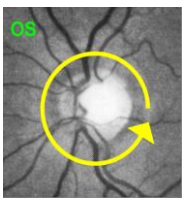
OCT- RNFL analysis

Circular scans around ONH of diameter 3.4mm.

Scan begins temporally.

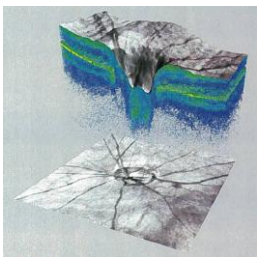
Healthy RNFL is seen to be thicker at superior and inferior quadrants



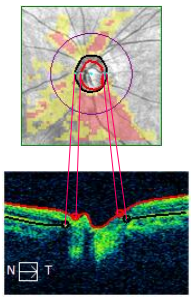


Optic Nerve Head Analysis

- Optic Disc Scan
- 6mm x 6mm cube
- Information available over whole cube
- Superior Analysis of Optic Nerve Head
- Precise measurement of neuro retinal rim
- Enhance Glaucoma diagnostics and management



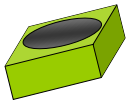
Optic Nerve Head Analysis



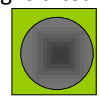
- Disc Edge = End Bruch's Membrane
- Tissue above this is considered to be neuro retinal tissue
- Rim Area is determined by measuring the amount of neural retinal tissue in the optic nerve

Optic Nerve Head Analysis

- Tilted Disc
- Oblique view of fundus can cause inaccurate measurement



- Version 5 uses whole cube of data so software realigns tilted disc



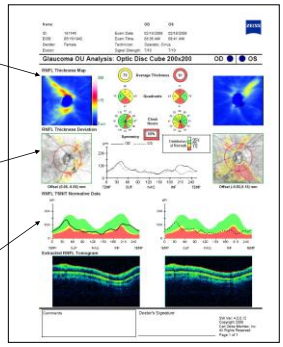
RNFL OU Analysis

RNFL THICKNESS MAP shows the patterns and thickness of the nerve fiber layer within the full 6mm x 6mm area

RNFL thickness and comparison to normative data is shown in circle, quadrants and clock hour display

RNFL DEVIATION MAP, overlaid on the OCT fundus image, illustrates precisely where RNFL thickness deviates from the normal range. Data points that are not within normal limits are indicated in red and yellow.

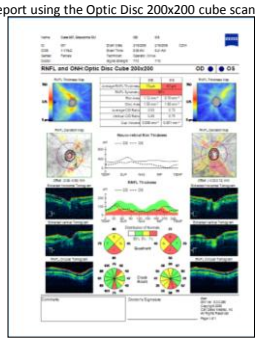
RNFL thickness along the calculation circle is displayed in graphic format and compared to age-matched normative data



Optic Nerve Head and RNFL OU Printout

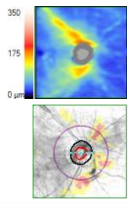
Combined report using the Optic Disc 200x200 cube scan

Software Version 5.0



2/11/2010

Analysis Elements



Software Version 5.0

RNFL thickness map with cup and disc mask

OCT *en* face fundus image shows boundaries of the cup and disc, and RNFL calculation circle integrated with the RNFL thickness deviation map

	OD	OS
Average RNFL Thickness	73 µm	61 µm
RNFL Symmetry	55%	
Rim Area	1.12 mm²	0.70 mm²
Disc Area	1.58 mm²	1.68 mm²
Average C/D Ratio	0.53	0.75
Vertical C/D Ratio	0.49	0.75
Cup Volume	0.036 mm³	0.201 mm³

Optic Nerve Head calculations are presented in a combined report with RNFL thickness data. Key parameters are displayed in table format

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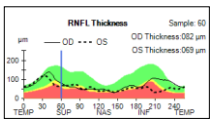
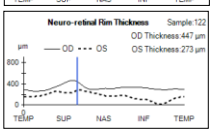
Analysis Elements



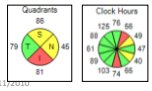
Software Version 5.0

RNFL Peripapillary Thickness profile, OU

- **Matched to normative data**



Neuro-retinal Rim Thickness profile, OU



RNFL Quadrant and Clock Hour average thickness

- **Matched to normative data**

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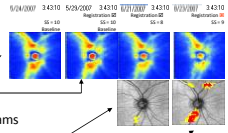
Cirrus HD-OCT GPA Analysis

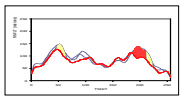
Image Progression Map



- Two baseline exams are required
- Third exam is compared to the two baseline exams
- Sub pixel map demonstrates change from baseline Yellow pixels denote change from both baseline exams
- Third *and* fourth exams are compared to both baselines. Change identified in three of the four comparisons is indicated by red pixels; yellow pixels denote change from both baselines

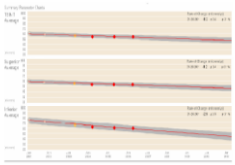
Change refers to statistically significant change, defined as change that exceeds the known variability of a given pixel based on population studies

Cirrus HD-OCT GPA Analysis



TSNIT Progression Graph

- TSNIT values from each exam are shown
- Significant difference is colorized yellow or red
- Yellow denotes change from both baseline exams
- Red denotes change from 3 of 4 comparisons



Summary Parameter Trend Analysis

- Rate and significance of change shown in text
- RNFL thickness values for overall Average Superior Average, and Inferior Average are plotted for each exam
- Yellow marker denotes change from both baseline exams
- Red marker denotes change from 3 of 4 comparisons
- Confidence intervals are shown as a gray band

- Legend summarizes GPA analyses and indicates with a check mark if there is possible or likely loss of RNFL

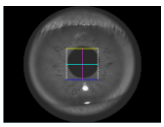
Anterior Segment Imaging

Cirrus HD-OCT Anterior Segment Imaging, a new indication for use, received FDA clearance in May, 2009.

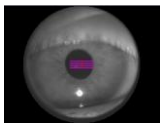
"…It is indicated for in-vivo viewing, axial cross-sectional, and three-dimensional imaging and measurement of anterior and posterior ocular structures, including cornea, retina, retinal nerve fiber layer, macula, and optic disc. . ."

