OCT Connect: Maximizing Your OCT

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College of Optometry

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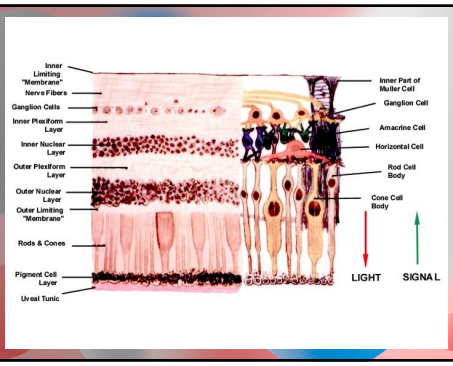
Disclosures:

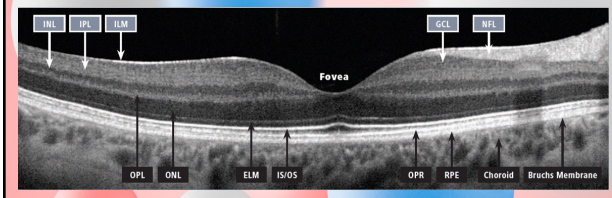
Speaker/Consultant: Optovue, Maculogix, iCare

2



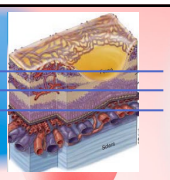
3

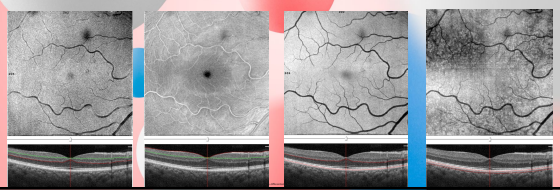
OCT B-Scan Layers



4

En Face Structural Visualization of Layers Based on Retinal Anatomy





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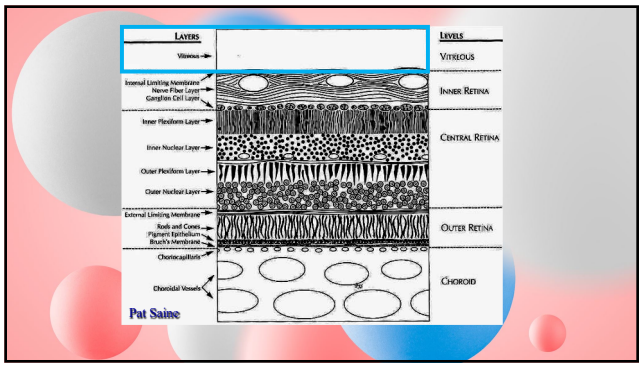
Anomalies of the Vitreous

6


Layers
Vitreous
Internal Limiting Membrane
Nerve Fiber Layer
Ganglion Cell Layer
Inner Plexiform Layer
Inner Nuclear Layer
Outer Plexiform Layer
Outer Nuclear Layer
External Limiting Membrane
Rods and Cones
Pigment Epithelium
Bruch's Membrane
Choriocapillaris
Choroidal Vessels
Levels
Vitreous
Inner Retina
Central Retina
Outer Retina
Choroid
Pat Saine

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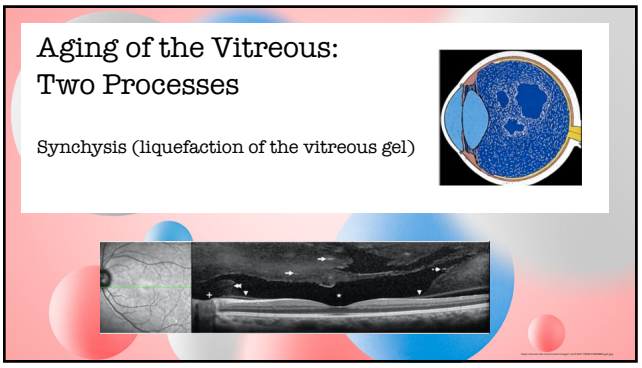
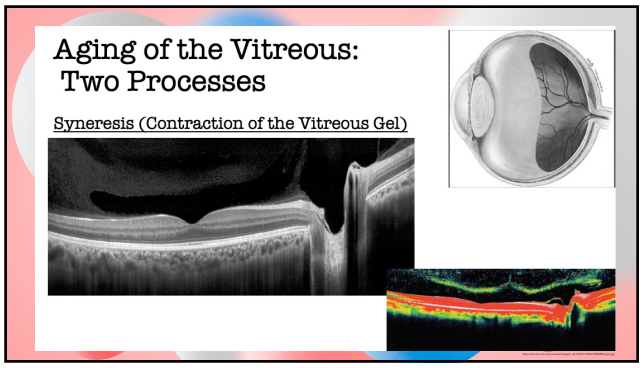
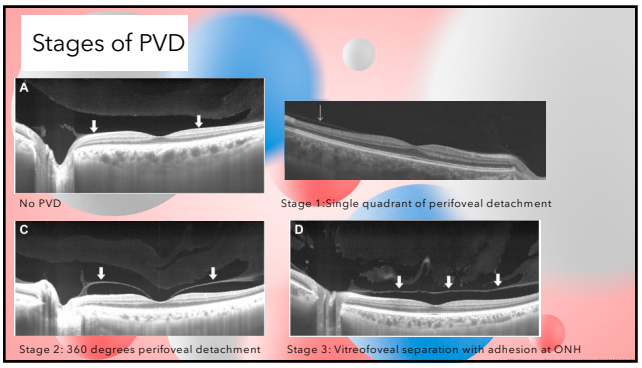

Aging of the Vitreous:
Two Processes
Synchysis (liquefaction of the vitreous gel)

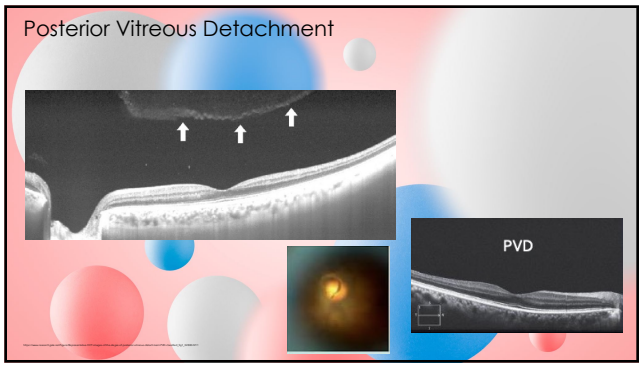
8


Aging of the Vitreous:
Two Processes
Syneresis (Contraction of the Vitreous Gel)

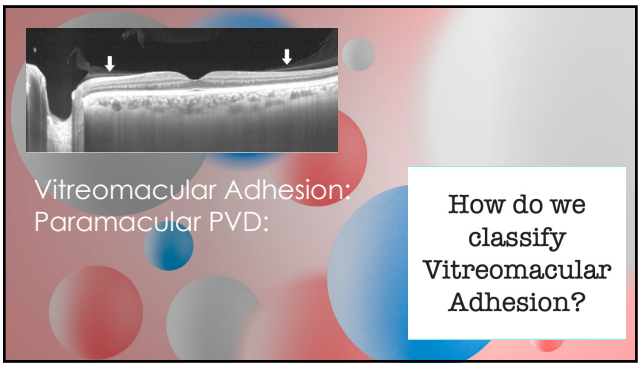
9


Stages of PVD
A
No PVD
Stage 1:Single quadrant of perifoveal detachment
C
Stage 2: 360 degrees perifoveal detachment
D
Stage 3: Vitreofoveal separation with adhesion at ONH

10


Posterior Vitreous Detachment
PVD

11


Vitreomacular Adhesion:
Paramacular PVD:
How do we classify Vitreomacular Adhesion?

