



# OCT ANGIOGRAPHY IN CLINICAL PRACTICE

Dr.Vignesh Raja  
Head of Department – SCGH & Joondalup Eye Clinic



# Overview

Introduction

Principles

Case studies

Limitations

# Introduction

New non-invasive, motion contrast vascular imaging modality

Does not need contrast dye injection

Provides 3-D volumetric images of the retinal and choroidal vasculature

Based on OCT technology

# Fluorescein Angiography vs OCTA

## FA

Injection of a dye

Risk of allergic reaction /  
anaphylaxis

5-10 minutes

Background fluorescence can  
obscure finer detail

## OCTA

Uses the movement of blood  
cells within the vessel

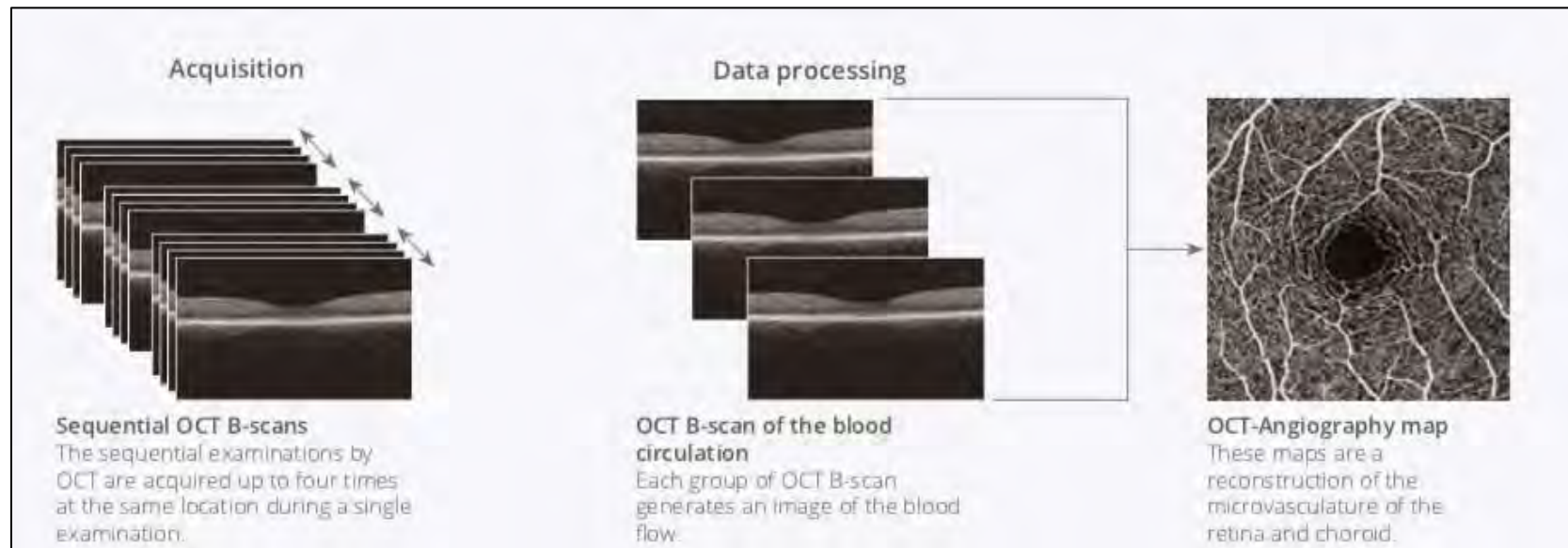
No risk

1-2 minutes

Crisper images of capillary bed  
and choroidal circulation

# Principles

Diffraction particle movement detection, such as red blood cells, on sequential OCT scans performed repeatedly at the same retinal location