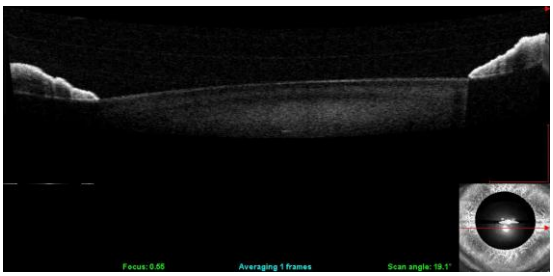
Two new scan patterns

Anterior Segment 512x128 cube scan. 4mmx 4mm



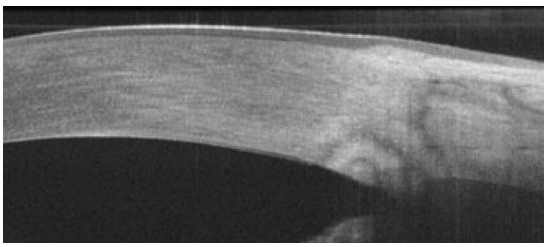
Anterior Segment 5-line raster 3 mm length, adjustable rotation and spacing



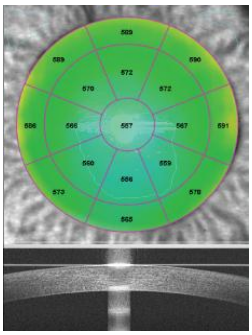


Anterior Segment Imaging Lens

- What's happening



Anterior Segment Imaging Angle Measurement

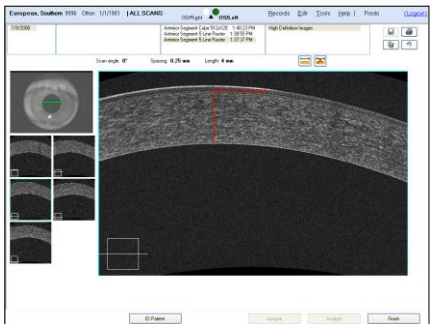


Anterior Segment Imaging

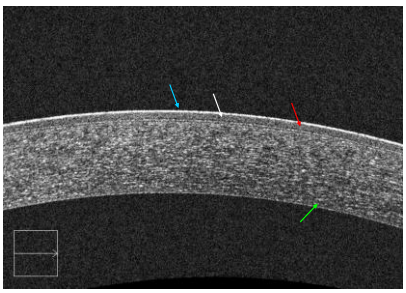
Corneal Topography

- Cirrus Anterior Segment Imaging

Caliper tool measures central corneal thickness

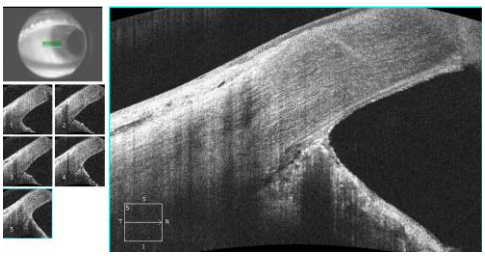


- Cirrus Anterior Segment Imaging



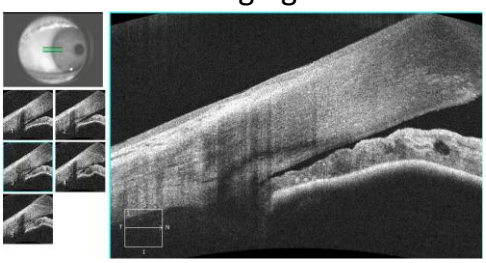
Cirrus HD-OCT scan of normal cornea. Layers identified with colored arrows as follows: tear film (blue), epithelium (white), Bowman's layer (red), Descemet's/endothelium (green).

- Cirrus HD-OCT Anterior Segment Imaging



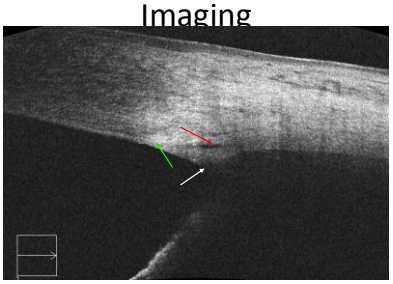
Images courtesy of Martha Leen, M.D. & Paul Kremer M.D. Achieve Eye and Laser Specialists, Silverdale, WA

- Cirrus HD-OCT Anterior Segment Imaging



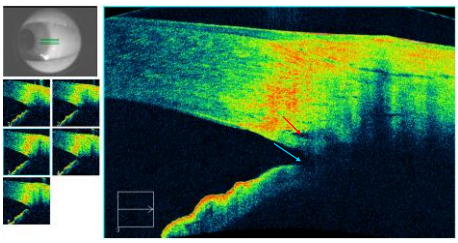
Images courtesy of Martha Leen, M.D. & Paul Kremer M.D. Achieve Eye and Laser Specialists, Silverdale, WA

- Cirrus Anterior Segment Imaging

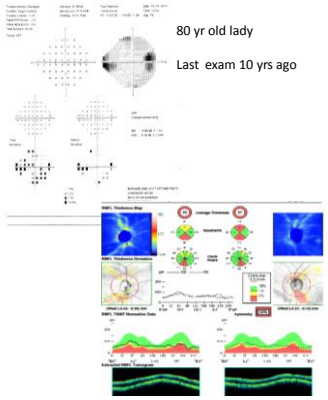


Cirrus HD-OCT angle scan. Note Schlemms canal (red arrow), Schwalbe's line (green arrow) and the scleral spur (white arrow). The angle recess is not very defined in this scan.

- Cirrus Anterior Segment Imaging



Cirrus HD-OCT image with a visible angle recess (blue arrow). Schlemm's canal is very well clearly seen (red arrow).