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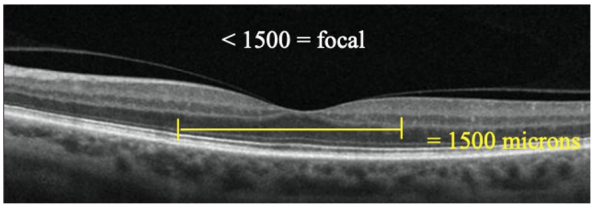
Focal VMA: <1500 um



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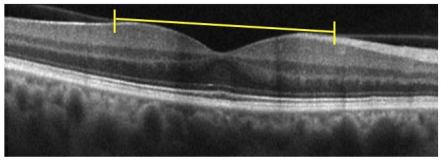
Broad VMA: >1500 um



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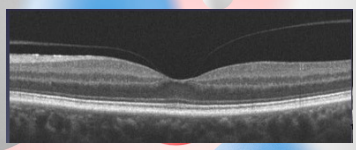
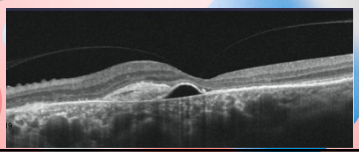
Isolated versus Concurrent

Isolated



Concurrent



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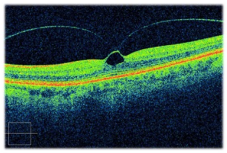
Vitreomacular Traction



Attachment of the vitreous cortex to the macula within a 3 mm radius of the fovea resulting in distortion of the foveal surface

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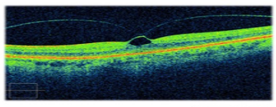
Focal VMT: <1500 um



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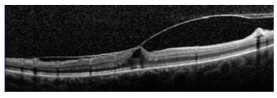
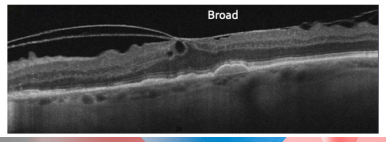
Broad VMT: >1500 um





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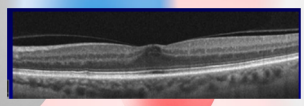
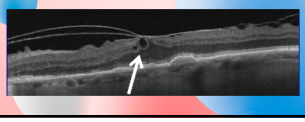
Isolated versus Concurrent

Isolated



Concurrent



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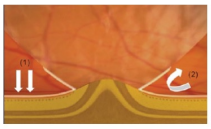
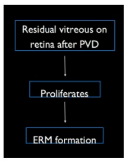
With PVD progression, residual vitreous tissue is left on inner retinal surface…

Residual vitreous proliferates to form ERM





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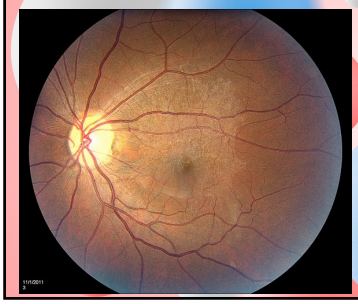
Epiretinal membrane: Grade 1



A cellophane-like sheen is observed over the macular area, causing very *mild wrinkling* of the inner retinal surface, with *little or no modification of retinal vessel trajectory*. These membranes are rarely symptomatic.

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Epiretinal membrane: Grade 2

Fibrous tissue is observed over the macular area, causing *significant wrinkling of the retinal surface and modification of the retinal vessel trajectory.*

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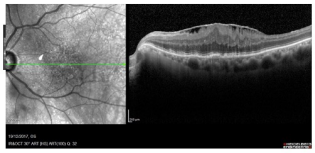
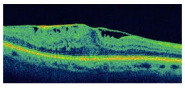
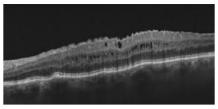
Epiretinal Membrane: OCT







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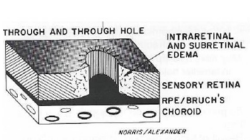
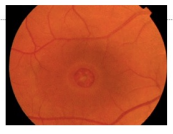
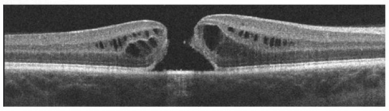
Full Thickness Macular Hole





Defect spans entire width of neurosensory retina



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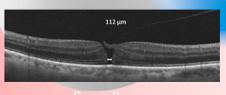
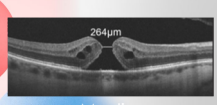
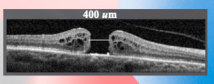
Small: Full thickness defect; < 250 um
Medium: Full thickness defect; >250 um and <400 um
Large: Full thickness defect; >400 um



Small



Medium



Large

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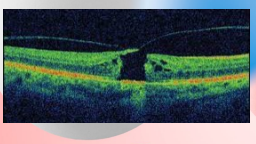
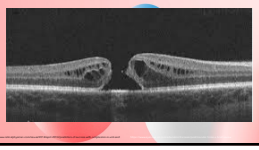
Is there VMT?? Primary versus Secondary



Primary



Secondary

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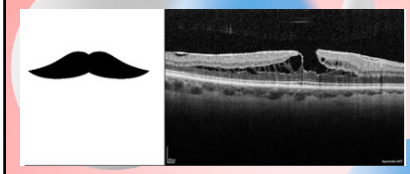
Partial Thickness Macular Hole: Lamellar



Tractional:
Epiretinal membrane
Foveal schisis

Degenerative:
Epiretinal proliferation
Round edges
Incomplete break

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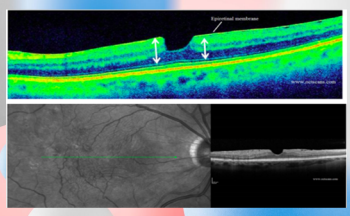
Partial Thickness Macular Hole: Pseudohole



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Inner Retinal Disease

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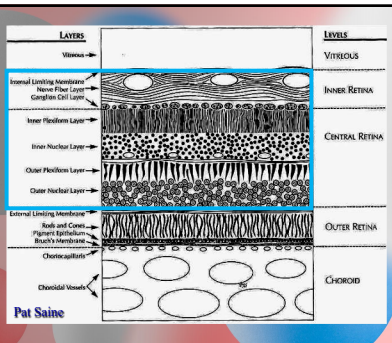

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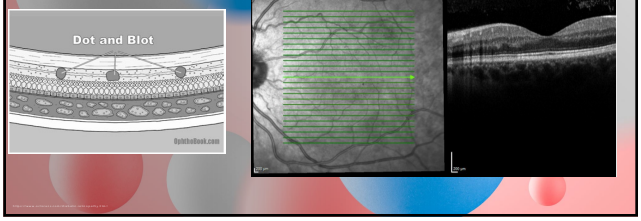
Diabetic Retinopathy: Non-Proliferative

Hemorrhage: HYPER-reflective

* *Check the layer* * *



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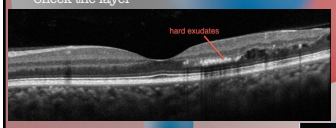
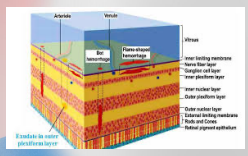
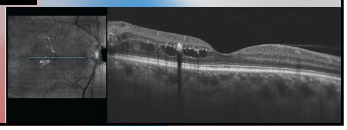
Diabetic Retinopathy: Non-Proliferative

Exudate: HYPER-reflective

* *Check the layer* * *







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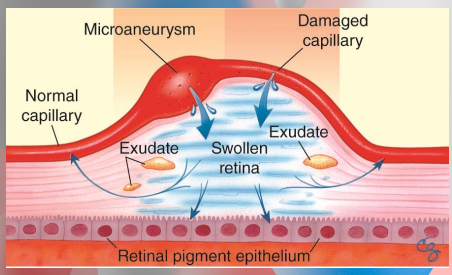
Diabetic Retinopathy: Macular Edema



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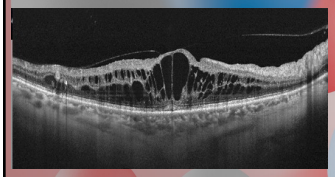
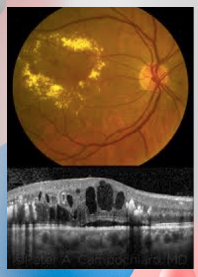
Diabetic Retinopathy: Macular Edema

HYPO-Reflective: Serous Fluid





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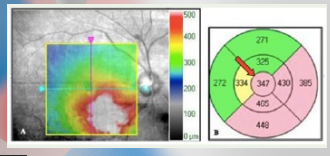
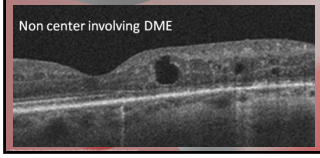
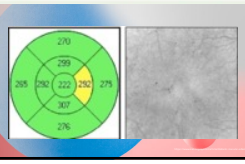
Macular Edema: CI versus NCI







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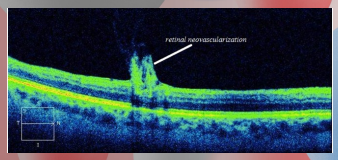
Diabetic Retinopathy: Proliferative



