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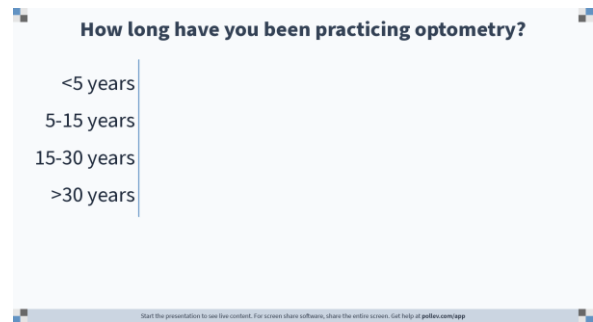
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1



2



3



You Make The Call
Interactive Retina
Grand Rounds
60795-PS 2 hours

Damon Dierker, OD, FAAO
Director, Optometric Services
Eye Surgeons of Indiana

4

Disclosures - Damon Dierker, OD, FAAO

- Aeris - A
- Alcon - A/C/S
- Allergan - A/C/R/S
- ArcticDx - R
- Avellino Lab - A
- Azura - A
- Bio-Tissue - A/C/R/S
- Carl Zeiss Meditec - A
- Eyevance - A/C/S
- Genentech - A
- Glaukos - A/C/S
- Gyroscope - R
- Johnson & Johnson - C
- Kala - C/S
- Lumenis - C/S
- MacuHealth - S
- MacuLogix - A/C/S
- Notal Vision - A/C/S
- NovaBay - C
- Novartis - A/C/S
- Ocular Therapeutix - A/R
- Optovue - S
- Osmotica Pharmaceutical - C
- Oyster Point Pharma - A
- Quidel - A/C
- ScienceBased Health - S
- Scope - C
- Shire - A/C/S
- Sight Sciences - A/C/S
- Sun Pharma - A/S
- Tarsus - A/R
- TearLab - C/S

A - Advisory Board
C - Consultant
R - Research
S - Speaker Bureau



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Case Series 1

Complications of early PVD

6

65 yo WM cataract evaluation

CC: blurry vision OU, glare at night
 POH: cataract OU
 PMH/meds: non-contributory
 FOH/FMH: non-contributory

7

BCVA: 20/40 OD, 20/25 OS
 Preliminary testing: normal
 Topography: mild WTR cyl OU
 IOP: 16/16
 SLEx: 2+ NS OU
 Fundus: normal OU

8

What should you do next?

Repeat refraction
 Order visual field
 Order macula OCT
 Proceed w/ cataract surgery

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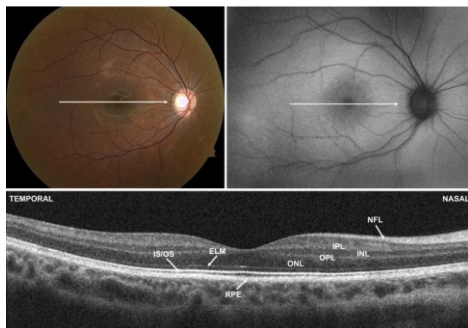
9

Do you have an OCT in your practice?

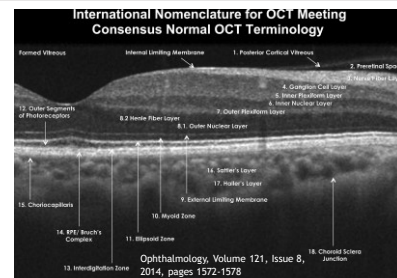
Yes
 No

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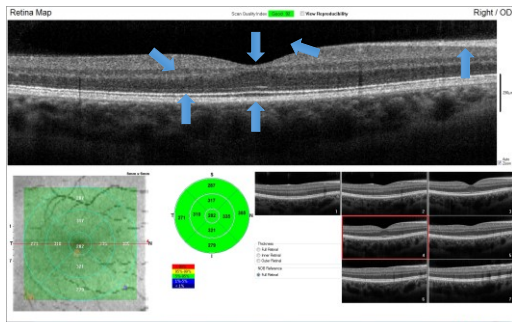
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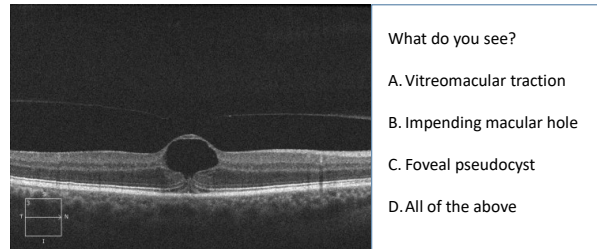


12



13

65 yo WM – VA 20/40 OD



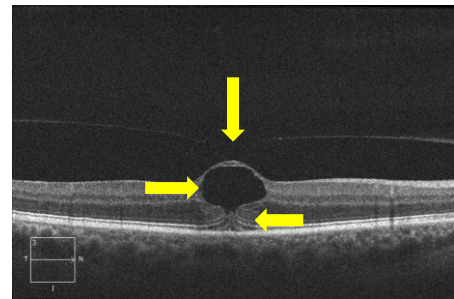
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What do you see?

- Vitreomacular traction
- Impending macular hole
- Foveal pseudocyst
- All of the above

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15



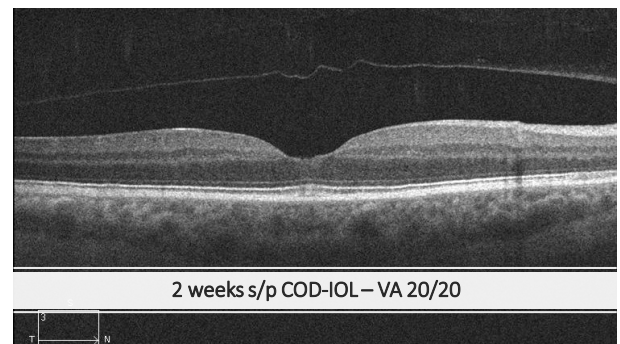
16

What next?

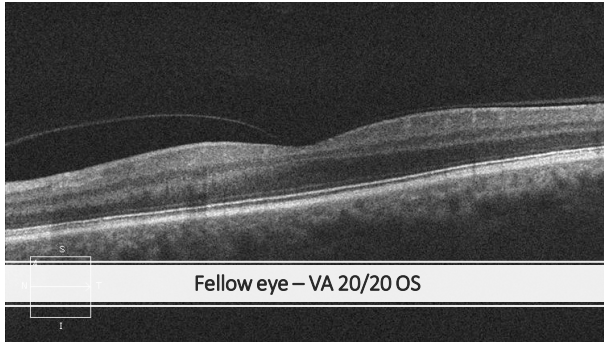
- Refer for retinal consult
- Proceed w/ cataract surgery
- Observe and F/U in 1 month

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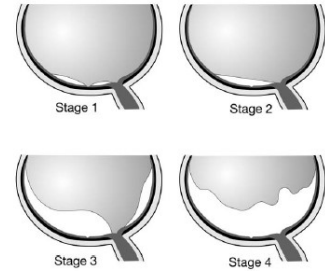


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19

PVD - Stages



Johnson MW. PERIFOVEAL VITREOUS DETACHMENT AND ITS MACULAR COMPLICATIONS. *Transactions of the American Ophthalmological Society*. 2005;103:537-567.

