

Slide 1

2025
AFOS/SECO
**EDUCATION
DESTINATION**
San Antonio

Course # 111

How OCT Forever Changed Retina

Joe Pizzimenti, OD

Please Silence All Mobile Devices.

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Slide 2

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DESTINATION**
San Antonio

Joe Pizzimenti, OD

Disclosure statements:
No financial relationships to disclose

All relevant relationships have been mitigated.

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HOW OCT FOREVER CHANGED RETINA

Joseph J. Pizzimenti, OD, FAAO

allthingsoct@gmail.com

Slide 4

DISCLAIMER #1

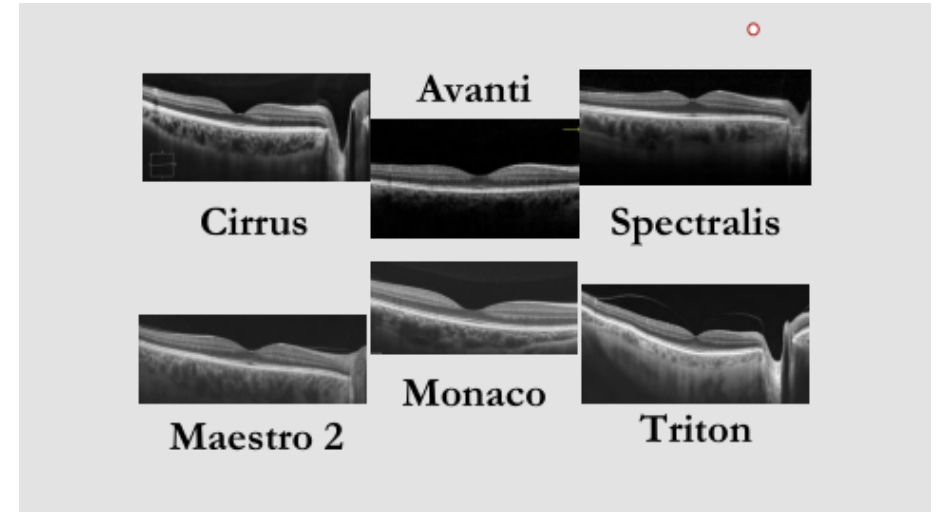
This is a **clinical course** focusing on the technology and its use in patient care. While we may briefly discuss some aspects of practice management, this is **not a billing and coding seminar**.

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DISCLAIMER #2

You will view many scans obtained with several OCT instruments made by multiple manufacturers. **We do not endorse any one OCT company, brand or model.**

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QUESTIONS AND ANSWERS

A grid of five OCT scan types arranged in a 2x3 layout. The top row shows a B Scan OCT (top left), a 3D VOLUME (top middle), and an EN FACE OCT (top right). The bottom row shows an OCT ANGIOGRAPHY (bottom left). Each scan is labeled with its respective type below it.

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COURSE GOAL

- To provide clinically relevant information about OCT/OCTA in retinal and macular disease.
- **Case examples**
- **Interpretation and clinical use**

STATEMENT OF THE PROBLEM

- Diseases of the posterior segment are among the leading causes of vision loss worldwide.
- The new frontier:
 - Optometrists have now begun to fully embrace vitreoretinal care.

“Most major advances in the understanding of retinal diseases have been preceded by advances in imaging.”

Richard Spaide, MD
NY Retina Consultants

Retinal imaging does
not
replace a dilated retinal examination.

Fundus Biomicroscopy and BIO



Invasive

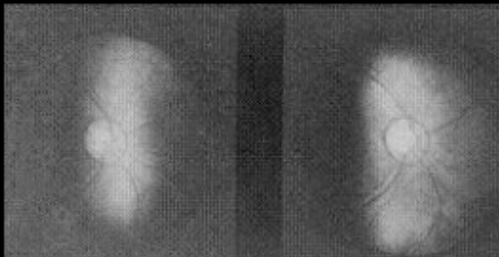
- Fluorescein angiography (FA)
- Indocyanine green angiography (ICGA)

Non-invasive

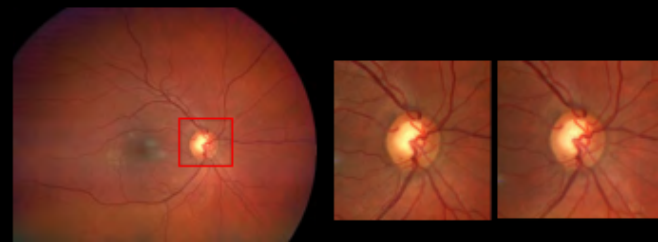
- Optical coherence tomography (OCT/OCTA)
- A/B scan ultrasonography
- Fundus photography
- Wide field and UWF imaging
- Fundus autofluorescence (FAF)
- Multi-color (multichannel) imaging

Milestones in Retinal Imaging

☐ Fundus Photography	1920s
☐ Fluorescein Angiography	1950s
☐ A/B-Scan Ultrasound	1970s
☐ ICG Angiography (Digital)	1980s
☐ CSLO (HRT), SLP (GDX)	1990s
☐ OCT first demonstrated	1991
☐ Time Domain (TD-OCT)	2001
☐ Fourier Domain (SD-OCT)	2006
☐ OCT Angiography (OCTA)	2015
☐ Swept-Source (SS-OCT)	2016

Milestones in Retinal Imaging

1909-Thorner's Stereo Photos

WF and Stereo Disc Images
w/CLARUS

Which one is right for my practice 

- Factors to consider when purchasing new technology:

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____



Which one is right for my practice 

- Factors to consider:

- Patient base
- Mode of practice
- Staff
 - Acceptance and aptitude to learn new technology
- Space considerations
 - The "footprint"
- Cost/ROI



Which one is right for my practice 

- Factors to consider:



- Networking capability/EMR Integration**
- Data archiving system
 - Retina "workplace" or ecosystem
 - Combined reports capability
- Future upgrades
- Support/training provided by company?
 - Installation and initial training
 - Periodic training

The Critical Question

Will this technology improve patient care?

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OCT IS...

An optical imaging modality that performs high-resolution, cross-sectional (A-scan) tomographic imaging of the internal microstructure in materials and biologic systems by measuring back-scattered or back-reflected light. OCT images are two-dimensional data sets (B-scans) which represent the optical backscattering in a cross-sectional plane through the tissue.

-Dr. James Fujimoto (2000)



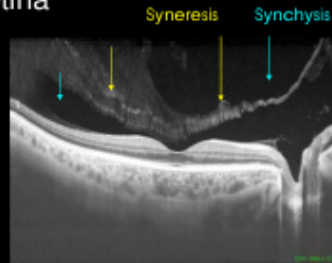
30 years of OCT

Then and.....Now

TO DOWNLOAD MY SLIDES IN COLOR:

Posterior Segment Applications

- Vitreous/Vitreoretinal Interface
- Neurosensory Retina
- RPE/Bruch's
- Choriocapillaris
- Deeper Choroid
- Optic Nerve
 - RNFL
 - GCL/GCC

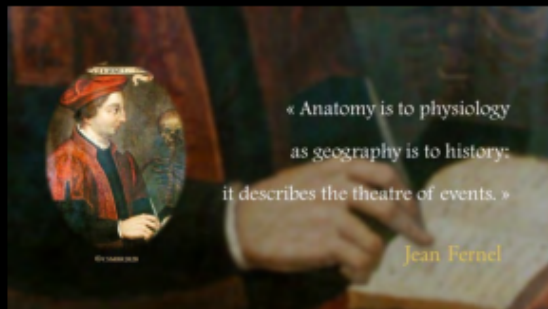


FRAUNCES TAVERN, 1782

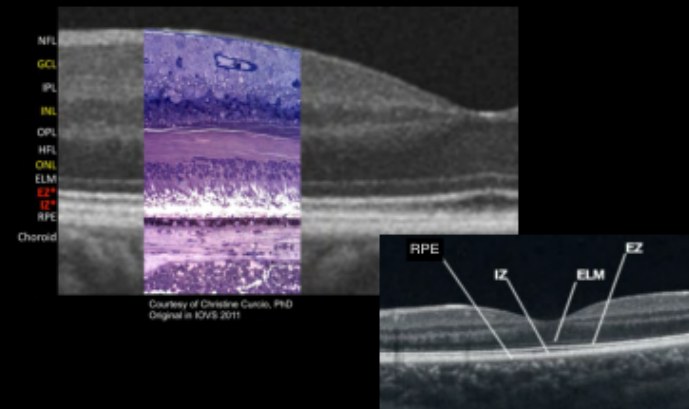
George Washington slept here. He also drank here.

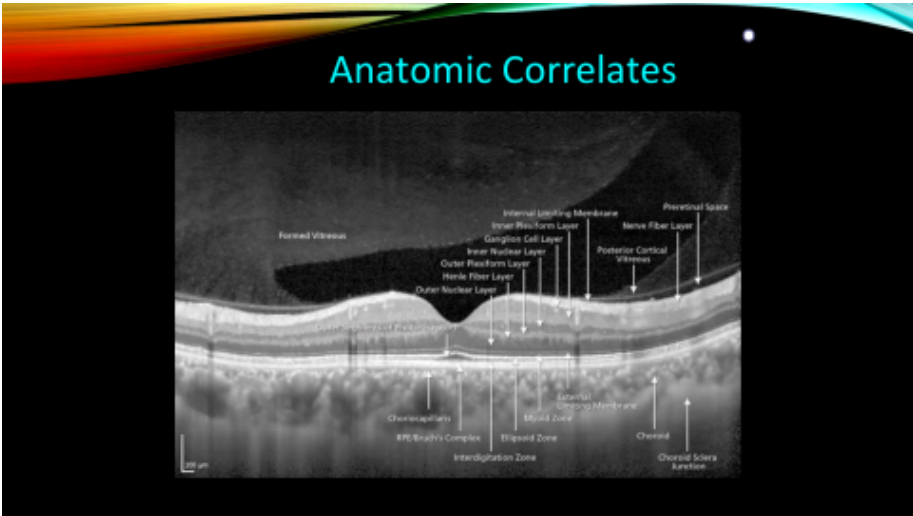
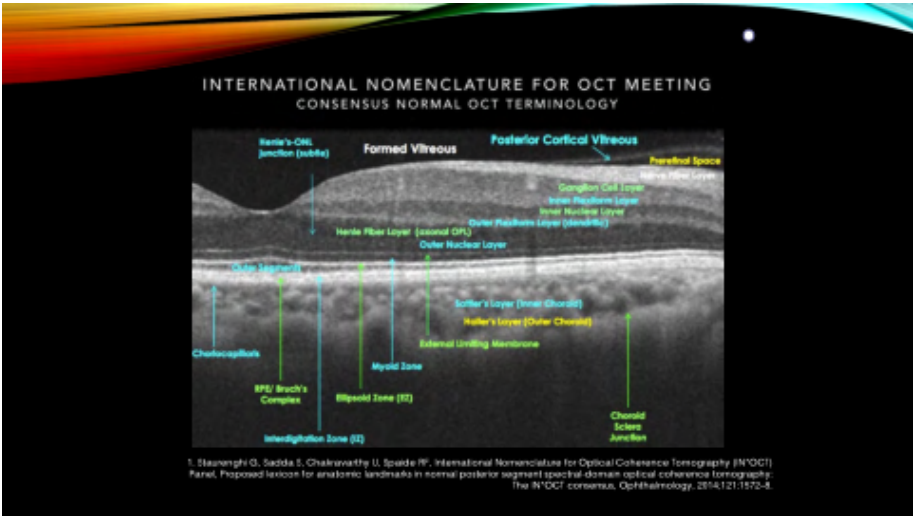


ANATOMY



RETINAL ANATOMIC CORRELATES





FOR COLOR PPT NOTES...

- Available at:
- <https://tinyurl.com/PIZVEE>
- Problems downloading? Send an email request for the handouts to allthingsoct@gmail.com.

WHAT IS OCT?

OPTICAL

OCT is an imaging technology that is based on principles of physics, specifically **optics**.

WHAT IS OCT?

COHERENCE

Coherent light is used in OCT imaging.

WHAT IS OCT?

TOMOGRAPHY

A technique used for displaying a representation of a **cross section** through a human body or a tissue.

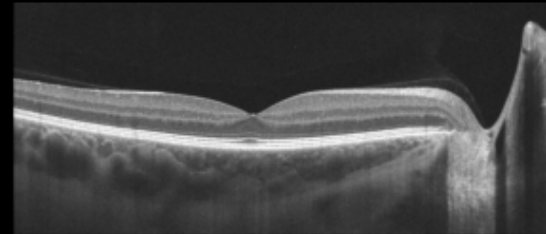
WHAT IS OCT?

Optical coherence tomography is a technology that uses **coherent light** to produce **cross-sectional** images.

-Pizzimenti (2018)

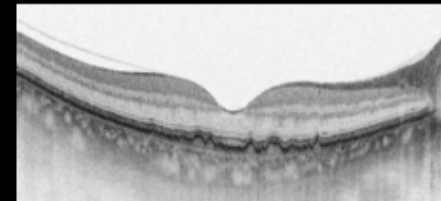
THE B-SCAN

- Two-dimensional, cross-sectional **single cut**.
- Used for qualitative and quantitative analysis.



OCT/OCTA has forever changed the classification, diagnosis, and management of **AMD**, and especially **nAMD**.

Foveal Drusen on B-scan "Negative"
VA = 20/20. Note normal foveal contour, **intact EZ band**



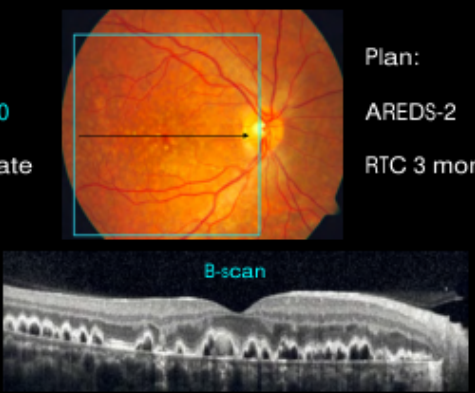
The B-scan represents a **single "slice"** through a **specific anatomic location**.

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Color Photo of Multiple Drusen/RPEDs
Simultaneous SD-OCT confirms **confluent** pattern
EZ band absent, c/w VA

69 yo WF
VA = 20/50
Intermediate Dry AMD

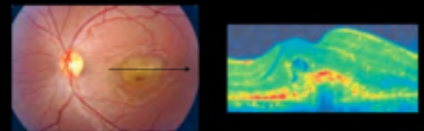
Plan:
AREDS-2
RTC 3 mon



B-scan

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Choroidal Neovascular Membrane (CNVM)



OCT shows **increased** retinal thickness due to leakage from CNV.

