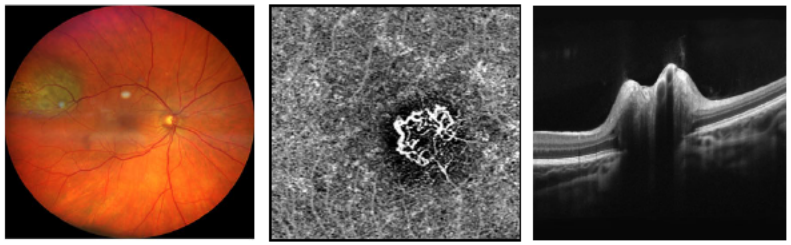


MULTIMODAL IMAGING GRAND ROUNDS

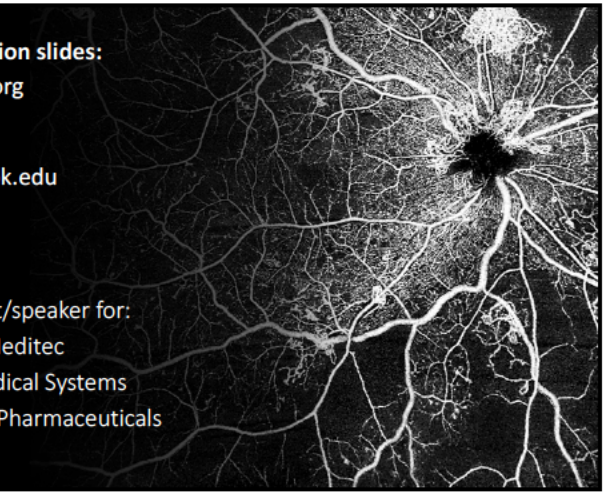
Carolyn Majcher, OD, FAAO, FORS
Oklahoma College of Optometry

1

Online high-resolution slides:
www.octangio.org

Contact:
- majcher@nsuok.edu
- 918-444-4155

Disclosures:
- Paid consultant/speaker for:
  - Carl Zeiss Meditec
  - Topcon Medical Systems
  - Regeneron Pharmaceuticals



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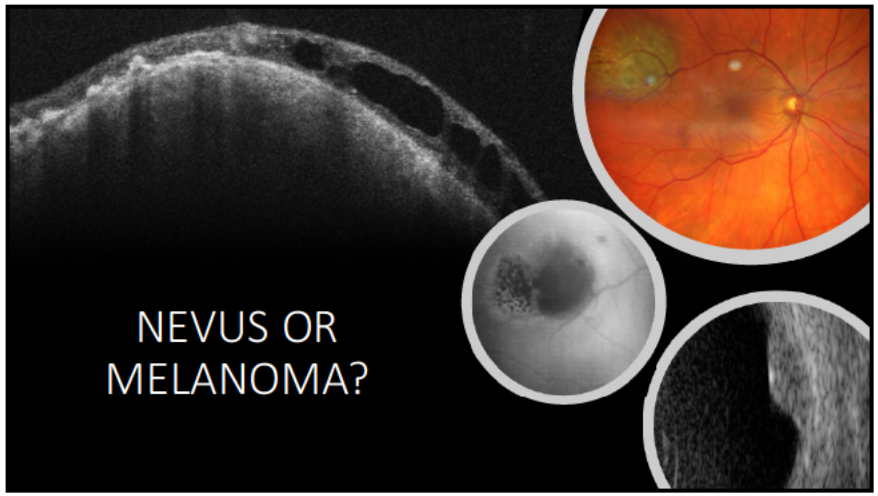
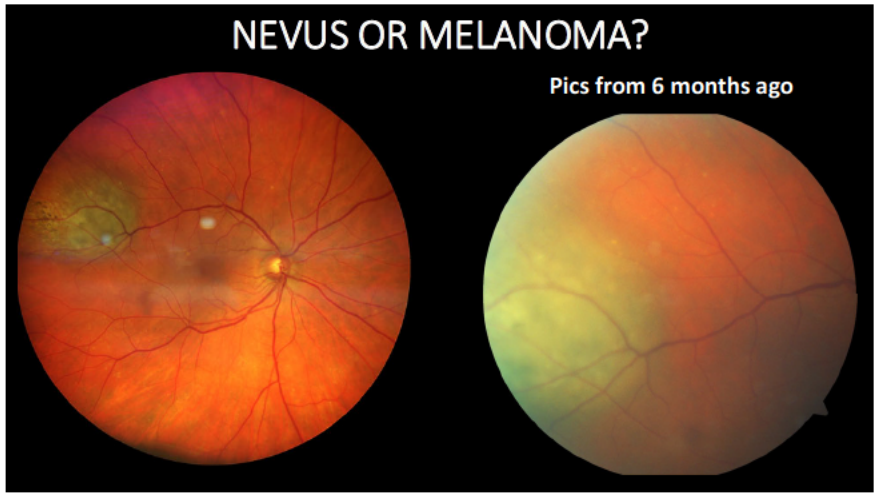


3

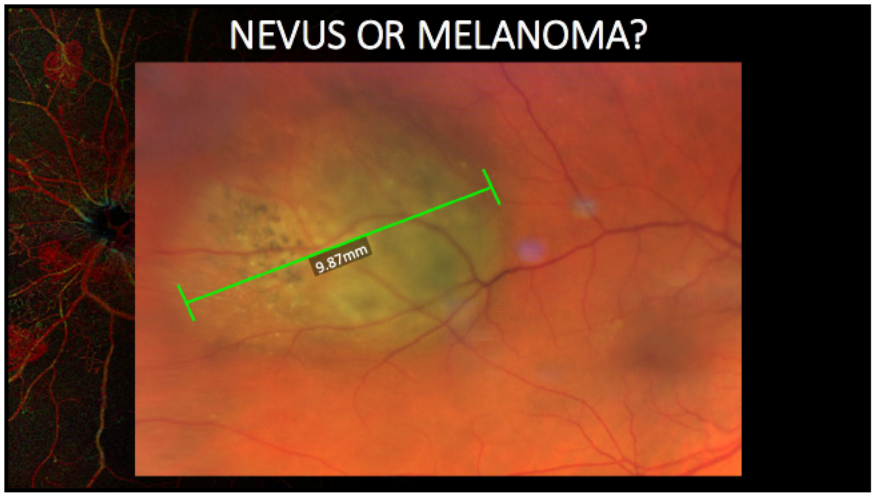
NEVUS OR MELANOMA?

72yo American Indian female
- CC: Doctor directed visit 6mo cataract FU
- Oc Hx:
  - Cataracts OU
  - LEE & DFE 6 months ago
  - Choroidal nevus OD (description from DFE 6mo ago: "Large choroidal nevus superior temporal 3DD flat, distinct borders," took photos but not linked to chart
- BCVA
  - OD 20/40
  - OS 20/30

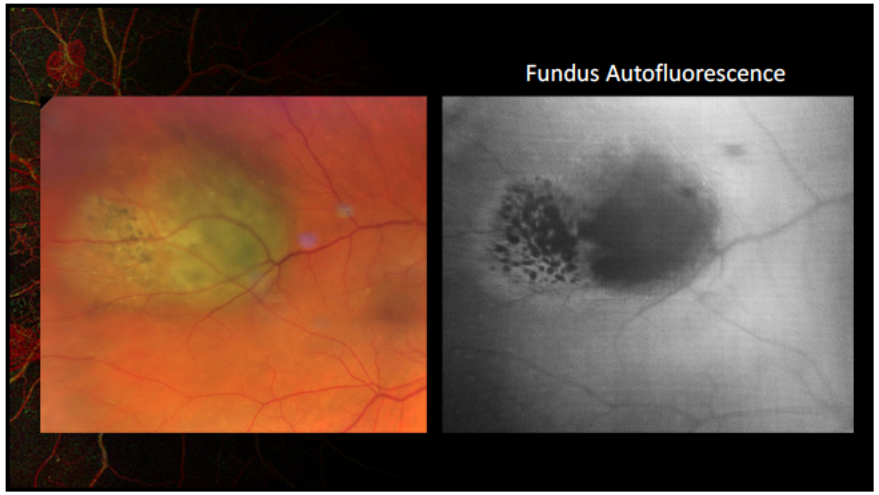
4


NEVUS OR MELANOMA?
Pics from 6 months ago

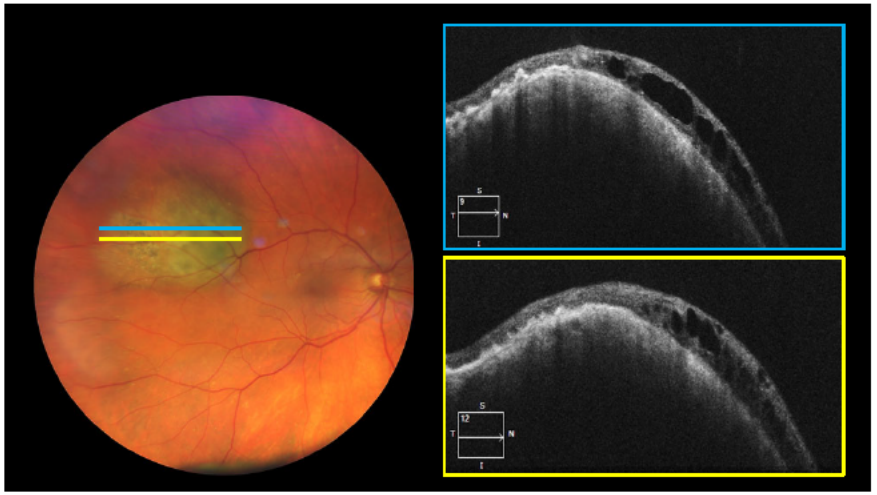
5


NEVUS OR MELANOMA?
9.87mm

6


Fundus Autofluorescence

7



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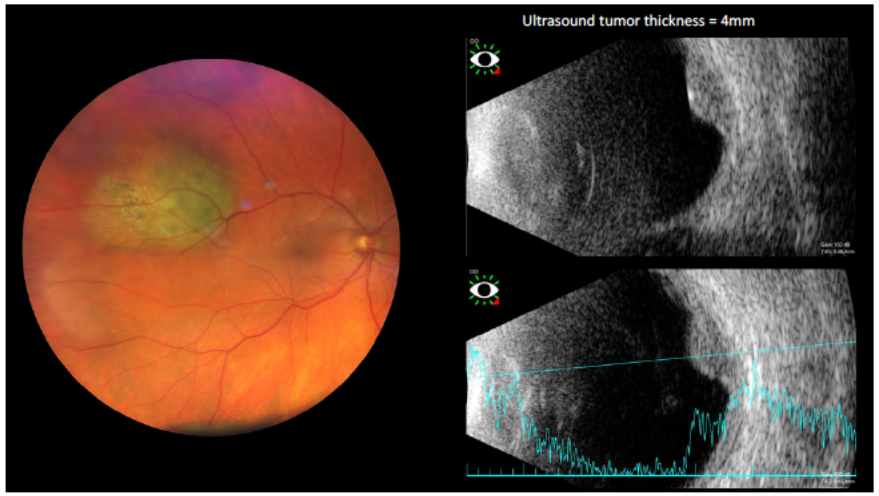


9

NEVUS OR MELANOMA?

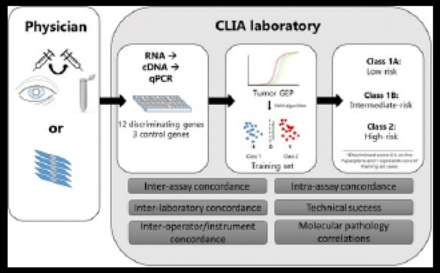
Decision Dx-Uveal Melanoma: Gene Expression Profiling

Assessment

- Choroidal melanoma

Plan

- Ocular oncologist treated with plaque radiotherapy and took sample for gene expression profile testing
  - Class 1A
- Liver ultrasound, liver function tests with LDH, and chest x-ray all WNLs



- DecisionDx-UM test results are reported as follows:
  - Class 1A – very low risk (2%) of metastasis within 5 years[4]
  - Class 1B – moderate risk (21%) of metastasis within 5 years[4]
  - Class 2 – high risk (72%) of metastasis within 5 years[4]

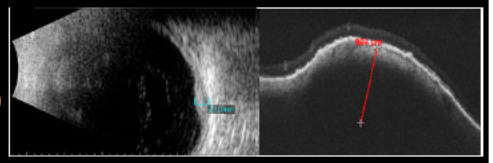
10

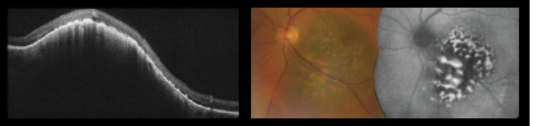
NEVUS OR MELANOMA?