20

Complications of early stage PVD

- Epiretinal membrane
- Macular hole
- Vitreomacular traction syndrome (VMT)
- Others
 - Myopic traction maculopathy
 - Macular microhole
 - Foveal red spot

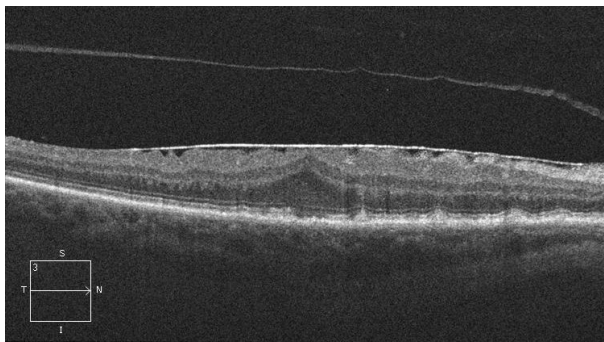
Johnson MW. PERIFOVEAL VITREOUS DETACHMENT: EVOLUTION AND COMPLICATIONS OF ITS EARLY STAGES. *American Journal of Ophthalmology*. 2010 Mar; 149(3):371-82.

21

Epiretinal membrane



22



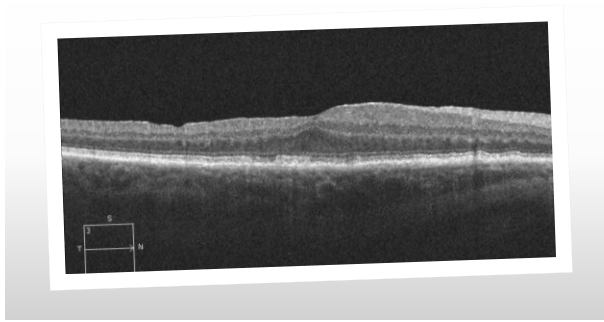
23

When should you refer a patient with an ERM for a vitrectomy consult?

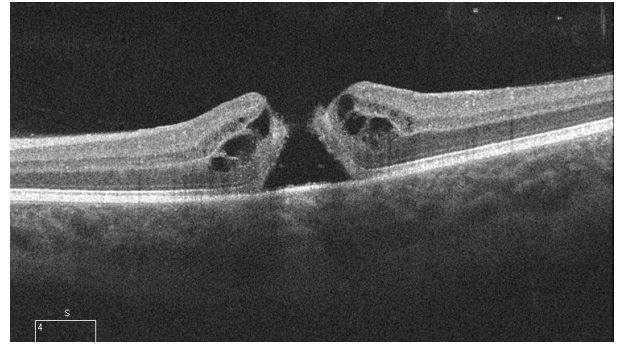
- Symptoms of blurry vision or distortion
- Visual acuity 20/40 or worse
- Condition affecting activities of daily living
- All of the above

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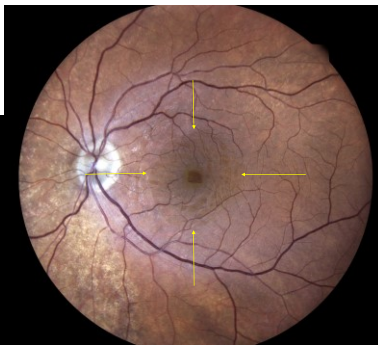
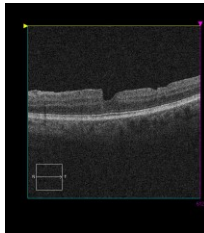


25



26

s/p PPV/MP/gas



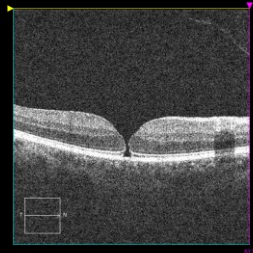
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EYE SURGEONS
of INDIANA

8/3/15 – VA 20/25

Macular microhole <150 microns

Observation recommended



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EYE SURGEONS
of INDIANA

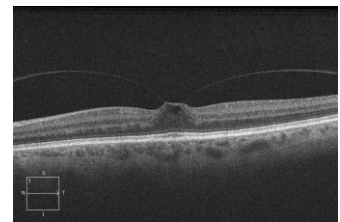
1/25/16 - VA 20/25

Spontaneous closure is
common in cases of
macular microhole

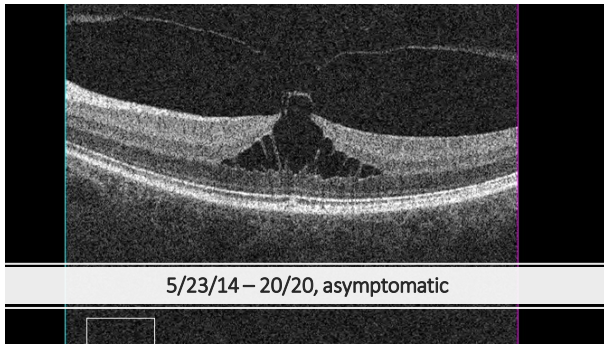
Zambarakji HJ, Schlottmann P,
Tanner V, Assi A, Gregor ZJ.
Macular microholes: pathogenesis
and natural history. *The British
Journal of Ophthalmology*.
2005;89(2):189-193.



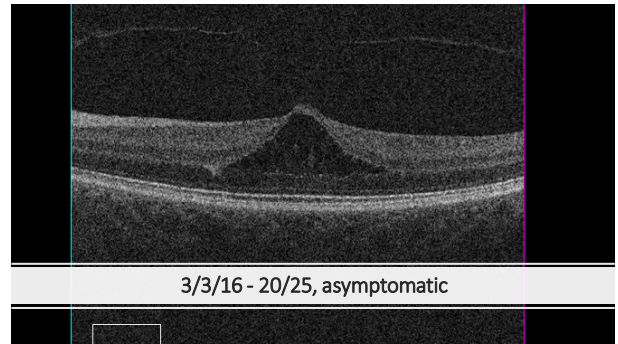
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Vitreomacular
Traction

30



31



32



83 yo WF comprehensive exam

CC: distortion OS x few months

POH: COU-IOL, YAG OS

PMH/meds: non-contributory

FOH/FMH: non-contributory

33



BCVA: 20/20 OD, 20/40 OS

Preliminary testing: Amsler defect OS

IOP: 15/15

SLEx: PC-IOL OU

Fundus: rare drusen OD, trace ERM OS

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What is the most appropriate diagnosis?