80 yr old lady

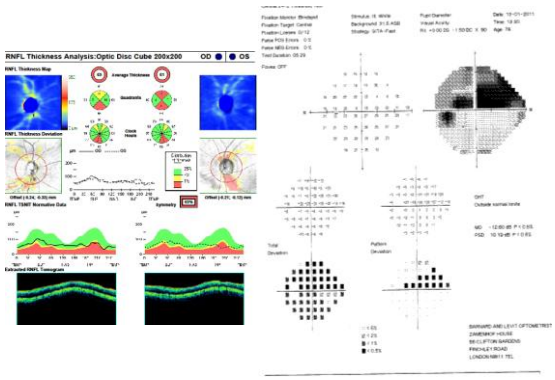
Last exam 10 yrs ago

Goldmann R & L 24

Pascal R & L 28 mmHg

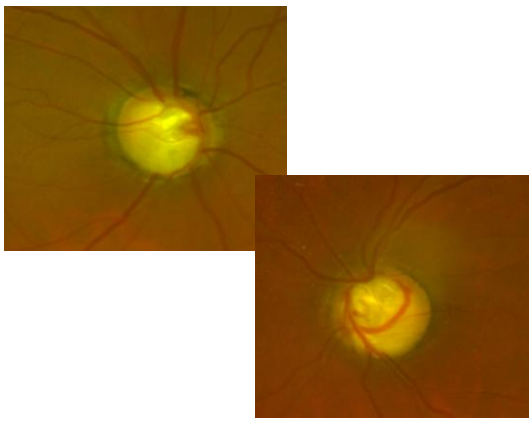
CCT 520 microns

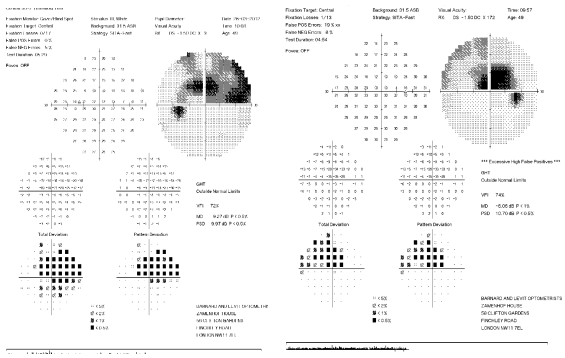
CD ratios R. 0.8 L. 0.9

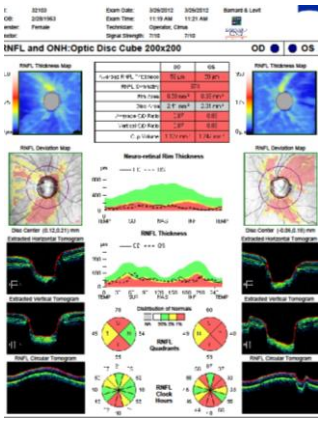


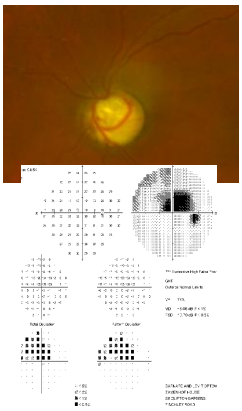
Case

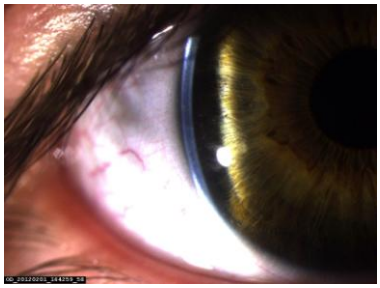
- 2 days ago
- 47 yr old woman attended for first time
- British African
- Xalacom bds for last 7 years
- IOP GAT 18mm Hg R & L

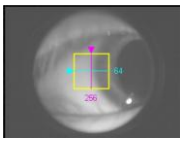


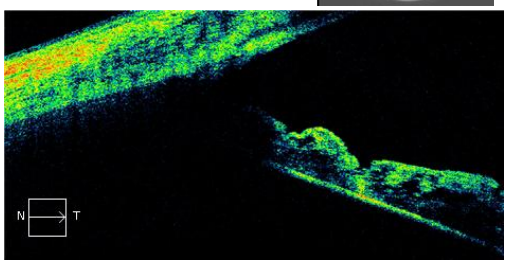




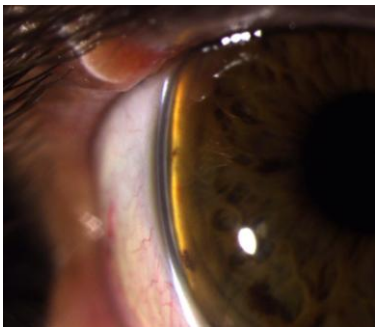




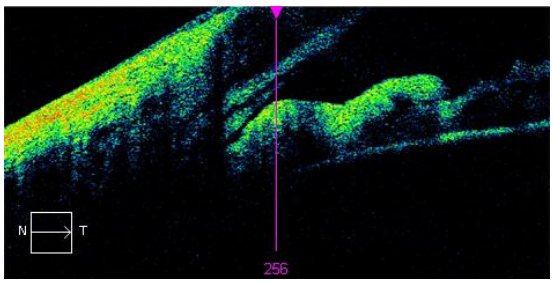


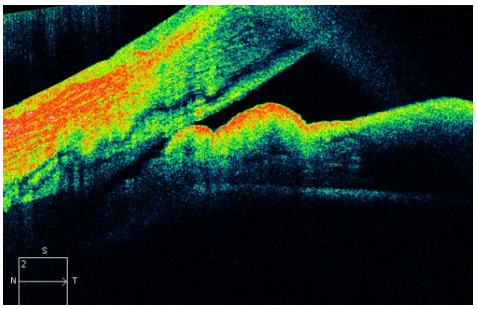


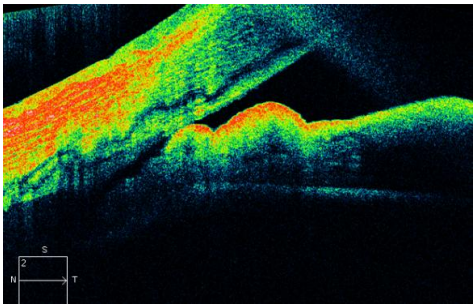
Asymptomatic – grade 1



Same patient as previous slide







How about narrow angles? Method and Patients

Clinical records of 886 consecutive patients aged 35 years and above seen between October 2009 and January 2012 for an eye examination were reviewed

If a patient was seen more than one time during this time period the most current result has been taken

500 female; 386 male

Sensitivity for correct referral

30 from consecutive 886 patients > 35 years referred for narrow angles 23 needed treatment

Sensitivity = 76.7%

Another = 16.7% (5) confirmed needs monitoring

93.4% (prevalence 3.2%)

2 Patient outcomes not known

Macular anomalies

Case History

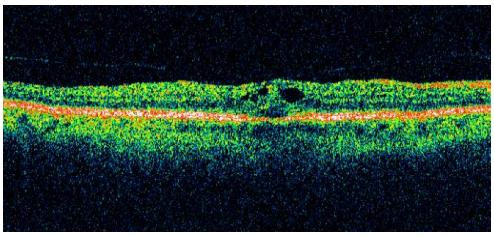
Patient: Mrs G

Age 63 years

Symptoms: Last 4 days grey patch in Right central vision

History: longstanding Left macular scar

Refraction & VAs: R. = 6/5 L. = 6/5-



Management ?

1. Refer to GP ?
2. Refer same day to hospital eye department casualty?
3. Refer to consultant retinal ophthalmologist?
4. No action but review in one month?

My decision was ?

1. Refer to GP ?
2. Refer same day to hospital eye department casualty?
3. **Refer to consultant retinal ophthalmologist?**
4. No action but review in one month?

Ophthalmologist confirmed diagnosis and recommended ?

1. No treatment?
2. Vitrectomy?
3. Avastin injection?
4. Review in one month ?

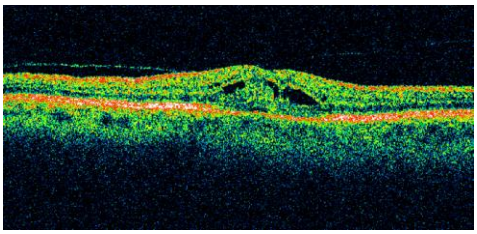
Ophthalmologist confirmed diagnosis and recommended ?

1. Vitrectomy?
2. No treatment?
3. Avastin injection?
4. **Review in one month ?**

And requested a repeat OCT on the day before he sees her

+ 1 month

6/18



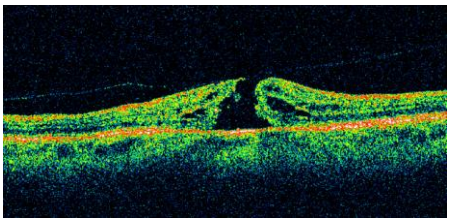
The ophthalmologist's advice was ?