Differentiating small choroidal melanoma from choroidal nevus

C Shields mnemonic 2002:

To Find Small Ocular Melanoma
- T- Thickness (>2mm US = ~ 890um OCT)
- F- Fluid
- S- Symptoms
- O- Orange pigment
- M- Margin near optic disc





Risk for growth within the next 5 years:
- 0 risk factors = 3%
- 1 factor = 38%
- 2 or more factors = > 50%

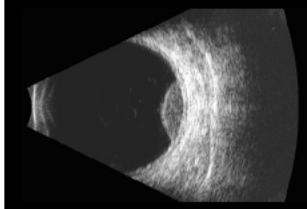
Shields CL, et al. Clinical features of small choroidal melanoma. Curr Opin Ophthalmol. 2002 Jun;13(3) 135-41.

11

NEVUS OR MELANOMA?

TFSOM- **UHHD**

Ultrasonic Hollowness (UH)



Halo ABSENT (H)

Drusen ABSENT (D)

12

NEVUS OR MELANOMA?

Differentiating small choroidal melanoma from choroidal nevus 2019 UPDATE ★

To Find Small Ocular Melanoma Doing IMaging (TFSOM-DIM)

- T- Thickness (>2mm US = ~ 890um OCT)
- F- Fluid, SRF
- S- Symptomatic VL (VA ≤20/50)
- O- Orange pigment (FAF)
- M- Melanoma acoustic hollowness
- DIM- DIaMeter >5mm

Risk for growth within the next 5 years:

- 0 risk factors = 1.1%
- 1 factor = 11%
- 2 factors = 22%
- 3 factors = 34%
- 4 factors = 51%

Table 1. Risk factors for choroidal nevus transformation into melanoma using multimodal imaging (multivariable analysis)

Variable	Letter	Mnemonic	Testing	Hazard ratio (mean) multivariate analysis	*P* value
Thickness tumor >2 mm	T	To	US	3.80	<.0.0001
Fluid subretinal	F	Find	OCT	3.56	<.0.0001 0.0003
Symptoms visual acuity ≤20/50	S	Small	Snellen VA	2.28	0.0050
Orange pigment	O	Ocular	AF	3.07	0.0004
Melanoma acoustic hollowness	M	Melanoma	US	2.10	0.0020
Diameter tumor >5 mm	DIM	Doing IMaging	Photography	1.84	0.0275

AF, autofluorescence; OCT, optical coherence tomography; US, ultrasonography; VA, visual acuity. Adopted from [13••].

Shields CL. Small choroidal melanoma detection with multimodal imaging and management with plaque radiotherapy or AU-011 nanoparticle therapy. Curr Opin Ophthalmol. 2019

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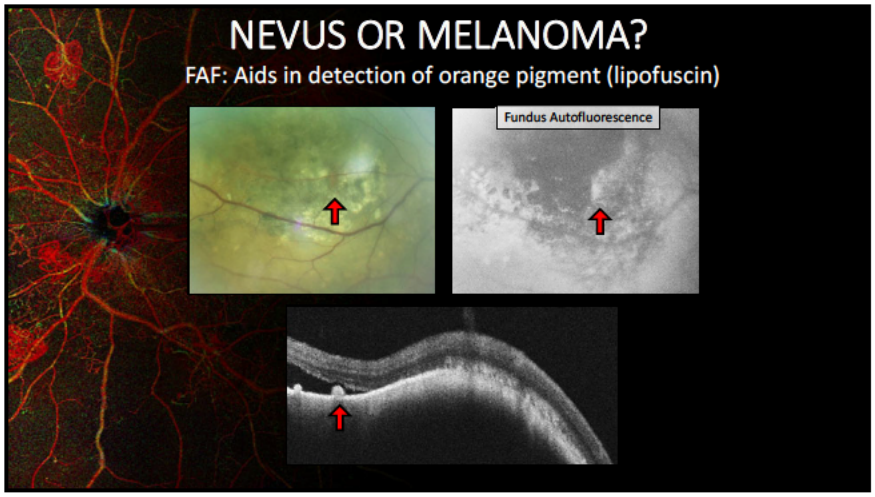
NEVUS OR MELANOMA?

FAF: Aids in detection of orange pigment (lipofuscin)



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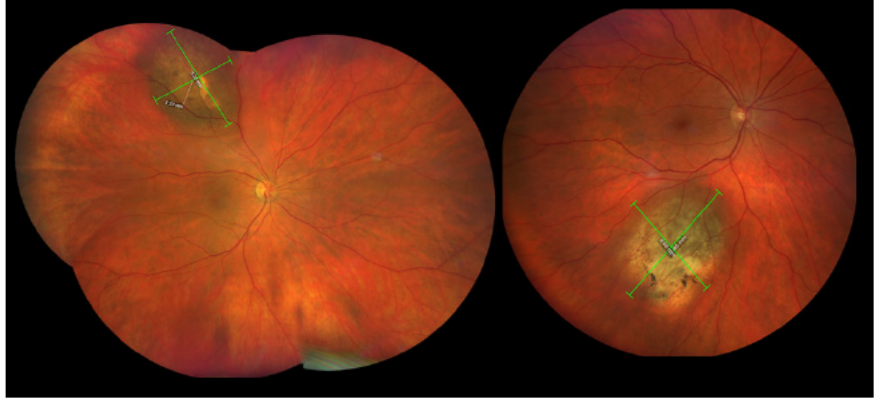
NEVUS OR MELANOMA?

Diameter more than 5mm (by photography)



15

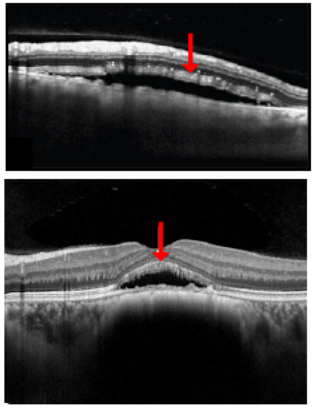
NEVUS OR MELANOMA?

Enhanced Depth Imaging-OCT Features of Small Choroidal Melanoma Compared with Choroidal Nevus

	Melanoma	Nevus	*P* value
Mean tumor thickness (EDI-OCT)	1025µm	685µm	NA
Subretinal lipofuscin	95%	45%	NA
Subretinal fluid	92%	16%	NA
Shaggy photoreceptors	49%	0%	<.001
PR abnormality	73%	43%	0.005
IS/OS junction loss	65%	6%	0.02
Intraretinal edema	16%	0%	0.003
ELM loss	43%	2%	0.008
IPL abnormality	8%	0%	0.04
GCL abnormality	8%	0%	0.04

* Small choroidal melanoma tumor thickness was overestimated by 55% on ultrasonography compared with EDI-OCT

Shields CL, et al. Enhanced depth imaging OCT of small choroidal melanoma comparison with choroidal nevus. Arch Ophthalmol. 2012 Jul;130(7) 850-6.



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TEST YOUR SKILLS!!

72yo American Indian female

- CC: 6mo ch tumor FU, no complaints
- Oc Hx:
  - LEE & DFE 6 months ago- noted a 4DD x 4DD inferior periphery OD with drusen (no photos)
  - Cataract surg OU 3 yrs ago
  - Early-stage non-exudative AMD OU
- Med Hx:
  - CKD, dyslipidemia, hypothyroid
  - Non smoker
- BCVA
  - OD 20/20
  - OS 20/20

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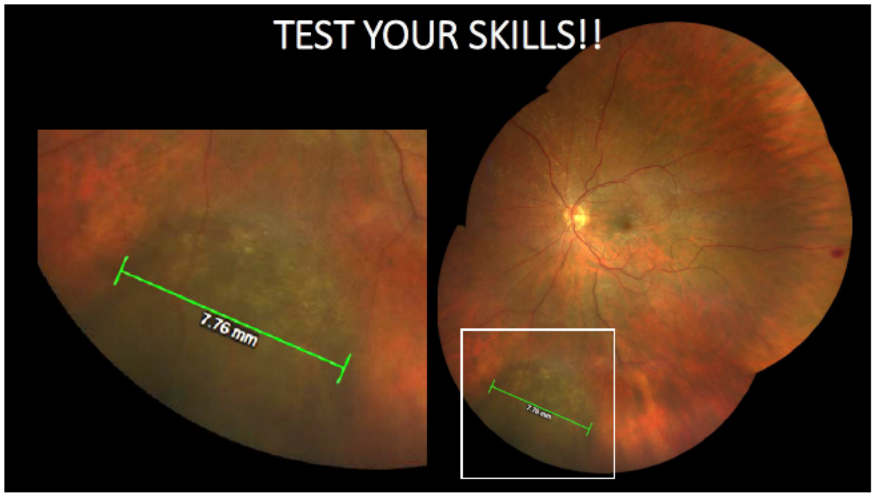
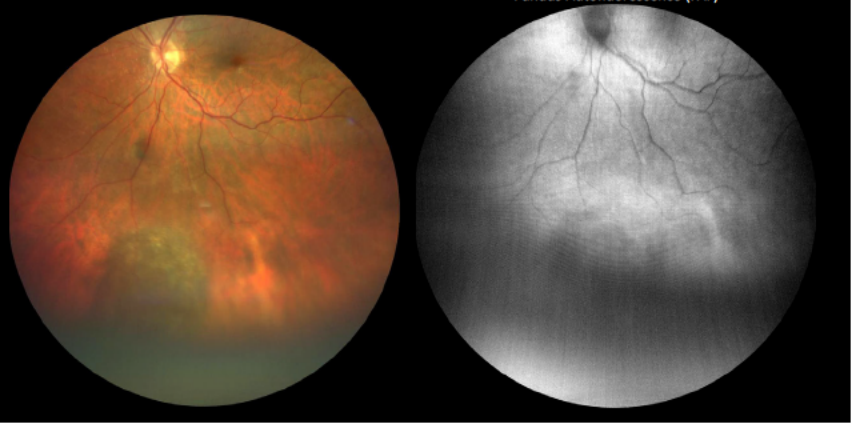
TEST YOUR SKILLS!!



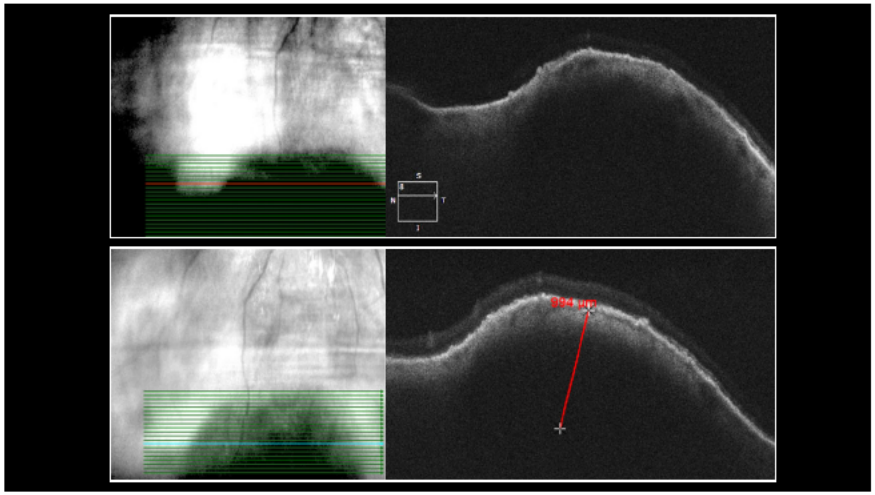
18

TEST YOUR SKILLS!!