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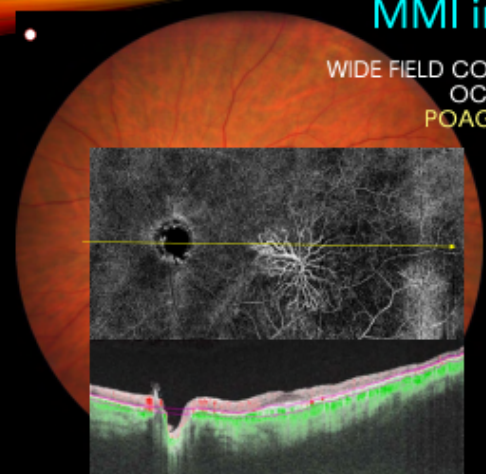
76 Y/O WM

- CC: Worsening central vision OS x 4 wks
- Oc Hx: POAG OU
 - S/p SLT OS x 6 mon, SLT OD x 9 mon
 - Intermediate Dry AMD OU
 - Taking AREDS2 Plus supplements
- VA:
 - OD 20/30 PHNI
 - OS 20/40 PHNI, **down from 20/25** four mon prior
- IOP: 14 OD/13 OS

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MMI in AMD

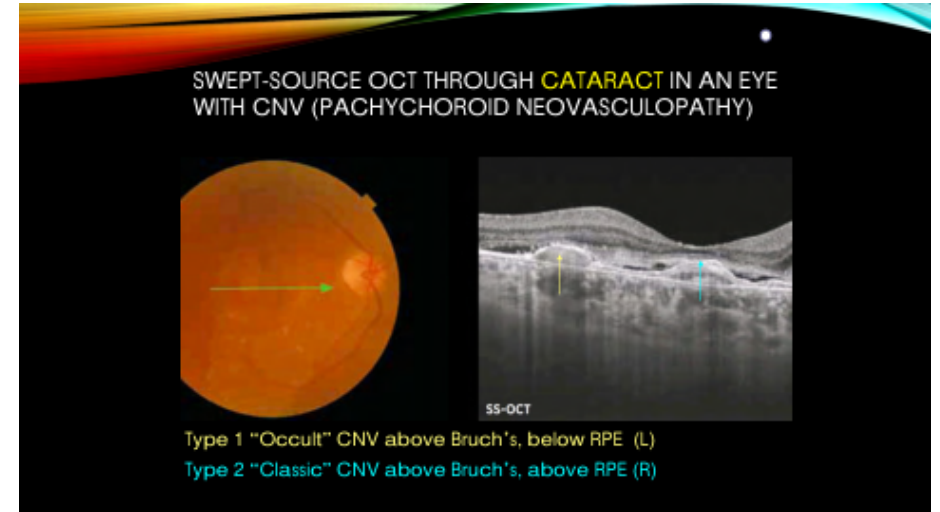
WIDE FIELD COLOR FUNDUS
OCT AND OCTA
POAG + WET AMD



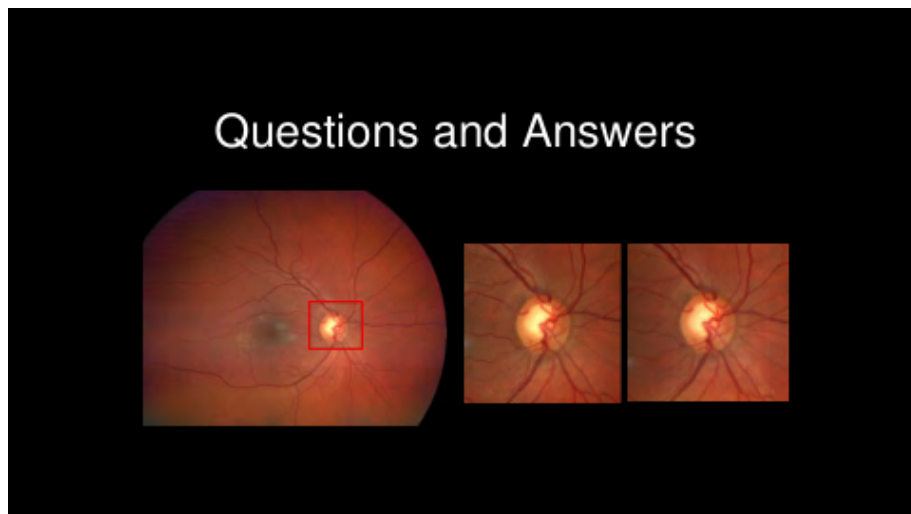
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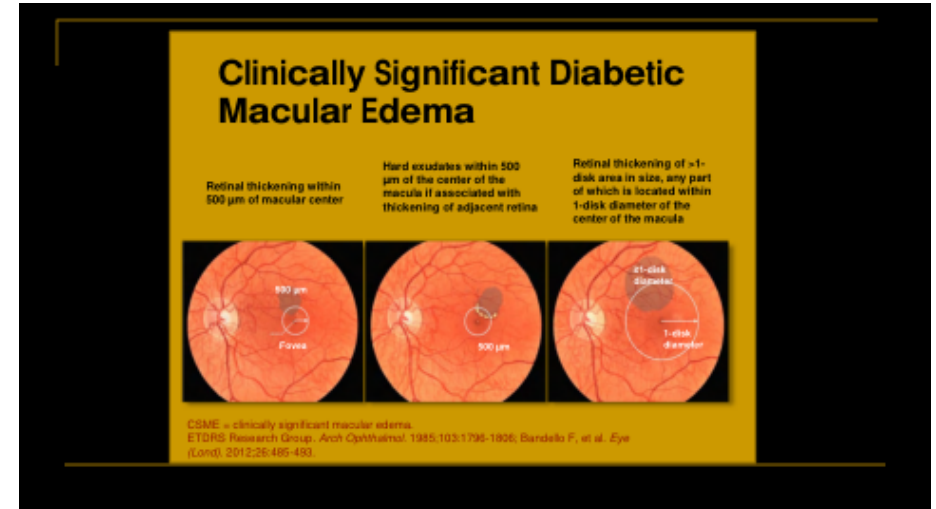
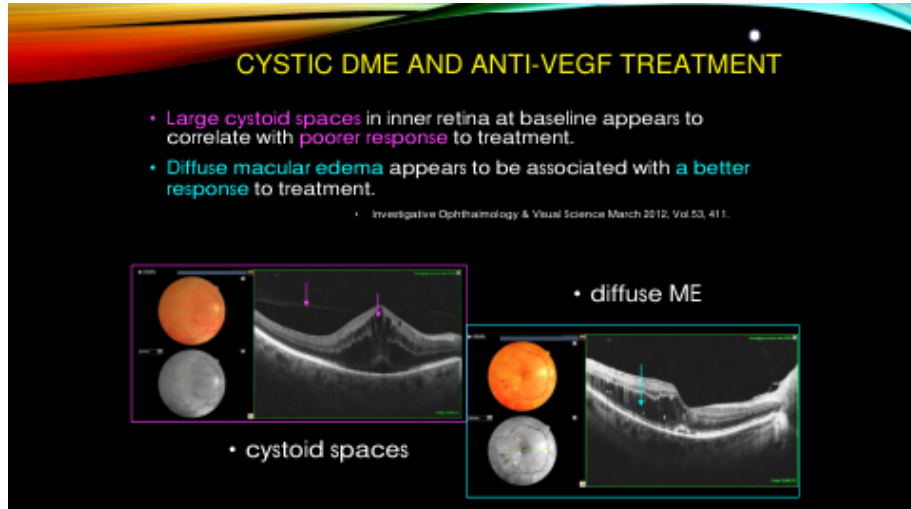
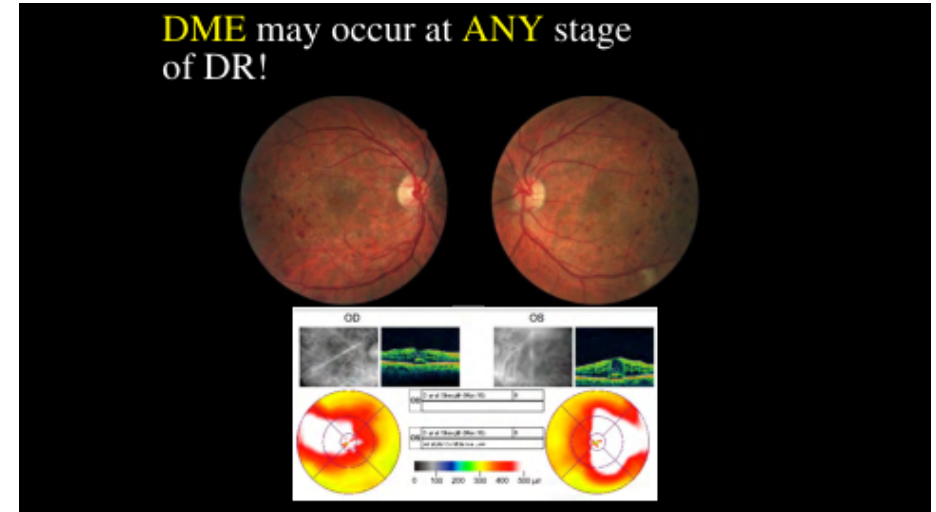
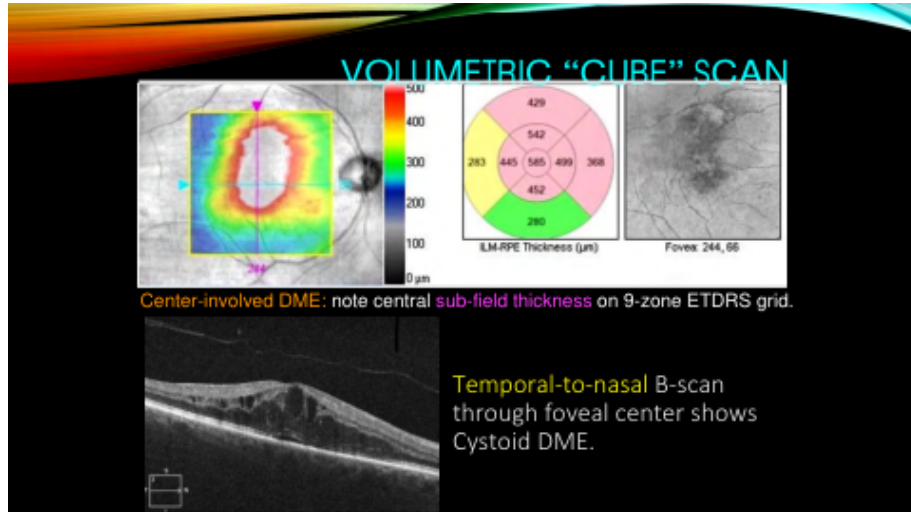


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Clinically Significant Diabetic Macular Edema

OLD CRITERIA

Retinal thickening within 500 μm

Hard exudates of ≥ 1 -disk size, any part located within 500 μm of the fovea

Thickening of ≥ 1 -disk size, any part located within 500 μm of the fovea

CSME = clinically significant macular edema.
ETDRS Research Group. Arch Ophthalmol. 1985;103:1796-1806; Bandello F, et al. Eye (Lond). 2012;26:485-493

DME Classification & Management: Center Involved or Not?

- Randomized clinical trials of anti-VEGF agents used the presence of DME in **OCT central subfield**.
- Older ETDRS definition of "clinically significant macular edema" modified in era of OCT.

Location	Average Thickness (μm)
Center	200
Superior	190
Inferior	190
Temporal	190
Nasal	190
Superior-Nasal	190
Superior-Temporal	190
Inferior-Nasal	190
Inferior-Temporal	190
Temporal-Nasal	190
Temporal-Temporal	190
Nasal-Nasal	190
Nasal-Temporal	190
Temporal-Nasal	190
Temporal-Temporal	190
Nasal-Nasal	190
Nasal-Temporal	190
Temporal-Nasal	190
Temporal-Temporal	190

central subfield

Nguyen, Quan Dang, et al. Ophthalmology 119.4 (2012): 769-801.
Brown, David M., et al. Ophthalmology 122.10 (2015): 2044-2052.

IS THE TREATMENT WORKING?

1st Visit Previous Visit Current Visit

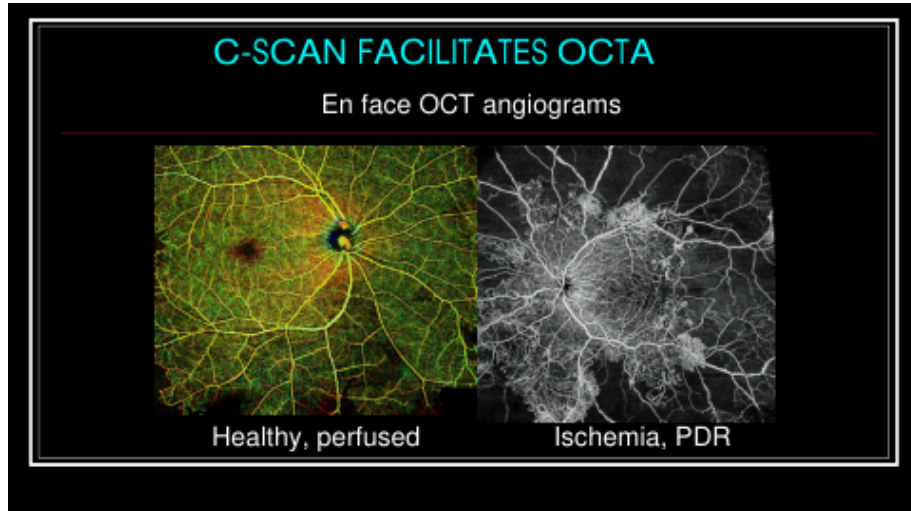
THE CORONAL SCAN C-SCAN: EN FACE SLICES

ERM VRI

Dark areas on C-scan (L) indicate non-adherence of ERM.

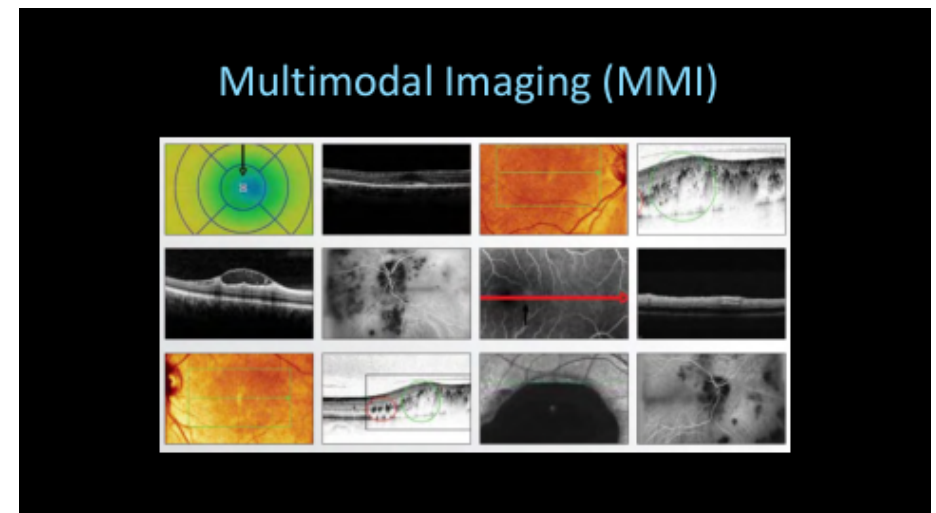
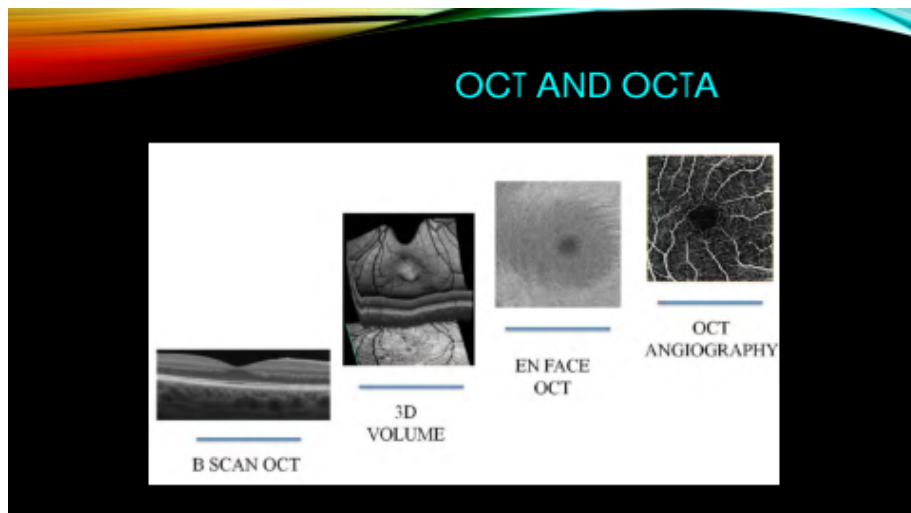
CME MID-RETINA

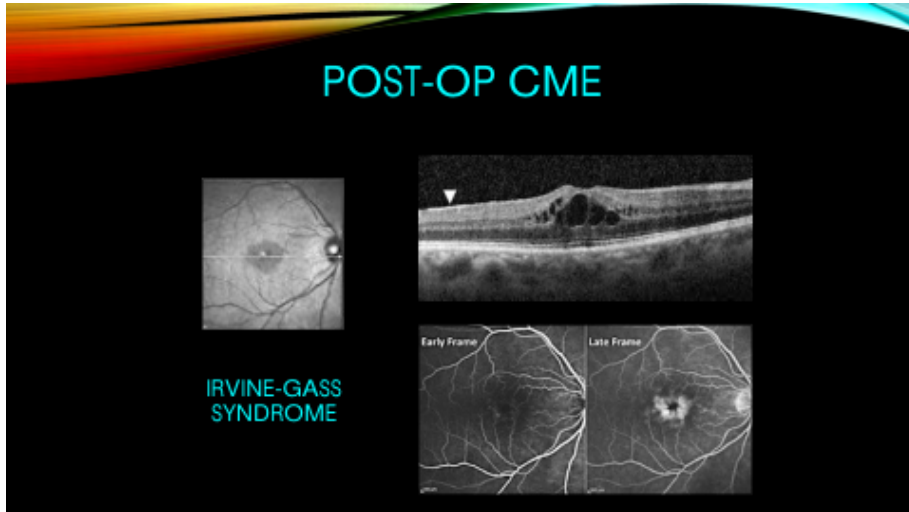
6 wks post-op CME. On C-scan, note petaloid appearance.



WHAT IS OCT-ANGIOGRAPHY?