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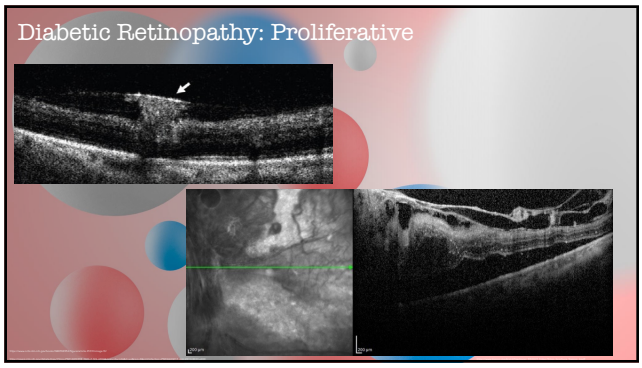

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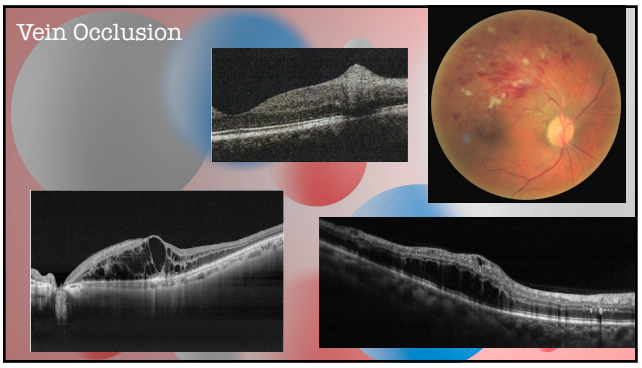

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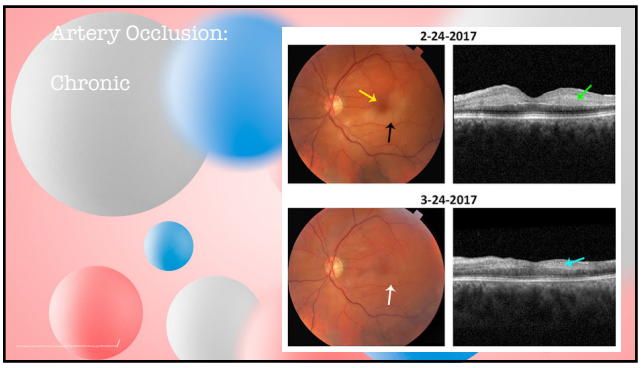

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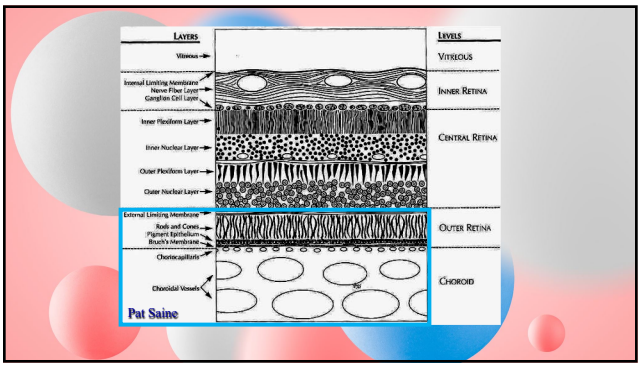

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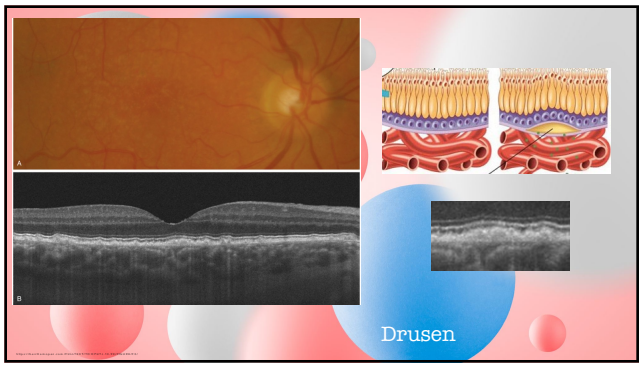

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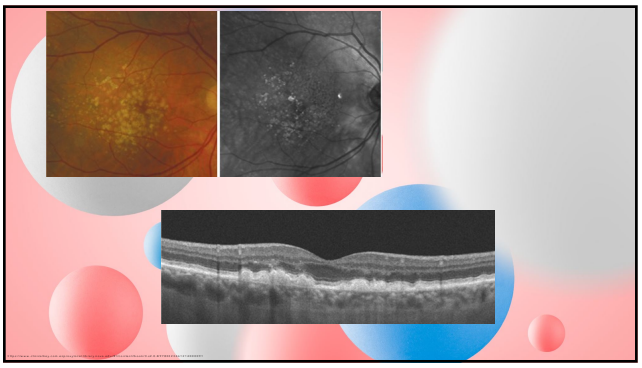

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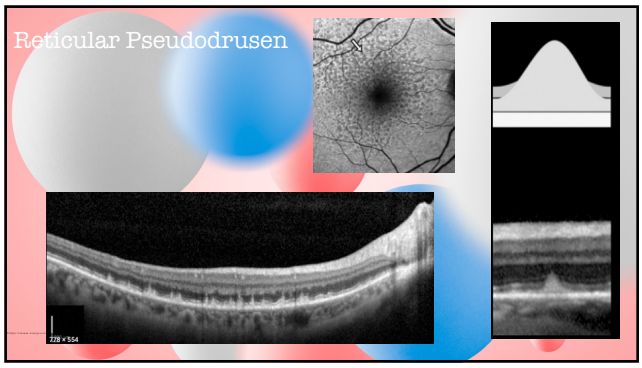

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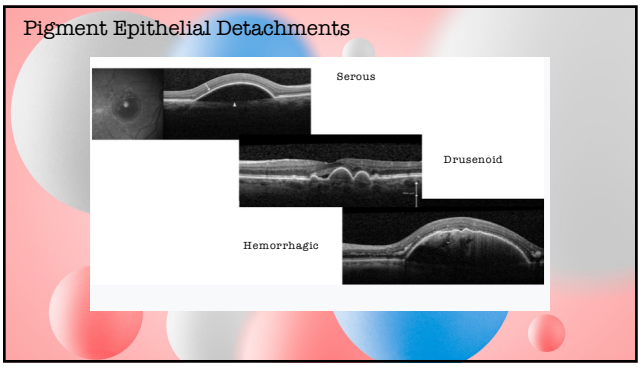

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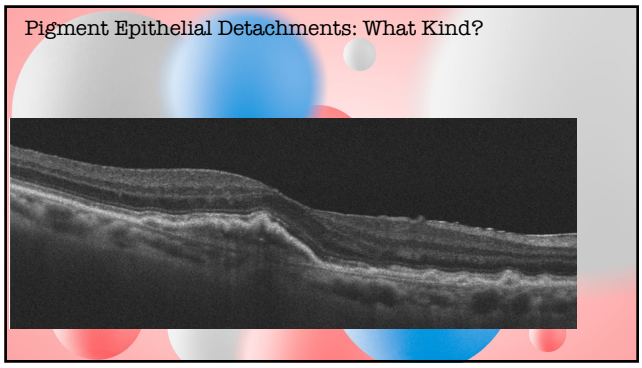

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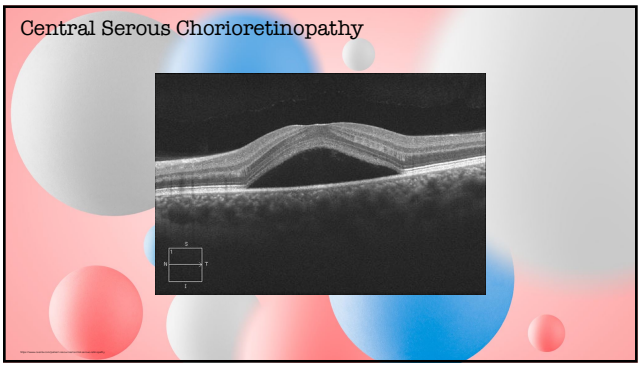

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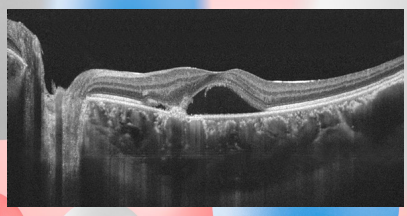
Central Serous Chorioretinopathy: Chronic