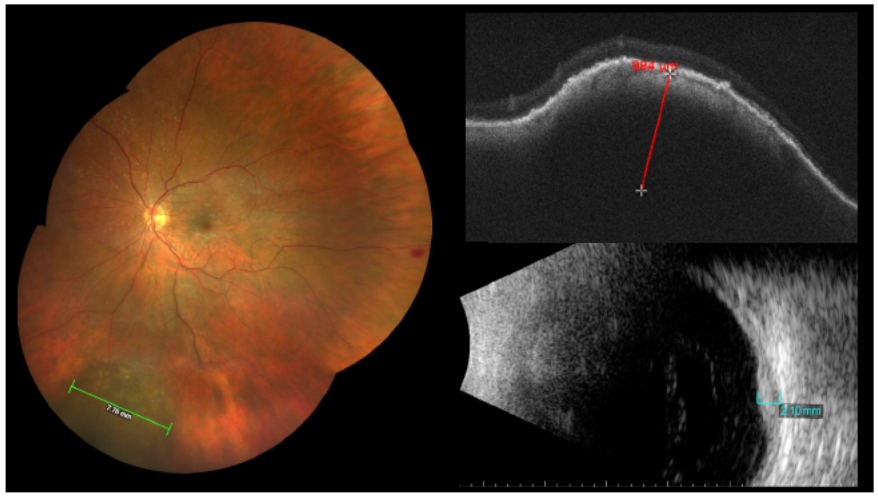
Fundus Autofluorescence (FAF)



19



20

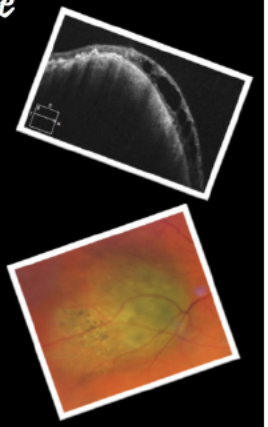


21

Take Home Message

Differentiating Choroidal Nevus from Small Melanoma

- Fundus autofluorescence aids in detection of subclinical orange pigment (lipofuscin) = ↑ malignancy risk
- Photography diameter >5mm = ↑ malignancy risk
- Ultrasound acoustic hollowness = ↑ malignancy risk
- OCT aids in the detection of subtle SRF and overlying retinal abnormalities = ↑ malignancy risk
- EDI OCT aids in measuring tumor thickness (OCT measurements approx. half of ultrasound measures)



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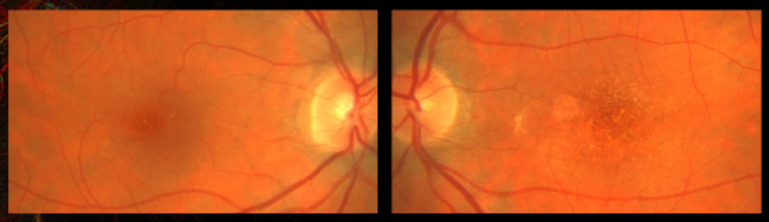
23

DON'T WAKE THE SLEEPING DRAGON

68yo male

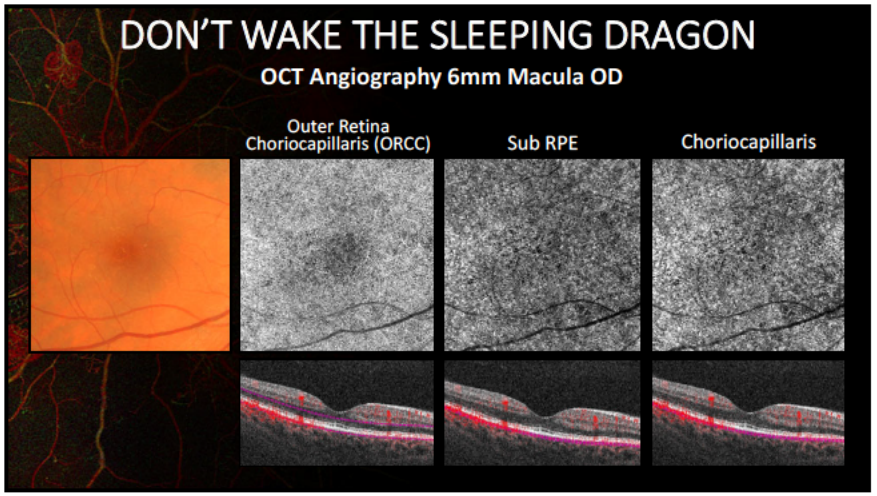
- CC: Routine exam, no visual complaints
- Oc Hx:
  - Dry AMD x 5 years OU, taking AREDS 2
  - Cataract NS 1+ OU
- Med Hx:
  - HTN, Type 2 DM
  - Never smoker
- Vision: BCVAs @dist
  - OD 20/20
  - OS 20/40+1



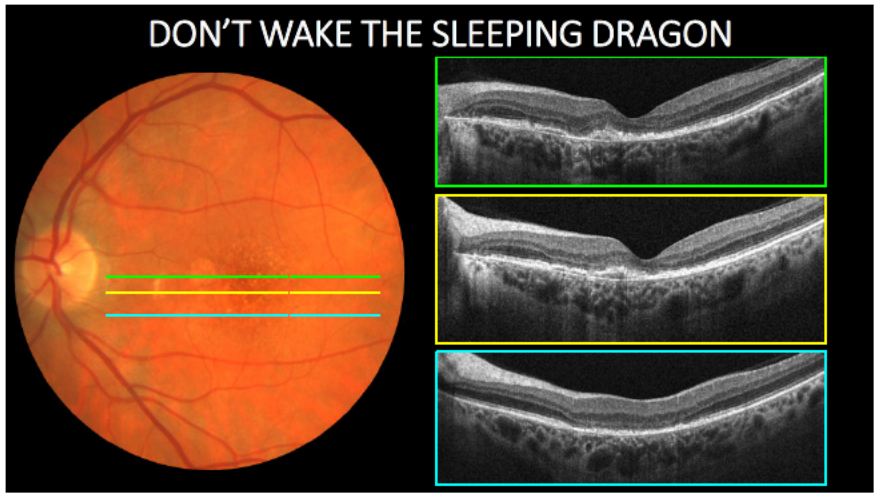
24


DON'T WAKE THE SLEEPING DRAGON

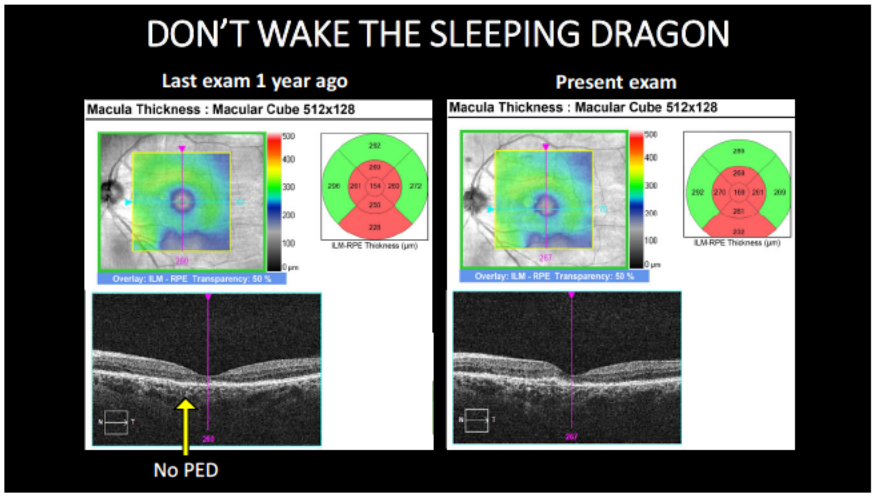
25


DON'T WAKE THE SLEEPING DRAGON
OCT Angiography 6mm Macula OD
Outer Retina Choriocapillaris (ORCC)
Sub RPE
Choriocapillaris

26


DON'T WAKE THE SLEEPING DRAGON

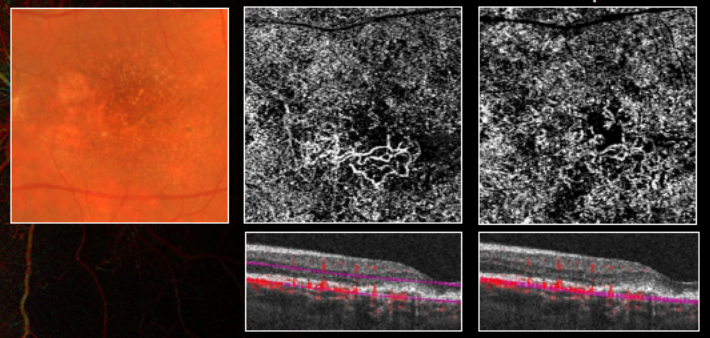
27


DON'T WAKE THE SLEEPING DRAGON
Last exam 1 year ago
Present exam
Macula Thickness : Macular Cube 512x128
Macula Thickness : Macular Cube 512x128
No PED

28

DON'T WAKE THE SLEEPING DRAGON

OCT Angiography 3mm Macula OS



29

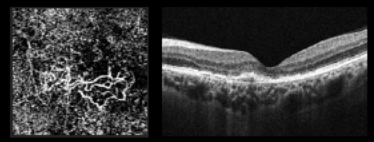
DON'T WAKE THE SLEEPING DRAGON

Assessment

- OD Early stage non-exudative AMD
- OS Non-exudative AMD with probably quiescent CNV

Management

- FU 3 months
- Cont. amsler & AREDS 2



30

DON'T WAKE THE SLEEPING DRAGON

No shows 3 month follow up appt, returns 6 months later

CC: Still no vision complaints, reports stable vision, no changes noted on amsler

- Vision: BCVAs @dist
  - OD $20/20^{-1}$
  - OS $20/40^{+1}$
- No change in fundus or OCT appearance OD
- No appreciable change in fundus appearance OS via ophthalmoscopy……..

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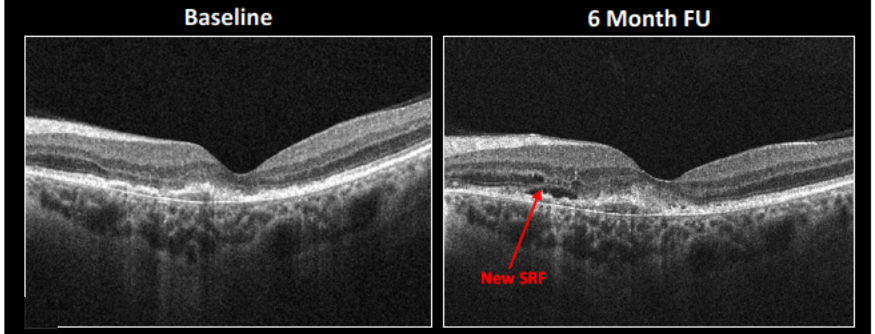
DON'T WAKE THE SLEEPING DRAGON

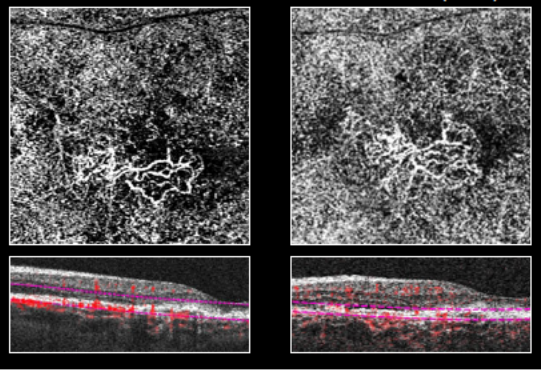


32

DON'T WAKE THE SLEEPING DRAGON

OCT Angiography 3mm Outer Retina Choriocapillaris OS

Baseline | 6 Month FU (6mm)



33

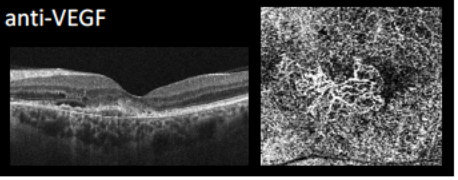
DON'T WAKE THE SLEEPING DRAGON

Assessment

- OD Early stage non-exudative AMD
- OS EXUDATIVE AMD

Management

- Refer to retina for intravitreal anti-VEGF



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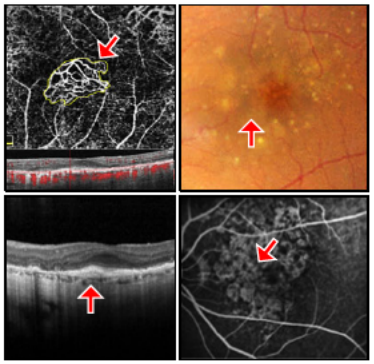
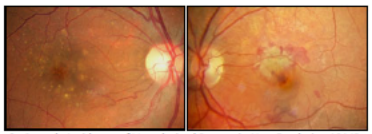
NONEXUDATIVE CNV



Carnevali A, et al. OCTA A Useful Tool for Diagnosis of Treatment-Naïve Quiescent CNV. Am J Ophth. 2016.