1. No treatment?
2. Vitrectomy?
3. Avastin injection?
4. Review in one month ?

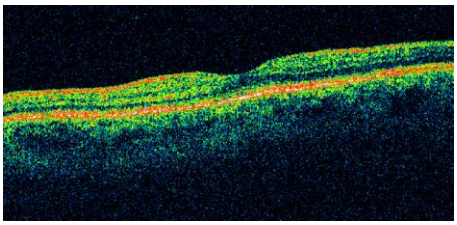
1. No treatment?
2. **Vitrectomy?**
3. Avastin injection?
4. Review in one month ?

The patient decided to take a second opinion

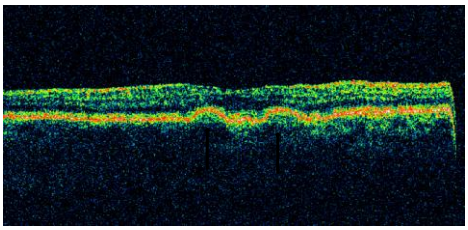
6/60-



6/36



RE



Case History

Patient: Mr H

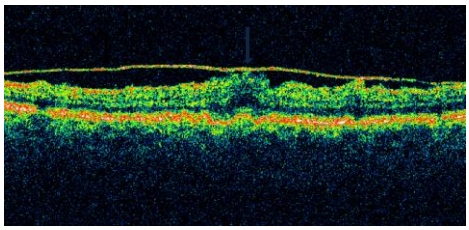
Age: 81 years

History: Longstanding poor vision left eye. Seen a few years ago by retinal specialist. Early cataracts

Symptoms: Routine check

Refraction & VAs: R. = 6/ 9 L. = 6/36

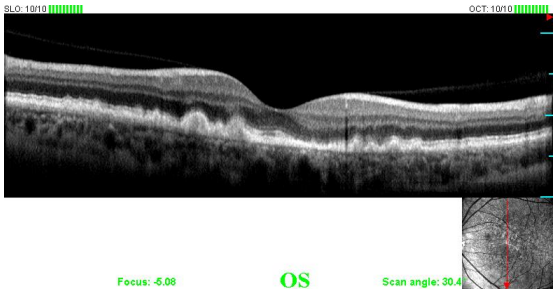
LE



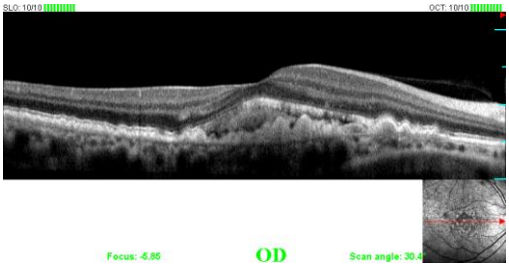
Management

Refer patient for

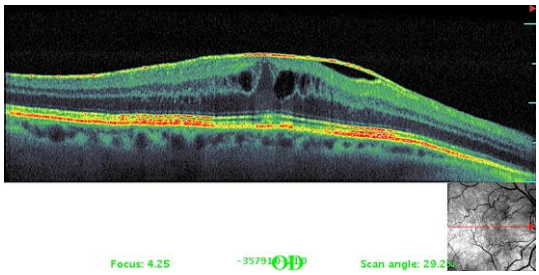
(a) Opinion on dry AMD RE and
(b) Partially detached epiretinal membrane LE with macular traction



Drusen



AMD



Epiretinal Membrane

Case History

Patient: Mr H

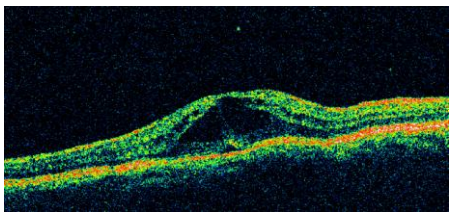
Age: 78 years

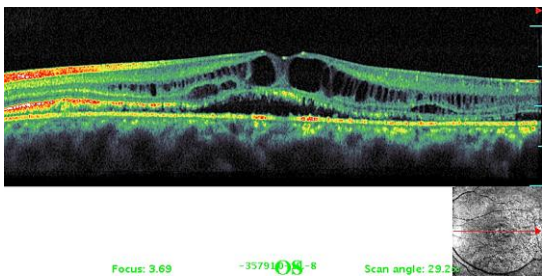
History: Referred by ophthalmologist after cataract surgery

Symptoms: poor vision

Refraction & VAs: R. = 6/6 L. = 6/36

CME

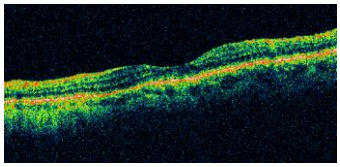




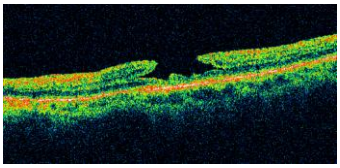
Cystoid Macular Edema

Case History

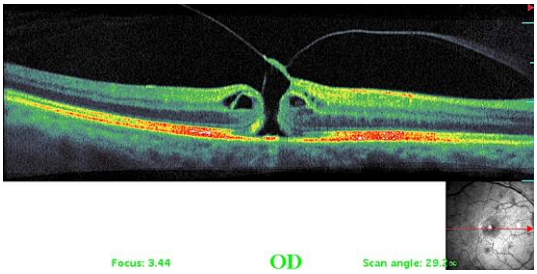
Patient: Mr S M
Age: 72
History: Poor vision in one eye for a year
Symptoms: poor vision LE
Refraction & VAs: R. +0.50DS = 6/6 L. = 6/60



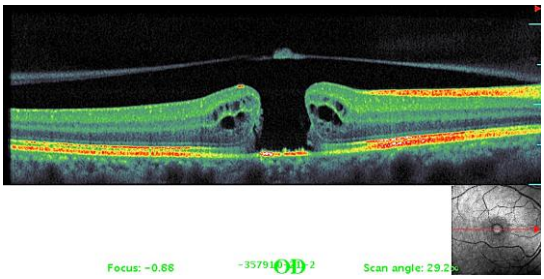
RE VA 6/6



LE VA 6/60



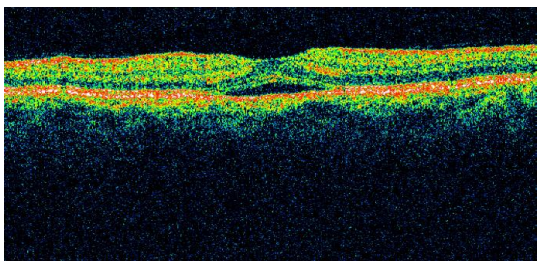
Partial Macular Hole



Macular Hole

Case History

Patient:	Mr D'S
Age:	41
Symptoms:	Last 4 days sees a spot "bubble" in the central vision of his right. Notices it more when closes eye
VAs	R. 6/6 L. 6/5



Management

a) Refer urgently?
b) Refer routinely?
c) Steroids ?
d) Explain diagnosis to patient and review in 1/12?

