


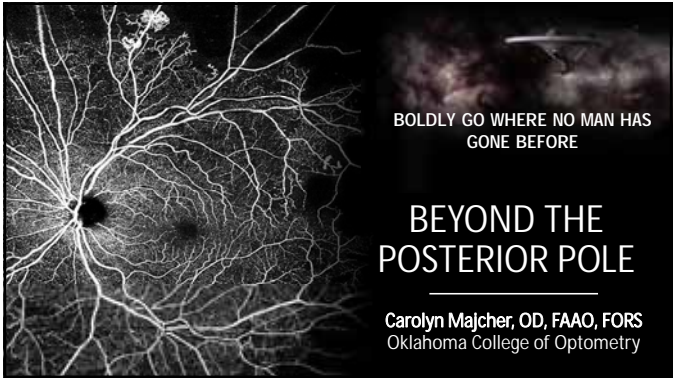
On behalf of Vision Expo, we sincerely thank you for being with us this year.

Vision Expo Has Gone Green!

We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Education Planning Committee considers content and speakers for future meetings to provide you with the best education possible.



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BOLDLY GO WHERE NO MAN HAS GONE BEFORE

BEYOND THE POSTERIOR POLE

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Oklahoma College of Optometry

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Disclosures:

- Paid consultant/speaker for:
 - Carl Zeiss Meditec
 - Regeneron Pharmaceuticals
 - Iveric Bio
 - Optomed
 - Apellis Pharmaceuticals
- Paid advisory board member for LENZ Therapeutics, Notal Vision, Ocuterra
- Non-financial support (writing assistance) from Roche

All relevant relationships have been mitigated

Handout:

- www.octangio.org




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OVERVIEW

Technology


- Widefield (WF)/UltraWF (UWF) color photography
- Fundus autofluorescence (FAF)
- WF Montage OCT Angiography (OCTA)
- Peripheral structural OCT imaging

Clinical Utility in Disease

- Diabetic retinopathy
- Ocular Ischemic Syndrome (OIS)
- Retinal vein occlusion
- Retinal emboli
- Choroidal & RPE tumors
- Peripheral retinal lesions & RD
- Presumed Ocular Histoplasmosis Syndrome (POHS)
- Peripheral CNV

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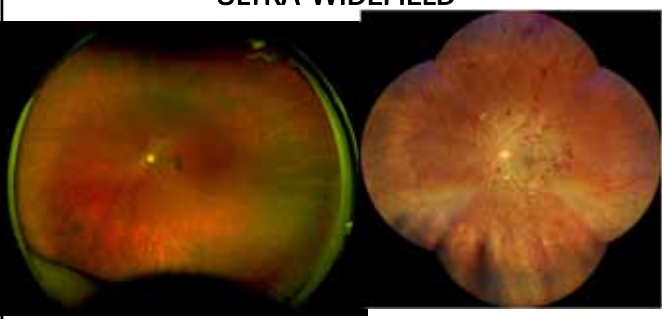
WIDEFIELD & ULTRA-WIDEFIELD CFP



WF= Up to the vortex vein ampullae, >50°
ampullae, ~200° and 80% retinal surface

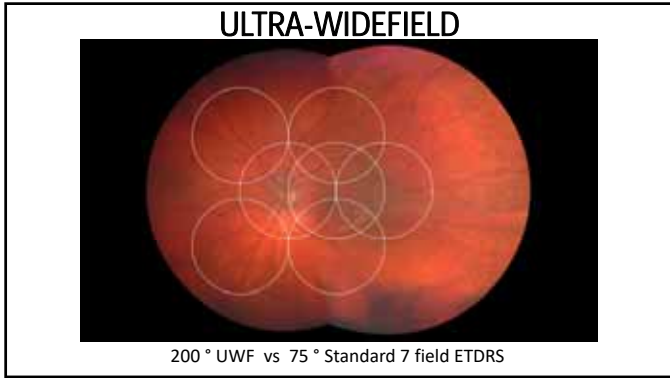
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ULTRA-WIDEFIELD

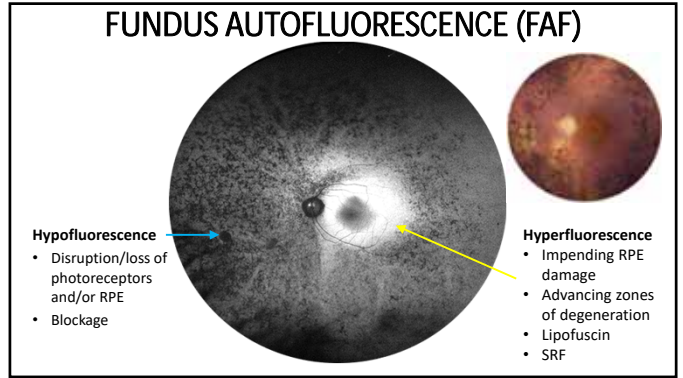


Single Capture Montage

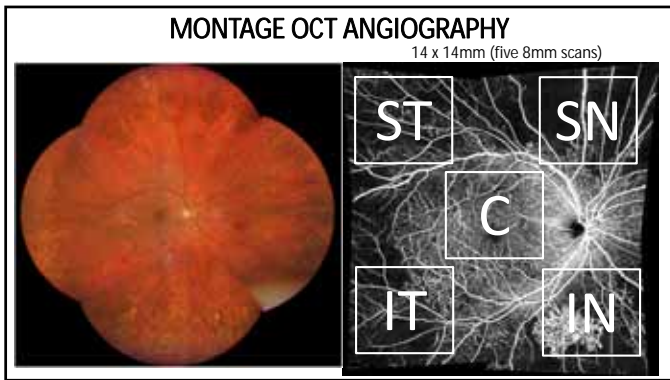
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DIABETIC RETINOPATHY

Utility of WF/UWF imaging

- **Live scan OCT** to look for neo and determine PVD status in high risk eyes
- **Determine PVD status**
 - Complete PVD = lower risk for neo growth and resultant vitreoretinal traction
- **Detect vitreoretinal traction** & monitor for progression
- **Detect retinal tears**
- **Montage OCTA**
 - **More accurate & efficient staging**
 - Detection and quantification of **nonperfusion** to determine likelihood of neo/risk for progression
 - **Earlier PDR detection**

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PREDOMINANTLY PERIPHERAL DIABETIC RETINOPATHY

S, et al. UWF Peripheral Lesions Predict Progression. Ophthalmology 2015.

- Followed 200 DR eyes for ~ 4 yrs
- Eyes with predominantly peripheral DR defined as majority of DR lesions outside the 75° ETDRS standard 7 fields
 - Compared to eyes without, eyes with predominantly peripheral DR had a 3.2-fold ↑ risk of ≥2-step DR progression (11% vs. 34%), and a 4.7-fold ↑ risk for progression to PDR (6% vs. 25%).

EYES WITH PREDOMINANTLY PERIPHERAL DR HAVE A GREATER RISK FOR DR PROGRESSION AND DEVELOPMENT OF PDR!!