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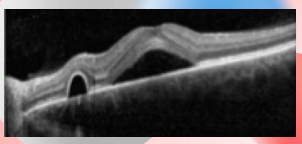
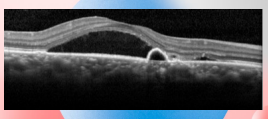
Central Serous Chorioretinopathy and PED





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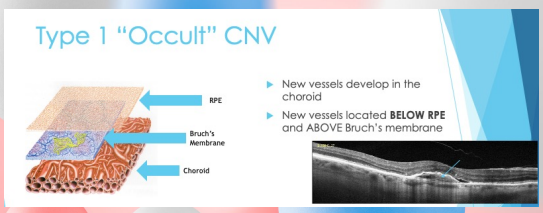
Age Related Macular Degeneration



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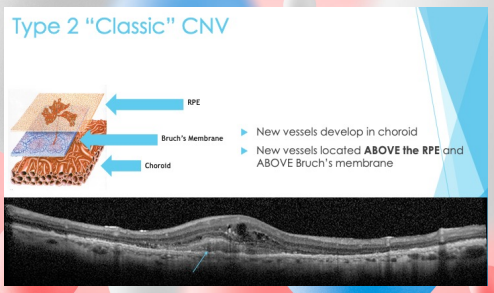
Age Related Macular Degeneration



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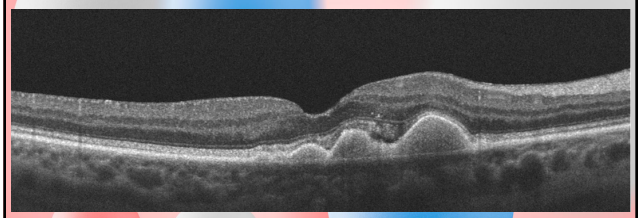
Age Related Macular Degeneration



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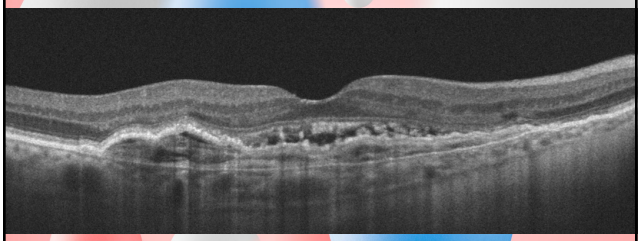
Age Related Macular Degeneration



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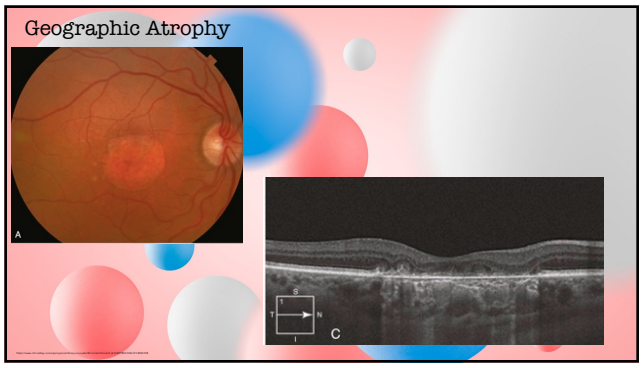

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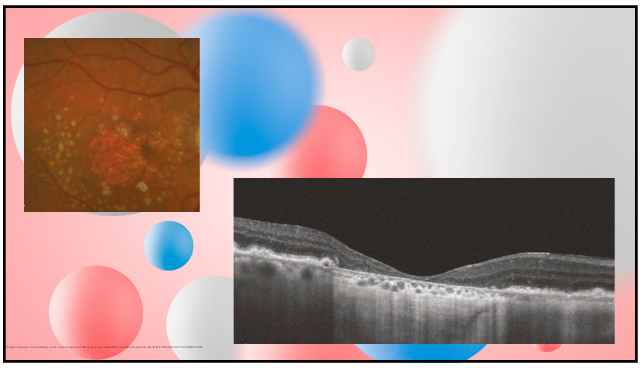

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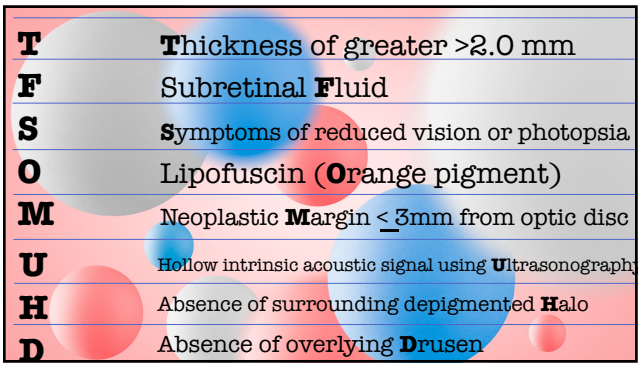

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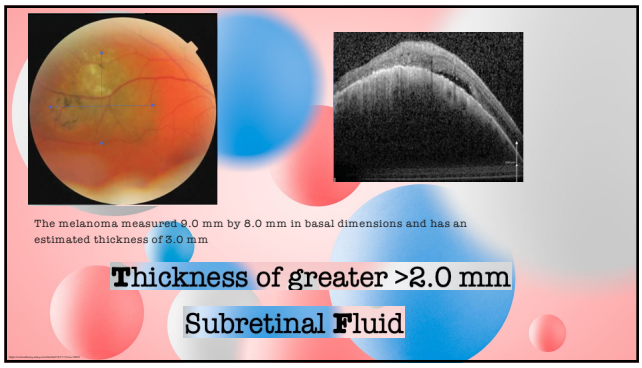

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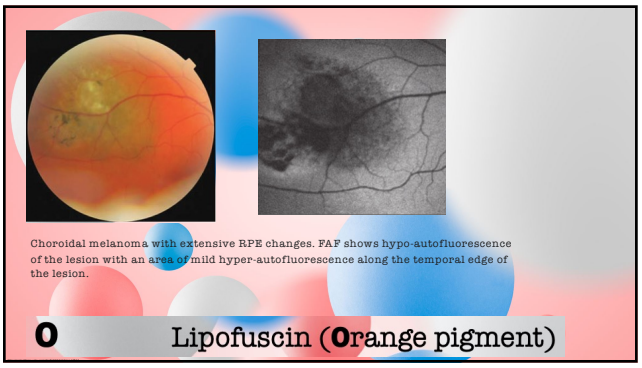

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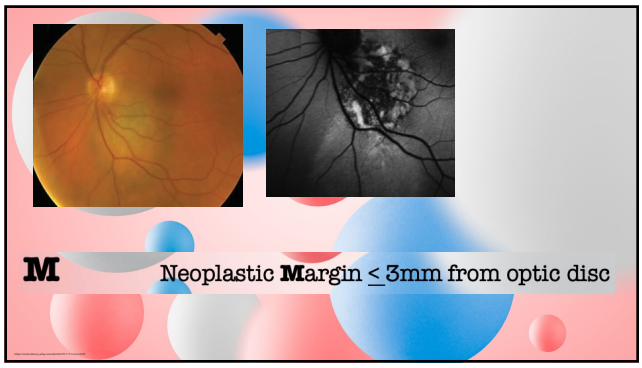

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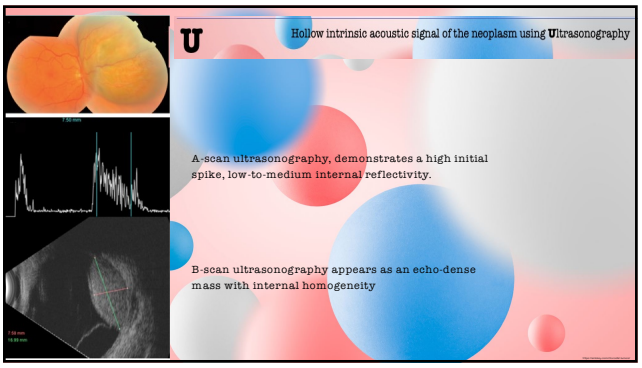