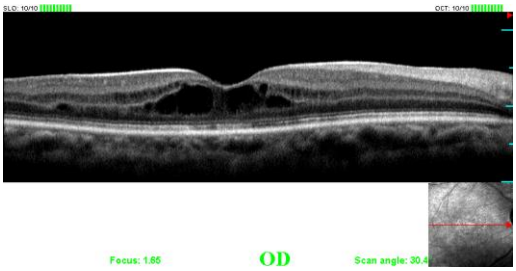
Management

•Refer ?
•This patient was going on holiday two days later for over three weeks
•Repeat OCT after 4 weeks ?

Diagnosis

Central serous retinopathy

- Usually young males
- Stress
- Resolution in weeks/months in most cases
- May have residual visual disturbance

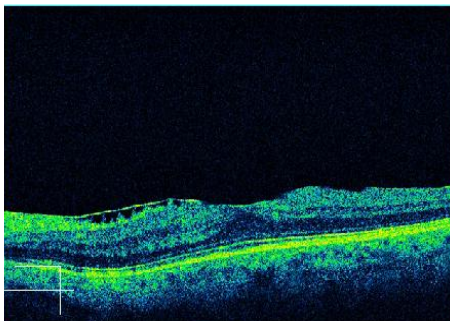


Central Serous Retinopathy

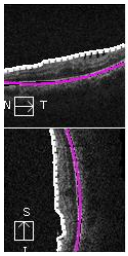
Case history

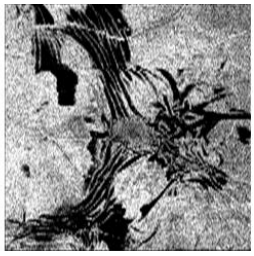
•70 year old female lawyer, Mrs BL
•Early cataract
•VAs R. 6/6 L. 6/9
•Refer for cataract surgery?
•Routine OCT prior to referral

optos



Next video thanks to Riaz Asaria MD FRCS FRCOphth





optos

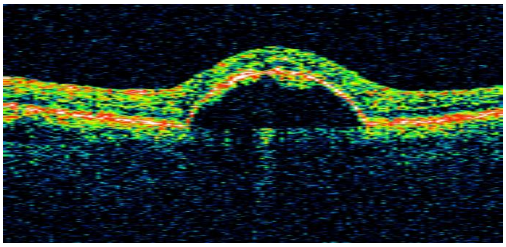
Case History

- July 2007
- Mrs D.B. telephones practice. Not seen previously. Actress
- Smokes 60 cigarettes a day
- Age 72 years
- Noticed sudden disturbance of vision RE for last three days. Central distortion of vision

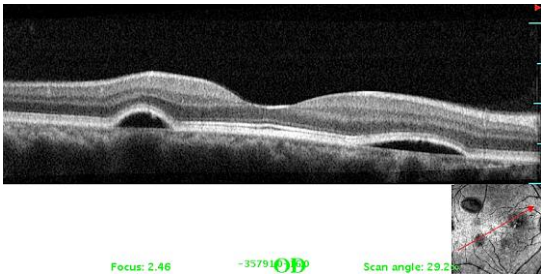
optos

- Requested name of ophthalmologist offering Avastin injections
- Name given
- Suggested attend for OCT prior to appointment with ophthalmologist
- What condition had she self-diagnosed?

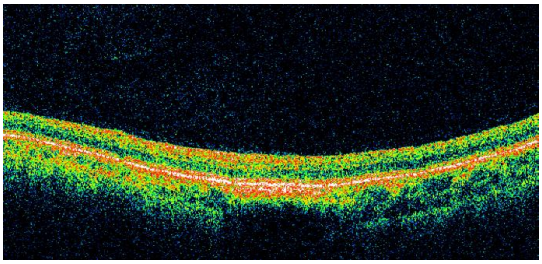
optos

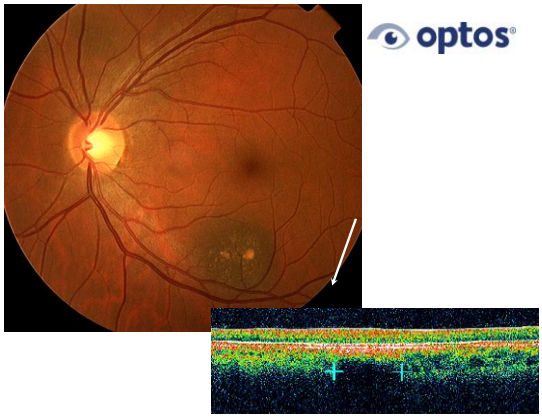


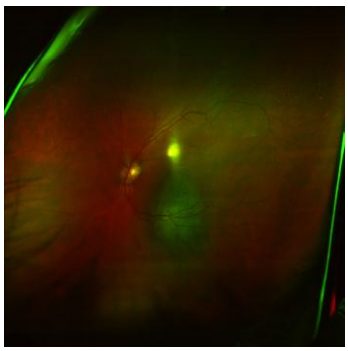
optos

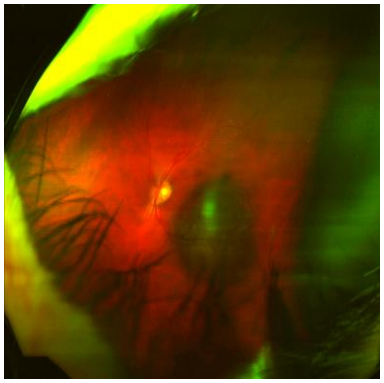


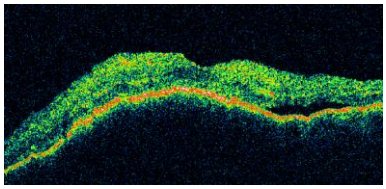
RPE Detachment

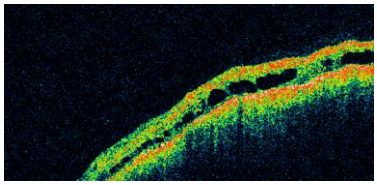








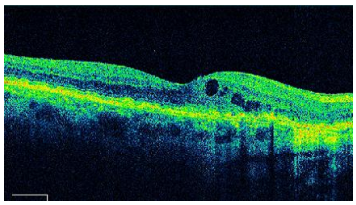




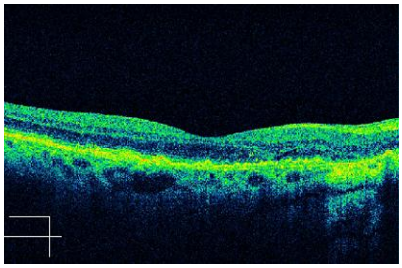
Case History

- Long standing patient 75 year old; Mrs MK
- Artificial left eye
- Dry AMD RE = 6/9+
- Taking quinine for cramps
- Routine check – slight deterioration in VA

7th May 2009

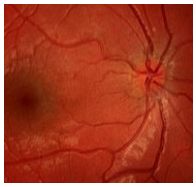


11th June 2009



Swollen nerve head ?