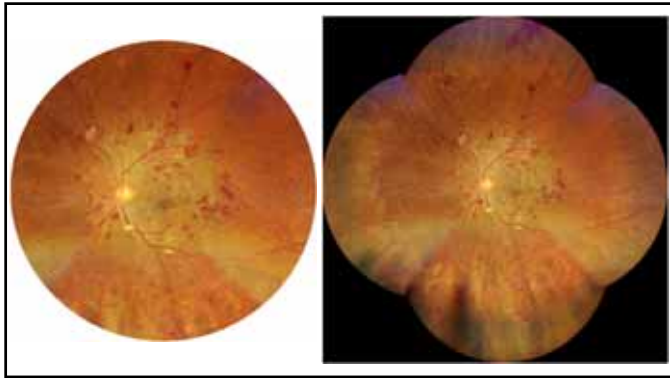
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COVID CASUALTY

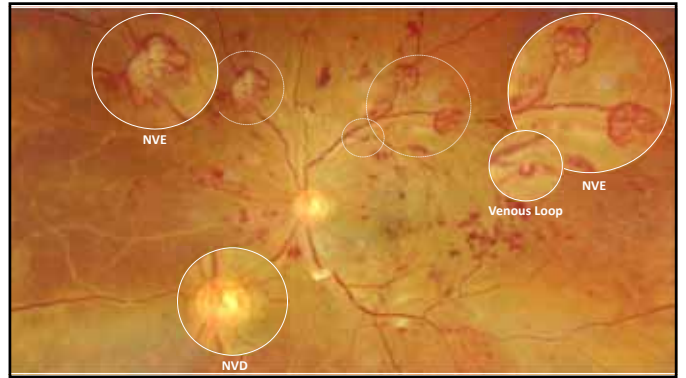
44yo male – Presents for first eye exam EVER, blur @ dist & near OU

- **MH:**
 - DM Type 2 x 2 yrs, last HbA1C **10.6%**
 - HTN, hyperchol
- **BCVAs @dist:**
 - OD **20/60**¹²
 - OS 20/50
- Entrance testing: WNL
- External exam: Normal OU
- BP: 121/81

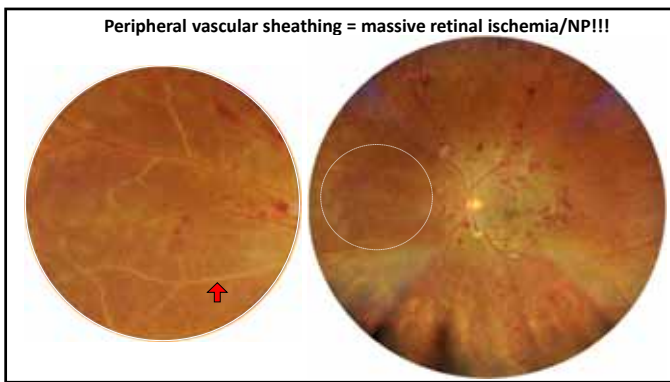
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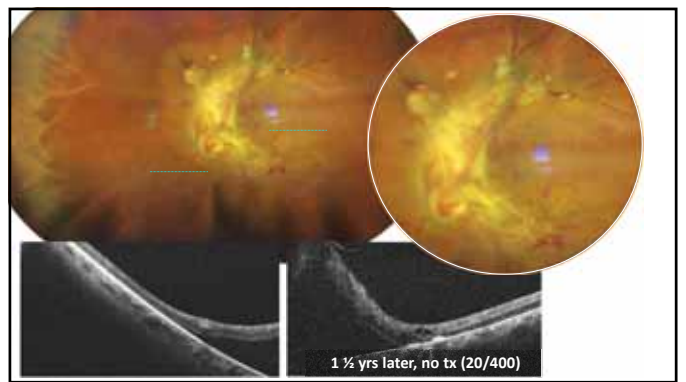
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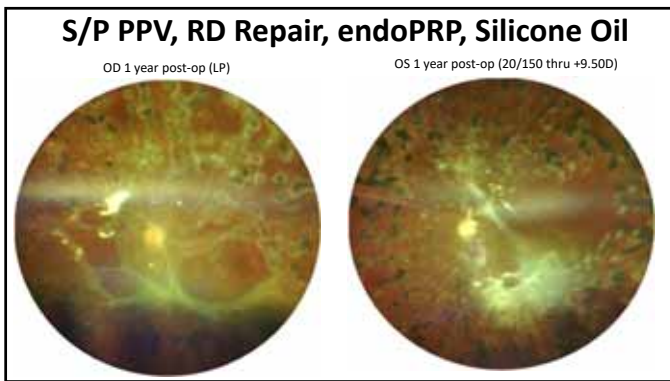
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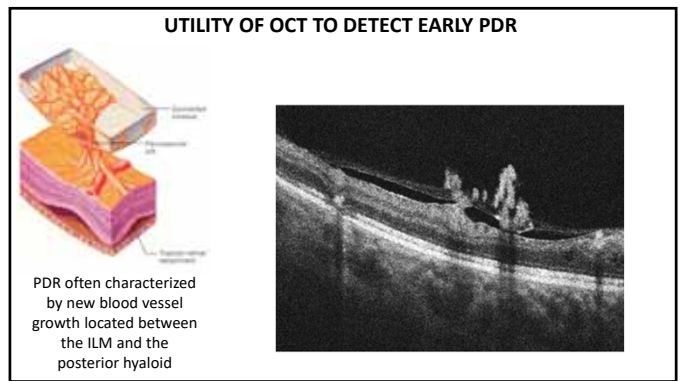
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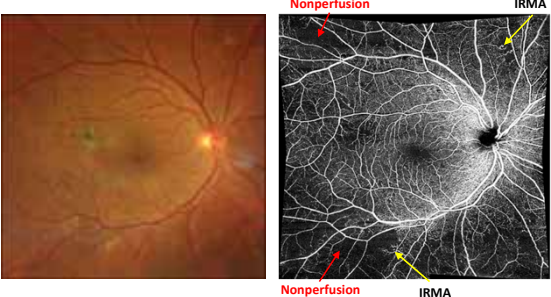
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Utility of OCTA Montage Imaging in DR

- OCTA highlights subtle vascular abnormalities = more accurate DR staging



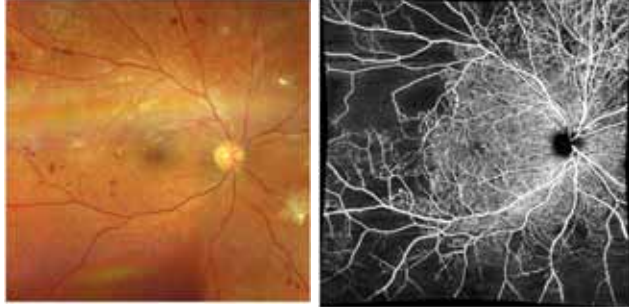
Nonperfusion IRMA

Nonperfusion IRMA

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Utility of OCTA Montage Imaging in DR

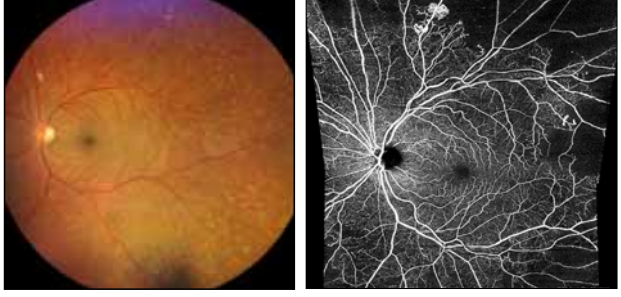
Nonperfusion



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Utility of OCTA Montage Imaging in DR

OCTA – Visualization of peripheral NP (nearly invisible without) and subclinical NVE



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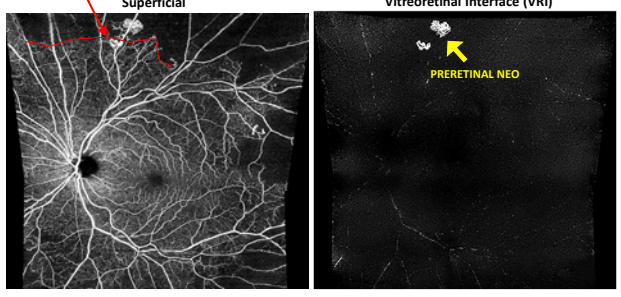
Utility of OCTA Montage Imaging in DR

Isolate Preretinal Neo!