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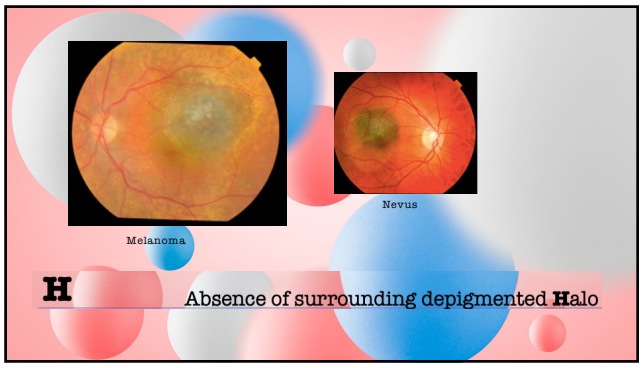

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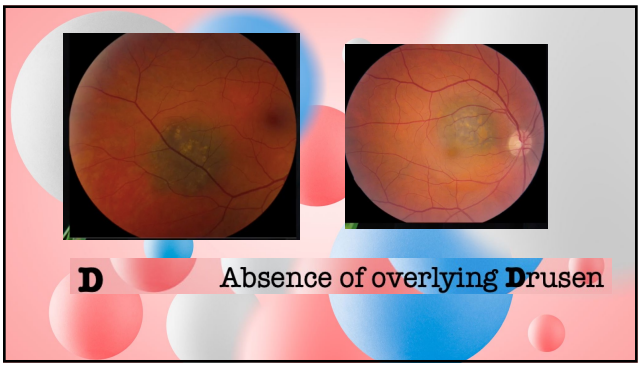

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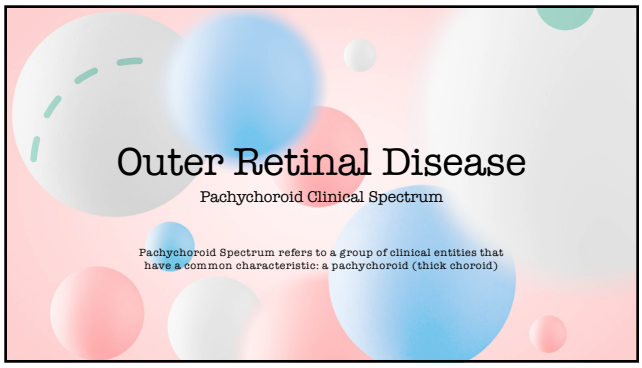

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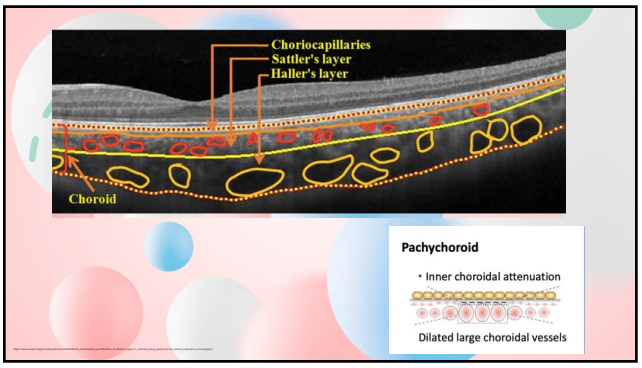

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Features of the Choroid

- Choroidal thickness varies with age, ethnicity and axial length
- Normal subfoveal choroidal thickness 250-350 um

- Pachychoroid: Choroidal thickness >390 um;
  - Extrafoveal thickness exceeding subfoveal by 50 um

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Chorioretinal Disease affects choroidal thickness!

Thicker

- Central Serous Chorioretinopathy
- Polypoidal Choroidal Vasculopathy

Thinner

- Age Related Macular Degeneration
- Proliferative DR/ DME
- Retinitis Pigmentosa
- Glaucoma

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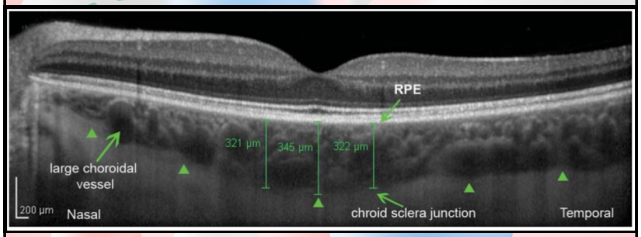
Choroid: In Detail



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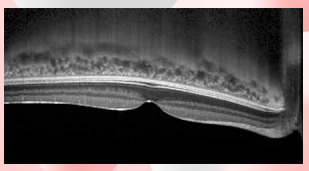
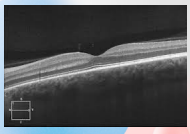
Enhanced Depth Imaging

Place OCT closer to patient's eye; improves image resolution

Inverting the image provides enhanced visualization of the RPE, Bruch's membrane, choroid and sclera (extra 500-800 um penetration)





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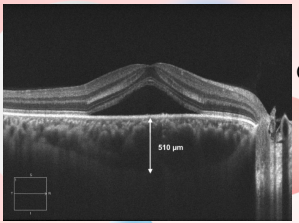
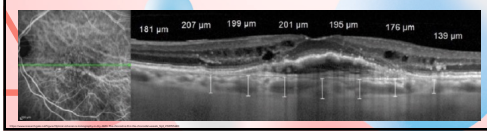


CSR: Thick



AMD: Thin

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Pachychoroid Clinical Spectrum

- Uncomplicated Pachychoroid
- Central serous chorioretinopathy (CSC)
- Pachychoroid neovasculopathy
- Polypoidal choroidal vasculopathy
- Focal Choroidal Excavation

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Pachychoroid Clinical Spectrum

❖ *Uncomplicated Pachychoroid*

•No RPE alterations

•No subretinal fluid

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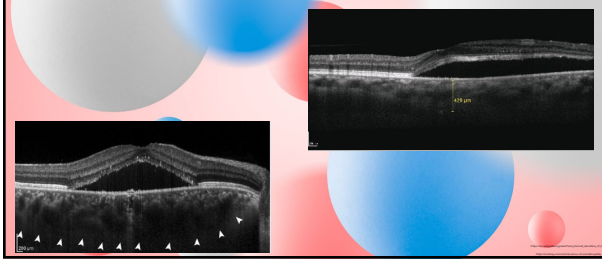
Pachychoroid Clinical Spectrum

❖ *Central Serous Chorioretinopathy*



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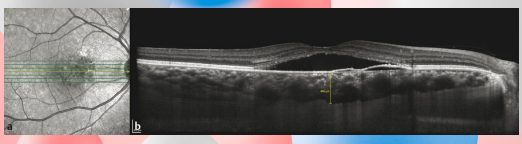
Pachychoroid Clinical Spectrum

❖ *Pachychoroid Neovasculopathy*

• Type 1 CNV with thick choroid!



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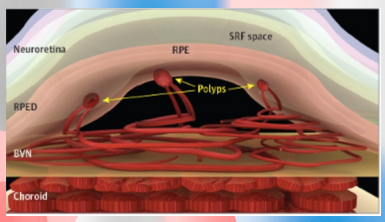
Pachychoroid Clinical Spectrum

❖ *Polypoidal Choroidal Vasculopathy*



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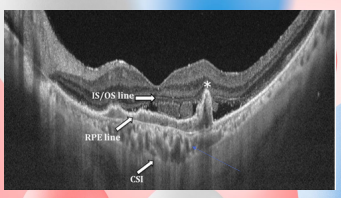
Pachychoroid Clinical Spectrum

❖ *Polypoidal Choroidal Vasculopathy*



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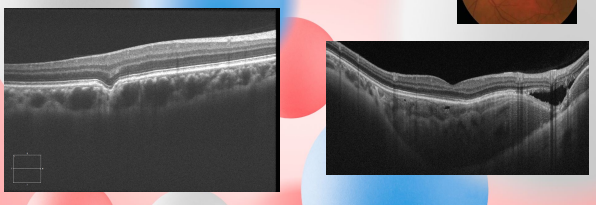
Pachychoroid Clinical Spectrum

❖ *Focal Choroidal Excavation*



- Conforming (photoreceptor tips are in direct contact with RPE)
- Non-conforming (photoreceptor tips are detached from RPE)

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Optic Nerve OCT

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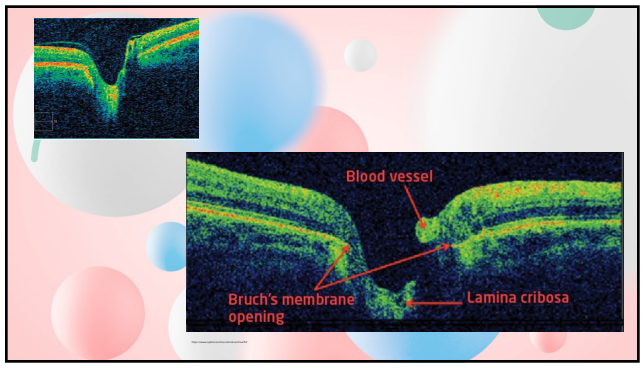