- Differential diagnoses
  - *Pseudopapilloedema (crowding)*
  - *Drusen*
  - *Choked disc*
    - *Papilloedema*
    - *Papillitis*



Swollen optic nerve head

- Raised optic nerve heads are common
- Subtle signs visible with slit lamp BIO
- Important to document appearance for future comparison
- Helpful for disease detection and diagnosis

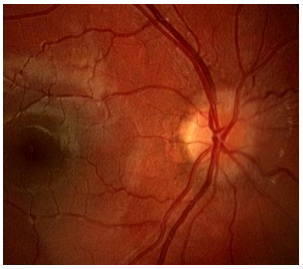
Congenital

- Typically a small eye but does occur in myopes
- Raised nerve head
- No field defect
- SVP helps suggest "normal"

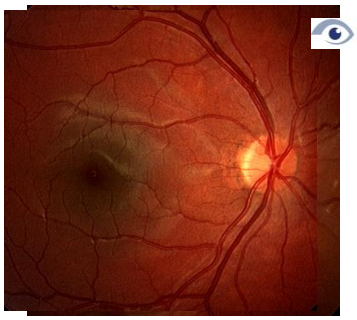
Routine imaging at every exam

Choked disc - case history

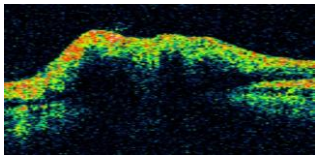
- 10 year-old boy
- Broken spectacles
- No symptoms

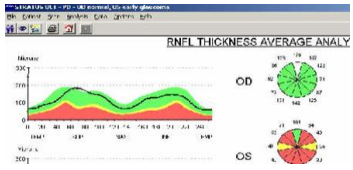


Diagnosis - Intracranial tumour



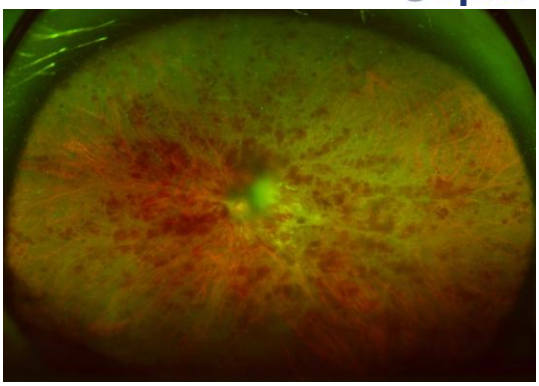
Use OCT to differentiate

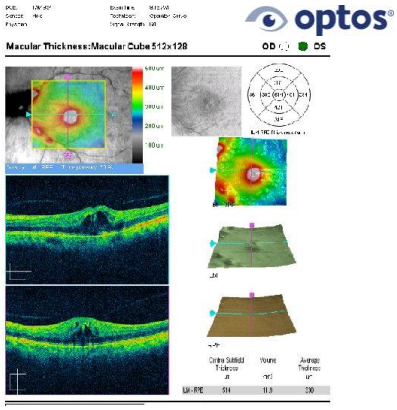


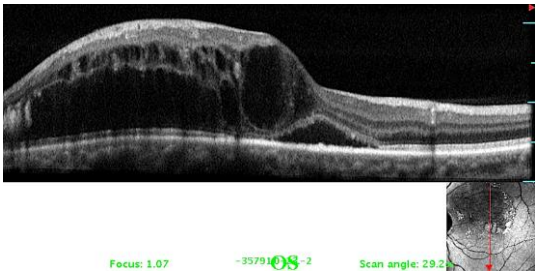


Sudden loss of vision

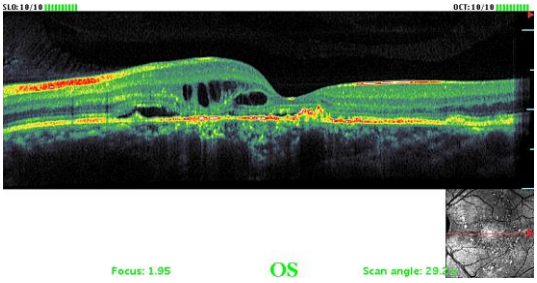
- Sudden loss of vision 6/60
- 74 yr old male







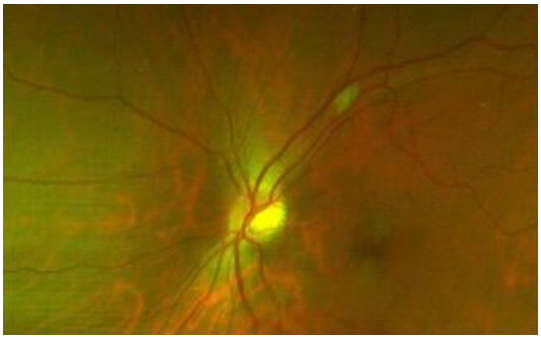
Branch Vein Occlusion

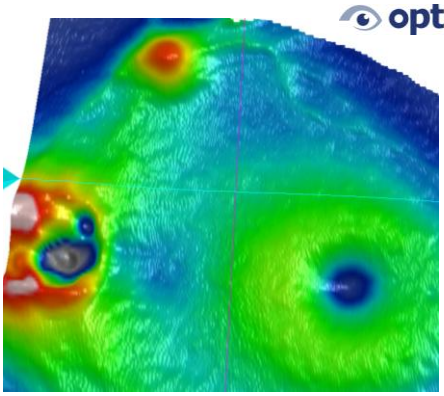


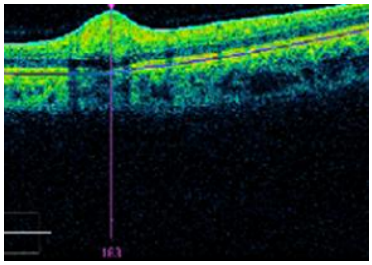
Branch Vein Occlusion

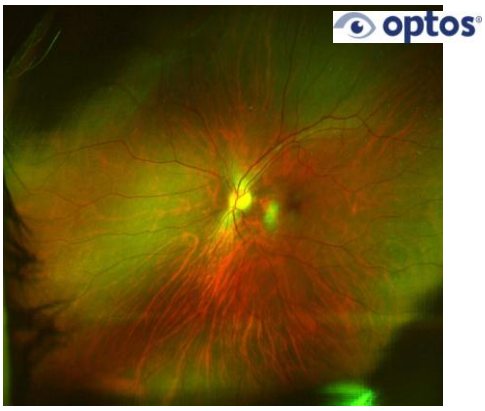
Case history

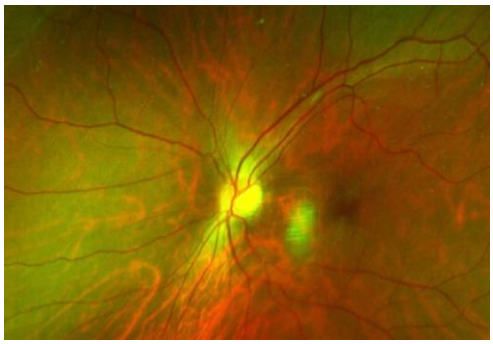
- Thirty-year old healthy woman presented complaining of a visual disturbance
- Optomap located a lesion
- OCT analysed further