Neo often forms at the border of perfusion and nonperfusion

Superficial Vitreoretinal Interface (VRI)

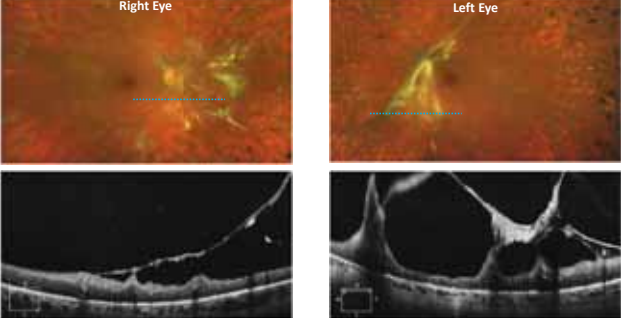
PRERETINAL NEO



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OCT to Detect & Monitor Traction in PDR

Right Eye Left Eye

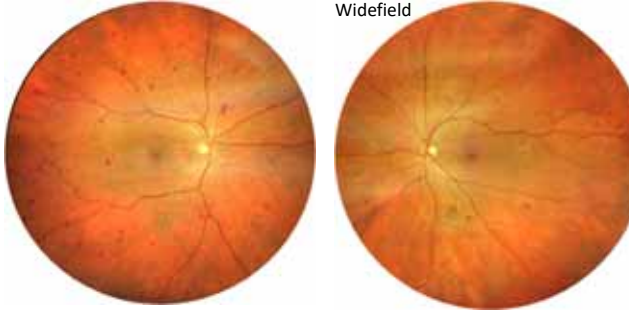


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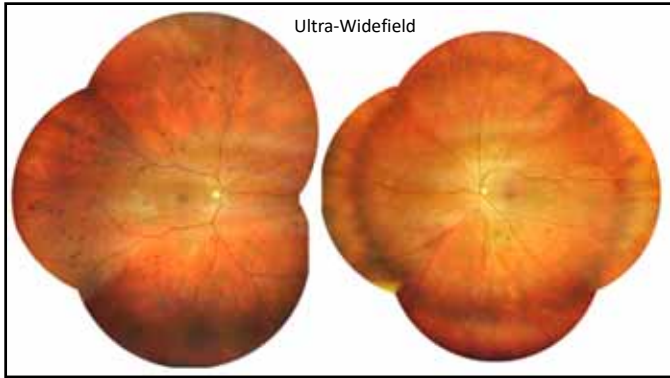
70yo male – routine exam, reports gradual ↓ vision OD x 2 years, 20/20 OD/OS

Med Hx: Type 2 DM x 24 yrs, HTN, dyslipidemia

Widefield



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OCULAR ISCHEMIC SYNDROME

	Ocular Ischemic Syndrome (OIS)	Diabetic Retinopathy	CRVO
Symmetry	asymmetric	symmetric	asymmetric
Heme Shape	blot	blot	flame > blot
Heme Location	Midperiphery/periphery > post pole	Usually more concentrated within the post pole	Usually more concentrated within the post pole
Retinal Vessels	Veins dilated and non-tortuous, arteriolar attenuation	Veins dilated & beaded	Veins dilated and tortuous
ONH	Normal to pale	Normal	Edematous
Mac Edema	Rare	Common, usually focal (decentered) with exudate	Common (central & diffuse CME)
Onset	Insidious	Insidious	Acute

Why is the retinopathy so asymmetric?? **WHEN PRESUMED DR IS ASYMMETRIC THINK ABOUT OCULAR ISCHEMIC SYNDROME (OIS) AND CRVO!!!**

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OIS Hemes mostly in midperiphery
Dilated & non-tortuous veins
MACULAR EDEMA RARE IN OIS!!

DR Hemes mostly in post pole
Dilated & **BEADED** veins
Macular edema common (usually focal with **EXUDATE**)

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OIS blot hemes
Dilated & non-tortuous veins
ONH normal or pale

CRVO FLAME & blot hemes
Dilated & **TORTUOUS** veins
ONH edema common

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BACK TO OUR PATIENT.....

Carotid Doppler US

- 70% stenosis of the right ICA
- 50-69% stenosis of the left ICA

CTA Head & Neck

- High grade 80% stenosis of the right proximal ICA 14mm distal to its origin
- 50% stenosis of the left proximal ICA

UNDERGOES RT CAROTID ENDARTERECTOMY!

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Diabetic Retinopathy?

73yo female

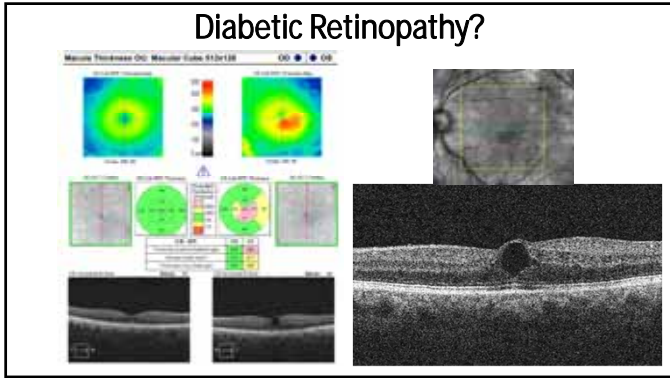
- CC: Referred to retina clinic for DME OS eval, **haze over vision OS > OD x 1 month**

Ocular Hx: POAG susp
Medical Hx:
HTN (BP in-office 147/76)
Type 2 DM x 3 years, last a1c 6.7%

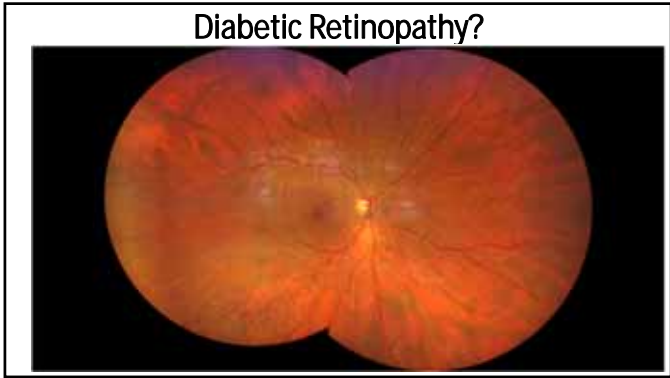
VA sc @dist
OD 20/25
OD 20/30

Pupils: Equally round, (-) APD
CVF: FTFC OU
Ant seg: 1+ NS OU
IOP: **21/20**

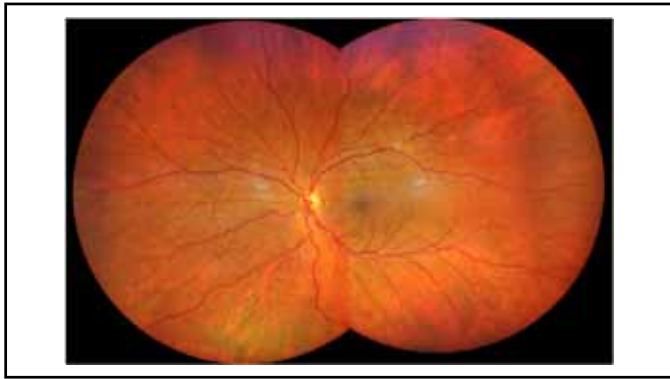
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RETINAL VEIN OCCLUSION

A fundus photograph showing the retina with a prominent, bright, and somewhat irregular optic disc. The retinal vessels appear slightly dilated and tortuous, which are signs consistent with diabetic retinopathy.

Utility of WF/UWF imaging

- Document extent of involvement
- Montage OCTA
 - Classify as ischemic vs nonischemic
 - Detect post seg neo

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RETINAL VEIN OCCLUSION

40yo American Indian female

- CC: Routine exam, no complains

Medical Hx:

- HTN (BP in-office 133/83)
- VA sc @dist
- OS 20/20
- Pupils: Equally round, (-) APD
- CVF: OD restriction inf nasal
- Ant seg: WNLs
- IOP: 15/16

A fundus photograph showing the retina with a prominent, bright, and somewhat irregular optic disc. The retinal vessels appear slightly dilated and tortuous, which are signs consistent with diabetic retinopathy.

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RETINAL VEIN OCCLUSION

A fundus photograph showing the retina with a prominent, bright, and somewhat irregular optic disc. The retinal vessels appear slightly dilated and tortuous, which are signs consistent with diabetic retinopathy.

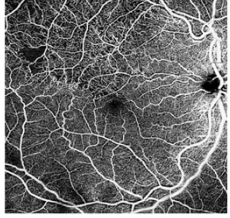
Montage OCTA superficial

A montage of OCTA superficial images showing the retinal vasculature. The image displays a complex network of vessels, with some areas appearing more dense and others more sparse, indicating retinal vein occlusion.