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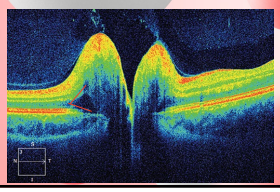
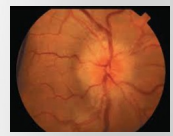
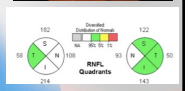
Papilledema

Important features of disc edema on OCT:

- Smooth contour of elevation
- Nasal RNFL >86 um
- Thick hypo-reflective space adjacent to disc "lazy V" (Especially nasal)







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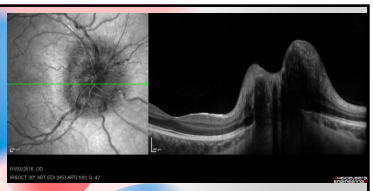
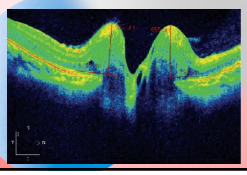
Papilledema



- Increased ICP will push the globe anteriorly
- With EDI, can see an anteriorly displaced Bruch's membrane



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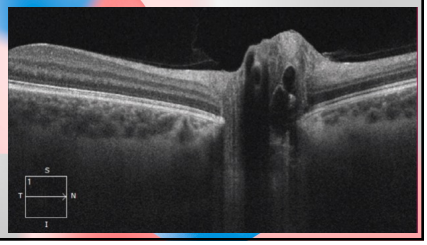
ONH Drusen

Irregular, bumpy contour
Hypo-reflective centers
Hyper-reflective margins



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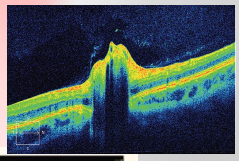
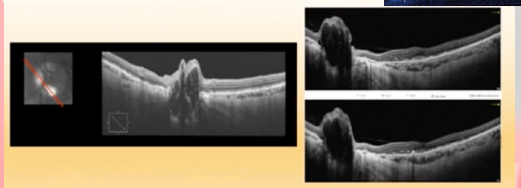
ONH Drusen

Reflectance of Hyaline and Shadowing beneath:
Not seen in cases of papilledema





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OCT Angiography

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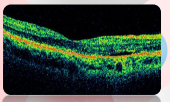
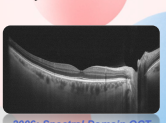
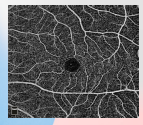
OCT Angiography: *The Next Chapter in Posterior Imaging*

- ❖Time Domain
- ❖Spectral Domain
- ❖OCT Angiography (OCTA)…THE NEXT CHAPTER!!


2002: Time Domain OCT


2006: Spectral Domain OCT


2014: OCTA

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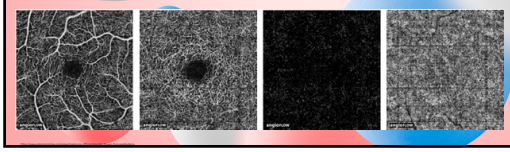
OCT Angiography

- See retinal vasculature without referring patients out of the practice
- Visualize signs of disease earlier and make more intelligent referrals
- Manage more pathology
- Elevate the practice with state-of-the art imaging technology



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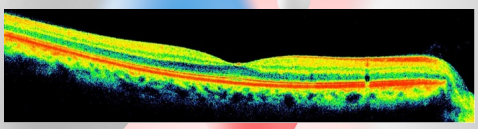
Optical Coherence Tomography



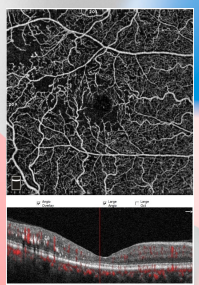
PROS:

- Excellent visualization of macular architecture
- Non-invasive
- Easy to perform

BUT…. UNABLE TO VISUALIZE VASCULATURE/ FLOW!!!

88

OCT with OCTA: *A Match Made in Heaven*



➢**Conventional SD-OCT**
- ➢Stationary tissue **(structure)**

➢ **OCT Angiography**
- ➢Moving red blood cells **(function)**

OCT angiograms co-registered with OCT B-scans from the same area allows simultaneous viewing of structure and function.

89

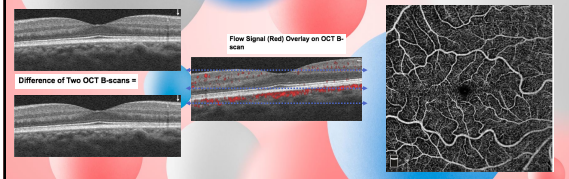
OCT & OCTA Provide Different – but Complementary – Information

OCT: Structure	OCTA: Function
Visualize STRUCTURAL changes • Drusen • Fluid • Elevations/disruptions in retinal layers	**Visualize blood flow in the vessels** • CNVM **Visualize ischemia/poor perfusion** • Diabetic retinopathy • Vascular occlusion

90

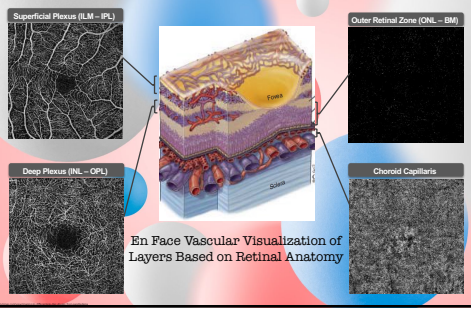
How does OCTA work?

OCTA uses motion contrast to detect flow from OCT data



91

En-face OCTA Slabs: Based on Retinal Anatomy



En Face Vascular Visualization of Layers Based on Retinal Anatomy

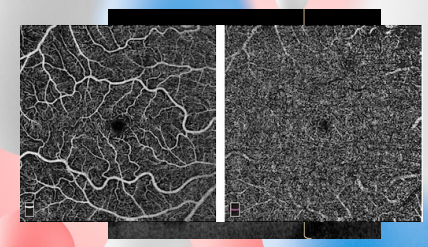
92

Apply This Clinically

Inner Retinal Disease

93

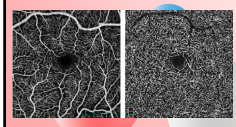
Inner Retinal Disease

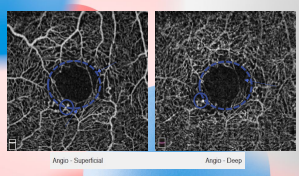


94

Diabetic Retinopathy

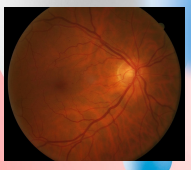
- **Positive Indicators**
  - Retinal capillary non-perfusion – seen as blackened area without blood flow outside FAZ
  - Microaneurysms
  - Enlarged FAZ

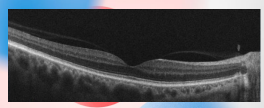




95

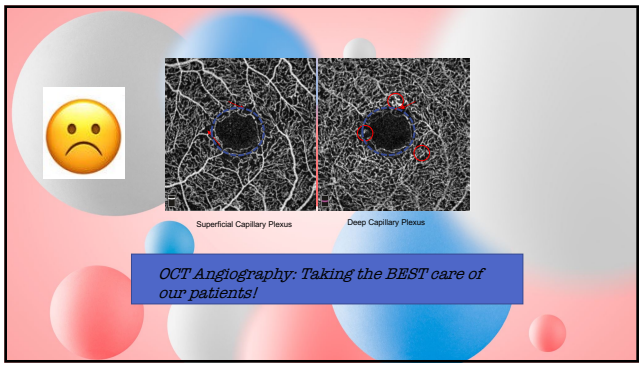
Meet Carla: *A 45-year-old African American female*





"My BS is excellent.... Can't remember the number .... But my A1C is 7!!! I'm so proud of myself"

96



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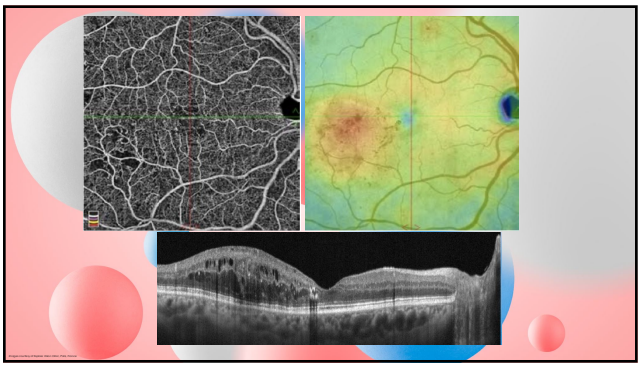