Vitreomacular
traction syndrome

Full-thickness
macular hole

Epiretinal
membrane

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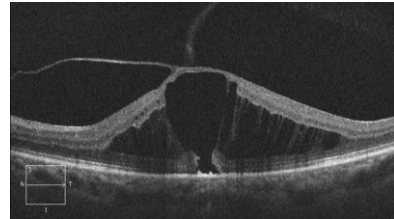
36

Sees retinal specialist 6/4/12

- No change in symptoms
- 20/40 OS
- Vitrectomy recommended
- Patient elects observation

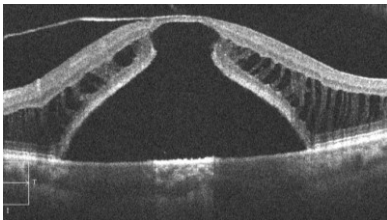
37

9/4/12 – 20/40



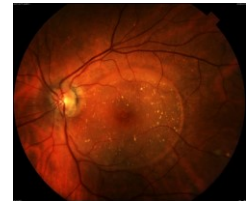
38

1/17/13 – 20/250 EF – Jetrea offered



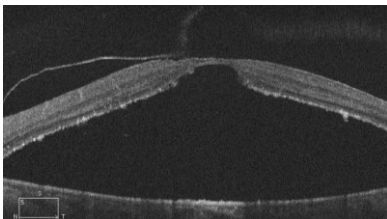
39

Back to me 9/16/13 – 20/400 EF



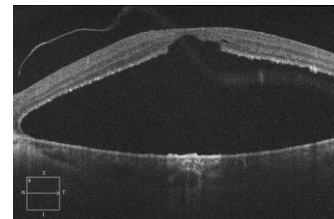
40

9/16/13 – 20/400 EF



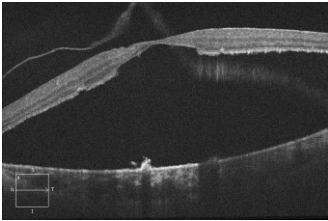
41

2/24/14 – 20/400 EF



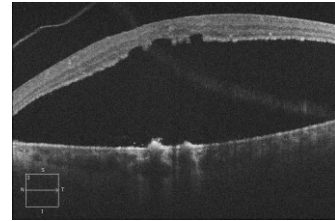
42

9/8/14 – 20/400 EF



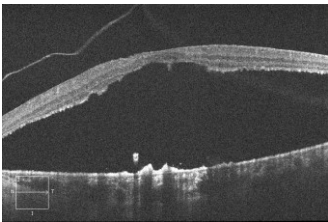
43

3/31/15 – 20/400



44

8/10/15 – 20/400



45

2018
20/400

46



← Macular
pathology



← Peripheral
pathology

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Case Series 2

Ugly Retinas

48

64 yo WM retina evaluation

CC: "spot in OS" x 6 weeks, getting worse
 POH: unremarkable
 PMH/meds: HTN, takes lisinopril-HCTZ, ASA
 FOH/FMH: non-contributory

49

BCVA: 20/25 OD, 20/150 OS
 Preliminary testing: normal
 IOP: 12/12
 SLEx: 2+ NS/C OU
 Fundus: see photos

50

Normal



51

Where is most of this blood located?

- A. Preretinal
- B. Intraretinal
- C. Subretinal



52

Where is most of the blood located?

Preretinal
 Intraretinal
 Subretinal

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Differential Dx

CNV
 Valsalva
 Polypoidal
 Macroaneurysm



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Retina specialist report

- CF 6' OS
- Peripapillary choroidal neovascularization (CNV)
- "Most likely AMD", a few drusen in fellow eye
- Monthly Avastin injections

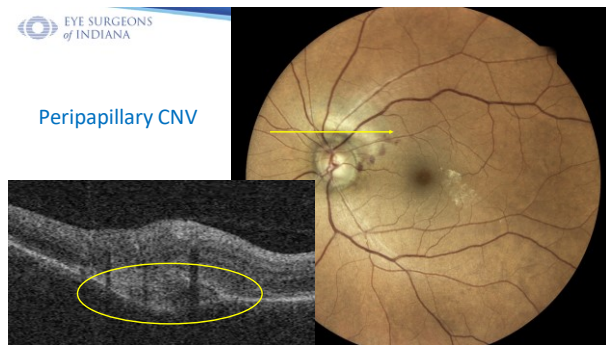
55

Peripapillary CNV - Etiology

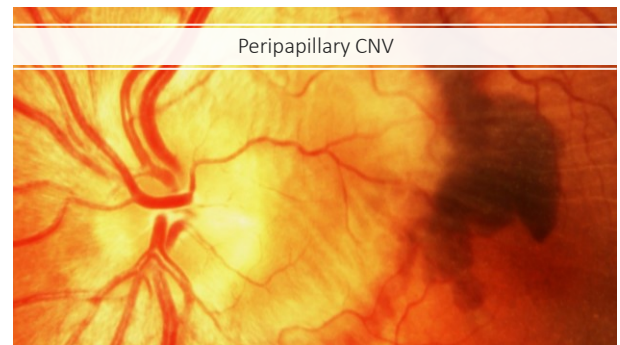
- AMD
 - High myopia
 - Optic nerve drusen
 - Ocular histoplasmosis
 - Angioid streaks
- Idiopathic -39%**

Lopez PF, Green R. Peripapillary subretinal neovascularization - a review. *Retina* 1992; 12: 147-171

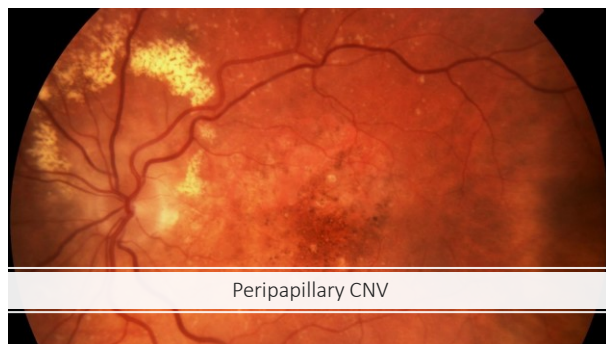
56



57



58



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Peripapillary CNV - Management

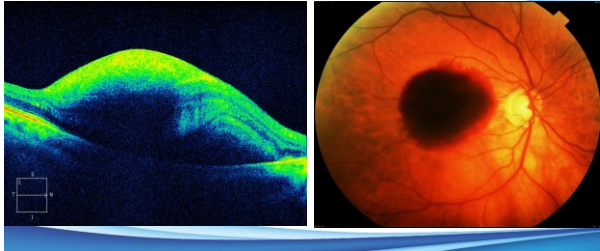
- Observation
- Anti-VEGF injections

Eye (Lond). 2011 Jun; 29(6): 675-681.
Published online 2011 Mar 11: doi: 10.1038/eye.2011.24
PMCID: PMC3178139
PMID: 21384119

Treating peripapillary choroidal neovascular membranes: a review of the evidence
G. Jullien,¹ G. Jullien,^{2,*} V. Tait,³ D. Lindfield,⁴ and G. Menon¹

60

89 yo WF – sudden vision loss OD



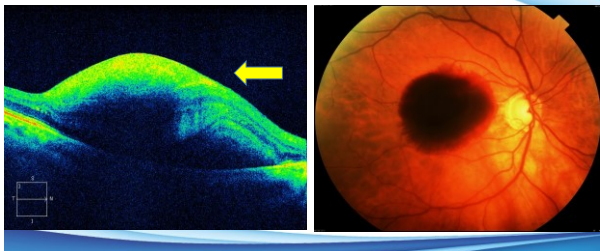
61

Where is most of the blood located?