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MONTAGE OCTA IN RVO

Non -ischemic BRVO



Ischemic BRVO



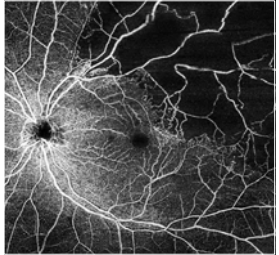
- Estimate the degree of NP and classify as ischemic or nonischemic
- CRVO → ant seg neo
- BRVO → post seg neo

Predictive Value of Retinal NP!!!
BVOS 50/50/50 rule:
 ~ 50% of eyes with ischemic BRVO will develop NVD/NVE

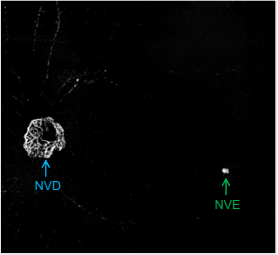
Branch Vein Occlusion Study Grp. Argon laser scatter photocoagulation for prevention of neovascularization and vit heme in BVO. A RCT. Arch Ophthalmol. 1986.

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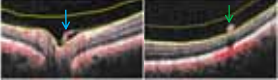
Montage OCTA Superficial



Montage OCTA Vitreoretinal Interface (VRI)



**Ischemic BRVO with post seg neo:
REFER FOR SECTORAL PRP!!!
40yo- get systemic WU!**



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RETINAL VEIN OCCLUSION


RVO Zebra Work-Up

- If young patient (<50), BRVO that did not occur at a A/V crossing, no history of HTN, or bilateral RVO consider more extensive systemic workup:
 - Causes of retinochoroiditis or retinal vasculitis: sarcoid, syphilis, SLE, TB, Lyme, AIDS/CMV
 - Hyperviscosity states: leukemia, Waldenström's macroglobulinemia, polycythemia, lymphoma, multiple myeloma, cryoglobulinemia
 - Hypercoagulable states and thrombophilia: factor V Leiden, hyperhomocysteinemia, protein C deficiency, antithrombin III, activated protein C resistance, sickle cell, antiphospholipid syndrome, anticardiolipin antibodies
 - Abnormal platelet function
 - Oral contraceptive/diuretic use
- Recommend: BP, A1c, CBC with diff & plat count, PT/aPTT, ESR, INR, lipid profile, homocysteine levels, ANA, FTA-ABS/RPR, QuantIFERON TB gold or PPD, hemoglobin & serum protein electrophoresis, antiphospholipid antibodies, protein C and S levels, factor V Leiden mutation,, antithrombin III mutation, prothrombin G20210A mutation.

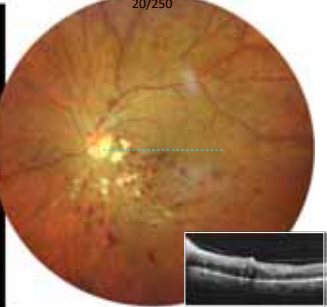
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MORE THAN MACULAR EDEMA

57yo female
DM (LADA), +ANA, hyperhomocysteine & ↑ cardiolipin IgM
CF, 3+ APB, CF




1 mo FU (2 weeks S/P aflibercept)
20/250




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MORE THAN MACULAR EDEMA



OCTA Montage Superficial




≥ 10 DAs of NP = ISCHEMIC CRVO

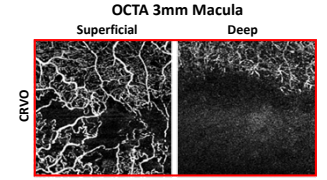
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UTILITY OF OCTA IN RVO – MACULAR ISCHEMIA

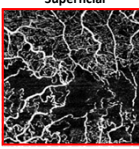
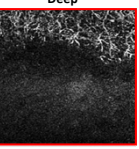
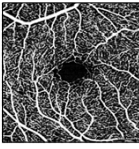
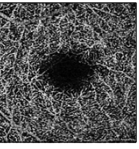
Baseline ME
CF



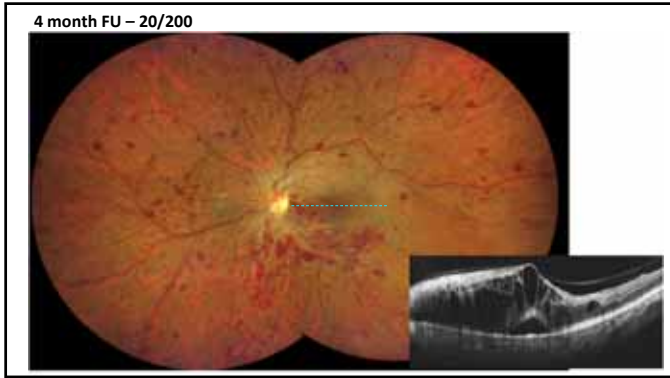
1 months later S/P anti-VEGF
20/250



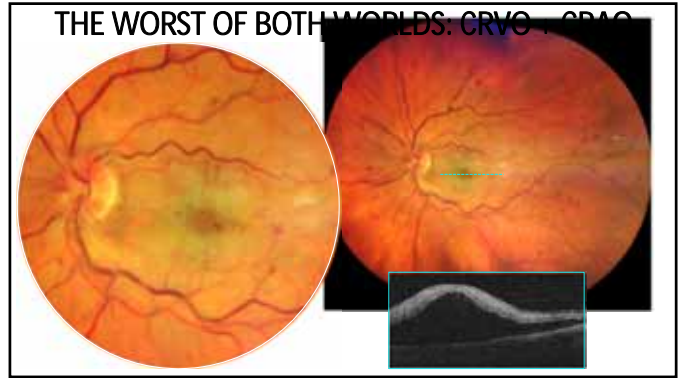
CRVO

OCTA 3mm Macula	
Superficial	Deep
	
<p>Normal</p> 	

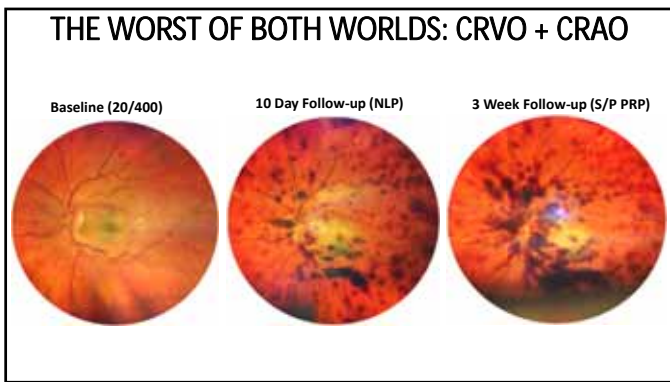
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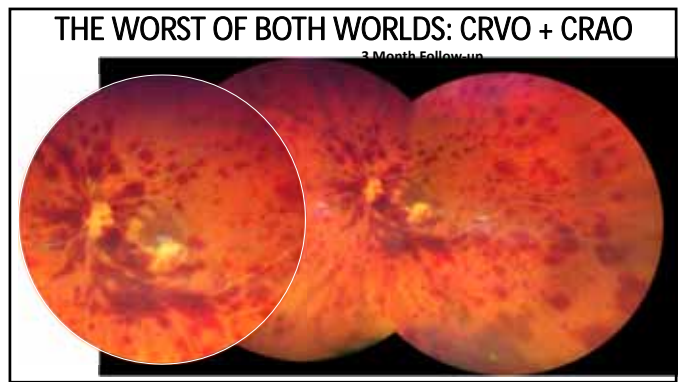
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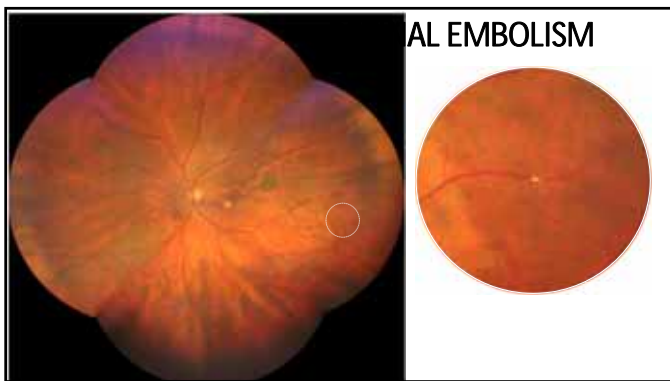
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NEVUS OR MELANOMA?