- OCTA is an extension of OCT that provides 3D angiograms of retinal and choroidal blood vessels, as well as ON vasculature.
- Unlike IV Angio, OCTA is **noninvasive** and allows for **rapid** image acquisition.
- Clinicians can now assess blood flow layer by layer, allowing a separated evaluation of the retinal and choroidal plexuses.
 - **Vasculature cannot be separately visualized by other techniques.**



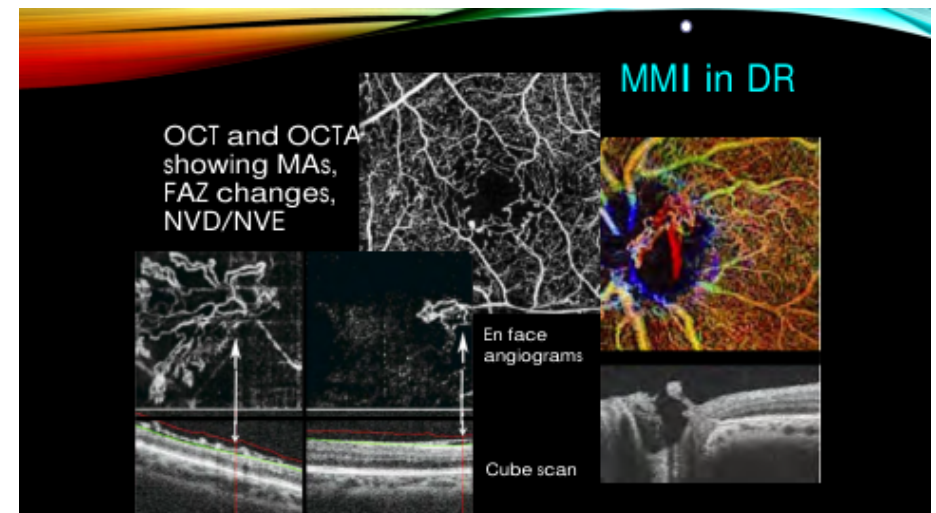


What is MMI?

- MMI refers to the use of multiple technological systems to acquire images.
- May also include hybrid devices that simultaneously perform 2 or more imaging modalities.
- Images acquired by MMI complement one another clinically.

MMI

- Common modalities include:
 - Color/multicolor fundus imaging
 - Near-infrared reflectance (NIR)
 - Fundus autofluorescence (FAF)
 - OCT/OCTA
 - Echography (A-scan and B-mode)



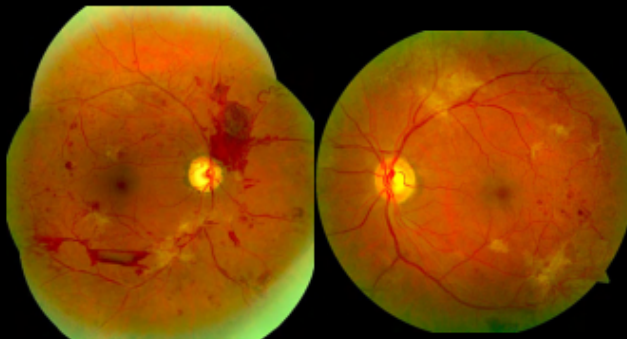
McSorley's Old Ale House (1854)

New York City's oldest continuously operated saloon.

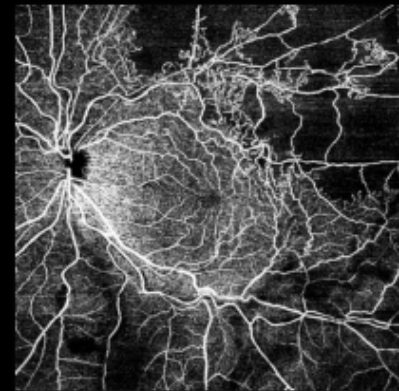


Bob Marley
get up,
stand up

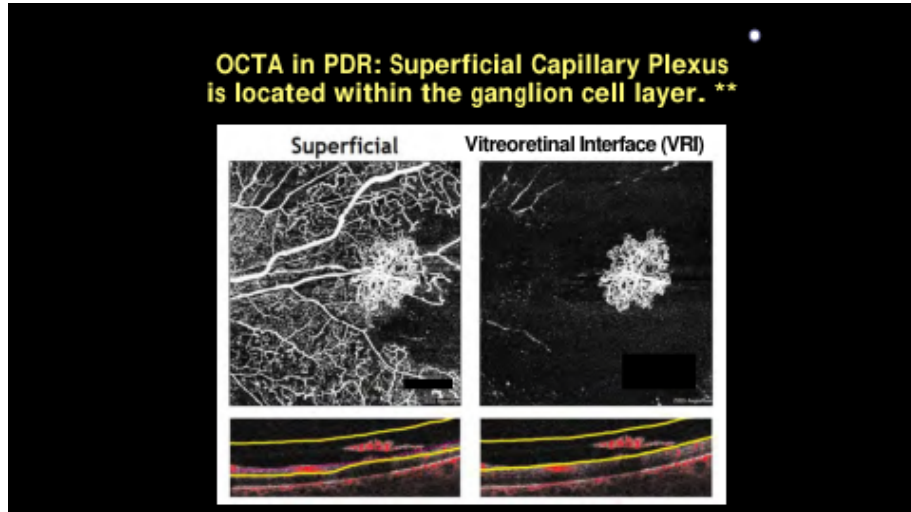
DR is NOT exclusive to
the central retina.



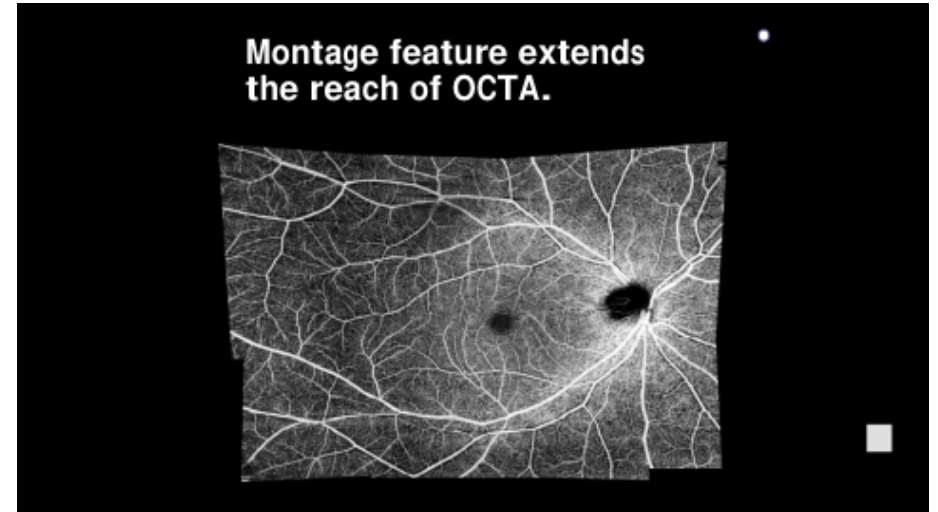
OCTA Beyond the Posterior Pole



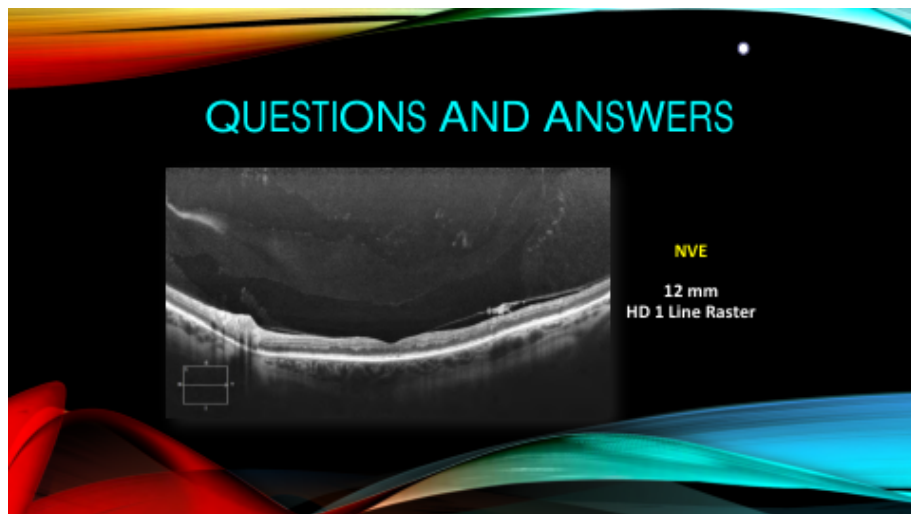
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Slide 75



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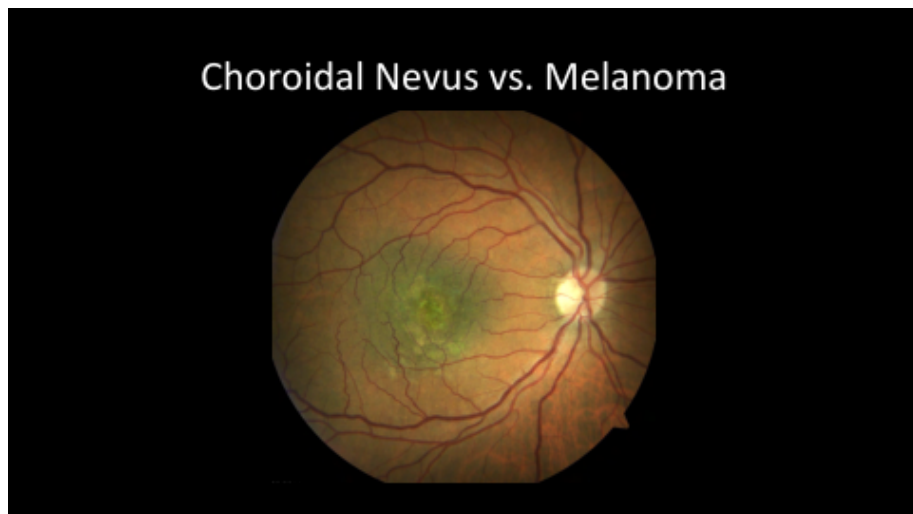
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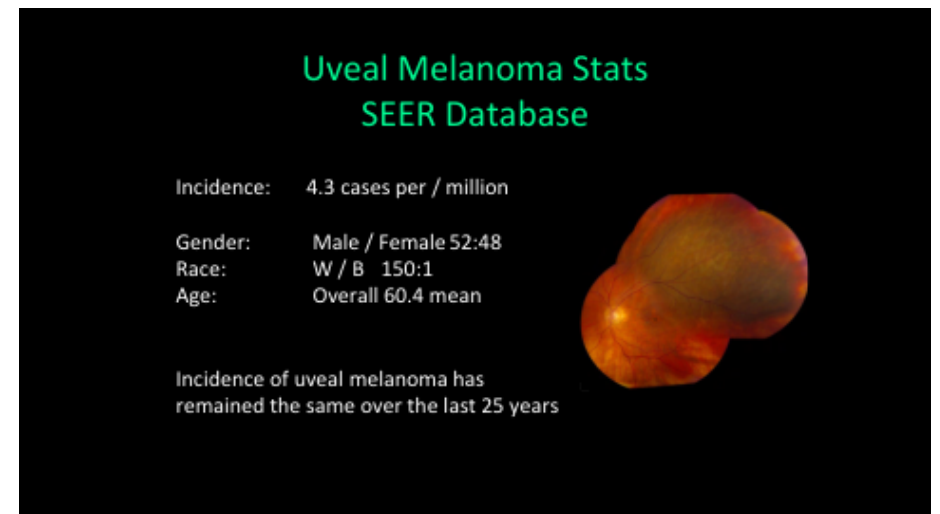
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Slide 80



WHAT WE KNOW

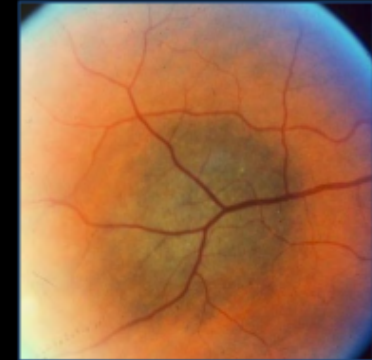


- Rare cancer
- Most common primary intraocular tumor
- Incidence: 7 per million per year in US
- Approximately 2000 new cases diagnosed annually in the US
- Median age 60yrs
- Overall Survival varied
- *Above based on what is reported to SEER/CINA national databases / single center experiences

Q: Where does choroidal melanoma come from?

A: Choroidal nevus

- Most common intraocular tumor
- Proliferation of melanocytes
- Present in ~ 7.9% of Caucasians
- Growth is rare after puberty?



As we age:

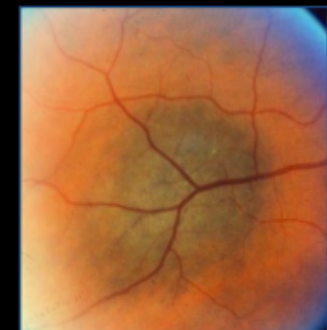
- Nevi may increase in number and thickness
- Pigment changes
- Metaplasia
- Drusen/lipofuscin

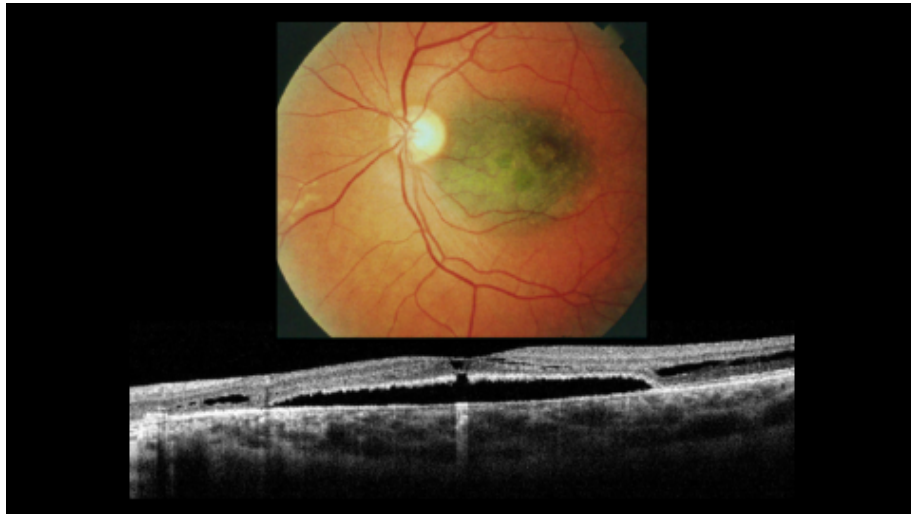


Nevus or melanoma?

Choroidal Nevus

- Nevi < 2 mm in thickness (A-scan)
- No known relationship to sunlight exposure
- Indistinct borders
- May undergo malignant change into melanoma





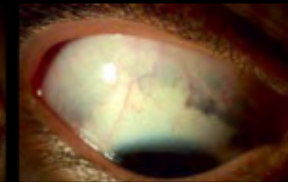
Risk Factors for Melanoma



Nevus of Ota: increased amounts of melanin and melanin producing cells (melanocytes) in and around eyes.

This includes the lids, uvea, and sclera.

1 in 400 convert to melanoma.



Choroidal Nevus Workup and Management

- DFE
- Baseline fundus photography, FAF
- OCT if location permits, OCTA?
- A/B-Scan
- IVFA?
- Yearly dilated fundus examination
 - Or more frequent



Risk Factors for Melanoma

- Caucasian
- Light colored eyes (blue)
- Fair skin
- Propensity to burn when exposed to UV light
- Cutaneous nevi or freckles
- Iris nevi
- Welders



To Find Small Ocular Melanoma Using Helpful Hints Daily

- T= thickness (**≥2mm**)
- F= subretinal fluid
- S= symptoms
- O= orange pigment
- M= margin near disk
- No risk factors (<4%)
- 1 risk factor (36%)
- 3 risk factors (50%)
- 5 risk factors (70%)

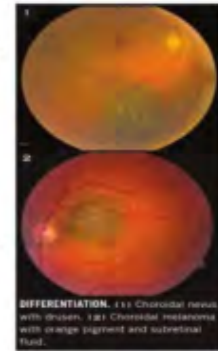
DOCUMENTED GROWTH - MEANS EVERYTHING

**Using Helpful Hints Daily = Ultrasound hollow,
halo absent, drusen absent**

Nevus to melanoma

"To Find Small Ocular Melanoma
Using Helpful Hints Daily" (TFSOM-
UHHD)

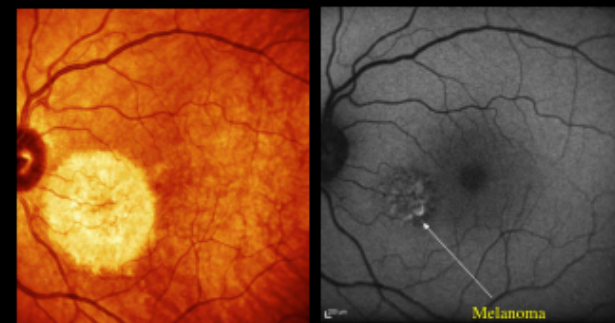
- T → *thickness greater than 2 mm,*
- F → *fluid subretinally*
- S → *symptoms*
- O → *Orange pigment present,*
- M → *margin with in 3 mm of the optic disc*
- UH → *USG hollowness (versus solid/flat)*
- H → *halo*
- D → *drusen absent*



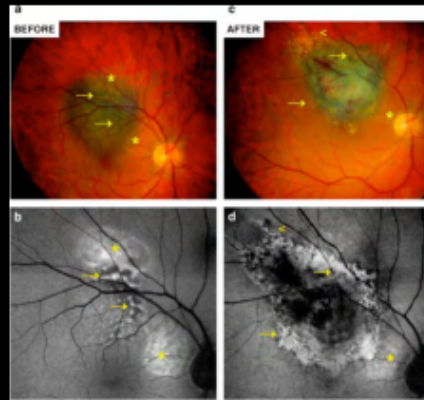
Orange Pigment = Lipofuscin



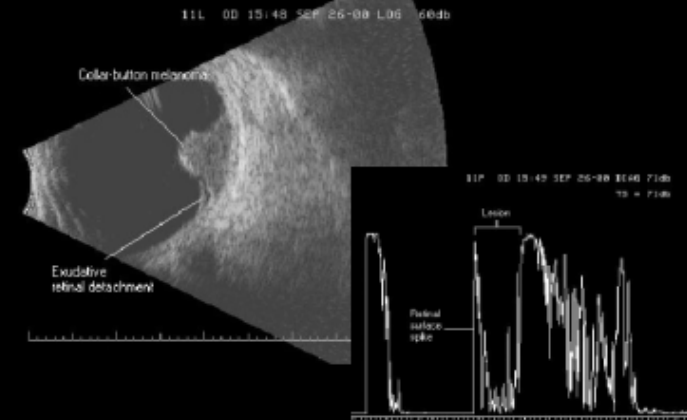
Fundus Autofluorescence (FAF) of a Small Choroidal Mass



Fundus Autofluorescence (FAF) in Choroidal Melanoma



Echography of Large Melanoma



EDI-OCT

ARCH OPHTHALMOL/VOL 130 (NO. 7), JULY 2012

CLINICAL SCIENCES

Enhanced Depth Imaging Optical Coherence Tomography of Small Choroidal Melanoma

Comparison With Choroidal Nevus

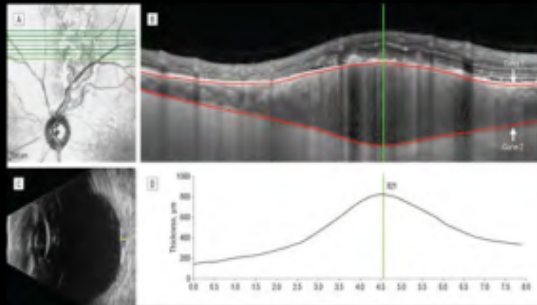
Carol L. Shields, MD; Swathi Kalish, MD; Daeguwan Rajanaporn, MD; Sankar R. Ferenczy, CRA; Jerry A. Shields, MD

- Mean small melanoma thickness was **1025 microns on EDI-OCT** compared to **2300 microns on ultrasonography**.