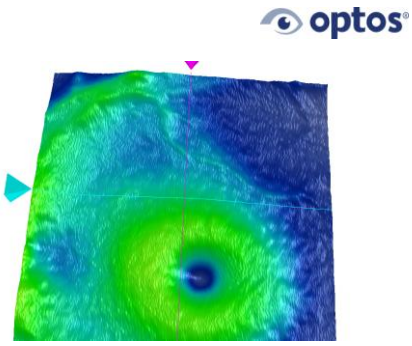








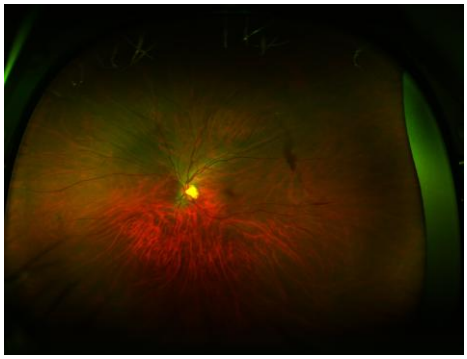


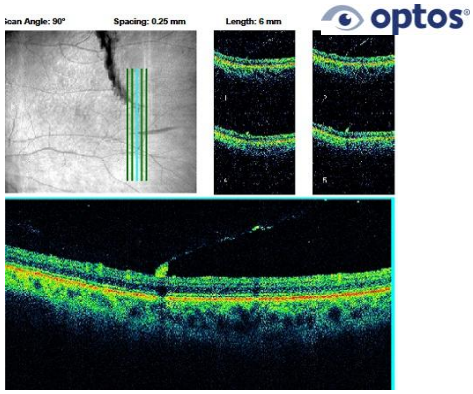


optos

Subtle visual disturbance

- 54 year old male 3 days ago noted a smudge inferior nasal vision RE
- Now its moving on blinking but superiorly - group of black dots
- No flashes of light
- No history of trauma. GH good, No meds
- VAs 6/7.5 L. 6/6



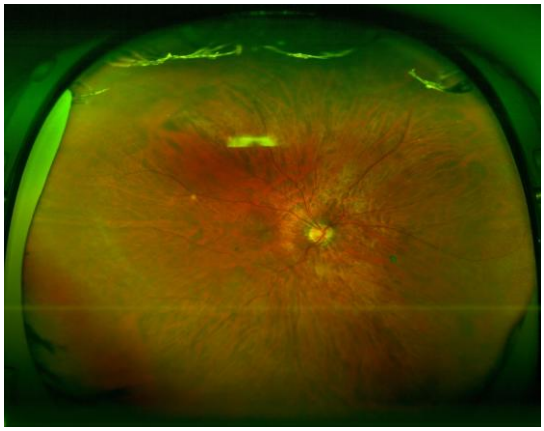


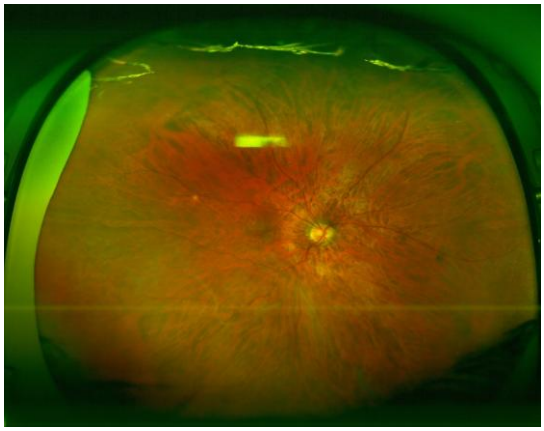
37 yr old female
R. -18.00 DS L. -17.00DS