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%

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





Fundus Autofluorescence

Variable	Value	Observation	Setting	Overall Risk Factor	P-value
Melanoma size (mm)	1	≤2	US	1.5%	<0.001
Fluid (SRF)	1	None	US	1.5%	<0.001
Melanoma growth (mm/yr)	0	None	US	1.5%	<0.001
Melanoma growth (mm/yr)	0	None	US	1.5%	<0.001
Melanoma growth (mm/yr)	0	None	US	1.5%	<0.001
Melanoma growth (mm/yr)	0	None	US	1.5%	<0.001
Melanoma growth (mm/yr)	0	None	US	1.5%	<0.001
Melanoma growth (mm/yr)	0	None	US	1.5%	<0.001
Melanoma growth (mm/yr)	0	None	US	1.5%	<0.001
Melanoma growth (mm/yr)	0	None	US	1.5%	<0.001

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NEVUS OR MELANOMA?


Diameter more than 5mm (by photography)

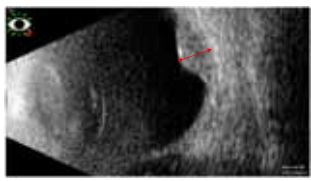
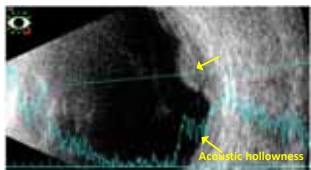



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ULTRASOUND MELANOMA ACOUSTIC HOLLOWNESS

Ultrasound tumor thickness = 4mm




Acoustic hollowness

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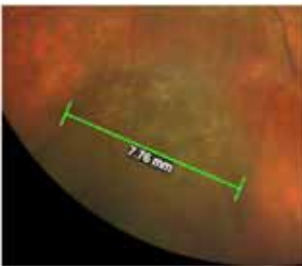

NEVUS OR MELANOMA? YOU DECIDE!!!

72yo female

- CC: 6mo ch tumor FU, no complaints
- Oc Hx:
 - LEE & DFE 6 months ago- noted a 4DD x 4DD choroidal nevus inferior periphery OS 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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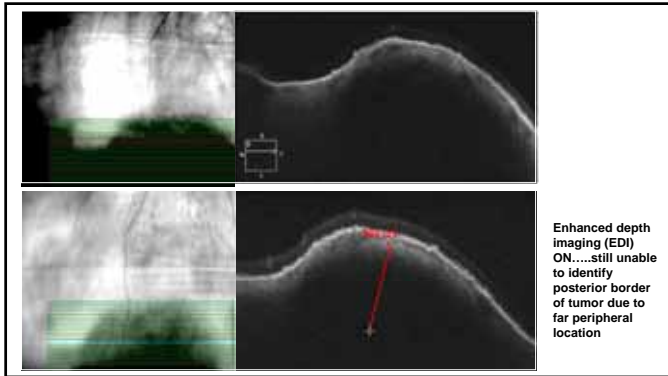
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NEVUS OR MELANOMA? YOU DECIDE!!!

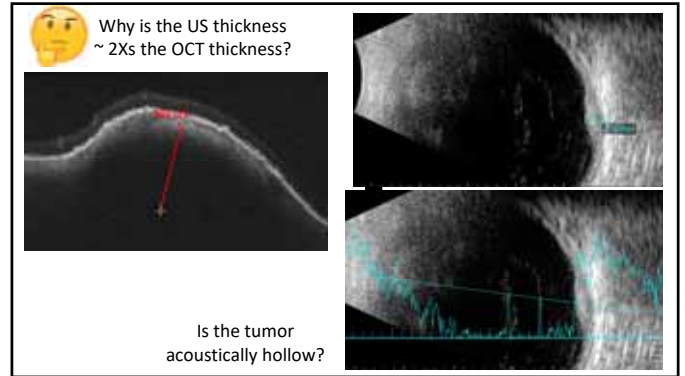
Fundus Autofluorescence (FAF)

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NEVUS OR MELANOMA? YOU DECIDE!!!

- Risky features:** US thickness >2mm and possibly hollow, diameter >5mm
- Benign features:** (+) drusen, no SRF or orange pigment

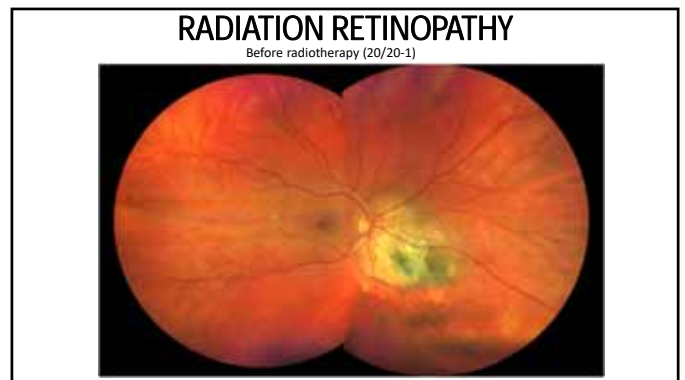
Variable	Letter	Measurement	Testing
→ Retinal tumor >2mm	F	To	US
→ Retinal detachment	F	Yes	OCT
→ Symptoms visual acuity <20/70	S	Small	Swollen VA
→ Orange pigment	O	Clashes	M
→ Melanocyst acoustically Subnormal	M	Melanoma	US
→ Diameter tumor >5mm	DIM	Strong Warning	Photography

3 risk factors = 34% risk for growth within the next 5

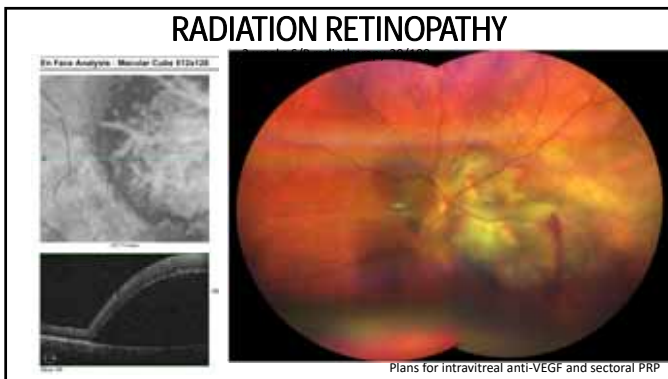
Management

- Referred to retina, who then referred to ocular oncology
- Ocular oncology rec observation, FU every 6 months

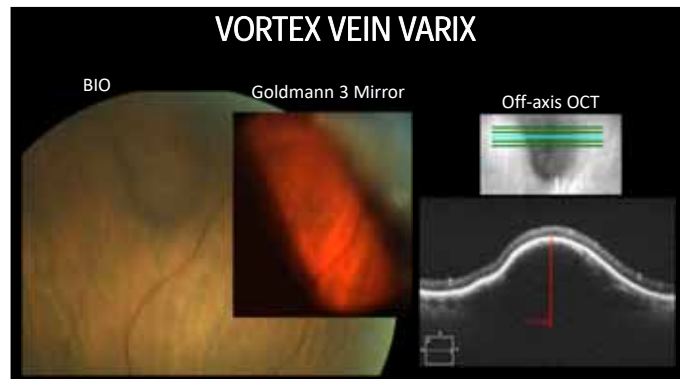
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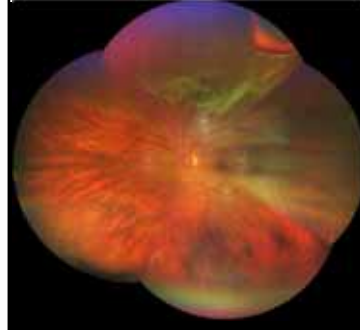
CHRPE-like Lesions in FAP (Familial Adenomatous Polyposis)

	Gardner's Syndrome	CHRPE
Appearance	Small: Identical to CHRPE Large: Oval with tail	Flat, round-oval, jet black
Bilaterality	Common (86% cases)	Very rare (5% cases)
Multiple quadrants	Common	Rare