WHAT IS ENHANCED DEPTH OCT IMAGING?

- EDI-OCT modifies the standard technique of image acquisition to better reveal the structural details of the **outer retina, RPE/Bruch's, and choroid**.

Enhanced Depth OCT (EDI) of Small Melanoma



Shields, 2012

Pete's Tavern (1864)

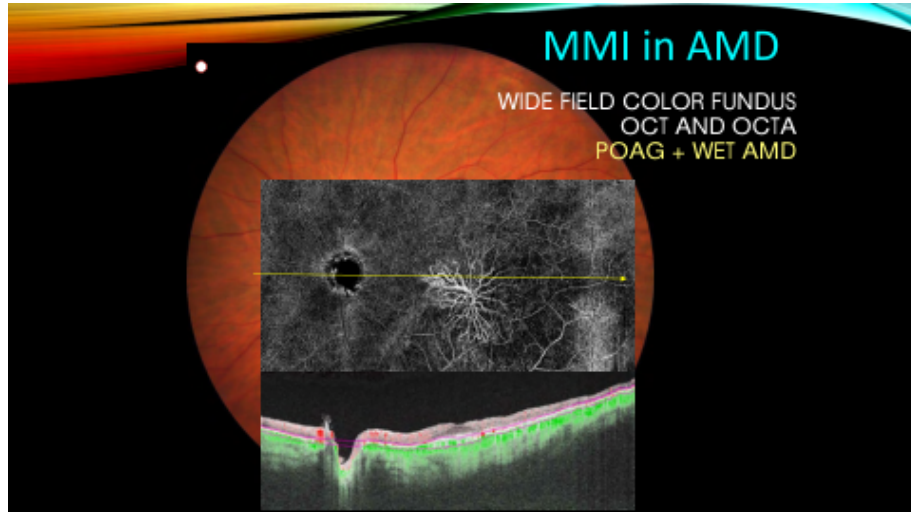
Throughout Prohibition, Pete's disguised itself as a flower shop while still keeping its imbibing clientele satiated behind the scenes.



OCT/OCTA has forever changed the classification, diagnosis, and management of AMD, and especially nAMD.

76 Y/O WM

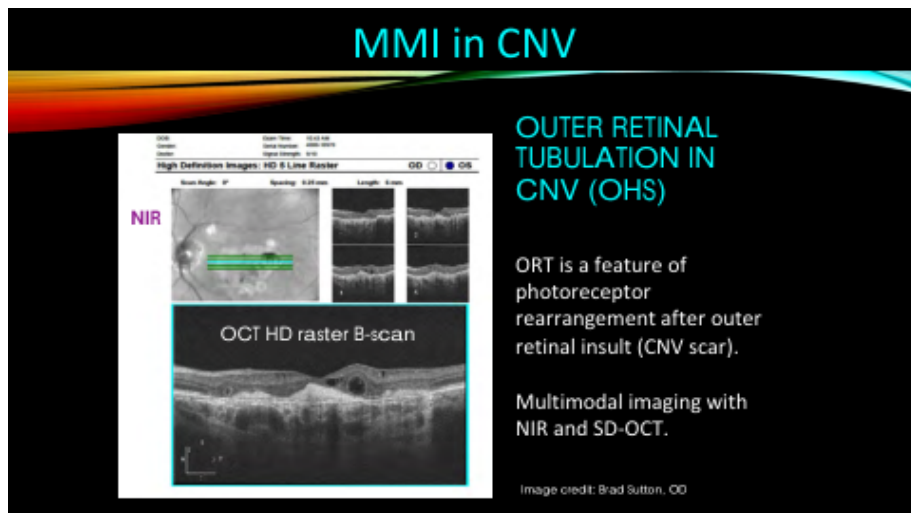
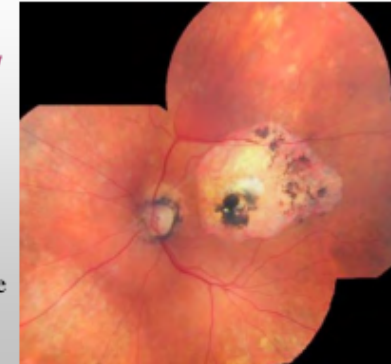
- CC: Worsening central vision OS x 4 wks
- Oc Hx: POAG OU
 - S/p SLT OS x 6 mon, SLT OD x 9 mon
 - Intermediate Dry AMD OU
 - Taking ARED2 Plus supplements
- VA:
 - OD 20/30 PHNI
 - OS 20/40 PHNI, down from 20/25 four mon prior
- IOP: 14 OD/13 OS



MMI in CNV

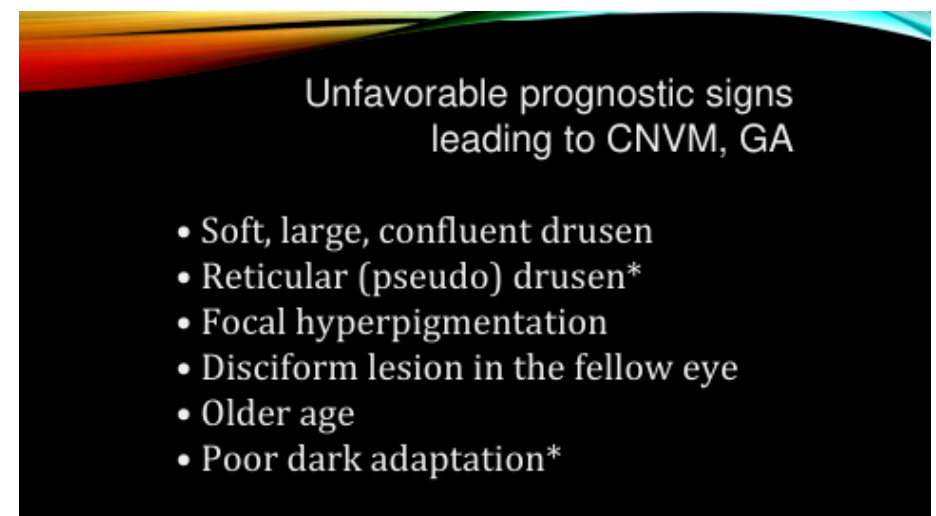
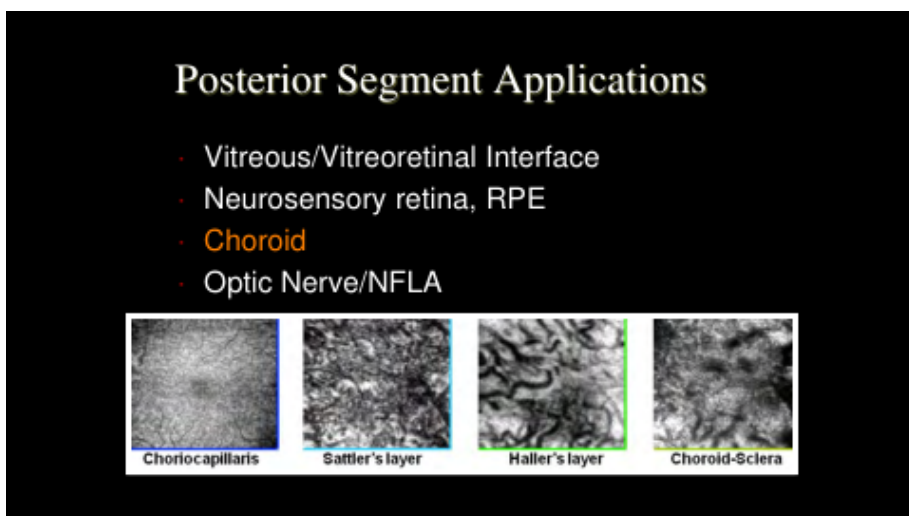
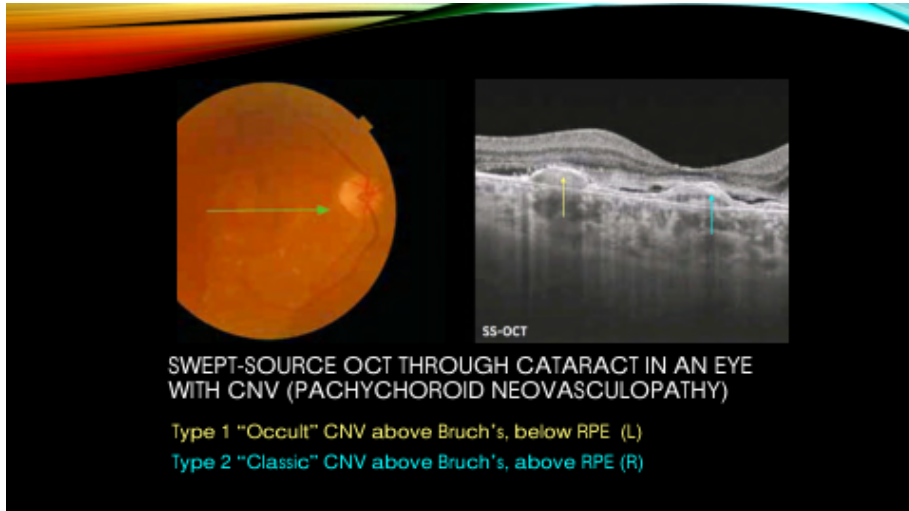
Causes of CNV

- AMD
- Angioid streaks
- OHS →
- High myopia
- Choroidal rupture
- Chronic CSC



3 MAIN CNV TYPES

- Type 1 or "Occult" CNV
 - NV develops in choroid
 - NV is located above Bruch's and **below the RPE**
- Type 2 or "Classic" CNV
 - NV develops in choroid
 - NV is located above Bruch's and **above RPE**
 - **May respond to anti-VEGF better than type 1.**
- Type 3 or RAP
 - NV develops in **retina**, anastomoses w/choroid

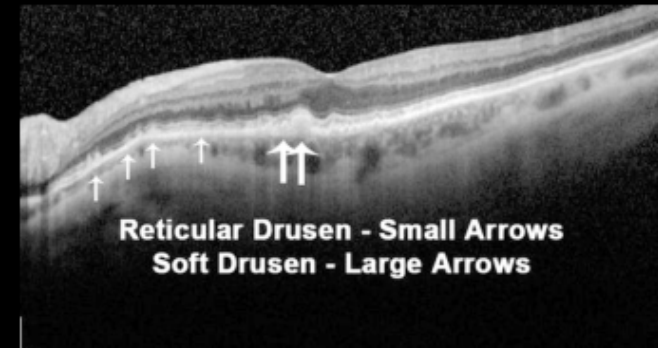


Reticular (Pseudo)drusen (RPD)

- Seen as a reticular pattern of small yellow-white lesions often in the superior macula, RPD are a high-risk sign for advanced AMD.

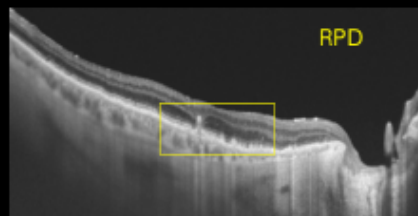


Reticular (Pseudo)drusen



AMD, HD Raster Scan w/EDI

Suspect Reticular Pseudodrusen

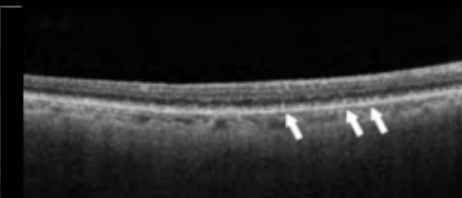
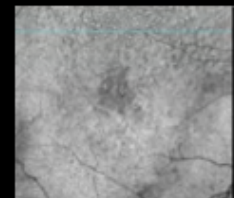


Reticular (Pseudo)drusen

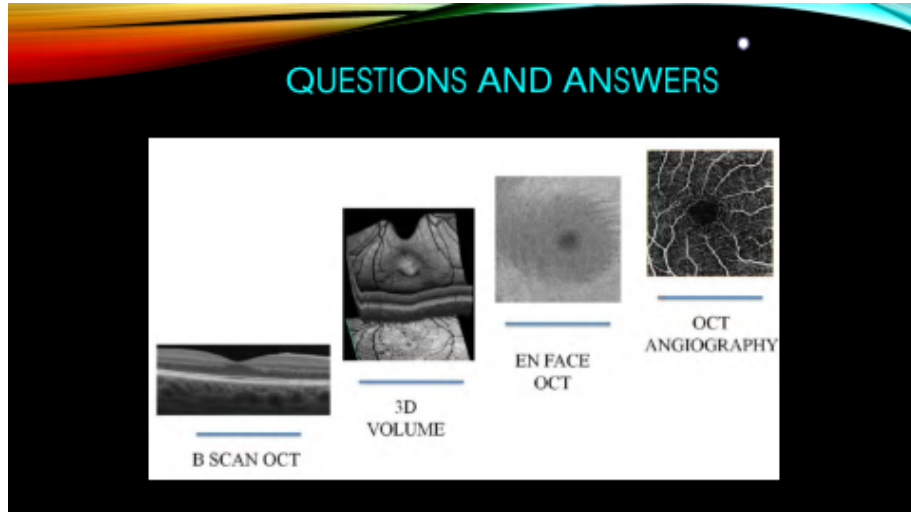
- Presence of RPD is a consistent risk factor for progression to both atrophy and CNV