Vitreous
Sub ILM
Intraretinal
Subretinal

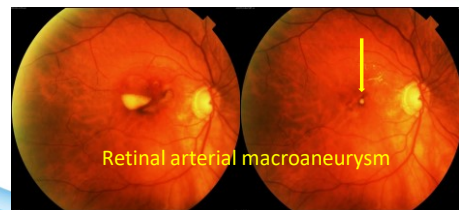
62

89 yo WF – sudden vision loss OD

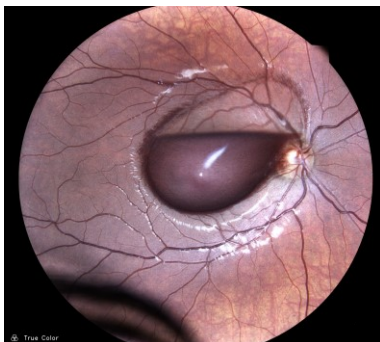


63

89 yo WF – 2 mos & 6 mos later

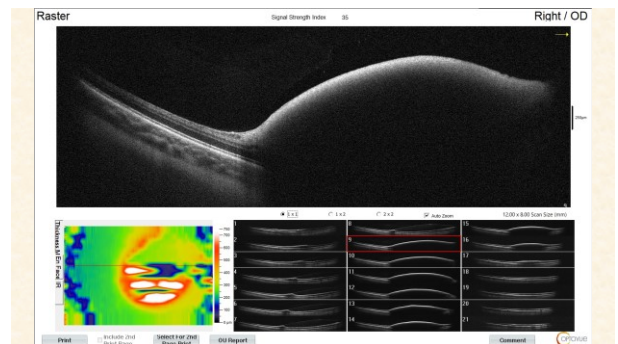


64



- 17 yo WM
- MVA 2 days earlier
- No loss of consciousness
- CT head nl
- VA hand motion OD
- Anterior seg nl
- IOP 14 mmHg OU

65



66

What is the diagnosis?

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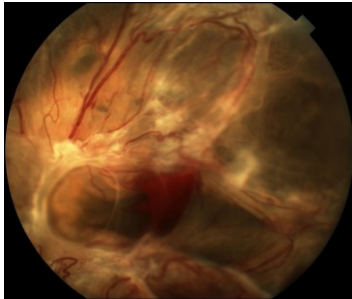
What is best initial management strategy?

Pars plana vitrectomy
Intravitreal tPA injection and
pneumatic displacement
YAG laser to retina to drain
hemorrhage
Close observation

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68

What is this??



69

What is this?

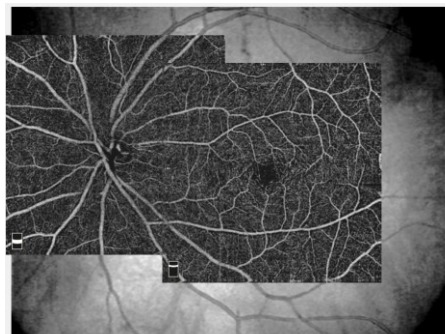
Start the presentation to see live content. For screen share software, share the entire screen. Get help at pdx.com/app

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Case Series 3

Things You Couldn't See Before
But Now You Can

71



72

What type of image is this?

Fluorescein
angiogram

OCT angiography

Fundus
autofluorescence

Start the presentation in one-line context. For screen share software, share the entire screen. Get help at [ppt.com/help](https://www.ppt.com/help)

73

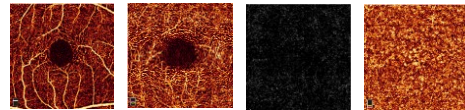
A New Approach to Visualizing Blood Flow

Patient Benefits

- Reduces patient burden to allow more frequent imaging
- Avoid potential side-effects of fluorescein injection

Clinical Benefits

- Faster than a dye-based procedure
- Ultra-high resolution imaging of retinal microvasculature
- 3D visualization: segments retinal vasculature into individual layers

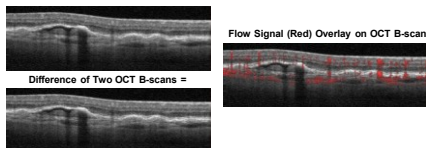


74

Principles of AngioVue OCTA

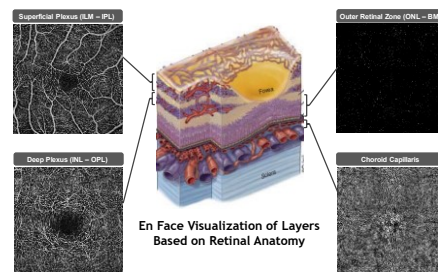
OCTA uses motion contrast to detect flow from OCT data

- Rapidly acquires multiple cross-sectional images from a single location
- Flow is the difference in signal between two sequential B-scans



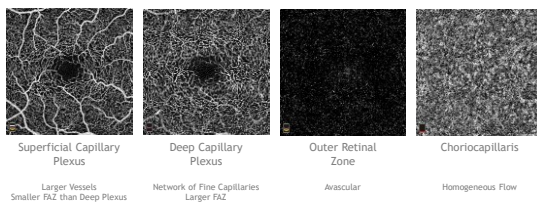
75

Enface Slabs - Based on Retinal Anatomy



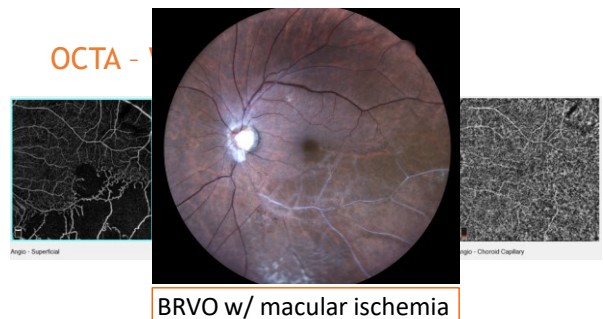
76

OCTA - What is Normal?



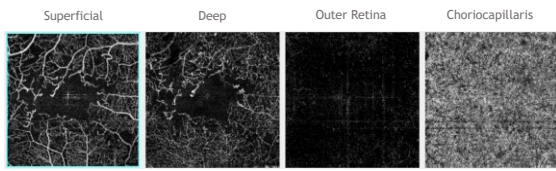
77

OCTA -



78

DR - Enlargement of Foveal Avascular Zone



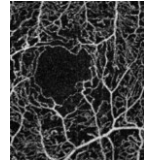
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OCTA in Diabetes & Diabetic Retinopathy

- Detects vascular abnormalities prior to funduscopically evident DR
- Remodeling/enlargement of foveal avascular zone
- Capillary non-perfusion

SUBCLINICAL DIABETIC RETINOPATHY

E11.319 Type 2 diabetes mellitus with unspecified diabetic retinopathy without macular edema

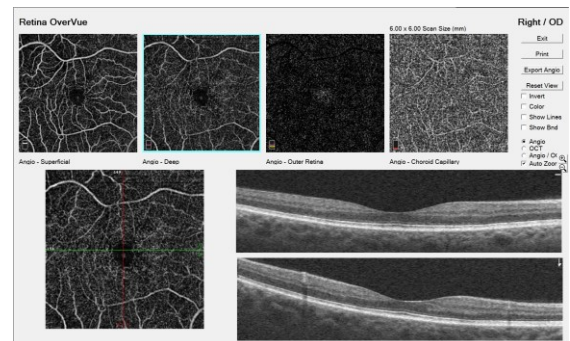


80

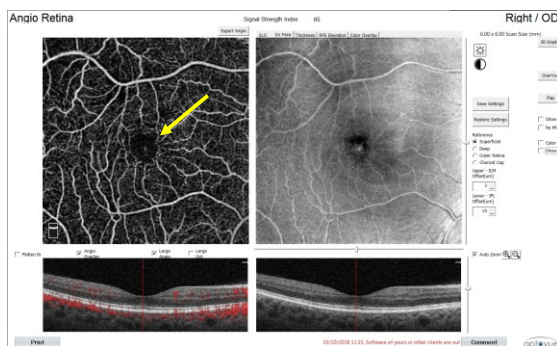
Case Example – mild NPDR

- 48 yo WF returns for scheduled 6 month DR F/U
- Type 1 DM – diagnosed 1977
- She notes worse vision quality OS x several months
- BCVA 20/25+ OD, 20/30 + OS
- Clinical exam – mild NPDR w/ no macular edema OU