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Peripheral retinal pathology & Rheg RD



Utility of WF/UWF imaging

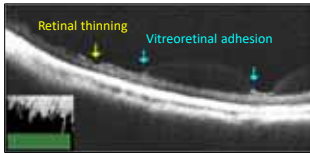
- Detect retinal breaks
- Document size and extent of RDs
- Monitor post repair

Utility of OCT

- Find holes within lattice
- Differentiate vitreoretinal tuft vs tear
- Differentiate retinoschisis vs RD
- Posterior Shafer's sign

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LATTICE

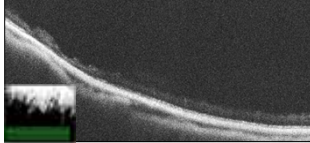


Lattice defined:

- Area of retinal thinning
- With overlying vitreous liquefaction
- & firm vitreoretinal adhesion along the margins

Utility of OCT in lattice evaluation

- Enhanced visualization of holes and surrounding vitreoretinal traction
- Differentiate between lamellar and full thickness holes within lattice

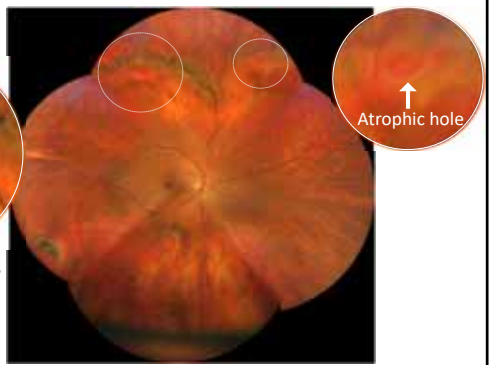


63

LATTICE



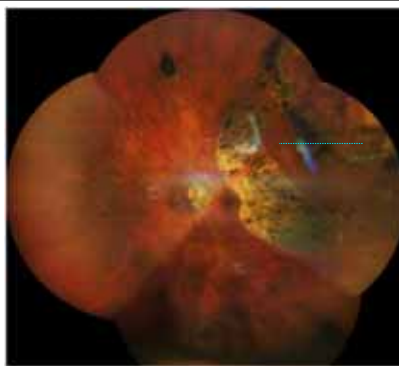
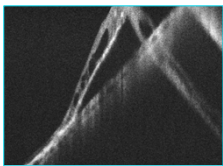
HIGH RISK Flap Tears that formed during acute PVD due to firm vitreoretinal adhesion along lattice margins !!



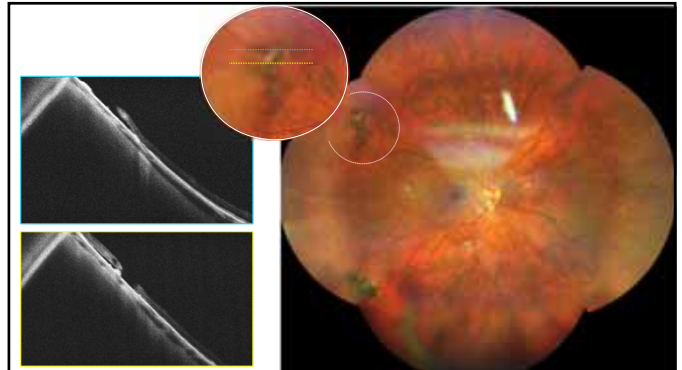
64

65yo female

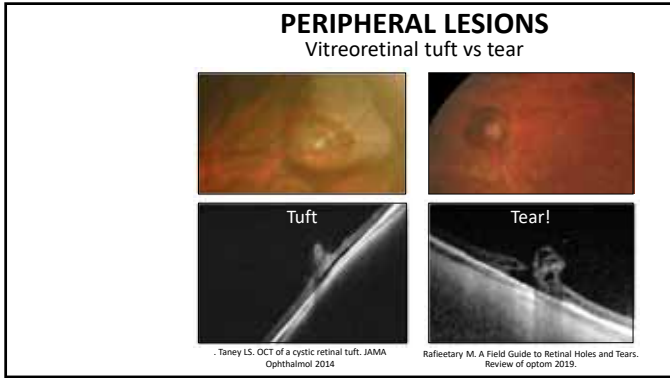
- CC: Referred to Retina Clinic for eval of chronic RD OS S/P barrier laser x2 1980s, pt asymptomatic
- Refraction: ~ -9.50D
- OD 20/20, OS 20/30