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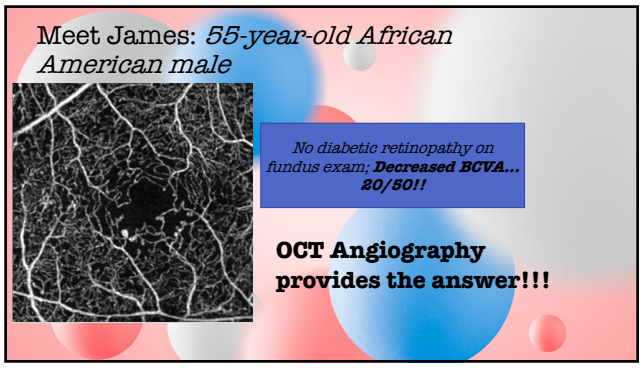

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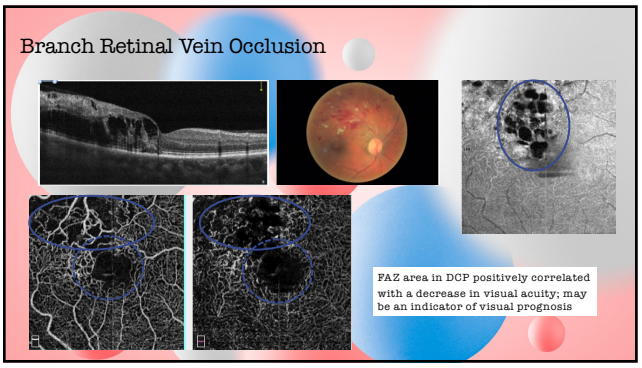

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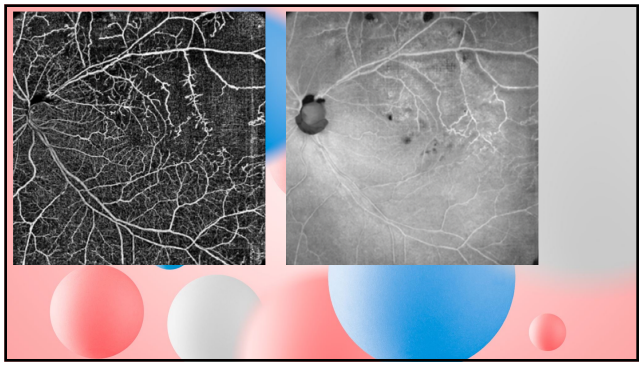

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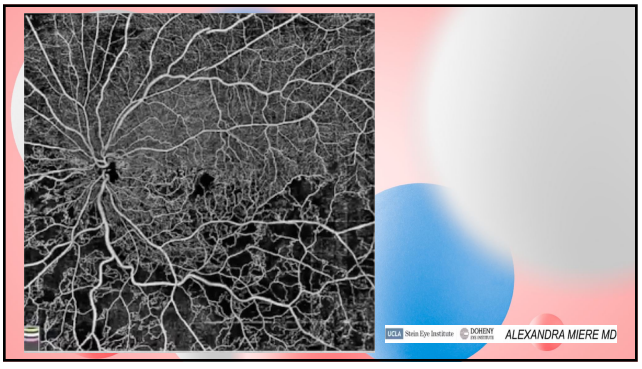


102

Apply This Clinically

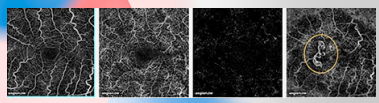
Outer Retinal Disease: Choroidal Neovascular Membrane

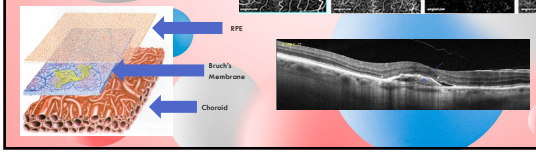
103

104

Type 1 "Occult" CNV

- New vessels develop in the choroid
- New vessels located **BELOW RPE** and ABOVE Bruch's membrane





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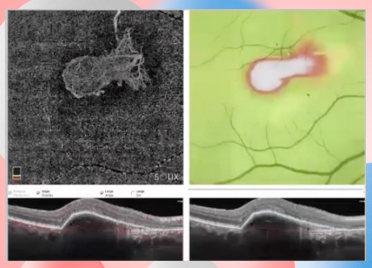

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106

65 y/o Caucasian Male

- History of Dry AMD, Recent decrease in vision OS

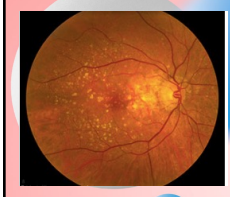
107

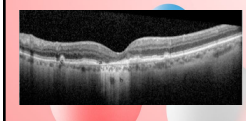
OD

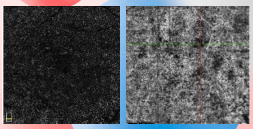
Multiple, large drusen

Geographic atrophy

But.... NO signs of CNVM







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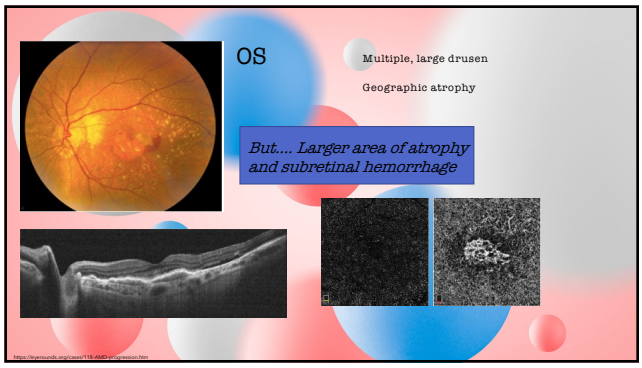

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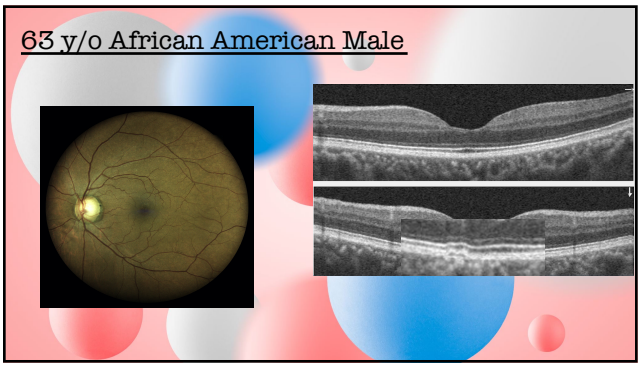

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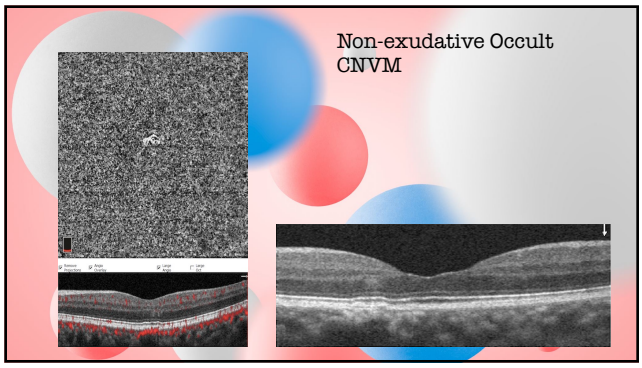

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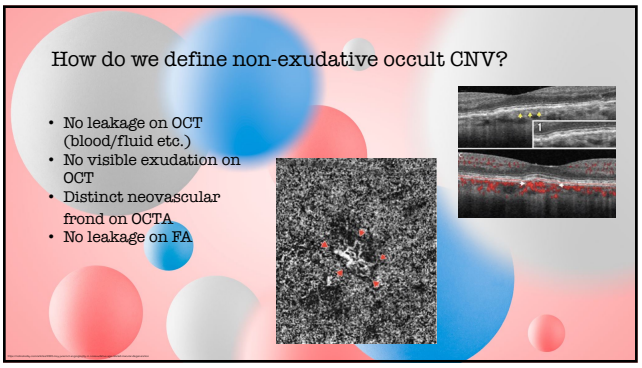