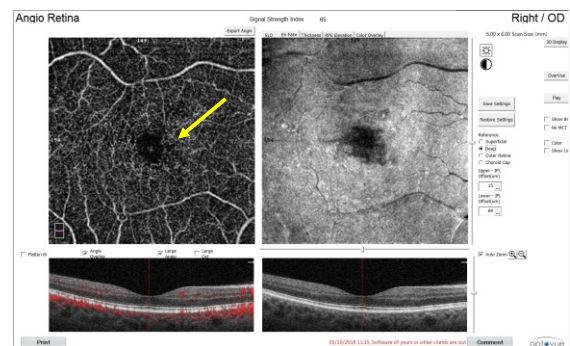
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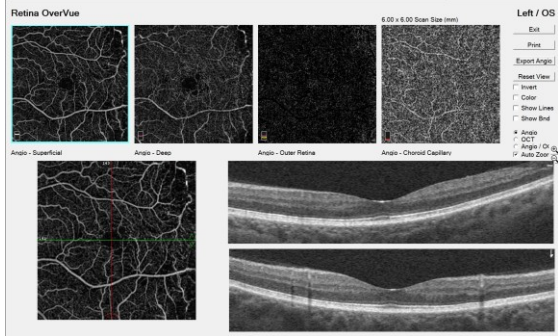
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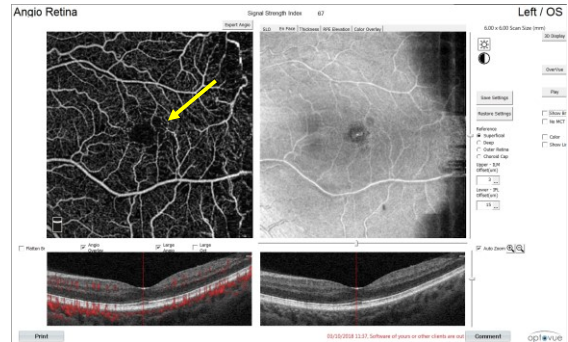
83



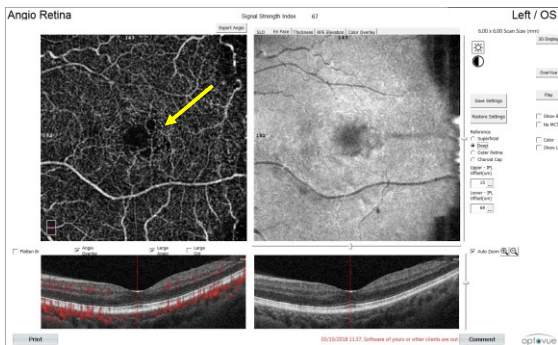
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85



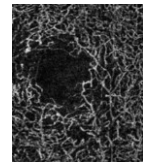
86



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OCTA Changes in Diabetes How Common is this?

- 61 eyes of 39 pts with DM w/o clinical retinopathy
- OCTA performed
 - Foveal avascular zone remodeling - 36%
 - Capillary non-perfusion - 21%
 - Microaneurysms or venous beading - 10%
- Conclusions
 - OCTA was able to detect foveal microvascular changes *that were not detected by clinical exam*
 - OCTA may be able to screen for diabetes quickly and non-invasively *before the systemic diagnosis is made*

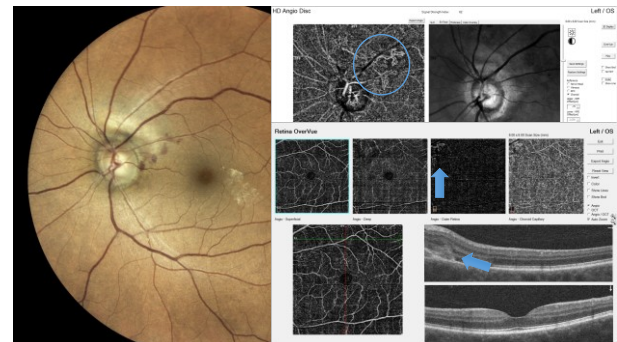


15. De Carlo TE, Chen AL, Bonini Filho MA, et al. Detection of microvascular changes in eyes of patients with diabetic retinopathy using optical coherence tomography angiography. Retina. 2013 Nov;33(11):2364-70.

88

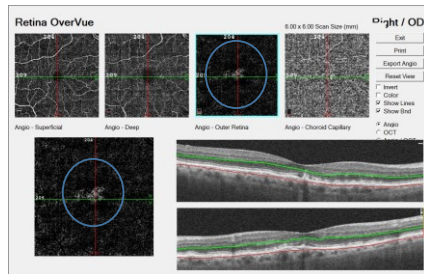


89



90

OCTA - Non-exudative CNV



91

What is most appropriate management strategy for non-exudative CNV?

- Single anti-VEGF injection
- Multiple anti-VEGF injections (treat and extend)
- Close observation

92

Natural History of Subclinical Neovascularization in Nonexudative Age-Related Macular Degeneration Using Swept-Source OCT Angiography

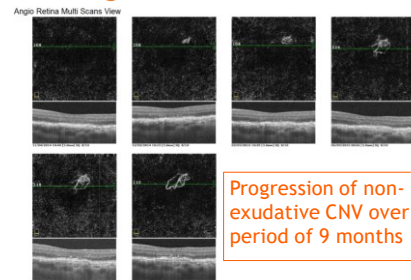
João R. de Oliveira Dias, MD, PhD,¹ Qinglin Zhang, PhD,² José M.B. Garcia, MD,¹ Fang Zheng, MD,^{1,3} Elie H. Moussley, MD, PhD,¹ Luis Rotman, MD, PhD,¹ Andrew Miller, MD,¹ Chieh-Li Chen, PhD,² Sophie Kubacki, MS,⁴ Luis de Siqueira, PhD,¹ Mary K. Durbin, PhD,⁴ William Feuer, MS,¹ Ruikang K. Wang, PhD,² Giovanni Gregori, PhD,¹ Philip J. Rosenfeld, MD, PhD¹

Ophthalmology 2018;125:255-66.

Conclusion: After detection of subclinical CNV, the risk of exudation at 12 months was 15.2 times greater compared with eyes without subclinical CNV.