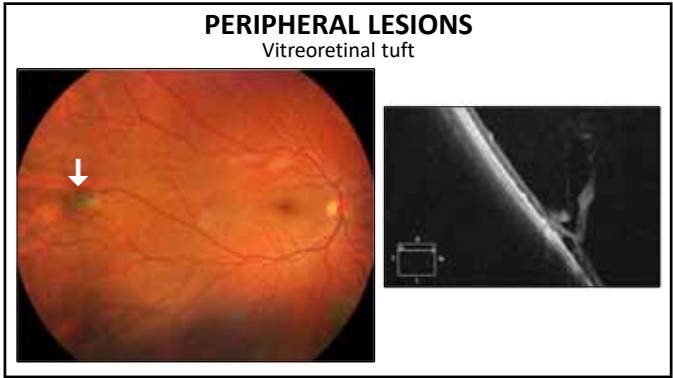
65



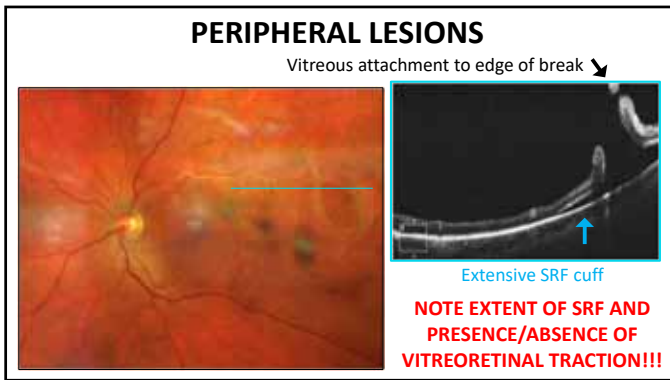
66



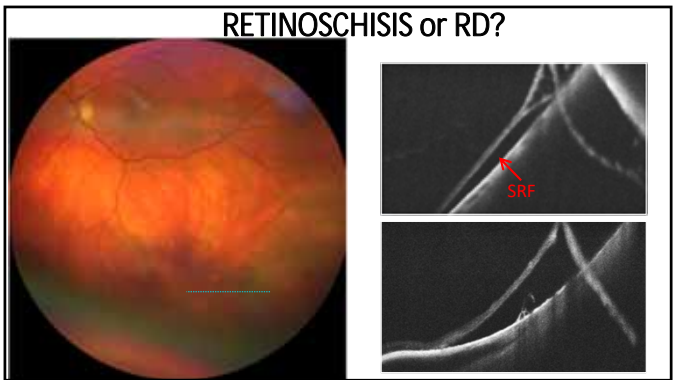
67



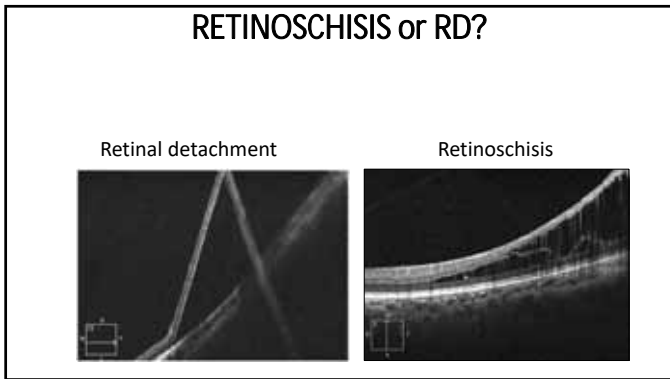
68



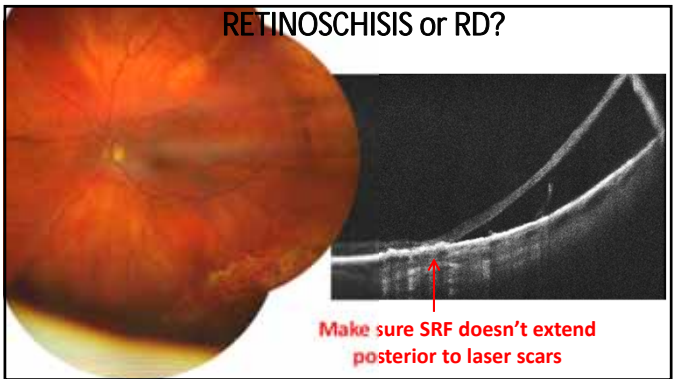
69



70



71




72

RETINOSCHISIS or RD? Round 2

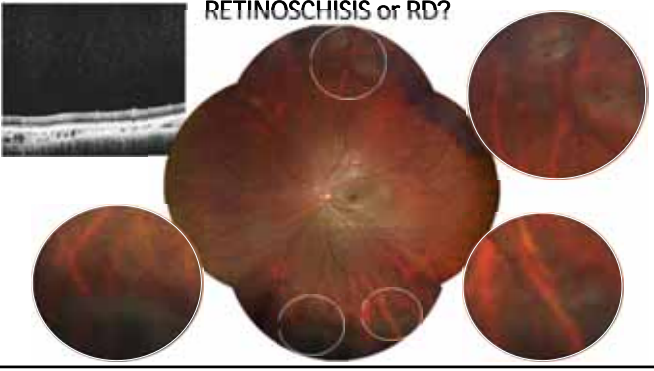
22yo female

- CC: Referred for lattice with holes OU eval
- Asymptomatic, seen in CL clinic ~ 2 weeks ago
- Refraction: ~ -SD 20/20 OD & OS



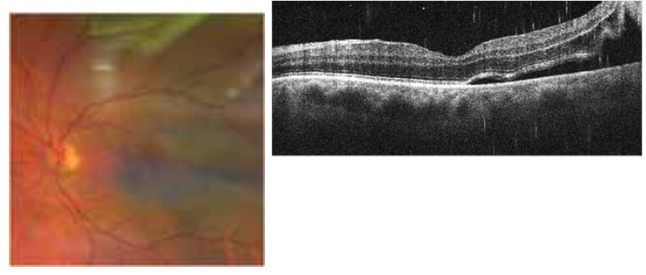
73

RETINOSCHISIS or RD?



74


"Falling Ash" Sign = Posterior Shaffer's Sign



Rayess N, et al. Spectral-domain OCT in acute PVD. Ophthalmology. 2015;122(9):1946-7.

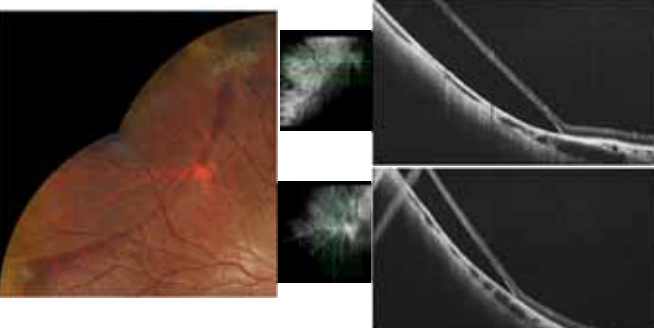
75

RETINOSCHISIS or RD?



76

RETINOSCHISIS or RD?

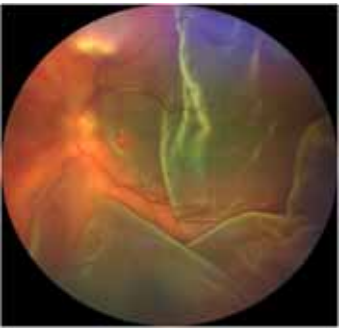


77

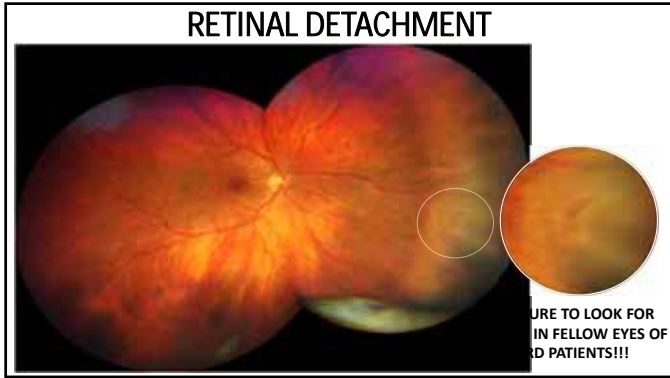
RETINAL DETACHMENT

61yo American Indian female

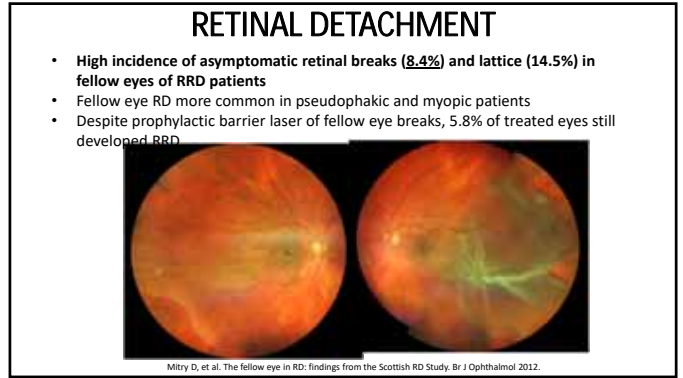
- CC: **Sudden onset floaters** "like a thousand flies" 3 weeks ago OS. Can only see temporally.
- VA
 - OD 20/25
 - OS LP