1. Well-defined neovascular complex via OCTA
2. No signs of exudation via ophthalmoscopy such as exudate or blood
3. No fluid via structural OCT
4. No leakage with IVFA

Present in approx. 10% of high risk AMD eyes (intermediate AMD, exudative fellow eye)



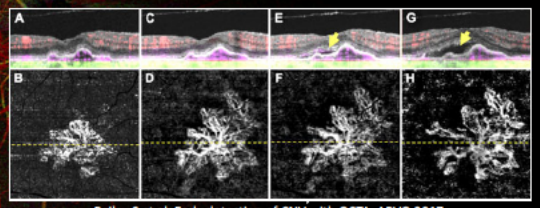
Or C, et al. Incidence of Vascularized Drusen in Non-Exudative ARMD using SD-OCTA. ARVO 2018.

35

NONEXUDATIVE CNV

Prognosis

- Rate of future exudation, eyes with nonexudative CNV vs eyes without nonexudative CNV
  - **Bailey S ARVO 2017.** 60% vs 4% (5 months)
  - **De Oliveira Dias J Ophthal 2018.** 21% vs 4% (12 months)
    - 15x greater risk of exudation after detection of nonexudative CNV



Bailey S et al. Early detection of CNV with OCTA. ARVO 2017.
De Oliveira Dias JR, et al. Natural History of Subclinical Neovascularization in Nonexudative ARMD Using SS-OCTA. Ophthalmol 2018.

EYES WITH NONEXUDATIVE CNV ARE AT HIGH RISK FOR EXUDATIVE CONVERSION!

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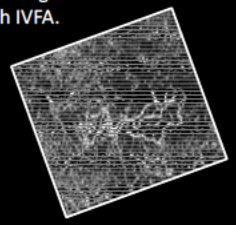
DON'T WAKE THE SLEEPING DRAGON

Take Home Message

Non-exudative CNV

- Non-exudative CNV is a well-formed CNV membrane in an untreated eye that has no OCT (fluid) or ophthalmoscopic signs of leakage (hemorrhage, exudative, fluid) and does not leak with IVFA.
- OCTA is the only method of detecting and monitoring growth of non-exudative CNV membranes.
- Non-exudative CNV in AMD carries a substantial risk for conversion from nonexudative to exudative AMD.



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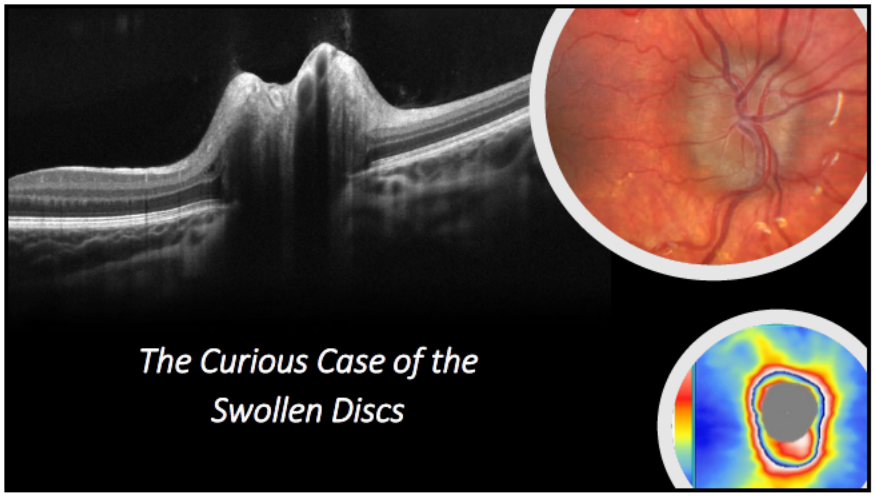

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THE CURIOUS CASE OF THE SWOLLEN DISCS

6yo white female

- CC: First eye exam. No ocular or systemic complaints per patient and mother.
- Oc Hx: unremarkable
- Medical Hx: unremarkable
- Meds: none
- Final Refraction
- OD: +1.00 -1.25x176: 20/20-3
- OS: +1.50 -1.75x002: 20/20-2
- Entrance testing and SLE of ant seg: Unremarkable OU
- IOPs 21/20mmHg
- BP: 98/66

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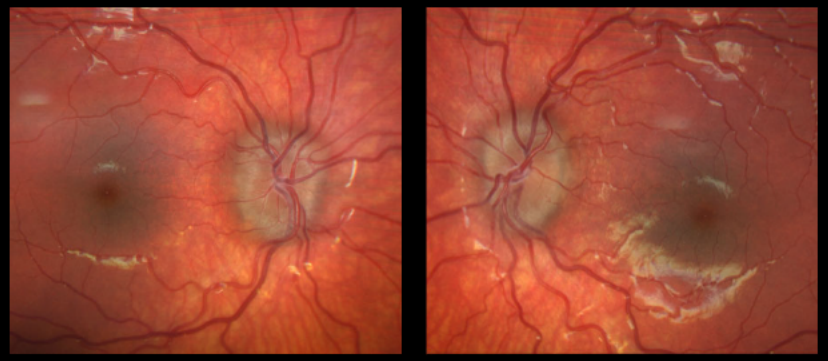
THE CURIOUS CASE OF THE SWOLLEN DISCS



(-) SVP

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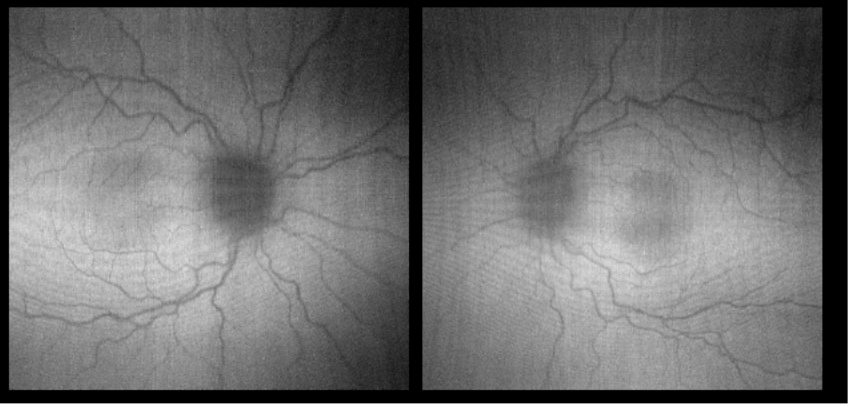
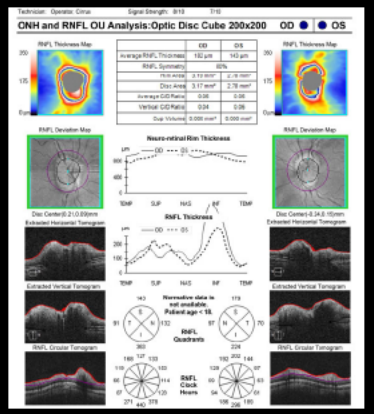
THE CURIOUS CASE OF THE SWOLLEN DISCS
Fundus Autofluorescence



41

THE CURIOUS CASE OF THE SWOLLEN DISCS



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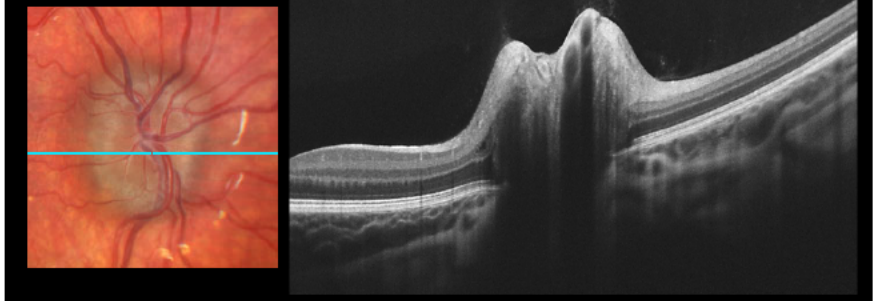
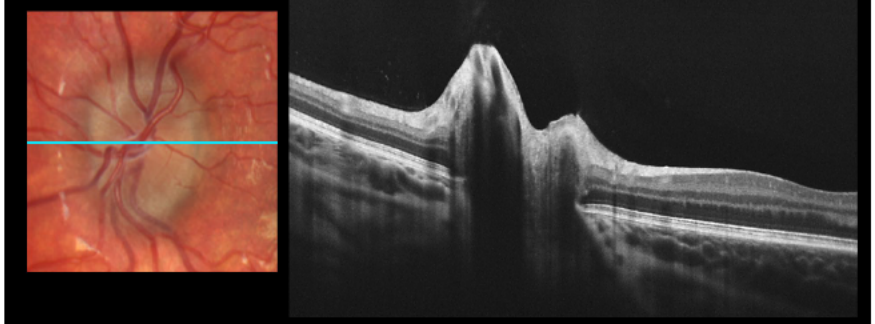
THE CURIOUS CASE OF THE SWOLLEN DISCS



OCT: Subtle intraretinal peripapillary cystic fluid and probable anterior angling of Bruchs temporal

43

THE CURIOUS CASE OF THE SWOLLEN DISCS



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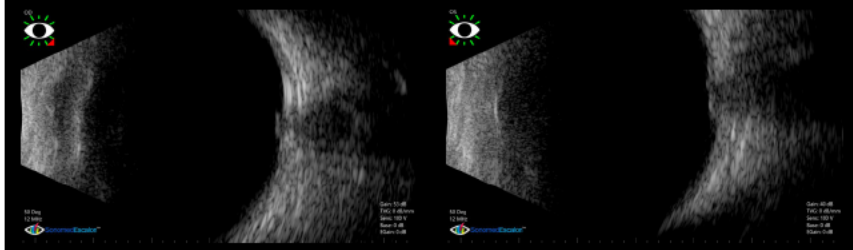
THE CURIOUS CASE OF THE SWOLLEN DISCS
B-scan OD/OS



No disc drusen, crescent sign visible OD, increased fluid in subarachnoid space OU

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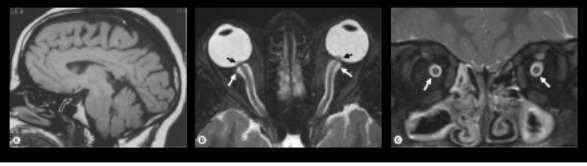
THE CURIOUS CASE OF THE SWOLLEN DISCS
MRI/MRV brain and orbits with and without contrast

MRI Head
- Mild concavity to the superior margin of the pituitary gland.. otherwise no intracranial space-occupying lesion and no evidence of acute hydrocephalus.

MRV Head
- The left transverse sinus appears to be significantly hypoplastic. Rt transverse sinus is dominant. No evidence of dural venous sinus thrombosis.

MRI Orbits
- Bilateral optic disc bulge and increased nerve sheath CSF (distended).

IMPRESSIONS
- Findings suggestive of raised intracranial pressure.



46

THE CURIOUS CASE OF THE SWOLLEN DISCS
Lumbar Puncture

Opening Pressure
- Elevated at 288 mm of H2O

CSF Analysis/cytology
- Glucose, lymphocytes, monocytes, protein and macrophages all WNL. No atypical or malignant cells identified. VDRL non-reactive and cryptococcus antigen negative.