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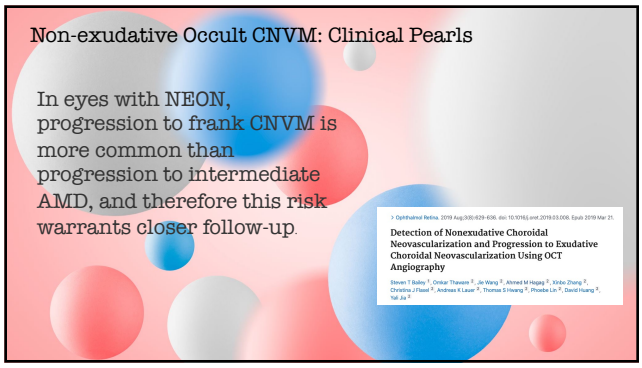

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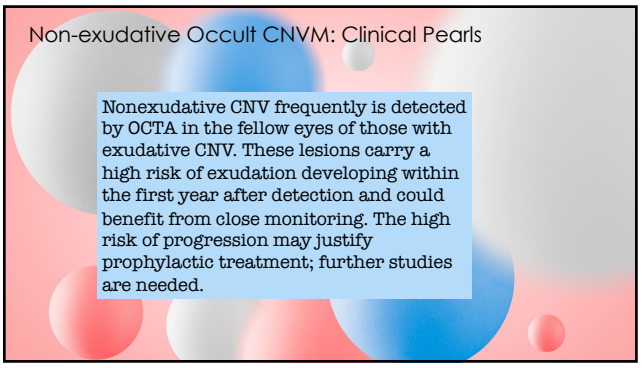
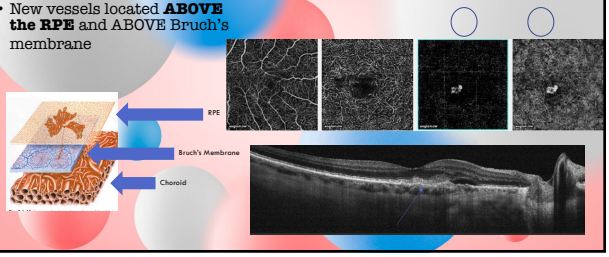


114

Type 2 "Classic" CNV

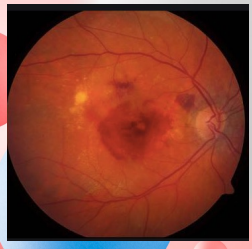
- New vessels develop in choroid
- New vessels located **ABOVE the RPE** and ABOVE Bruch's membrane



115

Meet Wendy: *A 66-year-old Caucasian female*

"I have a long-standing history of Macular Degeneration.... BUT.... My vision has gotten really bad in my right eye...."



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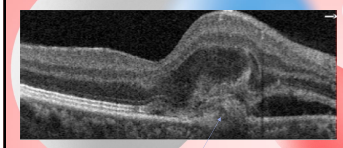
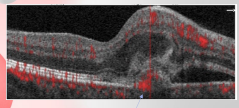


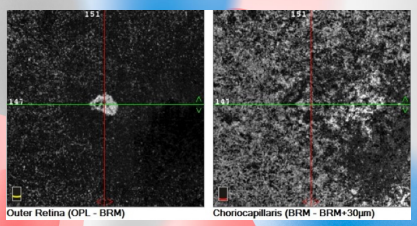
Choroidal neovascular membrane



Increased pixelation (flow) within area of abnormal flow

117

OCT Angiography



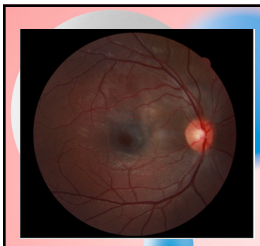
118

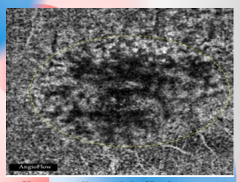
Apply This Clinically

Outer Retinal Disease: Central Serous Chorioretinopathy

119

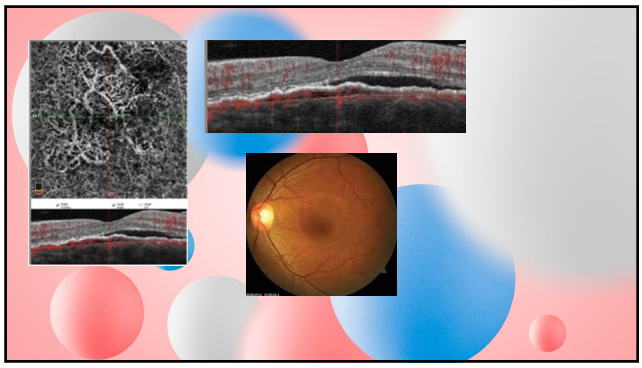
CSR: The easy one...





Choriocapillaris slab: Shadowing

120



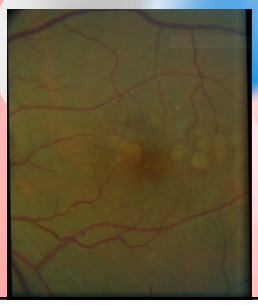
121

Apply This Clinically

Outer Retinal Disease: Pigment Epithelial Detachment

122

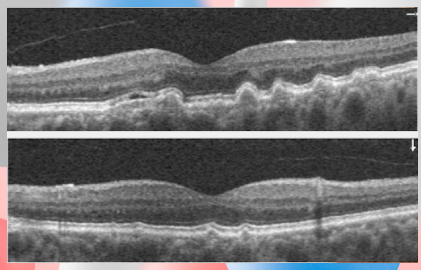
72-year-old Hispanic Male



No new visual complaints

Stable vision

123



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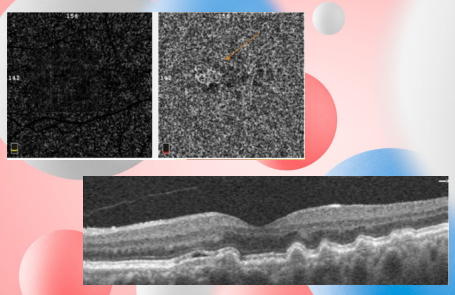
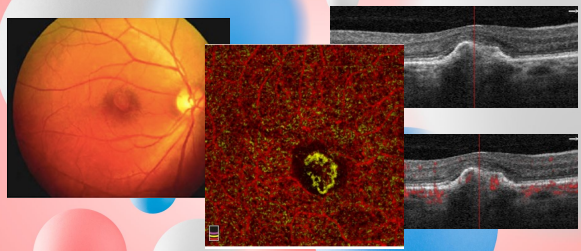


125

Another PED....



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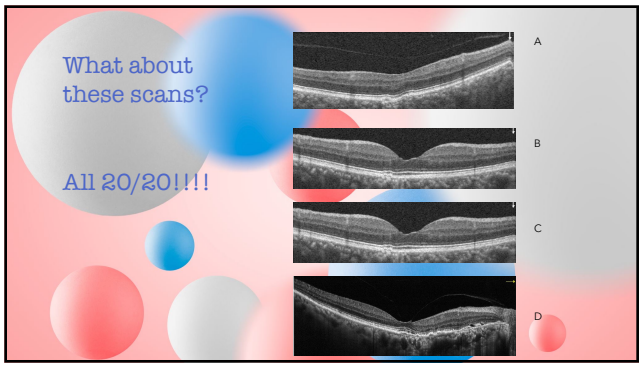
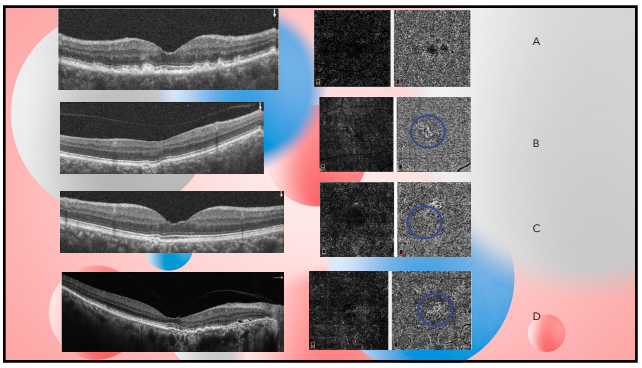

What about these scans?
All 20/20!!!!
A
B
C
D

127


A
B
C
D

128

Thank You
rjulie@nova.edu

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