IS/OS C-scan

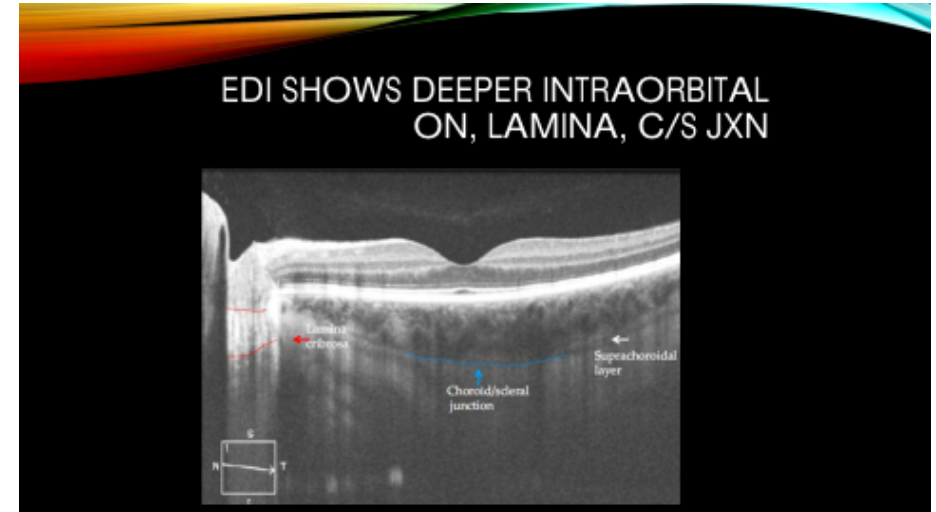
B-scan



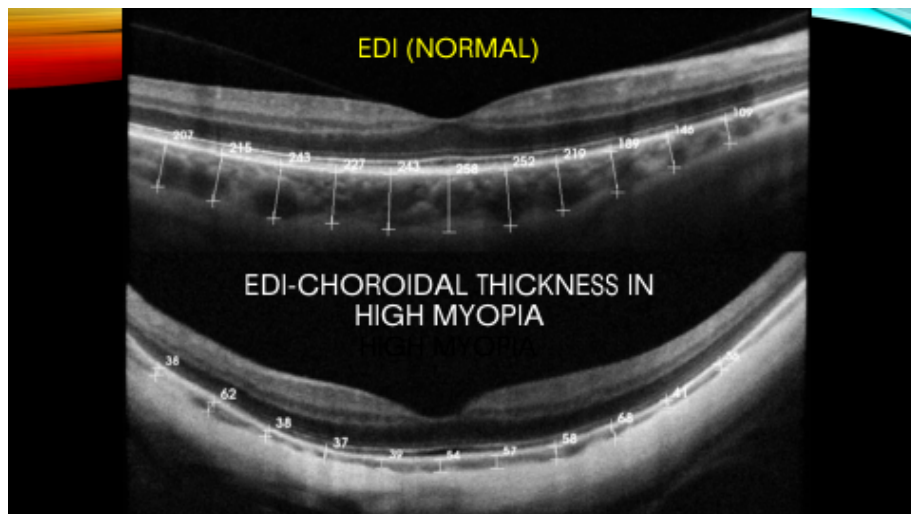
Slide 113



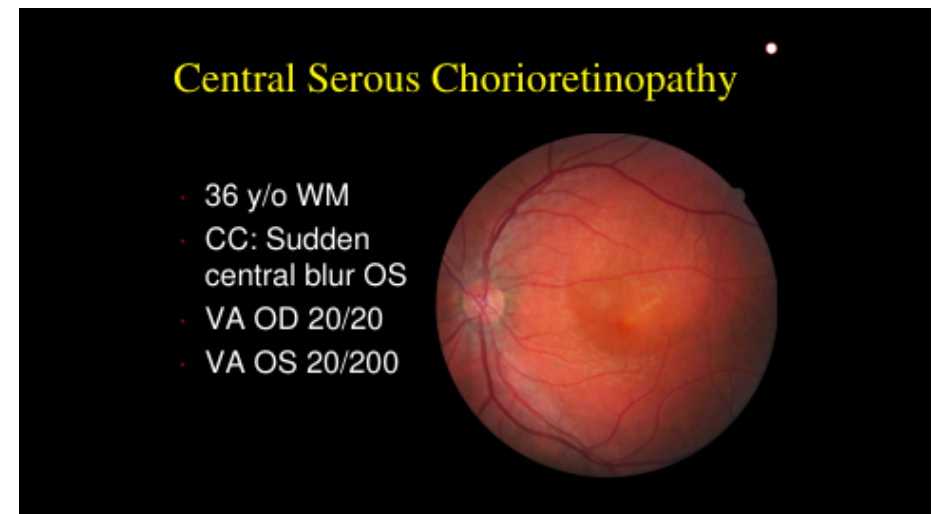
Slide 114



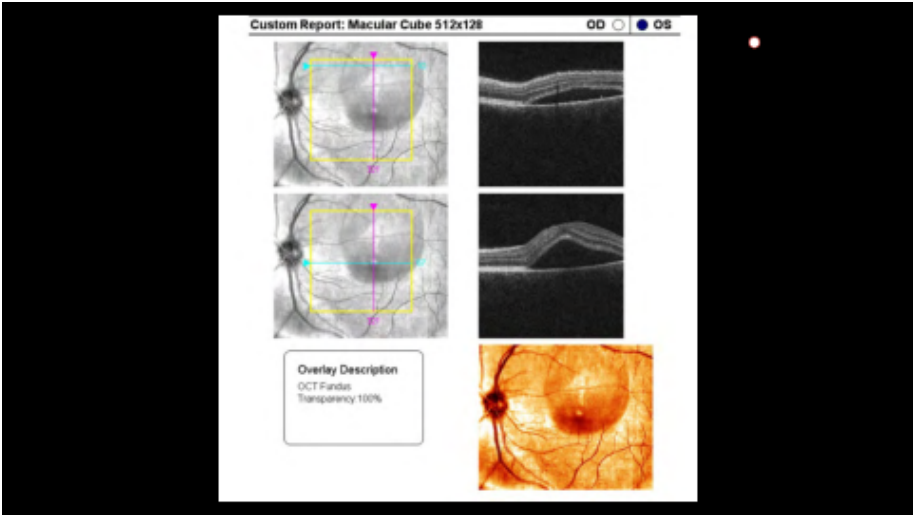
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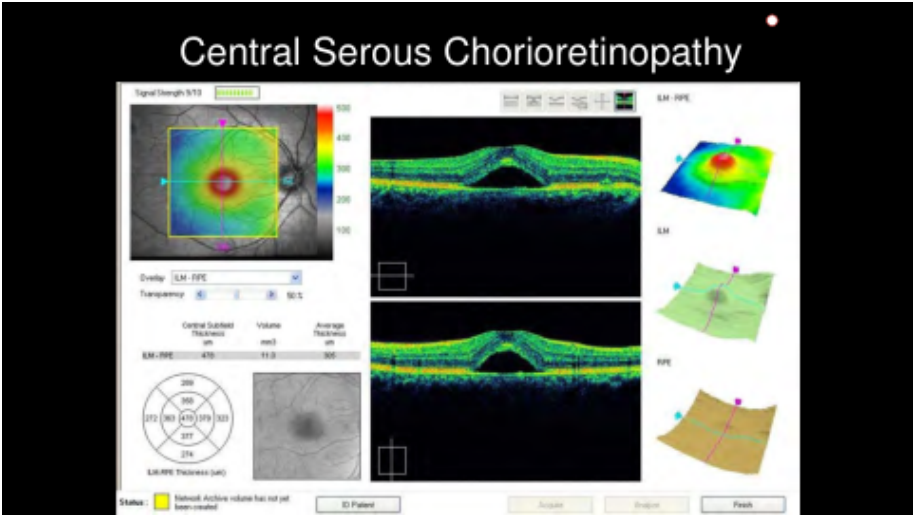
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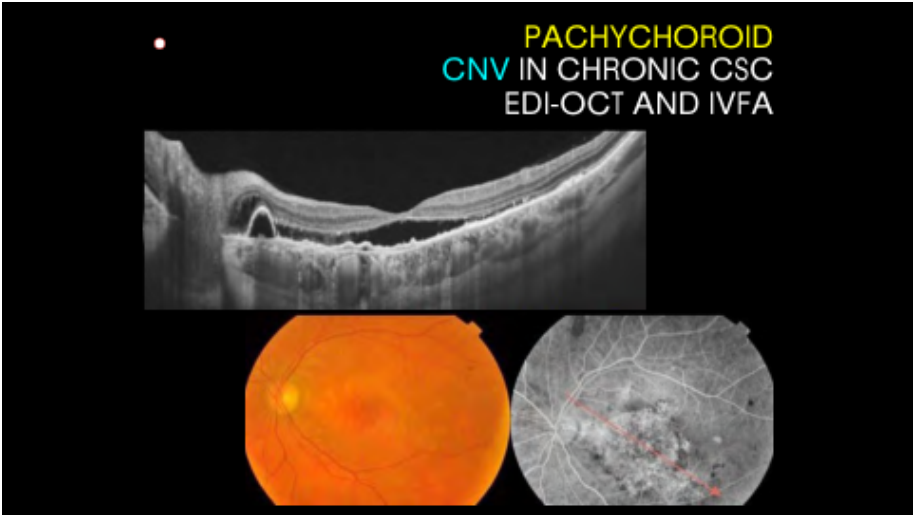
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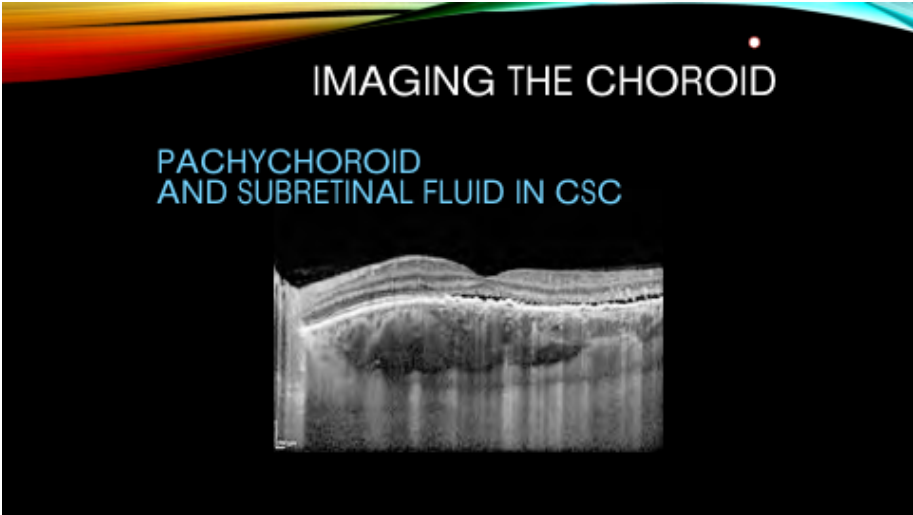
Slide 118



Slide 119

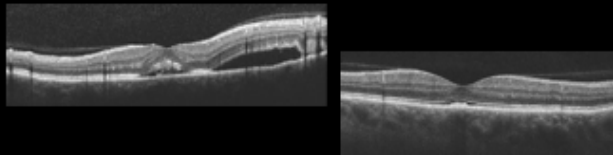


Slide 120



CSC MANAGEMENT

- Due to the high likelihood of spontaneous resolution, first line management for first time CSC remains risk factor modification (reduce stress, d/c steroids) and observation.



WHAT CAN BE DONE FOR CSC THAT PERSISTS OR RETURNS?

CSC MANAGEMENT

• For CSC that persists or returns:

- In eyes with focal lesions not involving the fovea, **focal argon laser** treatment may be suitable.
- In eyes with **foveal involvement**, **photodynamic therapy** or **micropulse diode laser** would spare central vision.
- As our understanding of the mechanism of CSC grows, new therapies, such as a **spironolactone** or eplerenone, may (or may not) prove to be beneficial.

- Pichi F, Carrai P, Ciardella A, Behar-Cohen F, Nucci P. "Comparison of two **mineralocorticosteroids receptor antagonists** for the treatment of central serous chorioretinopathy." Int Ophthalmol (2016)

ITALY WINE MOMENT





Bridge Cafe



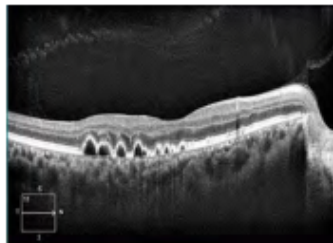
Bridge cafe- the building, dating back to 1794, was once a speakeasy and a pit stop for pirates.

Q & A WINE MOMENT



- pizzimen@uiwtx.edu

Tiny Bubbles



Joseph J. Pizzimenti, OD, FAAO

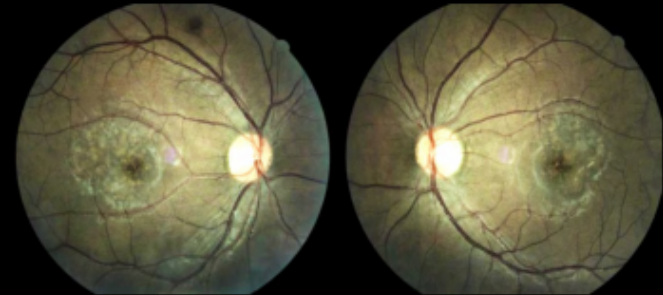
Case History and Clinical Findings

- A 30-year-old male presented with a chief complaint of mild, bilateral central blur of one year's duration.
- Health history was positive for type 2 diabetes.
- Best corrected visual acuities were 20/25 at distance and 20/20 at near for both eyes.
- Amsler testing revealed central metamorphopsia in each eye.

Additional Clinical Findings

- Dilated funduscopy showed a honeycomb pattern of pigment epithelial changes within each central retina that resembled small, translucent bubbles.
- Mod NPDR OD, Mild NPDR OS without macula edema.
- Peripheral retina intact and unremarkable OU

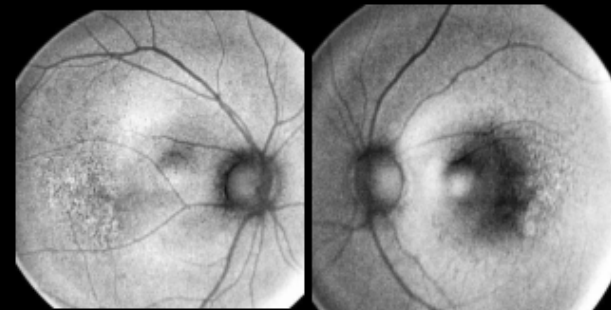
Color Fundus Photography



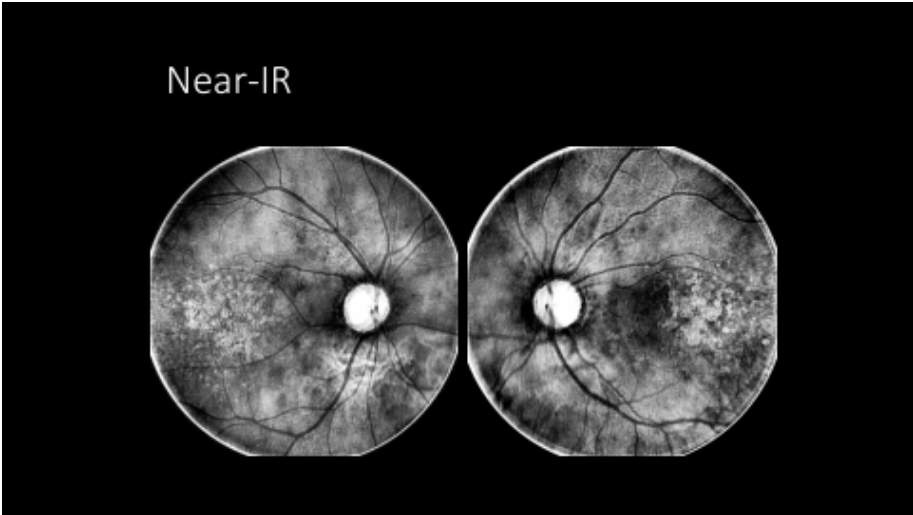
Special Testing

- Further investigation through MMI with FAF and OCT confirmed **multiple serous RPEDs** of various sizes in both eyes spanning 2.5 DD centered around the fovea.
- Differential Diagnosis
 - Pattern Dystrophy of RPE
 - Central Serous Chorioretinopathy
 - **Bilateral Idiopathic Multiple RPE Detachment**

FAF

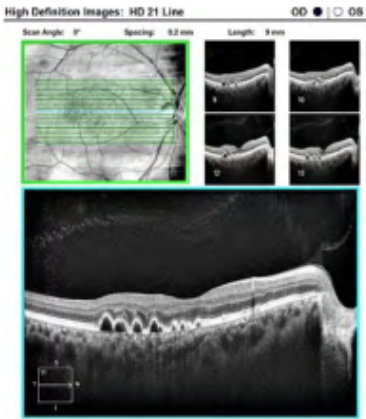


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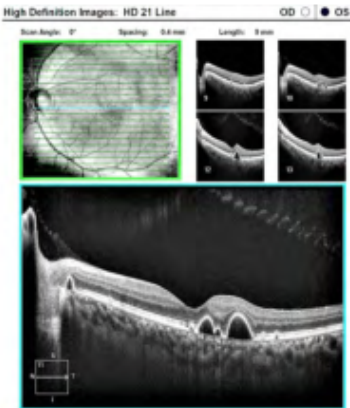
Slide 134

OCT-OD: Multiple RPEDs of Varied Size



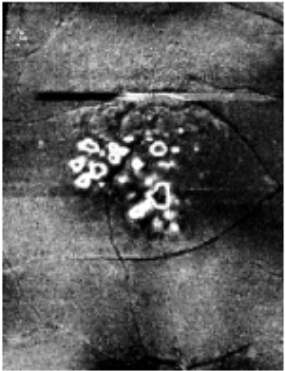
Slide 135

OCT OS: Multiple RPEDs of Varied Size,
Note Slightly Thick Choroid

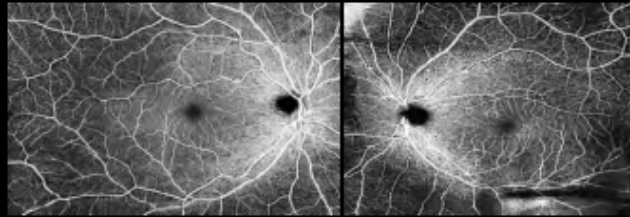


Slide 136

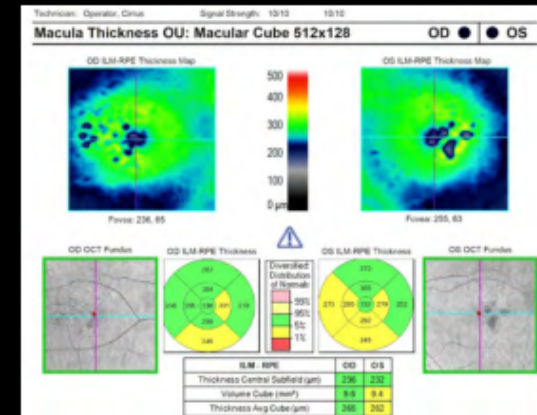
En Face OCT Showing “Tiny Bubbles”



OCTA rules out MNV



Retinal thickness maps show pattern of RPEDs. Sub-RPE fluid is underneath the dark blue areas.