ASSESSMENT
- Pediatric IIH

PLAN
- Acetazolamide 9.4mL (235mg total) by mouth every 12 hours

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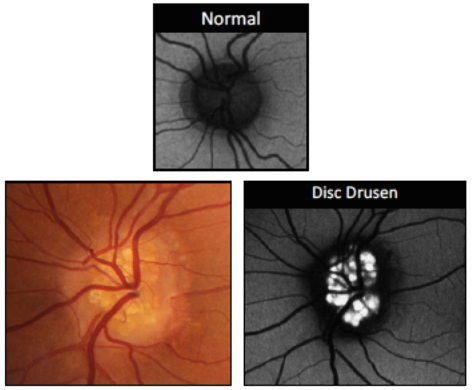
PAPILLEDEMA VS PSEUDOPAPILLEDEMA
Fundus autofluorescence (FAF)



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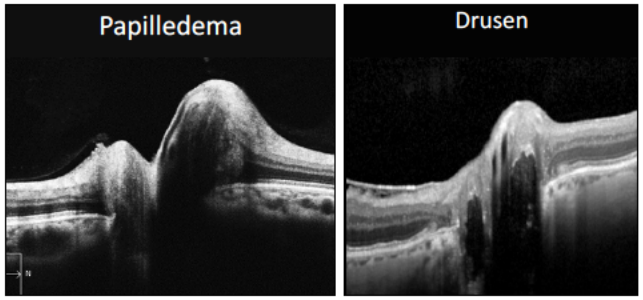
PAPILLEDEMA VS PSEUDOPAPILLEDEMA

OCT

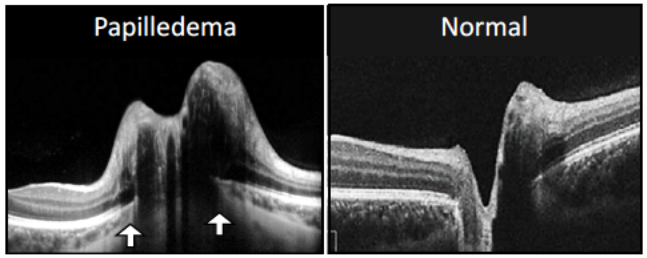


Johnson LN, et al. Differentiating optic disc edema from ONH drusen on OCT. Arch Ophthalmol. 2009.

49

PAPILLEDEMA VS PSEUDOPAPILLEDEMA

OCT



Upward angling and displacement of Bruch's membrane

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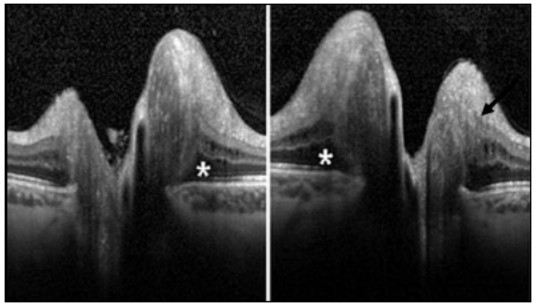
PAPILLEDEMA VS PSEUDOPAPILLEDEMA

OCT

Papilledema

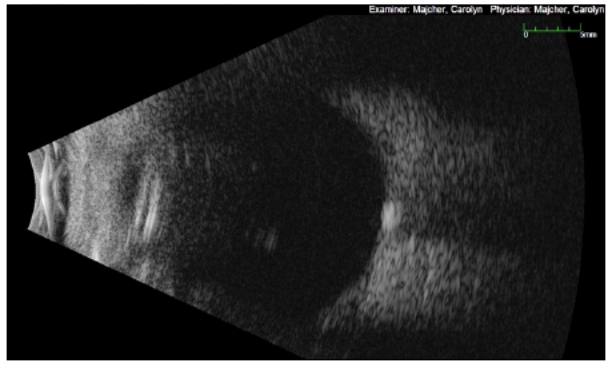


Subretinal hyporeflective space, intraretinal cysts

51

PAPILLEDEMA VS PSEUDOPAPILLEDEMA

B-scan: Disc drusen



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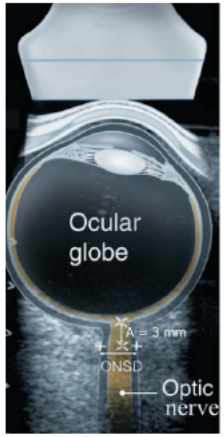
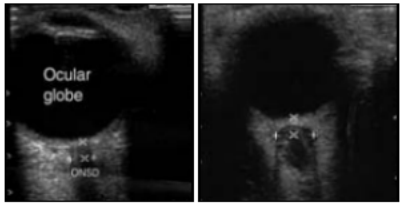
PAPILLEDEMA VS PSEUDOPAPILLEDEMA



B-scan

- Optic nerve sheath diameter (ONSD) >5 mm is highly suspicious for papilledema
- Need to put into a clinical context

Normal Papilledema



Blaivas M, et al. Elevated ICP detected by bedside emergency ultrasonography of the optic nerve sheath. Academic Emergency Medicine 2003;10 376-81

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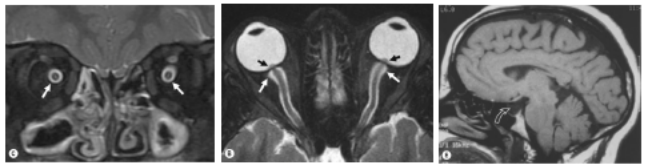
PAPILLEDEMA VS PSEUDOPAPILLEDEMA

MRI signs of papilledema

- Flattening of posterior sclera/globe
- Distension of perioptic subarachnoid space ± tortuous optic nerve
- Intraocular protrusion of the prelaminar optic nerve
- Enhancement of the prelaminar optic nerve
- Empty sella



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Pediatric Idiopathic Intracranial Hypertension (IIH)

Pediatric IIH

- May be a different underlying mechanism
- 50% males (prepubertal pediatric patients)
- Affected adolescents tend to be overweight, but obesity and weight gain are not associated risk factors in patients younger than 11 years
- Presentation S/S similar to adults except CN VI palsy more common (33%)
- Most cases improve with medical treatment

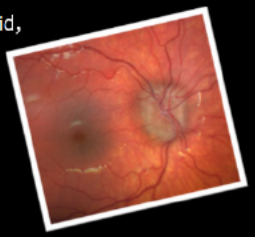
Liu G, et al. Pediatric IIH. Surv Ophthalmol. Nov-Dec 2007;52(6) 597-617.

55

Take Home Message

Differentiating Papilledema from Pseuopapilledema

- Symptoms/signs
- FAF: rule out superficial disc drusen
- B-scan: rule out buried/deep drusen, look for ↑ subarachnoid fluid and thickening of the ONSD
- OCT: Peripapillary slope/contour of swelling, fluid, contour Bruch's membrane
- MRI: Rule out hydrocephalus, features of papilledema include flattening of globe, distension of ON subarachnoid space, empty sella



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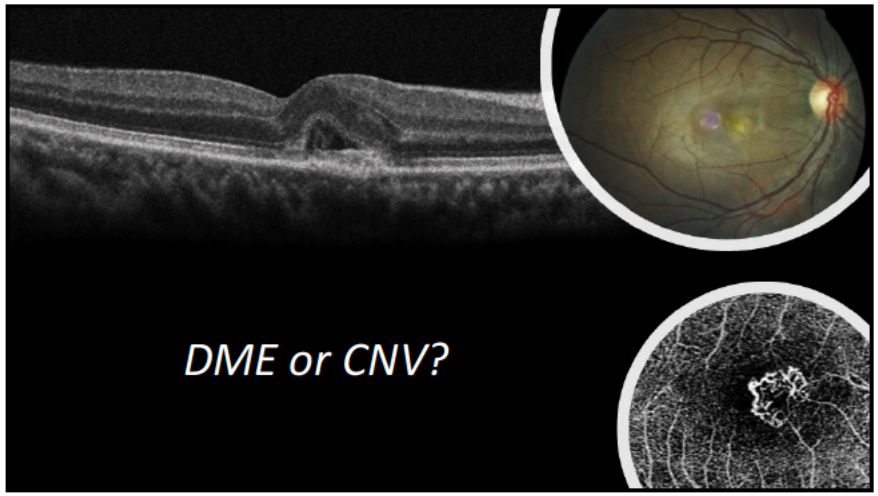

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DME or CNV?

39yo Hispanic female referred by outside doc for evaluation and management of CSME OD

- POH: Blunt trauma OD?, LEE 2yrs ago
- MH: DM Type 2 x 2 yrs, last HbA1C 6.7%
- Vision: BCVAs sc @dist
  - OD $20/25^{-2}$
  - OS 20/20
- Entrance testing: Normal
- External exam: Normal OU
- Tonometry: 15/16 mmHg

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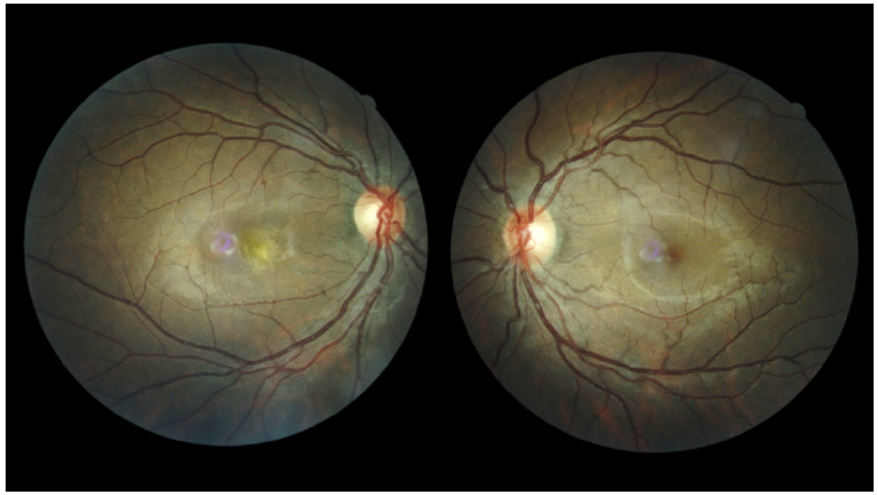

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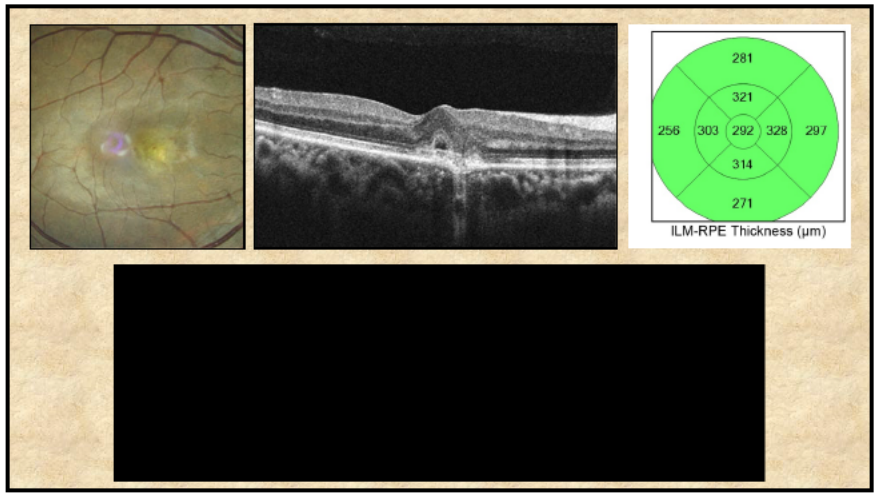

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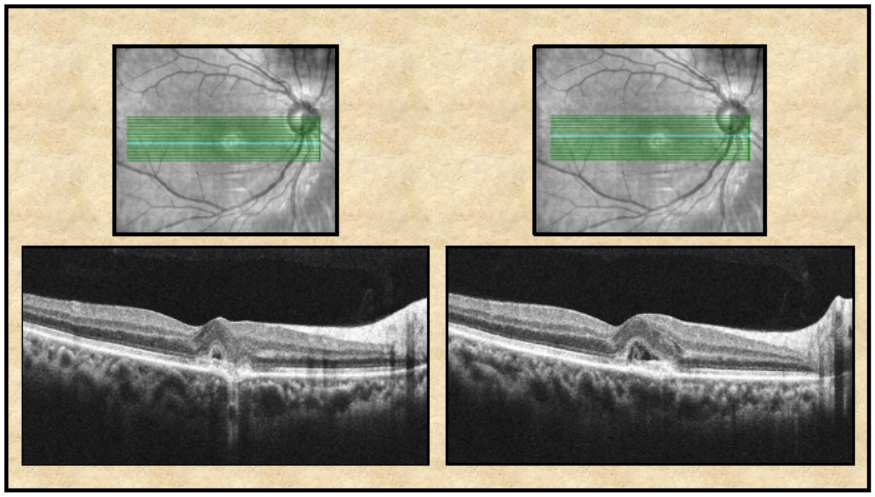