93

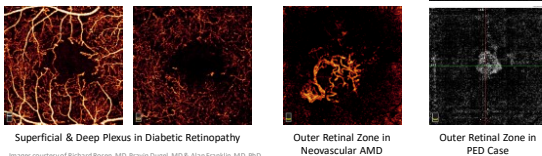
Assess Progress with Multiscan View



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Applications of OCTA in Primary Eye Care

- Monitoring diabetic patients
- Identify conversion from dry AMD to wet
- Identifying vascular changes in glaucoma
- Identifying CNV in central serous

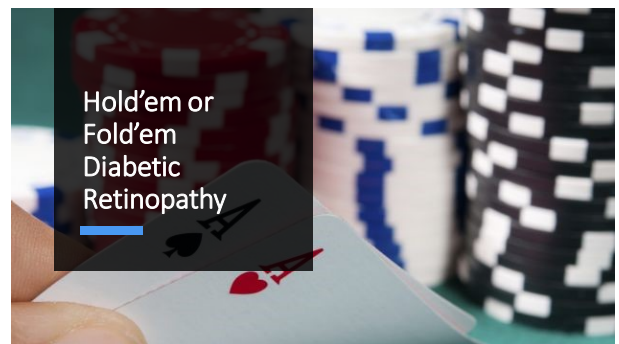


Superficial & Deep Plexus in Diabetic Retinopathy

Outer Retinal Zone in Neovascular AMD

Outer Retinal Zone in PED Case

95



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International Classification of DR and DME

Disease	Findings Observable on Dilated Ophthalmoscopy*
Diabetic retinopathy	No abnormalities
No apparent DR	Microaneurysms only
Mild nonproliferative DR	Microaneurysms and other signs (e.g., dot and blot hemorrhages, hard exudates, cotton wool spots), but less than severe nonproliferative DR
Moderate nonproliferative DR	Moderate nonproliferative DR with any of the following: intraretinal hemorrhages (≥20 in each quadrant), definite venous beading (in 2 quadrants), intraretinal microvascular abnormalities (in 1 quadrant), and no signs of proliferative retinopathy
Severe nonproliferative DR	Severe nonproliferative DR and 1 or more of the following: neovascularization, vitreous/preretinal hemorrhage
Proliferative DR	No DME
Diabetic macular edema	No retinal thickening or hard exudates in the macula
No DME	Retinal thickening in the macula that does not involve the central subfield zone that is 1 mm in diameter
Non-center-involving DME	Retinal thickening in the macula that does involve the central subfield zone that is 1 mm in diameter
Center-involving DME	

DME = diabetic macular edema; DR = diabetic retinopathy.

*Clinical findings as reported and observed from dilated ophthalmoscopy performed for DR and dilated binocular, stereoscopic ophthalmoscopy for DME.²⁸

²⁸Hard exudates are a sign of current or previous macular edema. Diabetic macular edema is defined as retinal thickening, and this requires a 3-dimensional assessment that is best performed by a dilated examination using slit-lamp biomicroscopy, stereo fundus photography, or both.

Ophthalmology. 2018 Oct;125(10):1608-22.

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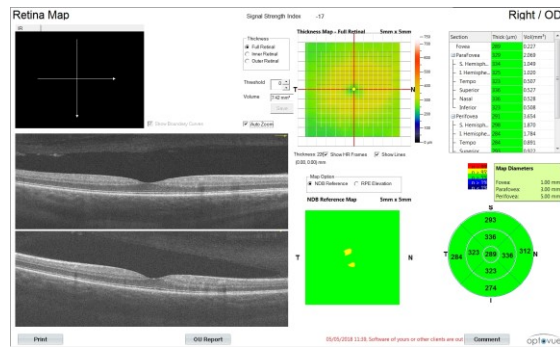
DR Management – ADA Position Statement

Indication	Referral to ophthalmologist	Follow-up	Recommended intraocular treatment*
No diabetic retinopathy	Within 1 year	Every 1–2 years	None
Mild NPDR	Within 1 year	Every year	None
Moderate NPDR	Within 3–6 months	Every 6–9 months	None
Severe NPDR	Immediate	Every 3–6 months	Can consider early PRP for patients with type 2 diabetes
PDR	Immediate	Every 3 months	PRP or intravitreal anti-VEGF therapy, especially if HRCs are present
No DME	Within 1 year	Every 1–2 years	None
Non-CIDME	Within 3–6 months	Every 6 months	None, but observe carefully for progression to CIDME
CIDME	Immediate	Every 1–4 months	Anti-VEGF as first-line therapy for most eyes. Consider macular laser as an adjunctive therapy in eyes with persistent CIDME despite anti-VEGF therapy. Intravitreal steroid treatment can be used as an alternative in selected cases.

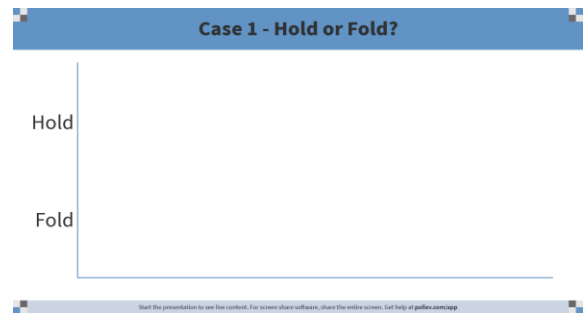
*In addition to optimizing systemic control of blood glucose, cholesterol, and hypertension, as well as educating the patient about importance of routine follow-up regardless of whether visual symptoms are present or absent.

Diabetes Care 2017;40:412-418

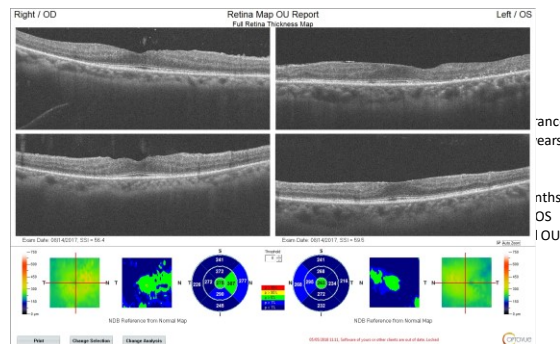
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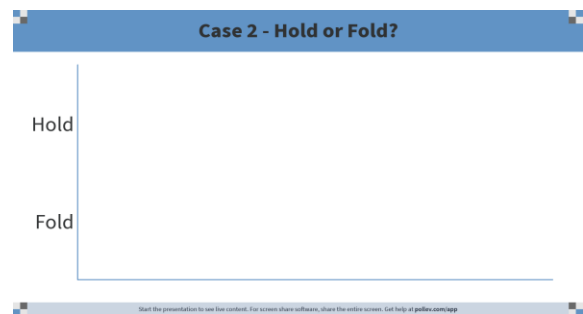
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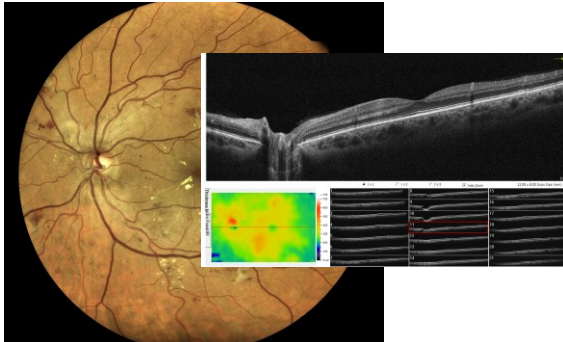
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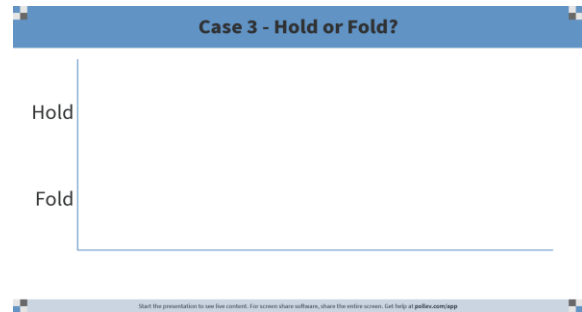
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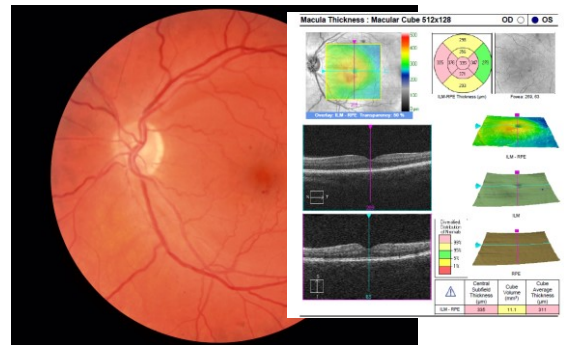
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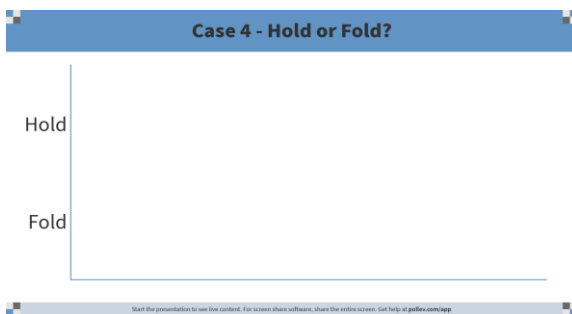
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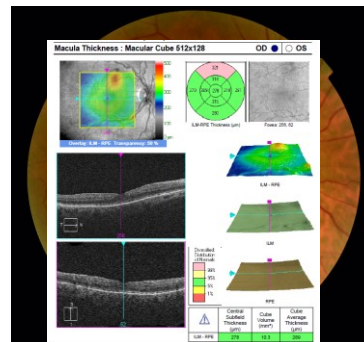
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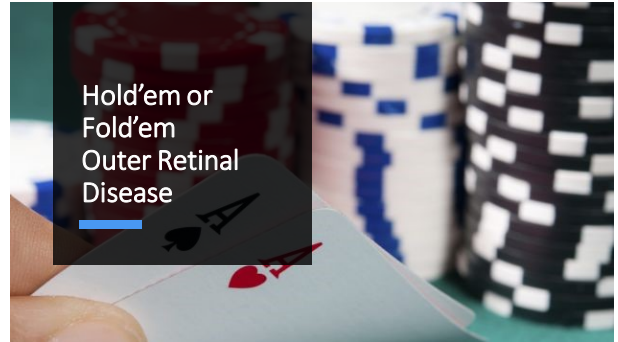
- 66 yo WM
- Referred by PCP
- Type 2 DM x 20 years
- Last HbA1c 8.7%
- Needs OTC readers more
- BCVA 20/40 OD, 20/25 OS
- 1-2+ NS/1+ cortical OU