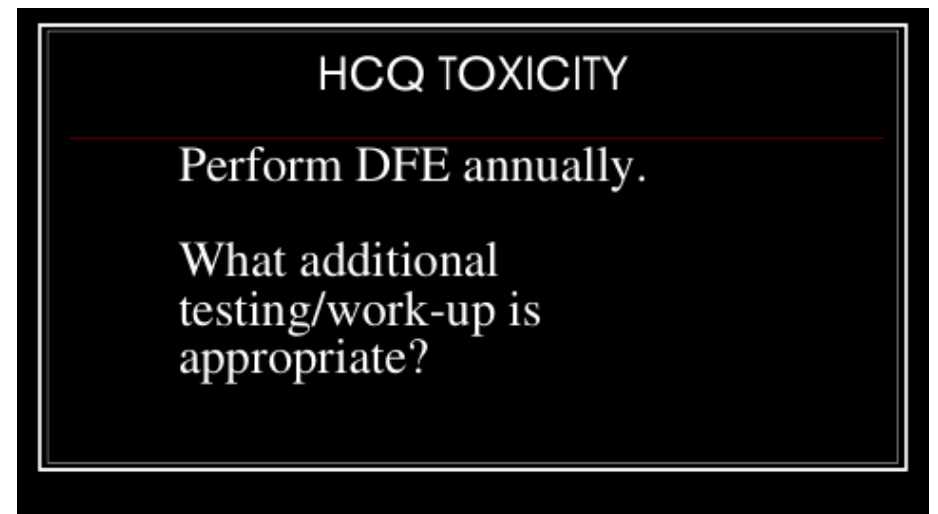
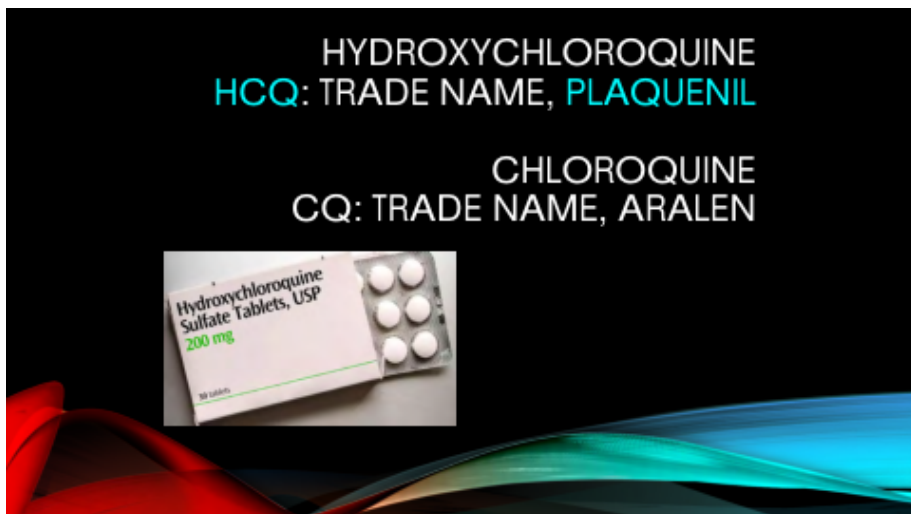
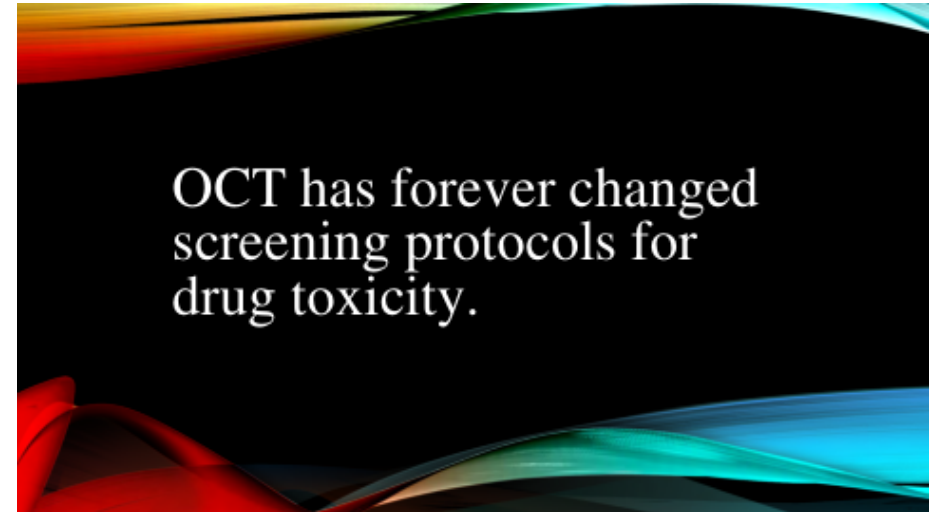
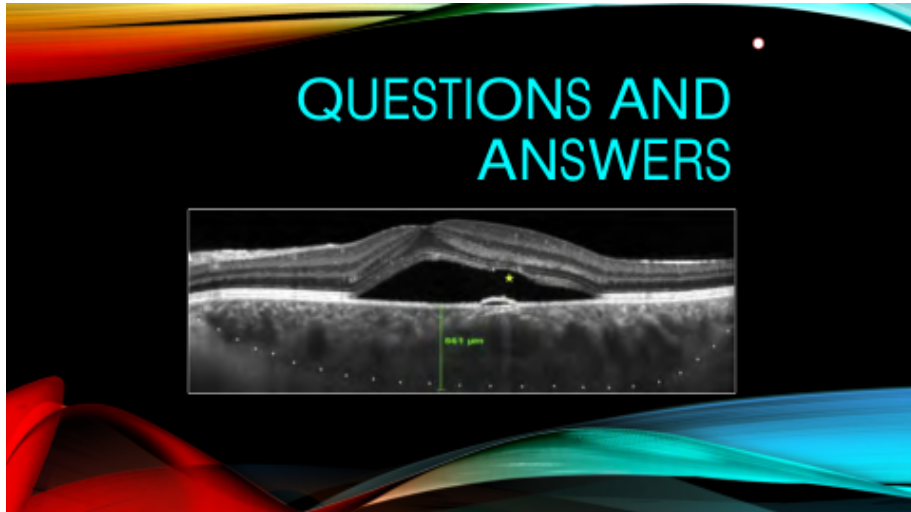


Discussion

- **Bilateral Idiopathic Multiple RPED** is a rare presentation that may represent an atypical form of CSC or another pachychoroid syndrome.
 - Pachychoroid Pigment Epitheliopathy
- There is currently no preferred treatment, besides observation, as visual prognosis is typically good.

Conclusion

- Multimodal ophthalmic imaging is useful in ruling out various differential diagnoses, as well as monitoring for progressive changes such as serous RD and MNV.
- MMI was a difference maker in revealing the diagnosis of this case.



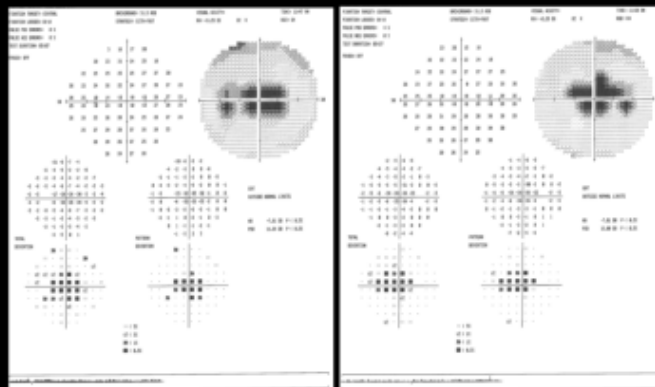
Case

- 65 Year old Asian Female
- Comes in with complaints of blurred and dimmed vision
- PMH: Rheumatoid Arthritis x 15 years
- OcHx: S/P CE and IOL OU

Ophthalmic Exam

- VA:
 - OD: 20/60 OS: 20/70
- IOP
 - OD: 14 OS: 13
- SLE:
 - OD: PCIOL OS: PCIOL
- DFE:

Patient Case: VY 65 y/o Asian Female Central Threshold Perimetry: Why 30-2?

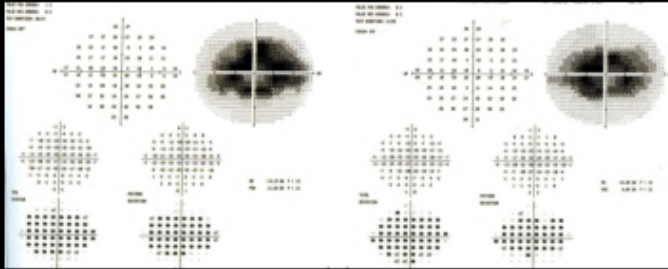


Pericentral Retinopathy and Racial Differences in Hydroxychloroquine Toxicity

Ronald B. Melles, MD,¹ Michael F. Marmor, MD²

Melles RB, Marmor MF. Pericentral retinopathy and racial differences in hydroxychloroquine toxicity. *Ophthalmology* 2015; 122: 110-116.

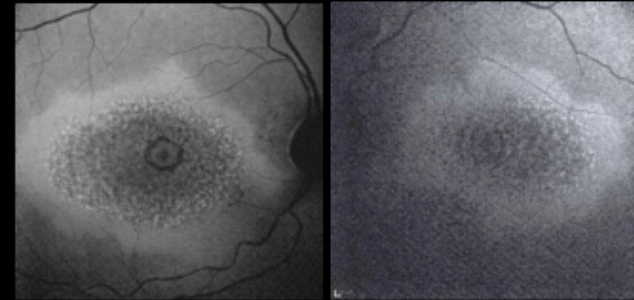
Patient Case: VY Central 10-2 VF



Fundus Auto-fluorescence (FAF): Case VY

OD

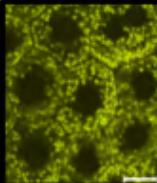
OS



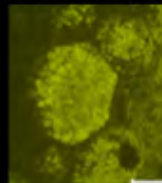
Imaging Technologies: FAF

What is autofluorescence in the retina?

- It is the fluorescence of the **lipofuscin** molecule within the RPE cell layer that fluoresces with a certain wavelength.



19 years



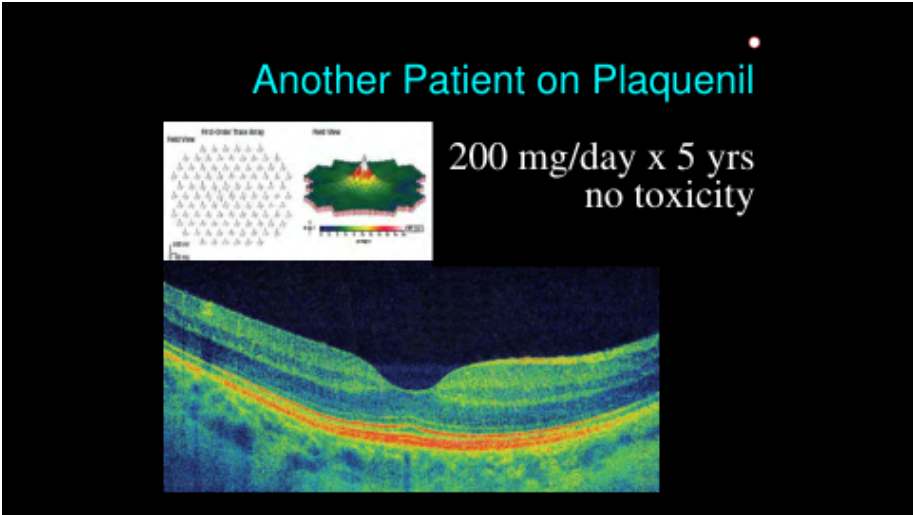
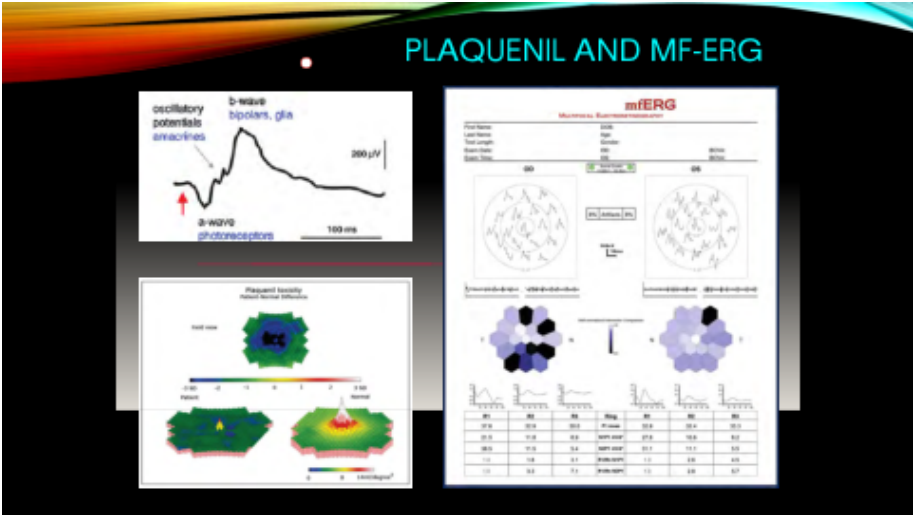
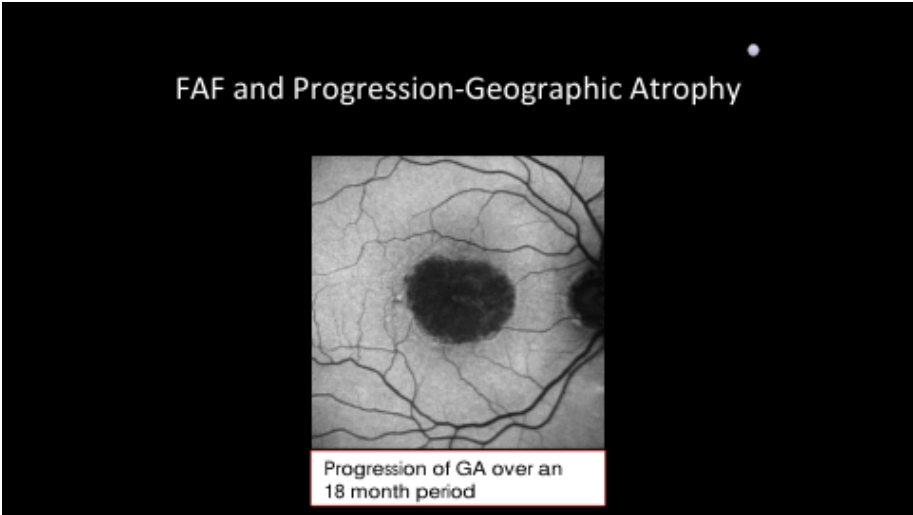
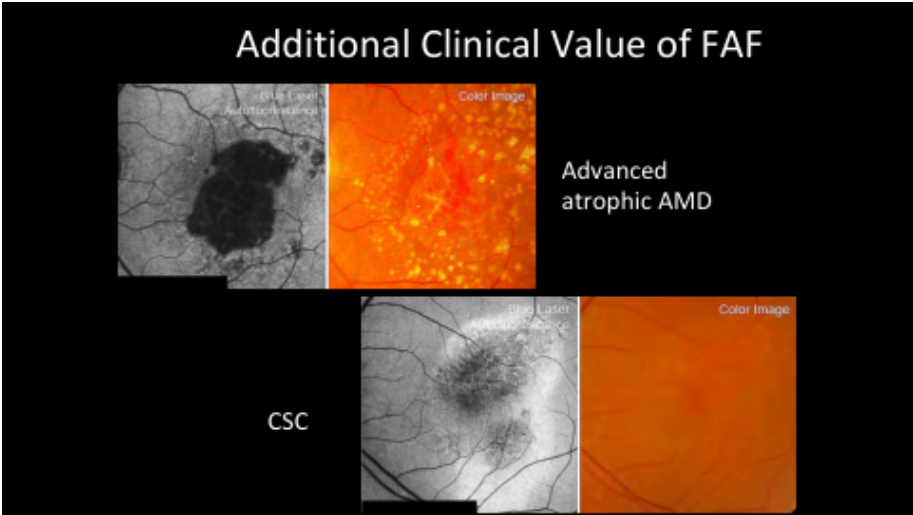
64 years

MULTIMODAL IMAGING:

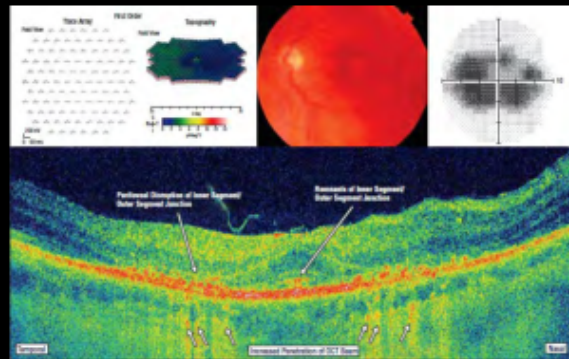
FUNDUS AUTOFLUORESCENCE

While OCT assesses structure, and IVFA assesses BRB integrity, FAF captures

metabolic activity.