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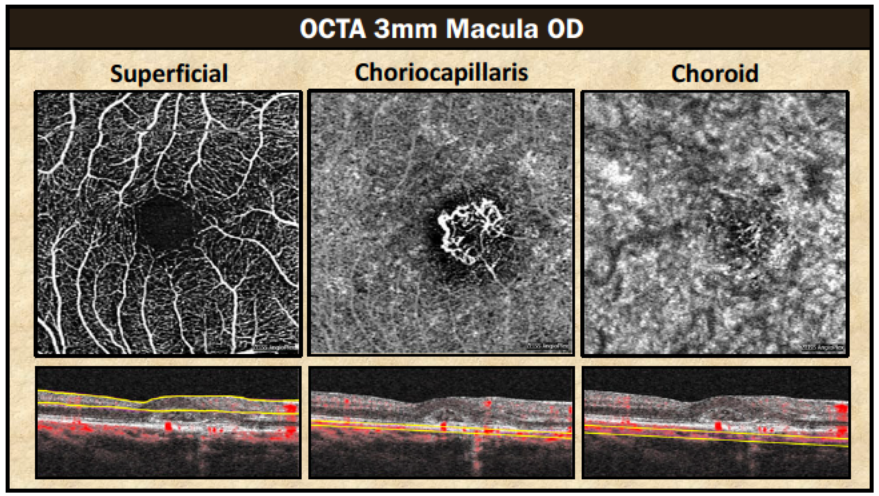

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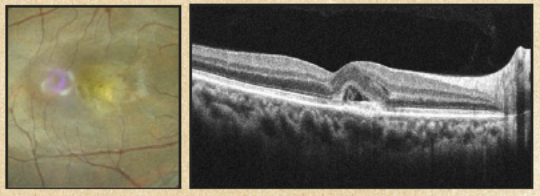
Assessment

- CNV secondary to trauma (choroidal rupture), **ACTIVE**

Management

- Anti-VEGF
- Amsler grid



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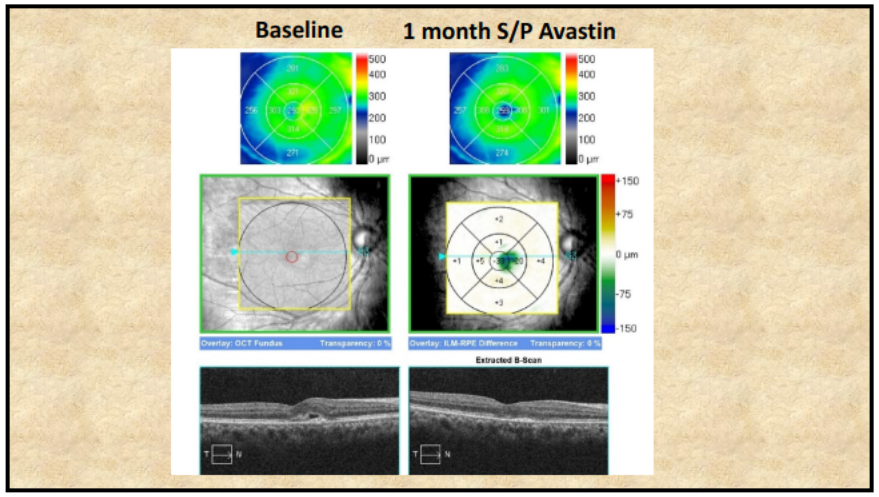

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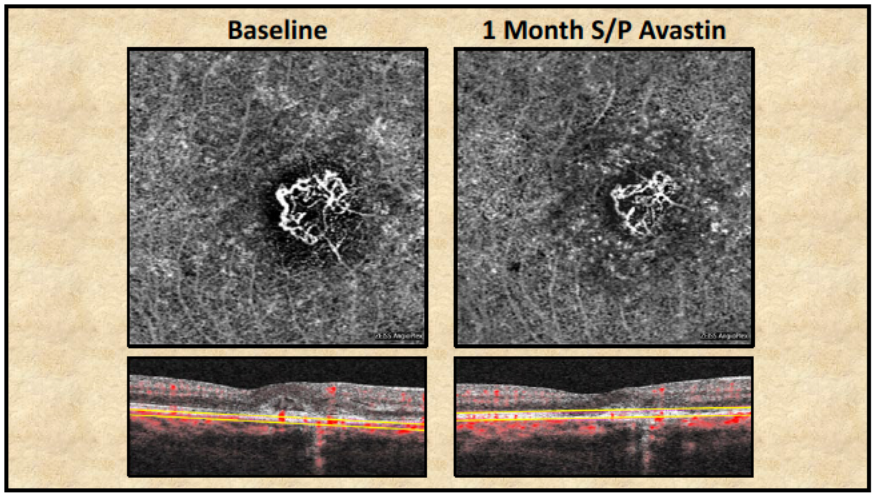

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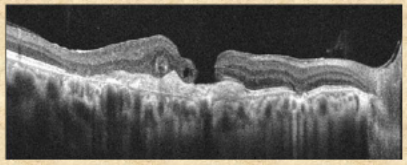
Post Seg Complications of Trauma

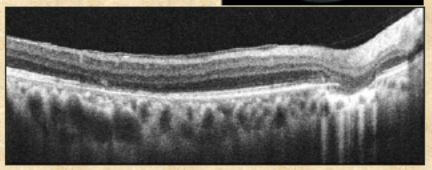
Acute

- Vitreous/subretinal hemorrhage
- Choroidal rupture
- Macular hole
- Commotio retinae
- Retinal tear/dialysis, RD
- Traumatic optic neuropathy

Chronic

- CNV, subretinal fibrosis
- Pigmentary scarring/retinopathy
- Angle recession glaucoma





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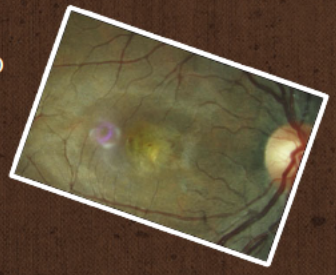
Take Home Message

Traumatic CNV

- Signs of ACTIVE CNV: blood, fluid, exudate
- More responsive to anti-VEGF than AMD
- OCT is helpful in detecting subtle complications of trauma such as choroidal rupture, macular hole, etc.
- OCTA is useful for detecting CNV secondary to choroidal rupture and monitoring response to TX
- Outer retina (CNV) vs inner retinal (DME) pathology



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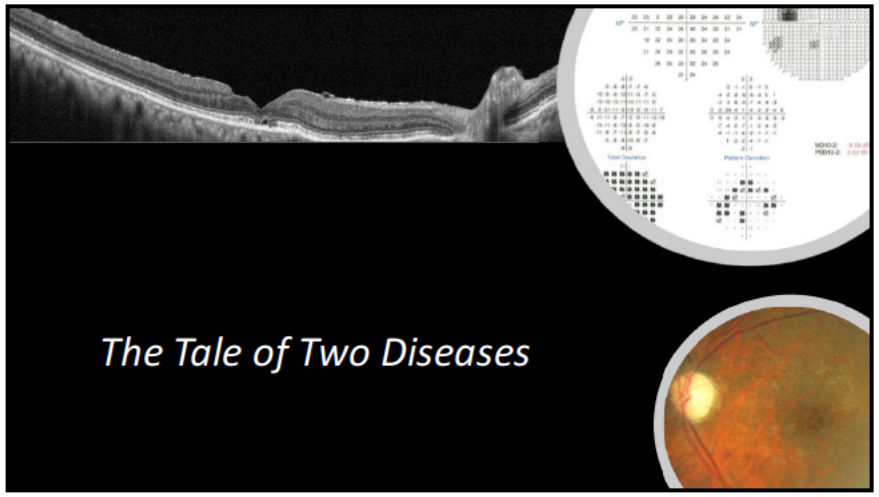

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HYDROXYCHLOROQUINE RETINAL TOXICITY OR AMD?

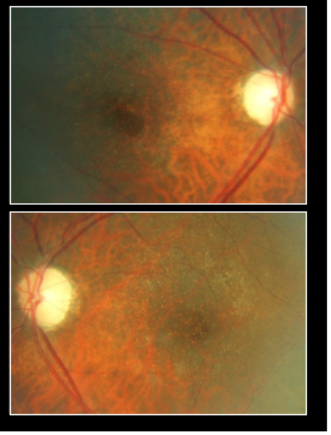
66yo American Indian female

- Taking Plaquenil 200mg BID x 20+ years
- Weight: 157lbs (max daily dose = 356mg)
- + ANA, possible SLE
- Stage 3 CKD
- Ex- heavy smoker of 45yrs
- History of nonexudative AMD OU
- BCVAs OD 20/25^{+2}, OS 20/25

Table 1. Major Risk Factors for Toxic Retinopathy

Daily dosage	
HCQ	>5.0 mg/kg real weight
CQ	>2.3 mg/kg real weight
Duration of use	>5 Yrs, assuming no other risk factors
Renal disease	Subnormal glomerular filtration rate
Concomitant drugs	Tamoxifen use
Macular disease	May affect screening and susceptibility to HCQ, CQ

CQ = chloroquine; HCQ = hydroxychloroquine.



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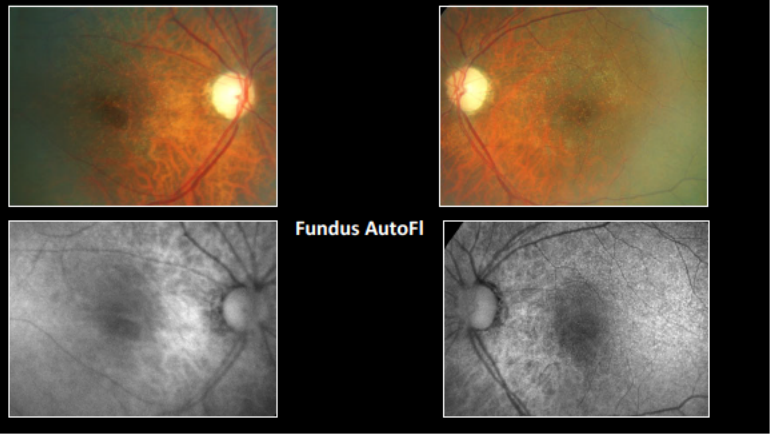
HYDROXYCHLOROQUINE RETINAL TOXICITY OR AMD?



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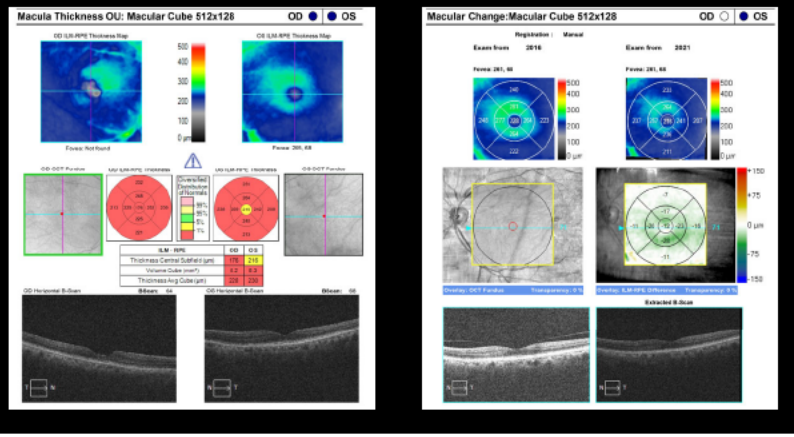
HYDROXYCHLOROQUINE RETINAL TOXICITY OR AMD?