Case 5 - Hold or Fold?



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Hold'em or Fold'em Outer Retinal Disease

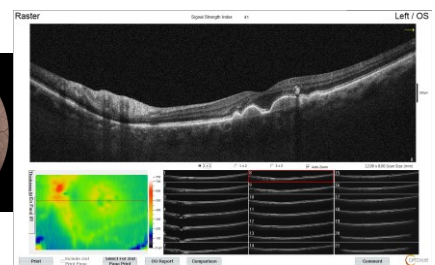
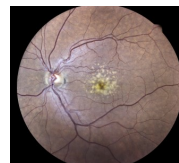


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- 68 yo WF
- 4 month AMD F/U
- c/o ↓va OS x few mos.
- BCVA 20/30 OD, 20/40 OS
- 2+ NS OU

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Case 6 - Hold or Fold?



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Predicting AMD progression w/ OCT

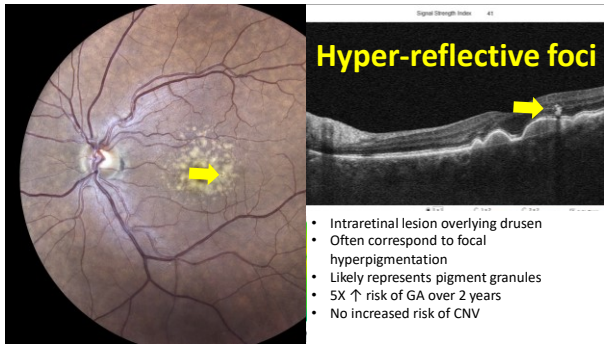
CLINICAL AND EXPERIMENTAL
OPTOMETRY
REVIEW
Developing prognostic biomarkers in intermediate age-related macular degeneration: their clinical use in predicting progression

doi.org/10.1016/j.optpr.2020.100000

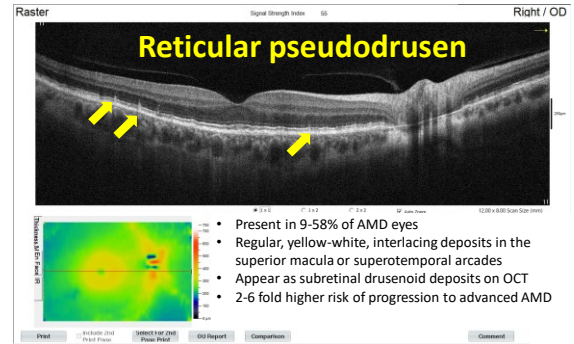
doi.org/10.1016/j.optpr.2020.100000

- Hyper-reflective foci
- Reticular pseudodrusen
- Nascent geographic atrophy
- Sub-RPE hyper-reflective columns
- Drusen with subretinal fluid
- Drusen substructures
- Drusen load
- Drusen regression

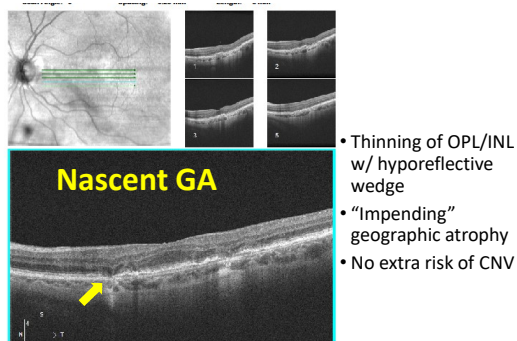
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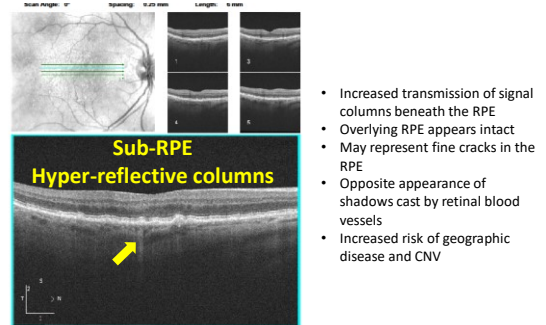
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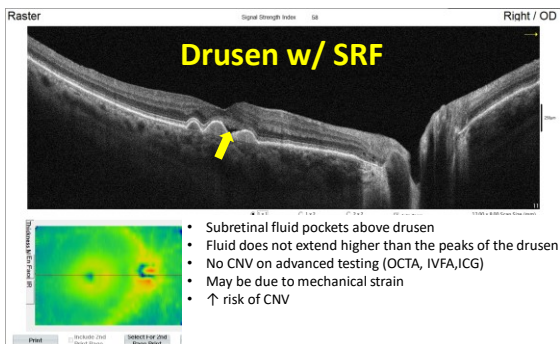
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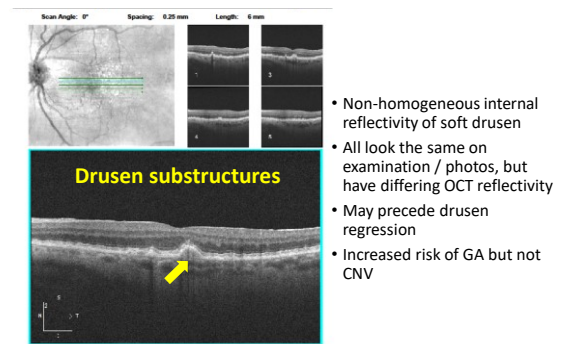
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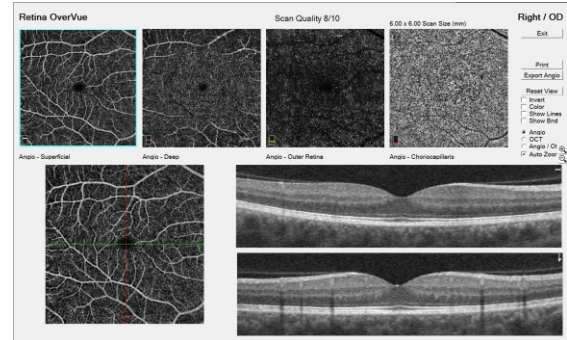