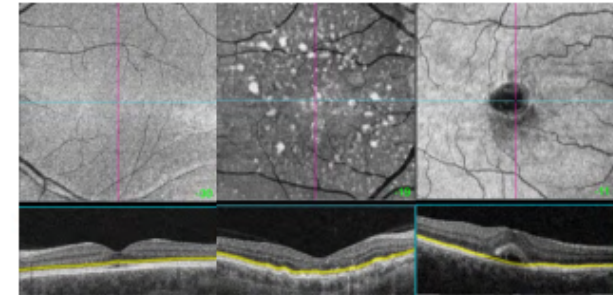


Plaquenil Toxicity- mfERG



Plaquenil Toxicity

- By the time “flying saucer” or “bullseye” is detected, significant toxic damage has occurred.
- May progress even if drug is stopped.
- Ganglion cell analysis and en face OCT may offer early detection.



What is the recommended maximum HCQ dose ?

- Calculate **Max Dose** in mg/day
- $2.3 \times \text{weight (in lbs.)} = \text{Max dose}$
- At recommended dose, risk of toxicity is < 1% after 5 years, < 2% after 10 yrs.
- **Risk rises to almost 20% after 20 years. ****
 - Our patient VY (~110-120 lbs) was taking 400 mg/d for 20 yrs
- Risk for HCQ maculopathy depends on **daily dose, duration of use**

American Academy of Ophthalmology Statement

Recommendations on Screening for Chloroquine and Hydroxychloroquine Retinopathy (2016 Revision)

Michael F. Marmor, MD,¹ Ulrich Kellner, MD,² Timothy Y.Y. Lai, MD, FRCOphth,³ Ronald B. Meller, MD,⁴ William F. Mieler, MD,⁵ for the American Academy of Ophthalmology

Background: The American Academy of Ophthalmology recommendations on screening for chloroquine (CQ) and hydroxychloroquine (HCQ) retinopathy are revised in light of new information about the prevalence of toxicity, risk factors, fundus distribution, and effectiveness of screening tools.

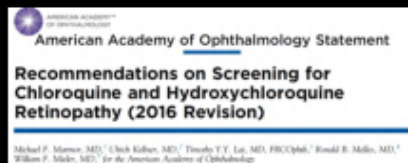
Pattern of Retinopathy: Although the locus of toxic damage is perifoveal in many eyes, Asian patients often show an extramacular pattern of damage.

Dose: We recommend a maximum daily HCQ use of ≤ 5.0 mg/kg real weight, which correlates better with risk than ideal weight. There are no similar demographic data for CQ, but dose comparisons in older literature suggest using ≤ 2.3 mg/kg real weight.

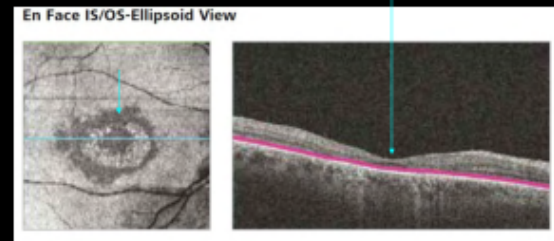
Risk of Toxicity: The risk of toxicity is dependent on daily dose and duration of use. At recommended doses, the risk of toxicity up to 5 years is under 1% and up to 10 years is under 2%, but it rises to almost 20% after 20 years. However, even after 20 years, a patient without toxicity has only a 4% risk of converting in the subsequent year.

HCQ SCREENING FREQUENCY

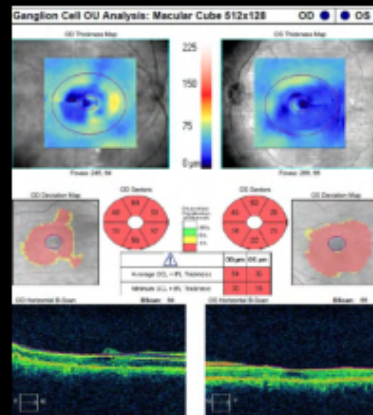
- **Baseline:** DFE within 1 year of starting HCQ
- **Visual field and SD-OCT** if macular abnormalities are present at baseline
- **Annual screening:** Begin after 5 years of use
 - Sooner in presence of "major risk factors"



PLAQUENIL MACULOPATHY WITH CLASSIC BULL'S EYE DUE TO ANNULAR FOVEAL ATROPHY



GCL + IPL loss in HCQ maculopathy



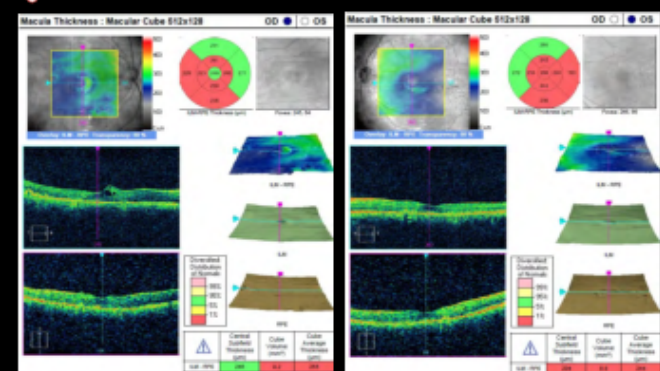
Expanded spectral domain-OCT findings in the early detection of hydroxychloroquine retinopathy and changes following drug cessation

David R. Kelly, Jeffrey S. Heier, Caroline Beaudou, Anne C. Miller, Steven Miller, Ching P. Shah, Chae-Rae Choi, Nathan S. Halpern, Igor Stancu, Adam Rogers and Jay S. Othman
 International Journal of Retina and Vitreous 2016; 32: 10
 doi:10.1016/j.ijretv.2016.03.004
 Received 1 April 2016; Accepted 27 June 2016; Published 10 July 2016



Acknowledgement: Drs. K. Ramirez and J. Rabin, UIWRSO VNS clinic

Note significantly thin maculae and cystic retinal changes



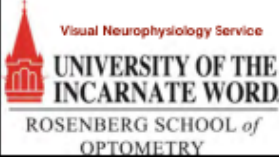
Acknowledgement: Drs. K. Ramirez and J. Rabin, UIWRSO VNS clinic

FROM THE AUTHORS

- “(Real) weight-based dosage and **early screening** (DFE, central fields, OCT, FAF, mfERG) are essential to prevent HCQ toxicity,
- particularly with certain **risk factors**: small stature, high total dosage, diminished renal function, concomitant tamoxifen use, and/or existing retinal/macular disease.
- **Interprofessional collaboration** to optimize patient outcomes.”



The Journal of Rheumatology
Volume 46, no. 12
Hydroxychloroquine Ocular Toxicity: Lessons Learned
JEFF C. HAHN and KIRSTI RAMIREZ
J Rheumatol 2019;46:1940-1941
<http://dx.doi.org/10.1093/rheumatology/kwz012>



Visual Neurophysiology Service
UNIVERSITY OF THE INCARNATE WORD
ROSENBERG SCHOOL of OPTOMETRY

Plaquenil Maculopathy

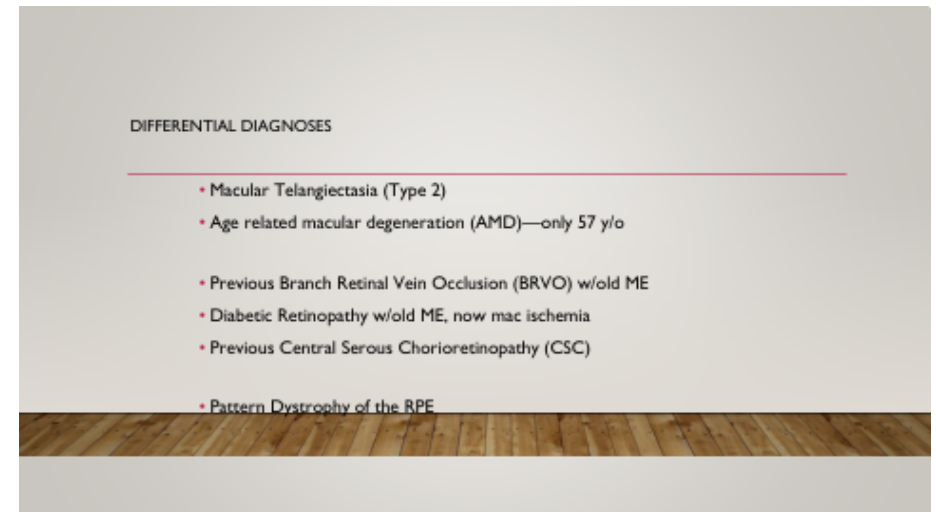
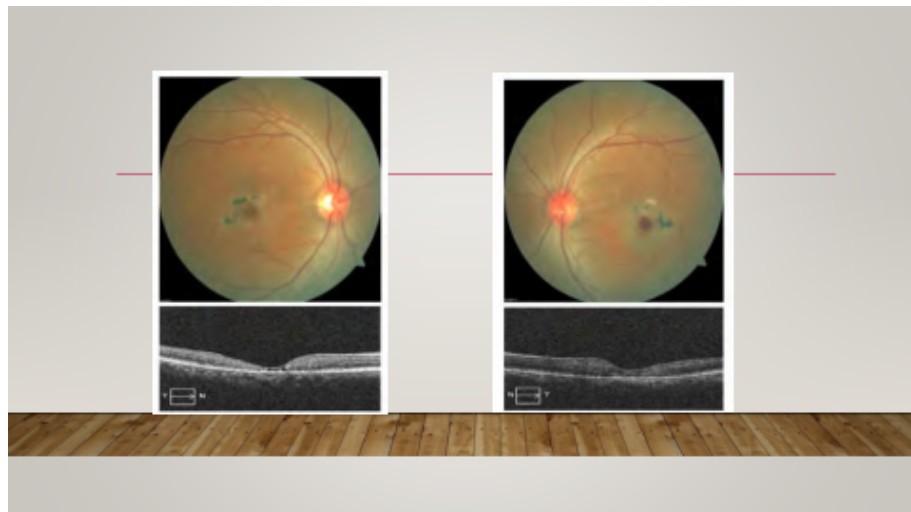
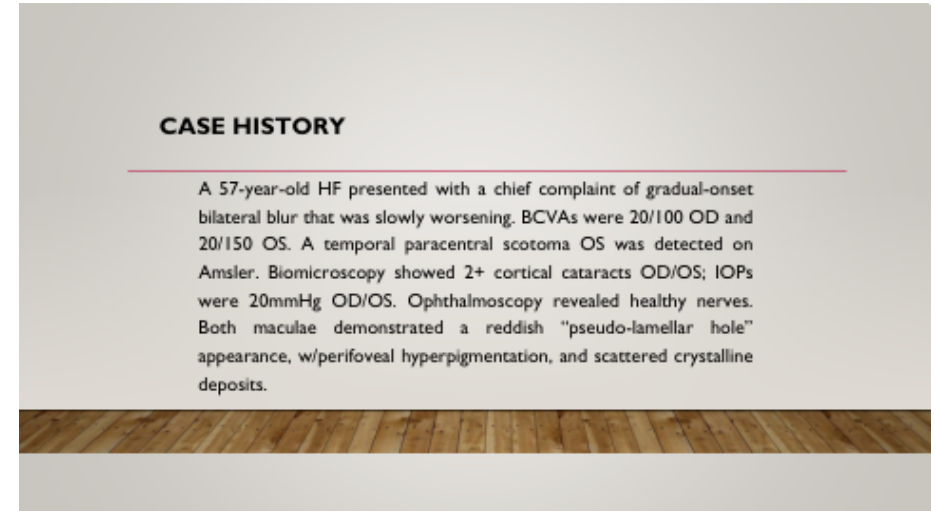
- Testing for patients on Plaquenil
 - DFE
 - VF 10-2 W/W (add 24-2 or 30-2 in Asians)
 - SD or SS-OCT: raster and cube scans
 - FAF
 - mfERG
- Increase frequency of monitoring (2+ visits per year) w/degree of pathophysiology.

Summary and Case Outcome

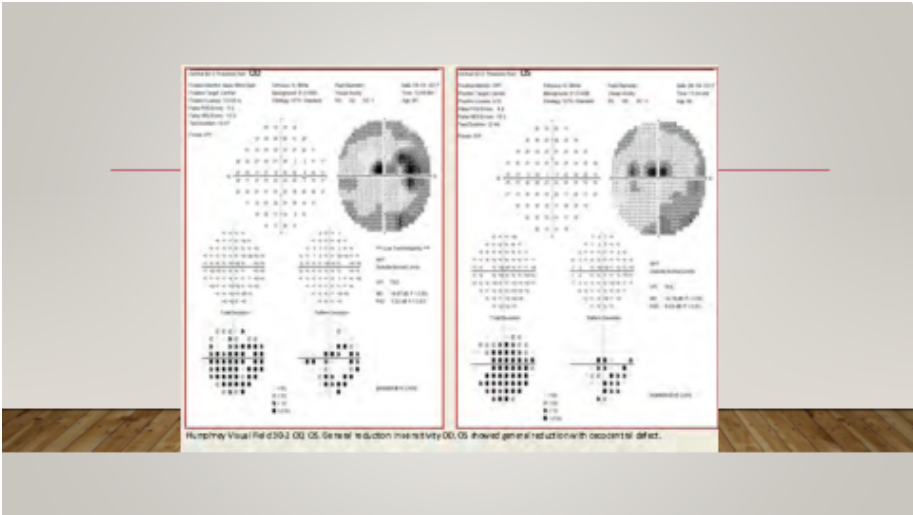
- MMI and other diagnostics are essential in evaluation of patients using CQ or HCQ on a chronic basis.
- Co-management team includes:
 - Optometry
 - **Rheumatology**
 - Other therapies: methotrexate, TNF inhibitors (our patient VY was switched to this drug class)

Q & A

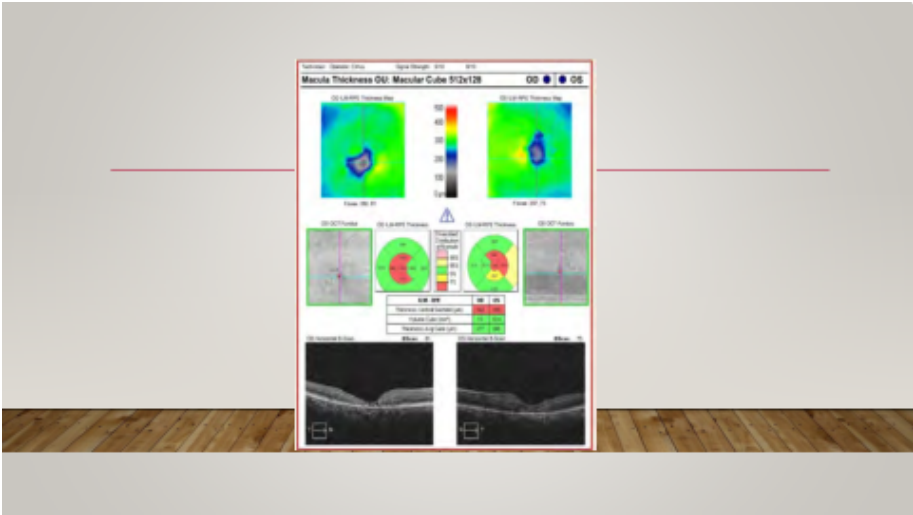




Slide 173



Slide 174

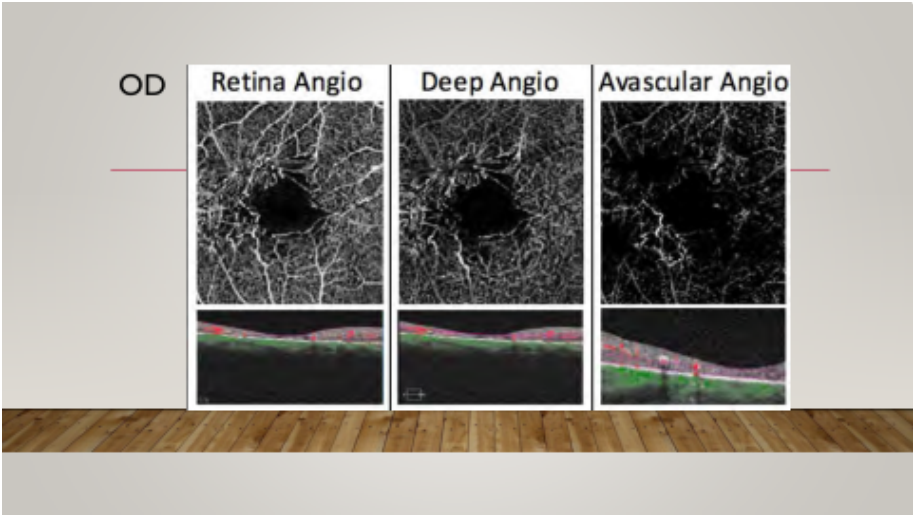


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OCTA- OD

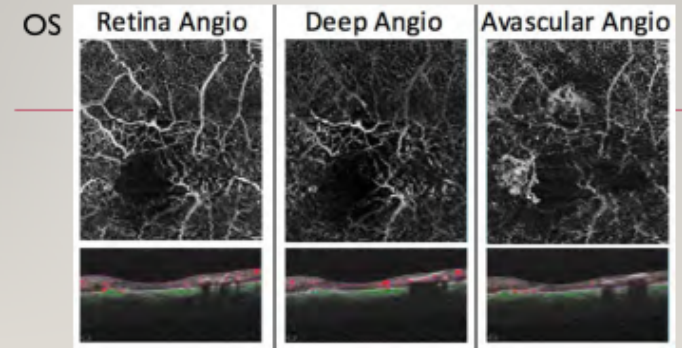
- OCT-Angiography of OD highlights temporal perifoveal telangiectasias in the superficial, deep, and even avascular layers of the retina.
- These particular telangectatic vessels appear deeper than usual.