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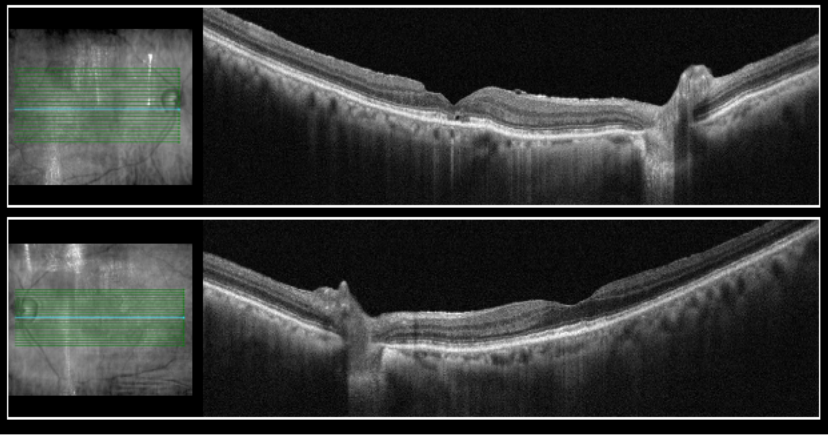
HYDROXYCHLOROQUINE RETINAL TOXICITY OR AMD?



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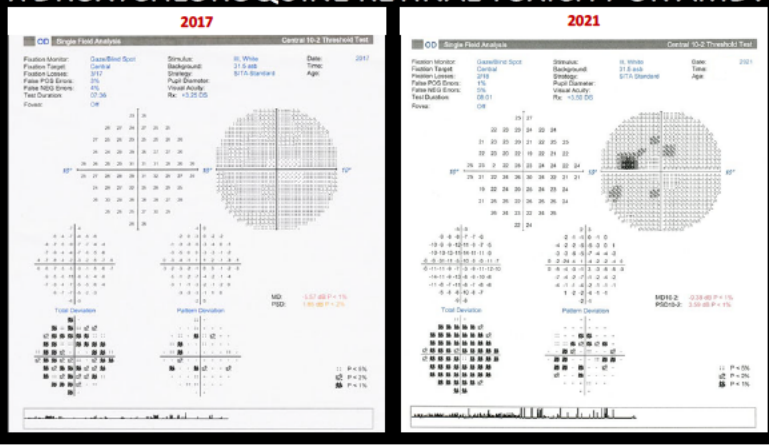
HYDROXYCHLOROQUINE RETINAL TOXICITY OR AMD?



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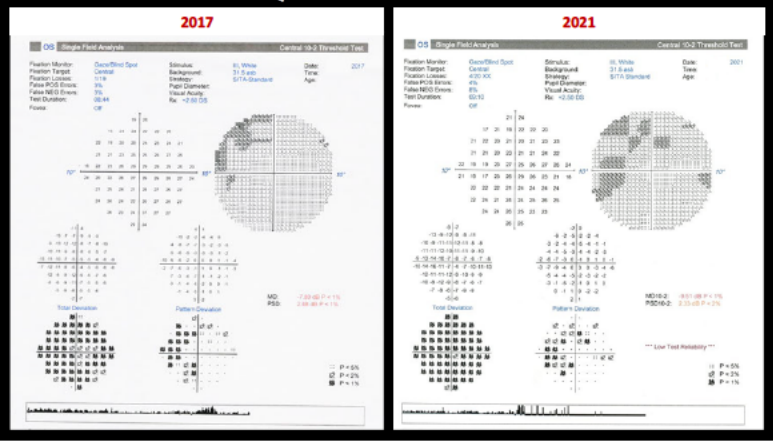
HYDROXYCHLOROQUINE RETINAL TOXICITY OR AMD?



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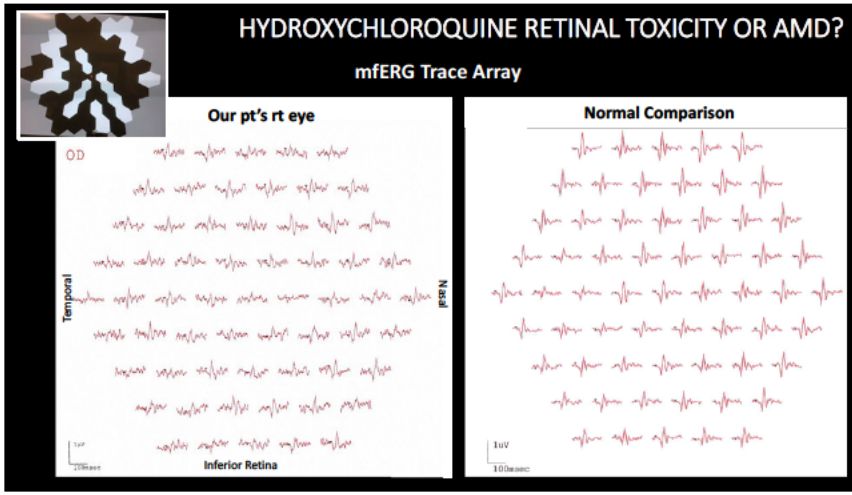
HYDROXYCHLOROQUINE RETINAL TOXICITY OR AMD?

mfERG Trace Array



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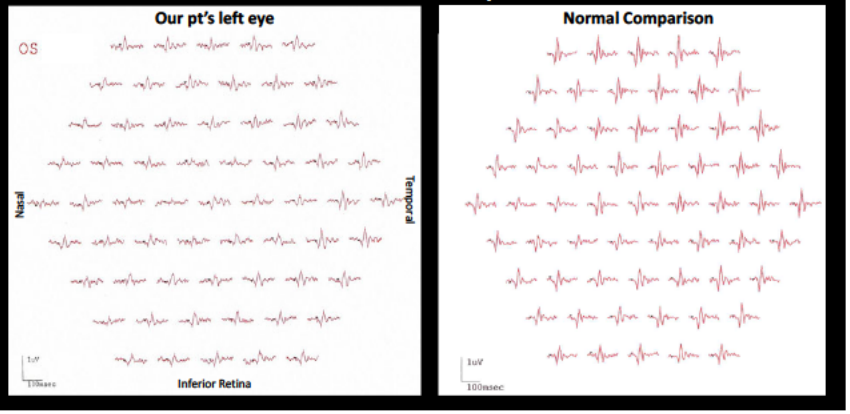
HYDROXYCHLOROQUINE RETINAL TOXICITY OR AMD?

mfERG Trace Array



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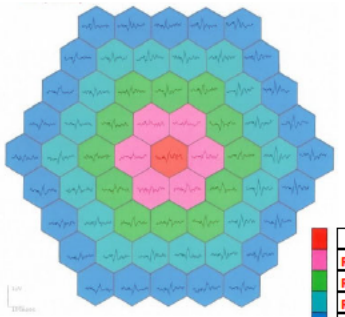
HYDROXYCHLOROQUINE RETINAL TOXICITY OR AMD?



RING AMPLITUDES

	OD Amp (nV/deg2)	OS Amp (nV/deg2)
R1	32.05	38.00
R2	20.49	11.85
R3	18.29	14.02
R4	12.49	12.35
R5	9.55	7.27

RING RATIOS

Ring Ratios	Our pt OD	Our pt OS	Norm mean	99% Limits
R1/R2	1.56	3.21	1.943	2.64
R1/R3	1.75	2.71	3.161	4.51
R1/R4	2.57	3.08	4.613	6.87
R1/R5	3.36	5.22	5.46	8.43

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Hydroxychloroquine Retinal Toxicity

AAO 2016 Recommendations on Screening for Chloroquine and Hydroxychloroquine Retinopathy

Table 1. Major Risk Factors for Toxic Retinopathy

Daily dosage	
HCQ	>5.0 mg/kg real weight
CQ	>2.3 mg/kg real weight
Duration of use	>5 Yrs, assuming no other risk factors
Renal disease	Subnormal glomerular filtration rate
Concomitant drugs	Tamoxifen use
Macular disease	May affect screening and susceptibility to HCQ/CQ

CQ = chloroquine; HCQ = hydroxychloroquine.

ANNUAL SCREENING WITH OCT AND VF AFTER 5YRS IS SOC!!!

Table 3. Clinical Examination Techniques

Recommended Screening Tests
- Primary tests: ideally do both
  - Automated visual fields (appropriate to race) — 10-2 non-Asians, 30-2 Asians
  - SD OCT
- Other objective tests (as needed or available):
  - mfERG
  - FAF
- Newer tests of possible value in future
  - Microperimetry
  - Adaptive optics retinal imaging

Not Recommended for Screening
- Fundus examination
- Time-domain OCT
- Fluorescein angiography
- Full-field ERG
- Amsler grid
- Color testing
- EOG

Screening schedule: baseline fundus exam, then annual screening starting at 5 yrs

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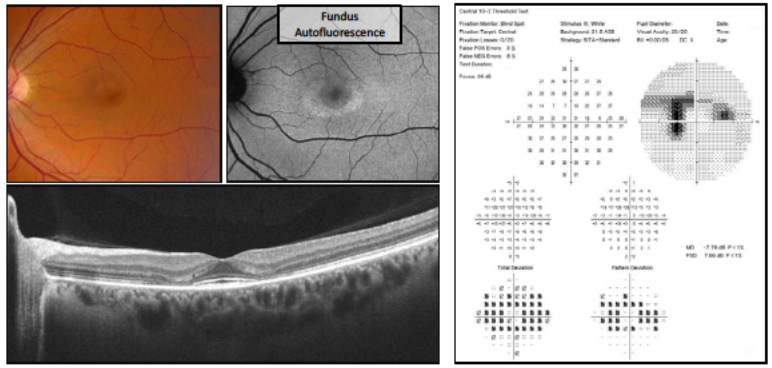
Hydroxychloroquine Retinal Toxicity



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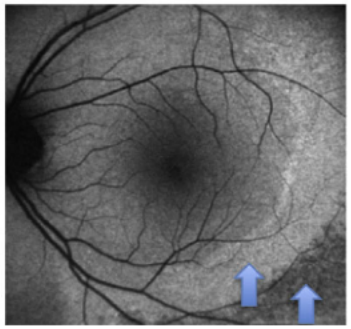
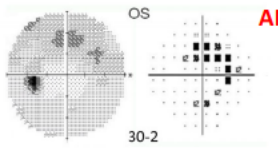
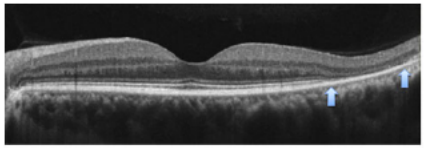
Hydroxychloroquine Retinal Toxicity

Toxicity often occurs outside the macula and near the arcades in Asians







PERFORM 30-2 VF AND OCT NEAR THE ARCADES IN ASIANS!!!

AAO. Recommendations on Screening for Chloroquine and Hydroxychloroquine Retinopathy 2016.

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CASE 5

65yo white male

- Decreased vision OD>OS, constant, painless, began 5 years ago after stroke
- Ocular Hx: None, LEE unknown
- Systemic HX: Heart bypass surgery 2014 but hasn't followed up with cardiologist or other MD for 5 years, stroke 2015, carotid endarterectomy right side, HTN, hypercholesterolemia, partial left sided carotid blockage not evaluated for several years
- Meds: Ventricor, carvedilol, 81mg ASA
- Does not smoke or drive

VA cc @ dist

- OD HM
- OS $20/30^{-2}$ PHNI

- EOMs full and smooth
- CVF: OD generalized constriction, OS full
- Pupils: PERRL (+) APD OD
- IOP: 18/18
- SLE: 1+ NS OU

- BP: 150/98 RAS

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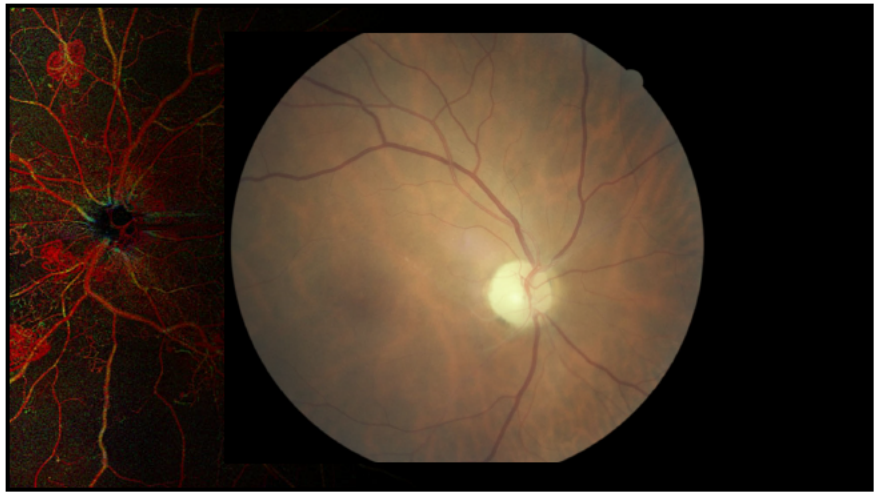