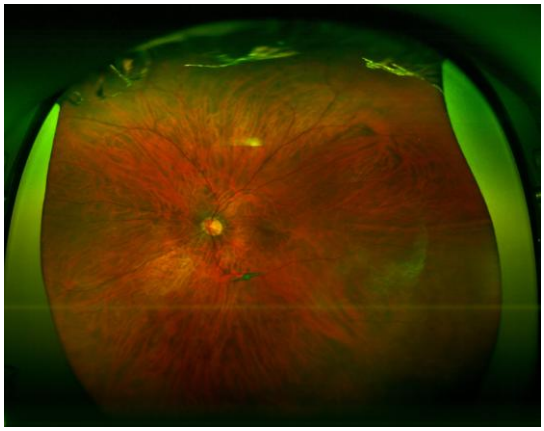
IOPs R. 15 L. 15 mmHg

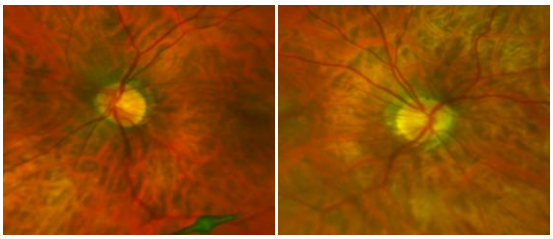
Humphrey C40 screening full

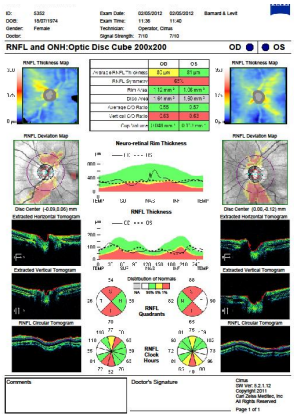
Pigment dispersion syndrome

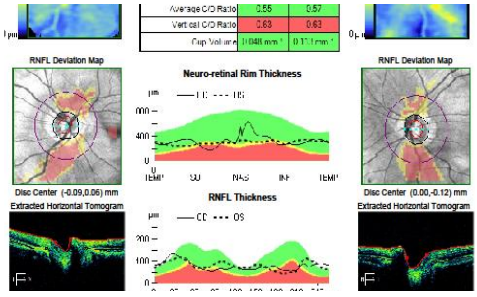




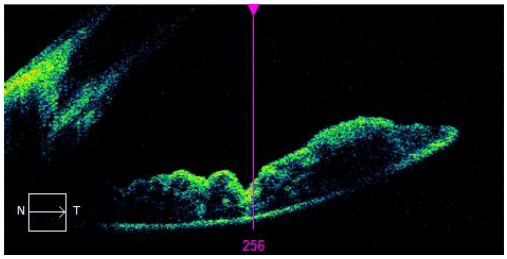








PDS concave iris



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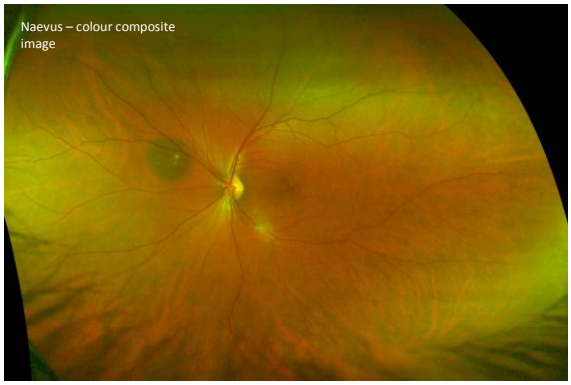
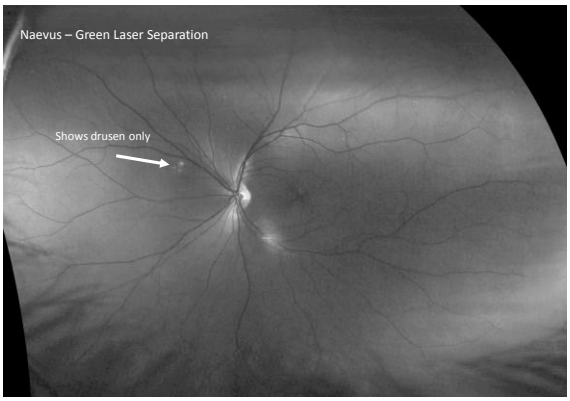
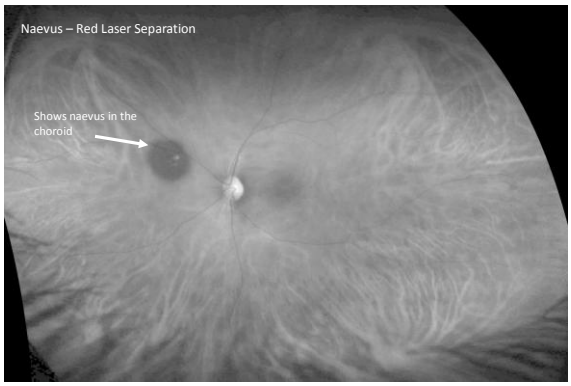
OCT is a phenomenal and powerful diagnostic tool

The biggest revolution since Helmholtz's invention of the ophthalmoscope in the 19th century

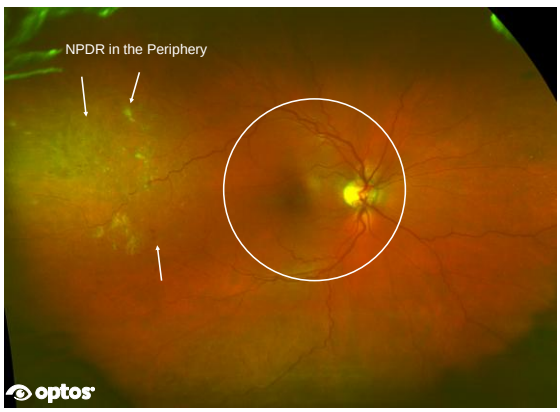
Improves standard of care in primary and secondary care

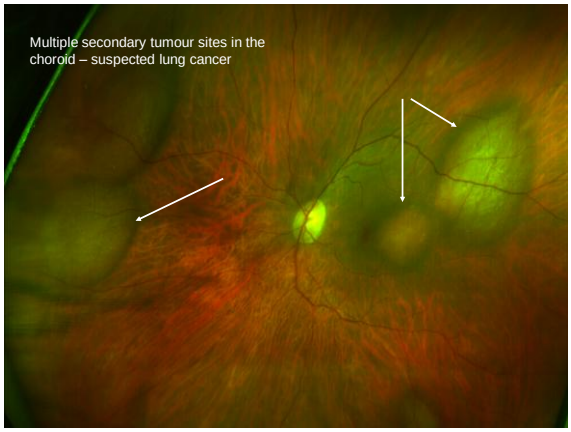


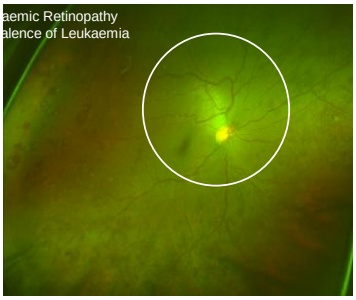




Systemic Diseases





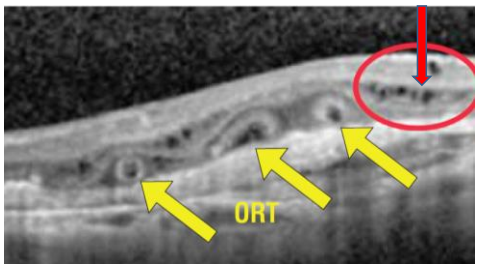


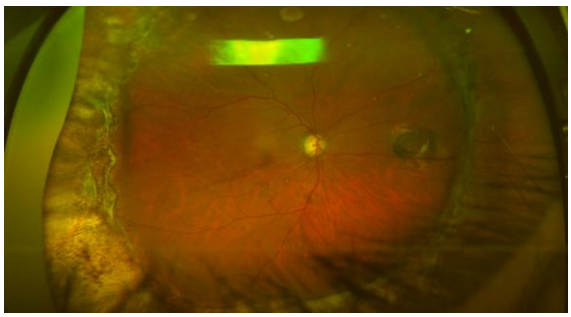
Outer Retinal Tubulation

Sandrine A. Zweifel, MD; Michael Engelbert, MD, PhD; Ketan Laud, MD; Ron Margolis, MD; Richard F. Spaide, MD; K. Bailey Freund, MD
Arch Ophthalmol. 2009;127(12):1596-1602

- Branching tubules identified in outer retina of 54 patients with AMD and in 9 patients with other diagnoses (24% prevalence)
- Round or ovoid hyporeflective spaces with hyper-reflective borders on the B-scans (40 -140 µm high and 40 - 2260 µm wide
- The tubules generally remained stable over time
- Degenerating photoreceptors may become arranged in circular or ovoid fashion during a process called *outer retinal tubulation*
- Occurs in dvanced diseases affecting the outer retina and retinal pigment epithelium.
- These findings can be misinterpreted as intraretinal or subretinal fluid, possibly prompting unnecessary interventions

Cystic Macula Oedema





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Hey ! what more do you want?

THE dream team....

Optomap + OCT