Slide 176



OCTA- OS

- OCT-Angiography of OS highlights temporal perifoveal telangiectasias in the superficial and deep layers of the retina. In addition, two areas of sub-retinal neovascularization (SRN) can be visualized in the avascular retina: the most prominent SRN is nasal to the fovea, and more subtly, a small SRN is present superior to the fovea.



HD RASTER SCANS
OD OS OS



Below: A color HD raster scan of the macula and peripapillary optic nerve (OS) revealing areas of pigment dumping and sub-retinal atrophy. B/C: HD raster scan of OS showing two SRNs adjacent to areas of pigment dumping in the macula.

ASSESSMENT AND PLAN

Assessment: Bilateral MacTel (Type 2)

Plan. The patient was referred for consideration of SRN treatment, low vision evaluation, and diabetes and hypertension workup. An Amsler grid was dispensed.

Treatment. Most treatment options for MacTel are of limited efficacy and lack sufficient evidence. Anti-VEGF and PDT may be beneficial in MacTel cases with SRN.

TREATMENTS AND DISCUSSION

Treatment/Discussion.

- Anti-VEGF therapy is the most promising treatment for Mactel with SRN.
- New research suggests that Anti-VEGF agents improve structure in Mactel both with and without SRN, but functional gain is limited to eyes with proliferation.
- It is important to monitor eyes with Mactel every 4-6 months for SRN development.

Conclusion.

- OCT-A aids in the diagnosis of MT and may enable earlier detection of SRN.

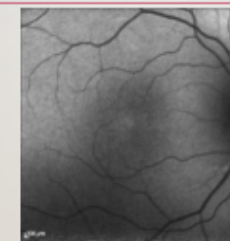
ABOUT MACTEL

- Macular telangiectasia (Mactel) is characterized by congenital or acquired perifoveal dilated retinal capillaries. Some caps take a right-angle turn toward FAZ.
- Mactel Type 2 is bilateral, affects both sexes equally, and is the most common form.
- The pathophysiology is unknown; however, dominant inheritance is suspected.
- Fundus findings include perifoveal telangiectasia, crystalline deposits, retinal pigmentation, retinal/RPE atrophy, blunted venules, and sub-retinal neovascularization (SRN).
- Long-term visual prognosis is variable. According to the Mactel Project, patients with type 2 will have a mean VA of 20/40; rarely do patients have VA <20/200.
- In several studies, HTN and DM have been highly correlated to cases of Mactel.

TYPES OF MACTEL

- Type 1
 - Perhaps a mild form of Coats disease.
 - Like Coats, these patients are typically male and have a unilateral presentation. Exudates, heme.
 - Changes are more often localized to the macula and paramacular area than is seen in Coats disease.
- Type 2
 - Male or female and usually have a bilateral presentation. This form is associated with minimal to no lipid exudation and demonstrates superficial retinal crystals in approximately 50% of patients.
 - Pigment hyperplasia, migration and plaque formation can be seen in the later stages.
- Type 3
 - This type is exceedingly rare. Capillary occlusions are a hallmark sign.

QUESTIONS AND DISCUSSION



FAF useful in visualizing right-angle telangiectatic BVVs.

OCT has forever changed the classification and management of macular holes and other disorders of the vitreoretinal interface.

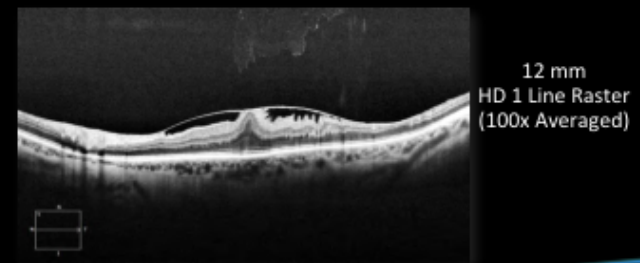


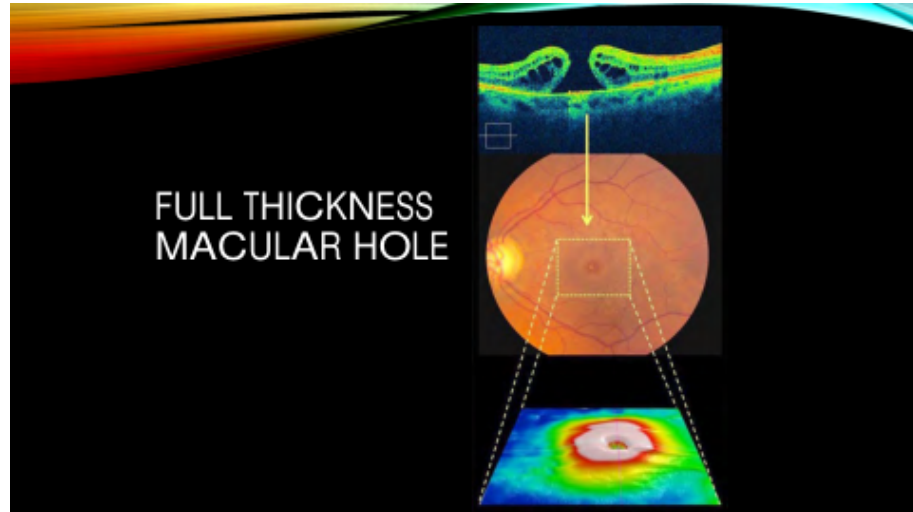
MH CLASSIFICATION & MANAGEMENT

- The International Vitreomacular Traction Study (IVTS) Group formed a classification scheme for VMT and macular holes based on OCT findings:
 - Vitreomacular adhesion (VMA): No distortion of foveal contour; size of attachment area between hyaloid and retina defined as focal if ≤ 1500 microns and broad if >1500 microns
 - Vitreomacular traction (VMT): Distortion of foveal contour present or intraretinal structural changes in the absence of a full-thickness macular hole; focal if ≤ 1500 microns and broad if >1500 microns

Duker JS, Kaiser PK, Binder S, et al. The International Vitreomacular Traction Study Group Classification of Vitreomacular Adhesion, Traction, and Macular Hole. Ophthalmology. 2013;120:2811-2819.

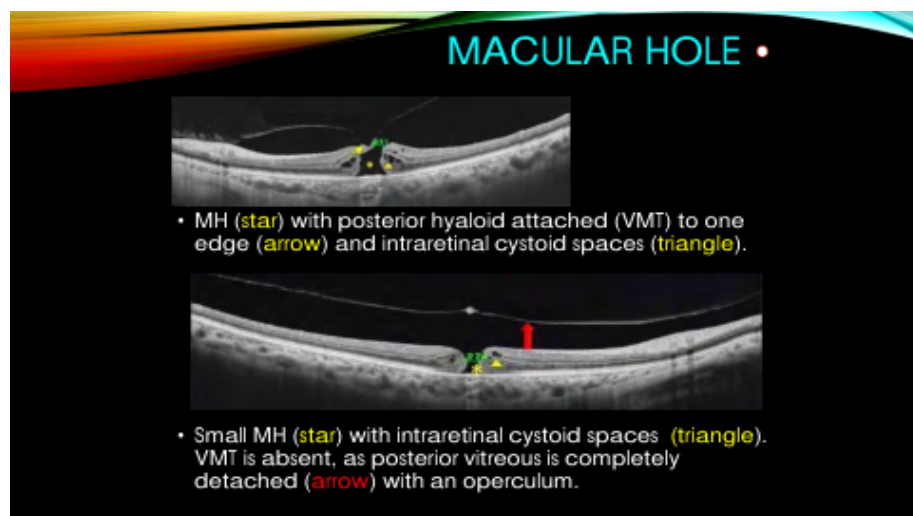
ERM: surgery or wait?





IVTS Classification, cont'd

- **Full-thickness macular hole (FTMH)**: defect from ILM to RPE. Describe 3 factors:
 1. **Size** -- horizontal diameter at **narrowest** point: small ($\leq 250 \mu\text{m}$), medium (250-400 μm), large ($> 400 \mu\text{m}$)
 2. **Cause** -- primary or secondary
 3. Presence or absence of **VMT**
- Other features to note include yellow deposits at base of the hole, RPE changes at base of the hole, and ERM adjacent to hole.



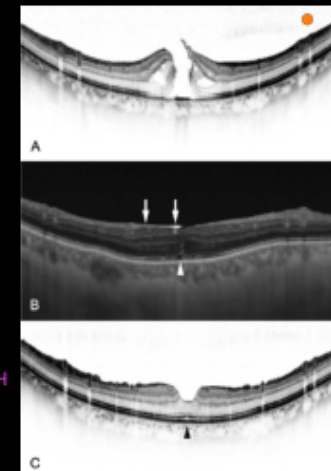
- 59 year-old WM with FTMH.

A. Preoperative SD-OCT "negative" grayscale.

B. SS-OCT on post-op Day 1.

MH is closed with a hyper-reflective junction (arrows) and disruption of the EZ band (arrowhead) at the fovea. Foveal depression is not seen.

C. SD-OCT image of a closed MH at 5 months post-op w/intact EZ band at the fovea (arrowhead).



FOR FURTHER READING: OCT OF MH

DURATION OF PRONE POSITIONING AFTER MACULAR HOLE SURGERY DETERMINED BY SWEEP-SOURCE OPTICAL COHERENCE TOMOGRAPHY

MASAHITO SANO, MD, MARGOTO INOKI, MD, YUJI ITOKI, MD, YOSHIFUKU KITA, MD, KAZUNARI HIRATA, MD, TAKASHI KOTO, MD, AKITO HIRAKATA, MD

Purpose: To compare the closure rate of macular hole closure and duration of the prone positioning after macular hole (MH) surgery with two protocols for halting the prone positioning.

Methods: The authors studied 128 eyes of 128 consecutive patients with MH who had undergone vitrectomy. In 63 eyes of 63 patients, the prone positioning was halted after detecting an MH closure in the swept-source optical coherence tomographic images (SS group). In 65 eyes of 65 patients, the prone position was halted by the surgeon's decision (conventional group). The MH closure rate and duration of the prone positioning were compared.

Results: Close images of the MH were recorded in the SS group on postoperative Day 1 in 58 eyes (90%). In the SS group, MH closure was detected on postoperative Day 1 in 47 eyes (75%) and Day 2 in 4 eyes (7%). The MH was closed in 58 eyes (91%) in the SS group and 53 eyes (82%) in the conventional group ($P < 0.27$). None of the eyes had a reopening of the MH. The duration of prone positioning in the SS group was 1.8 ± 2.5 days, which was significantly shorter than that in the conventional group of 6.1 ± 4.2 days ($P = 0.003$).

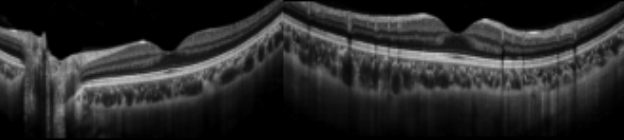
Conclusions: The SS-OCT protocol can significantly decrease the duration of the prone positioning without a reopening of the MH.

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WHAT IS SWEEP SOURCE OCT?

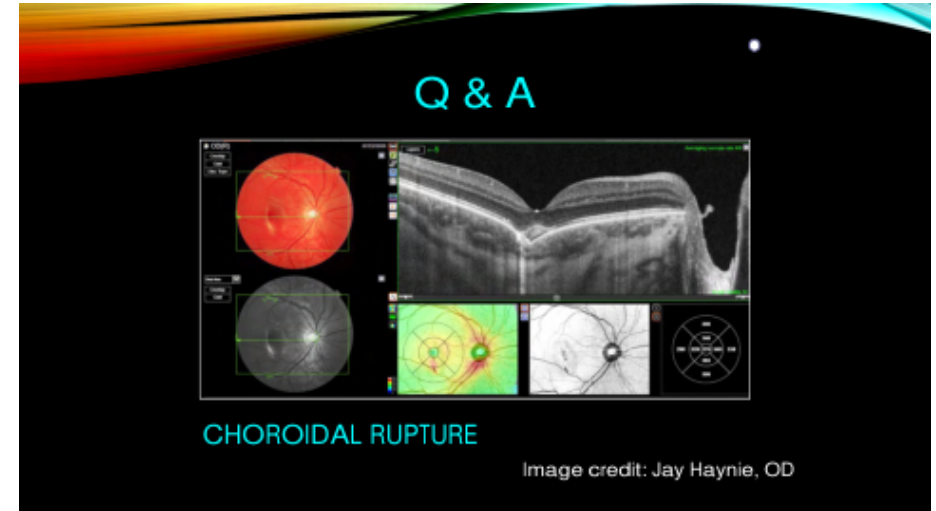
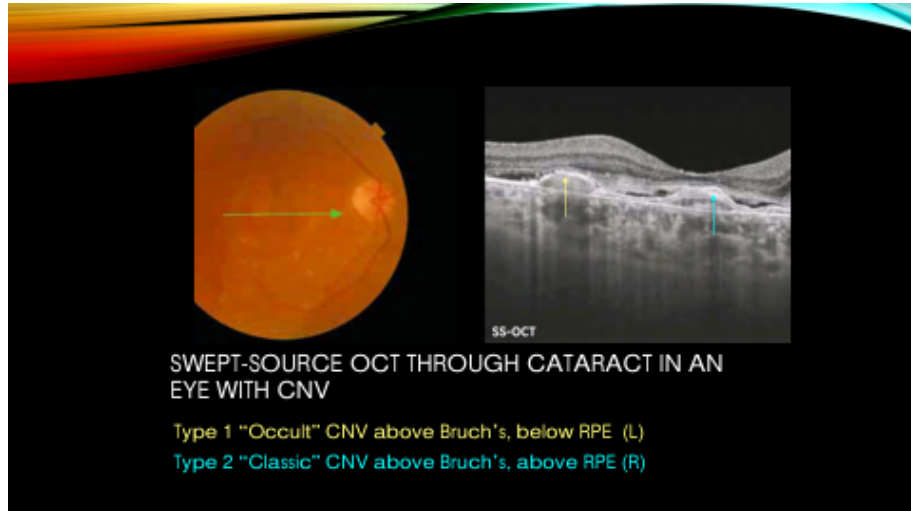
- A second type of **Fourier Domain**-based OCT.
 - The other FD-OCT is Spectral Domain (SD-OCT)*
- SS-OCT
 - Twice as fast (twice as many A-scans / second) as SD-OCT.
 - Allows for wide field imaging (12 mm vs 6-9 mm). Easily captures ONH and macula in same scan.
 - **Uses a longer wavelength**, so can image much more effectively through media opacities, and penetrate **deeper** into the choroid (2.6 mm depth vs. 2.3 mm).

Swept Source OCT



- 1,050nm wavelength
- **100,000-249,000 A-scans/sec!!**
- Allows deeper imaging of choroid, sclera, intra-orbital ON, vasculature (SS-OCTA)

SS-OCT: IMAGING THROUGH CATARACT



Summary

- Contemporary OCT and OCTA provides valuable information about tissue morphology, retinal/choroidal vasculature, and stability versus progression of disease.
- This information, combined with history, DFE, MMI and functional testing, enables clinicians to establish accurate diagnoses and make better-informed decisions.

CONCLUSION

- OCT, OCTA, and MMI have revolutionized posterior segment care.
- Indeed OCT has forever changed retina!

THANK YOU!

Joe

- allthingsoct@gmail.com

A black and white photograph of a man wearing a suit, tie, and a fedora-style hat. He is standing at a podium with a microphone, gesturing with his right hand as if speaking. The background is slightly out of focus, showing what appears to be a stage or lecture hall setting.

Thank you!

Joe

A color photograph of the Sagrada Família, a large, ornate Gothic Revival church in Barcelona, Spain. The church features multiple spires and intricate architectural details. It is surrounded by green trees and a clear blue sky. In the foreground, there is a body of water reflecting the church and the sky.