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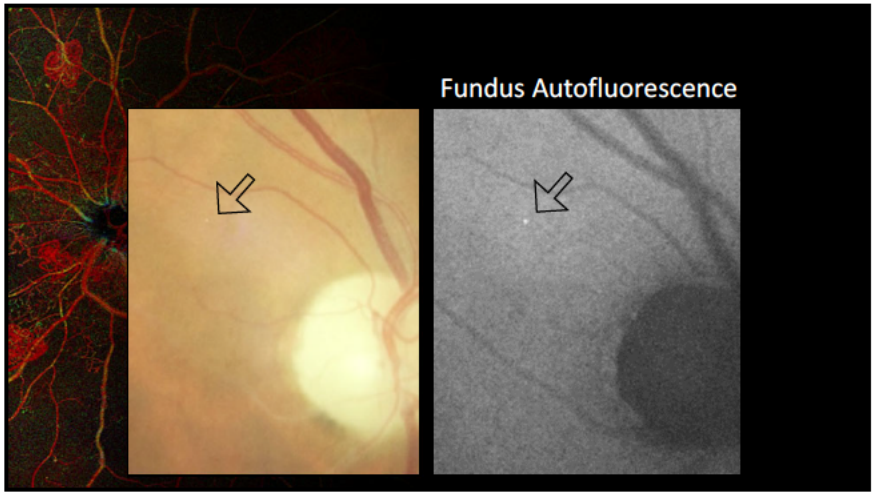

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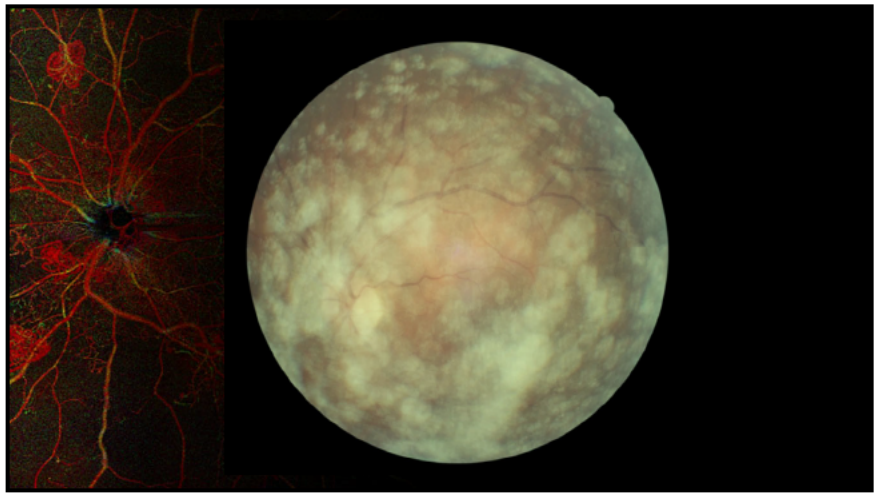

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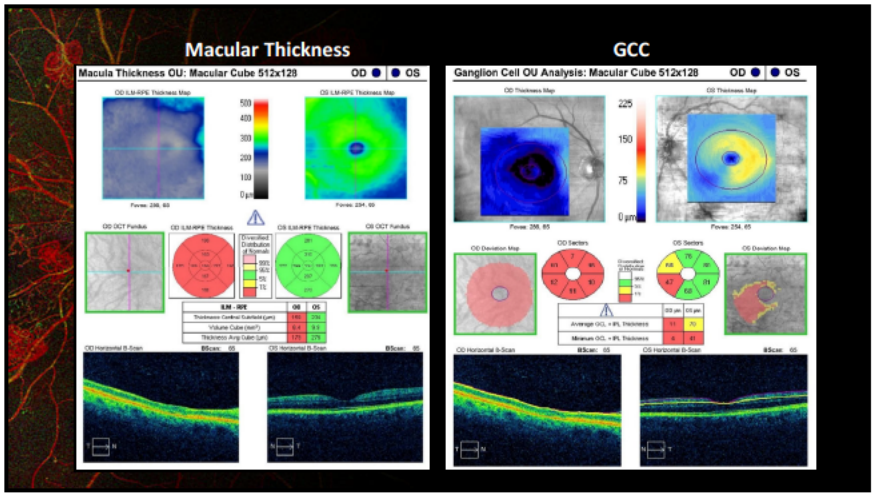
Macular Thickness
GCC
Macula Thickness OU: Macular Cube 512x128
OD
OS
Ganglion Cell OU Analysis: Macular Cube 512x128
OD
OS

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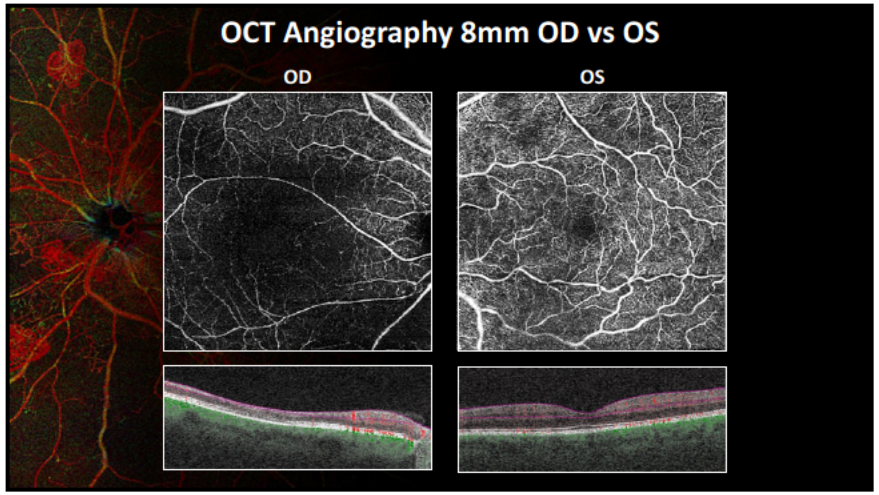
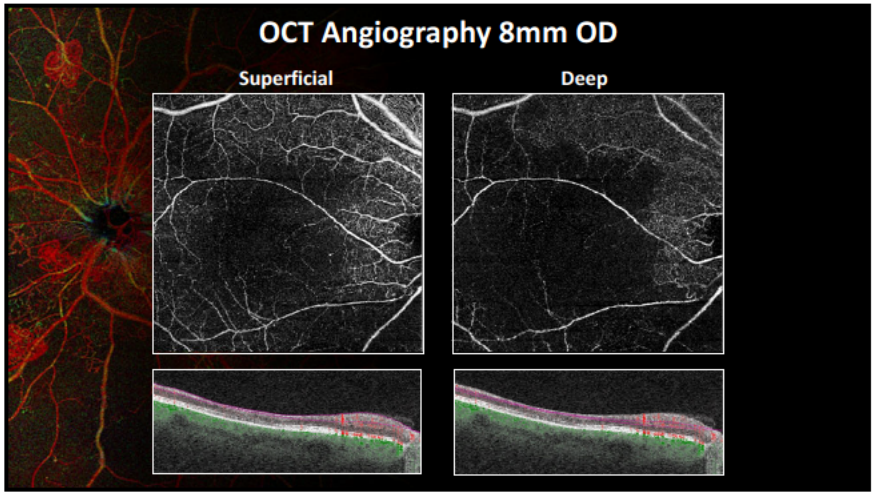

OCT Angiography 8mm OD vs OS
OD
OS

87


OCT Angiography 8mm OD
Superficial
Deep

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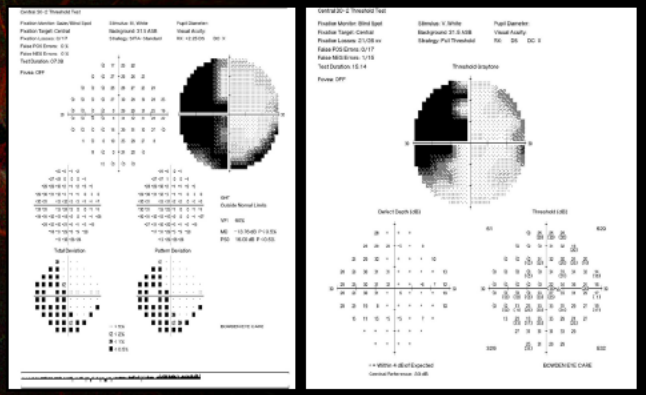
OS 30-2

OD 30-2 with size V stimulus



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Assessment & Plan

1. Late CRAO OD
   - S/P carotid endarterectomy right side
   - Encourage FU with PCP/cardiologist, statin?
   - Monitor 3 months for ocular sequelae such as NVG
   - Monocular precautions given
2. Old left incomplete homonymous hemianopia due to ischemic stroke (right-sided retro-chiasmal infarct)
   - Refer for low vision consult
3. Partial carotid stenosis left side per history
   - Due to risk of embolic CRAO OS pt edu on need for cardiac and carotid eval, as well as tight control of arteriosclerotic risk factors.
   - Pt edu to RTC immediately if vision loss occurs OS

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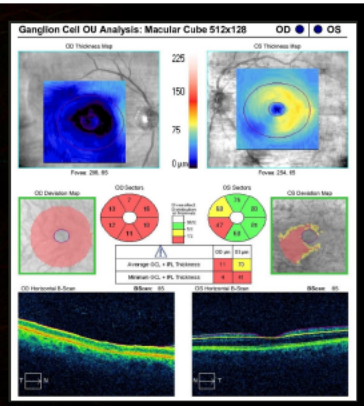
Why is there GCC loss OS?



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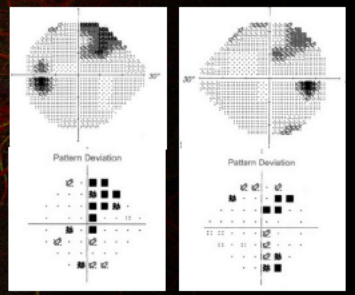
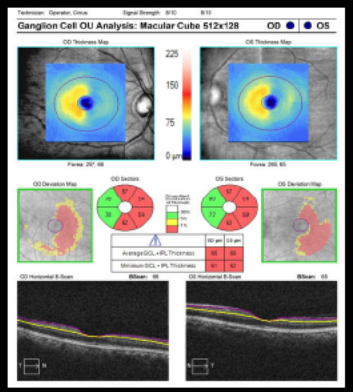
Retrograde GC Degeneration

Retrochiasmal visual pathway infarction can result in corresponding hemi-macular GCC thinning





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Take Home Message

Carotid Artery Disease

- Ocular manifestations of carotid disease include:
  - Retinal emboli or retinal arterial occlusion, OIS, hemianopic VF defects due to CVAs
- Differential diagnosis of optic neuropathy is difficult- vascular etiologies may have associated arterial attenuation, acute presentation
- Homonymous hemianopic VF defects point to a retrochiasmal lesion on the opposite side
- APD OD likely due to old CRAO, not stroke

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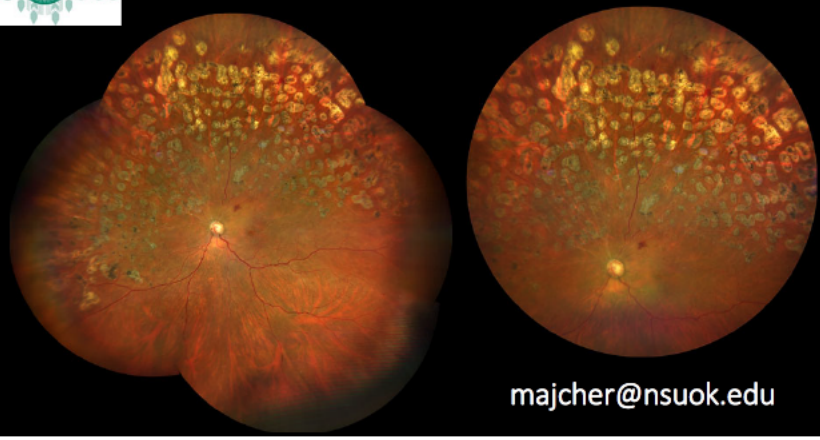
THANK YOU!!



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