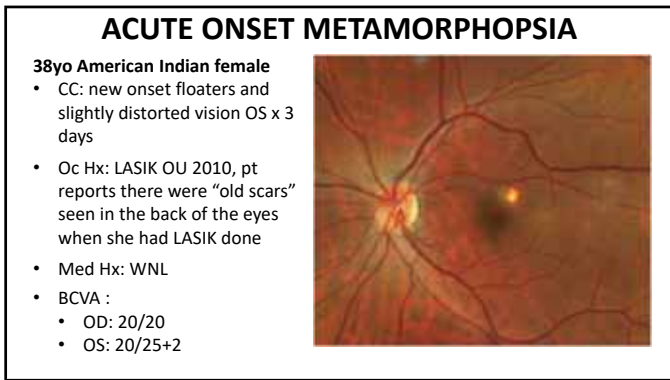
78



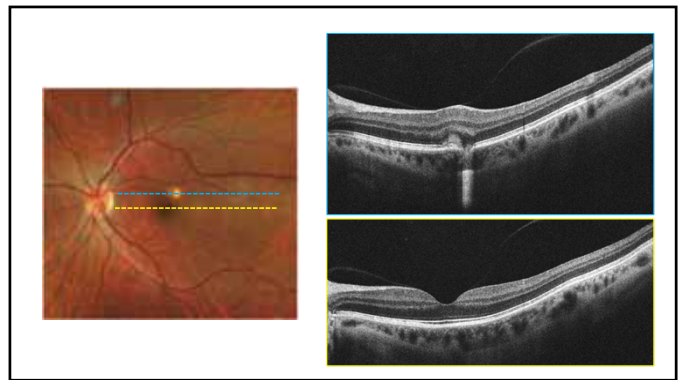
79



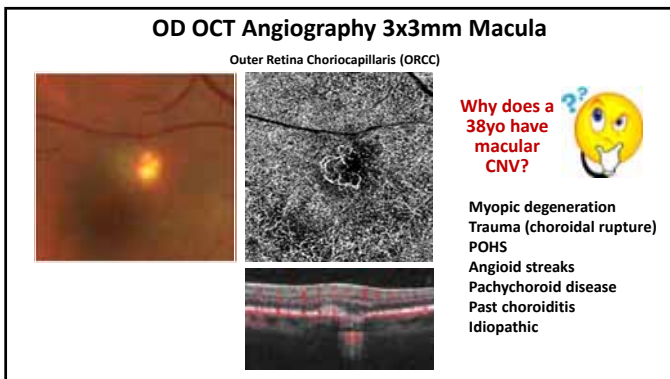
80



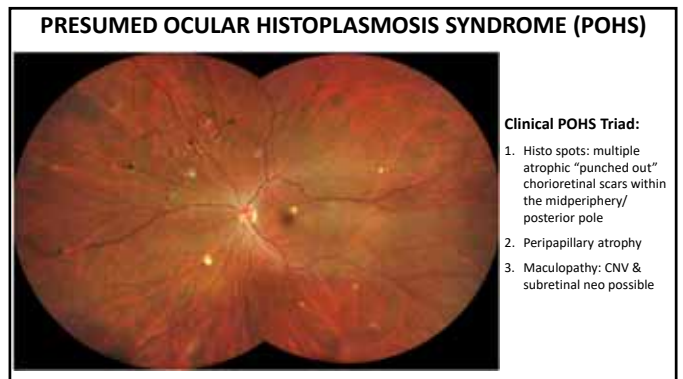
81



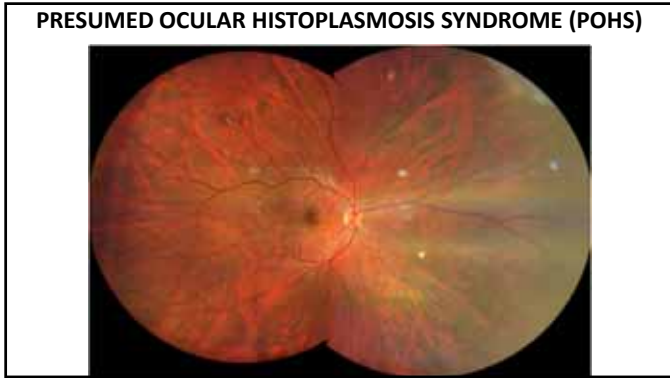
82



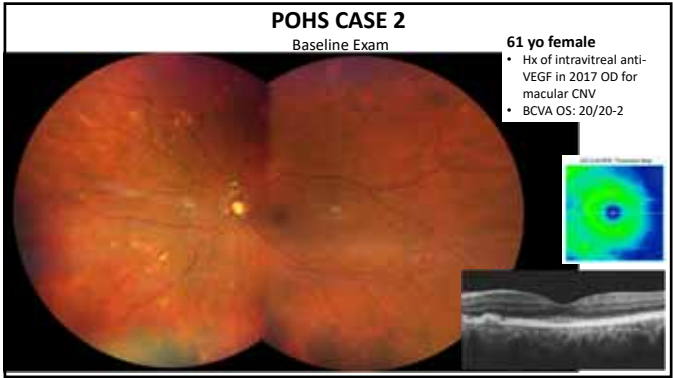
83



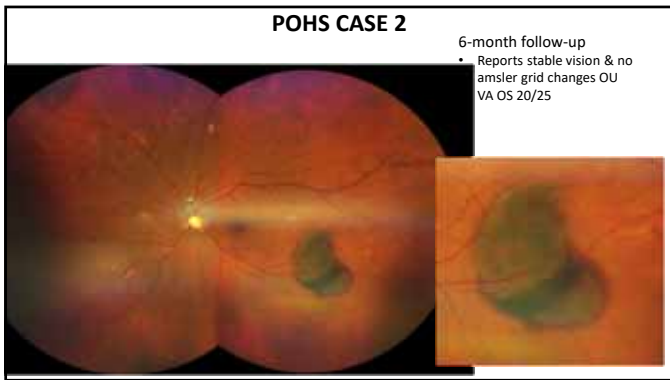
84



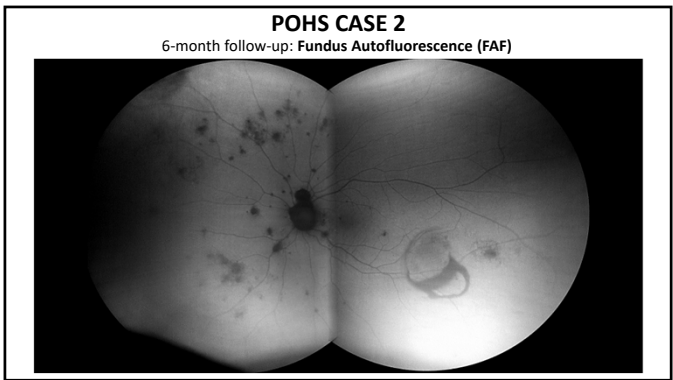
85



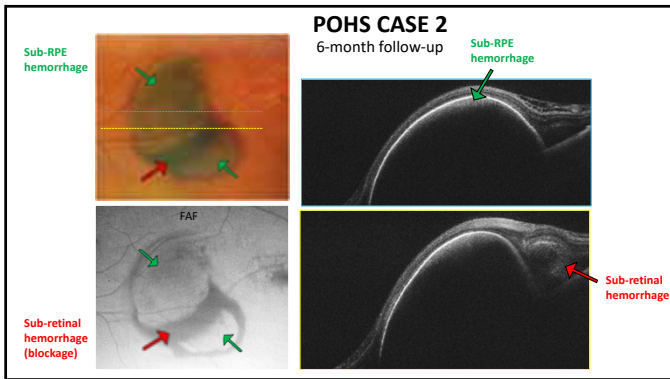
86



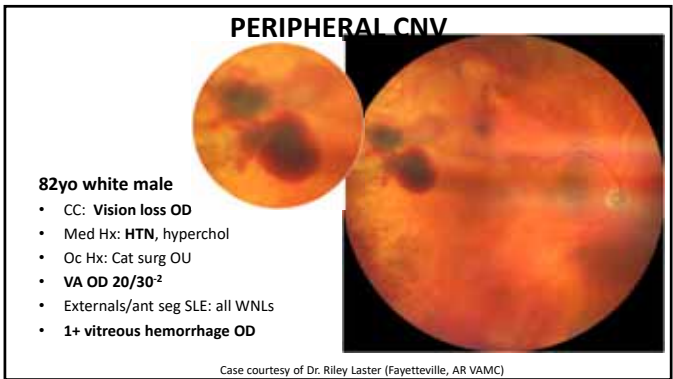
87



88



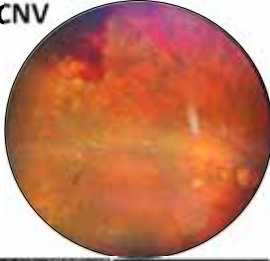
89




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PERIPHERAL CNV

- AKA: **Peripheral exudative hemorrhagic chorioretinopathy (PEHCR)**
- Uncommon peripheral degeneration causing **peripheral exudative mass** (subretinal or subRPE hemorrhage & fluid, exudates, vit heme possible)
 - Usually **temporal**, 30% bilateral
- **Older Caucasian females** (mean 77-83 yrs)
- Systemic assoc: **HTN ~ 50%**, systemic anticoagulation or anti-platelet tx
- Ocular Assoc: **ARMD ~ 23-70%**, **macular CNV 8%**
- ~ 90% stabilize or regress without tx



- Consider anti-VEGF and/or laser photocoag if macular involvement
- **R/O macular CNV and choroidal melanoma!!!**



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THE "TAKE HOME" MESSAGE

Diabetic Retinopathy

- Eyes with predominantly peripheral findings have a greater risk for DR progression and development of PDR
- OCT useful in the detection of retinal breaks and early tractional RD
- Montage OCTA useful in detection of early PDR and quantification of peripheral nonperfusion

Choroidal Tumors

- TFSOM
- FAF highlights subtle lipofuscin that increases risk for melanoma
- OCT useful in detection of fluid and measure thickness

Peripheral lesions


- OCT useful to differentiate schisis from RD
- OCT useful to differentiate lamellar from full thickness breaks, and to monitor SRF surrounding breaks
- High risk for tears in fellow eyes of RRD patients

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On behalf of Vision Expo, we sincerely thank you for being with us this year.

Vision Expo Has Gone Green!

We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Education Planning Committee considers content and speakers for future meetings to provide you with the best education possible.



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