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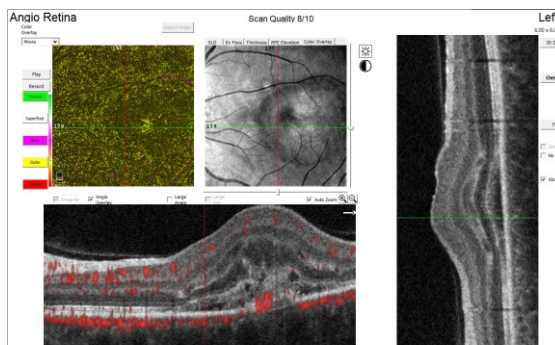


- 31 yo WF
- Retina eval
- c/o ↓va OS x few mos.
- BCVA 20/20 OD, 20/150 OS
- Normal anterior seg

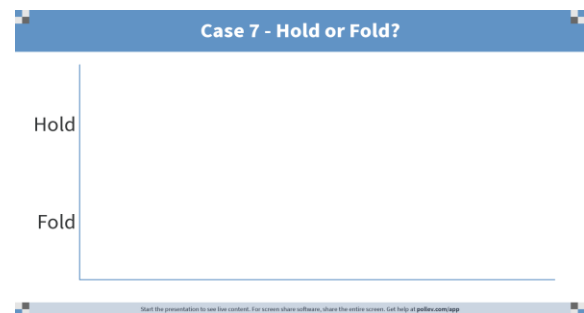
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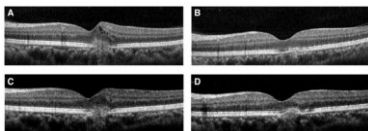
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Long-Term Outcome and Recurrence of Idiopathic Choroidal Neovascularization Treated with Intravitreal Bevacizumab

Jae Hui Kim¹, Young Suk Chang², Jong Woo Kim³, Chul Gu Kim⁴ and Dong Won Lee⁵

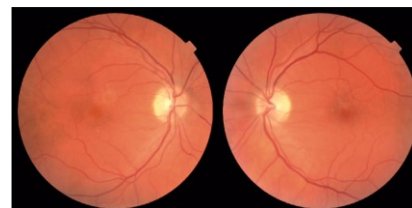


- A – initial presentation
- B – s/p Avastin #1
- C – recurrence @ 9 mos.
- D – s/p Avastin #2

Conclusion: The long-term outcome of intravitreal bevacizumab treatment was generally favorable. Although recurrence was noted in 30.8% of patients, this may not significantly influence long-term visual prognosis.

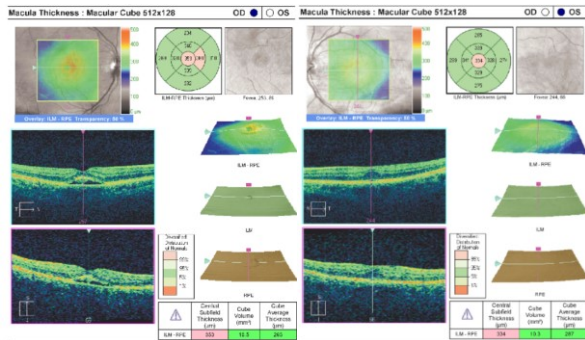
Journal of Ocular Pharmacology and Therapeutics Volume 32, Number 7, 2016

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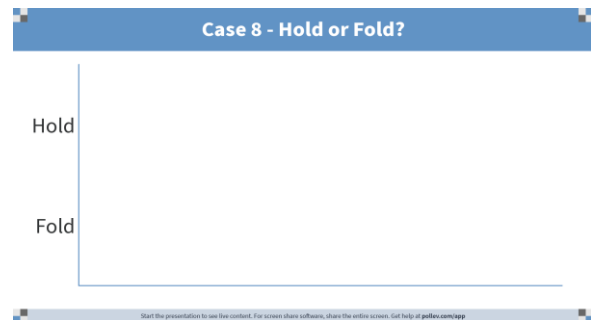


- 61 yo WM
- Referred by POD
- AMD consult
- OD "dim" x mos.
- BCVA 20/20 OD, OS
- Normal anterior seg

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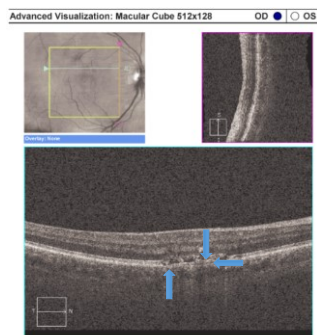
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"Double-layer Sign"

- Upper band is RPE
- Lower band is Bruch's
- Space in-between is CNV



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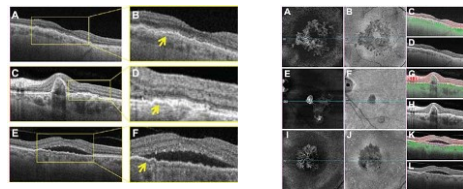
Double-Layer Sign and Type 1 CNV

How OCT can be a powerful tool for detecting choroidal neovascularization in a variety of retinal diseases.



By Philip J. Rosenfeld, MD, PhD

<http://www.retina-specialist.com/article/doublelayer-sign-and-type-1-cnv>



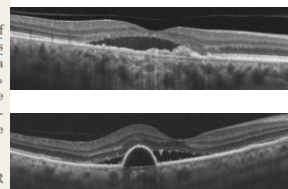
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MATERIALS AND METHODS: Retrospective review of OCTA images of chronic CSCR eyes with irregular RPED (group 1) and regular RPED (controls, group 2) for presence of CNV, subretinal fluid, and intraretinal fluid. Fluorescein angiography was also evaluated for CNV.

RESULTS: CNV was detected using OCTA in 13 of 31 eyes (41.9%) in group 1 and in one of 18 eyes (5.6%) in group 2 ($P = .007$). Irregular RPED was a risk factor for CNV (odds ratio [OR] = 12.28; 95% CI, 1.45-104.3). There was no significant difference between detection by OCTA and FA ($P = 1.0$). Sensitivity and specificity of detection by OCTA were 85.7% and 95.7%, respectively.

CONCLUSIONS: Irregular RPEDs in chronic CSCR eyes may harbor neovascularization more often than previously thought, which has implications on therapy.

Chronic Central Retinal Pigment Epithelial Detachment Evaluated With OCT



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Thank you!



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