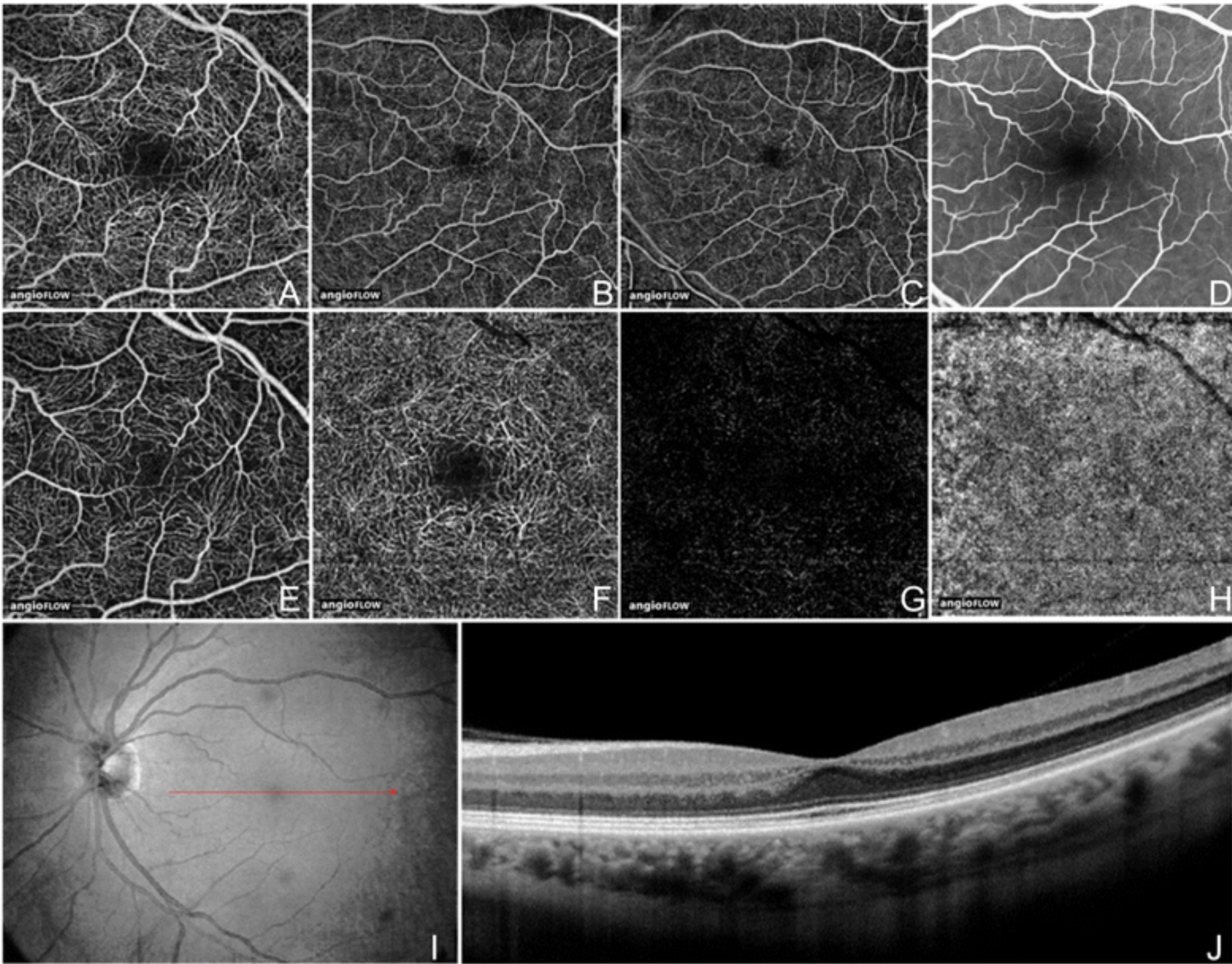


# Principles

To generate an image of the retinal microvascular structure, each B-scan is consecutively repeated several times

The contrast comparisons on consecutive B-scans at the same location reveal some areas with a contrast change over time and some areas with a constant contrast

The temporal change in contrast in a specific location is attributed to the movement of erythrocytes, which indicates the location of the vessels



# Principles

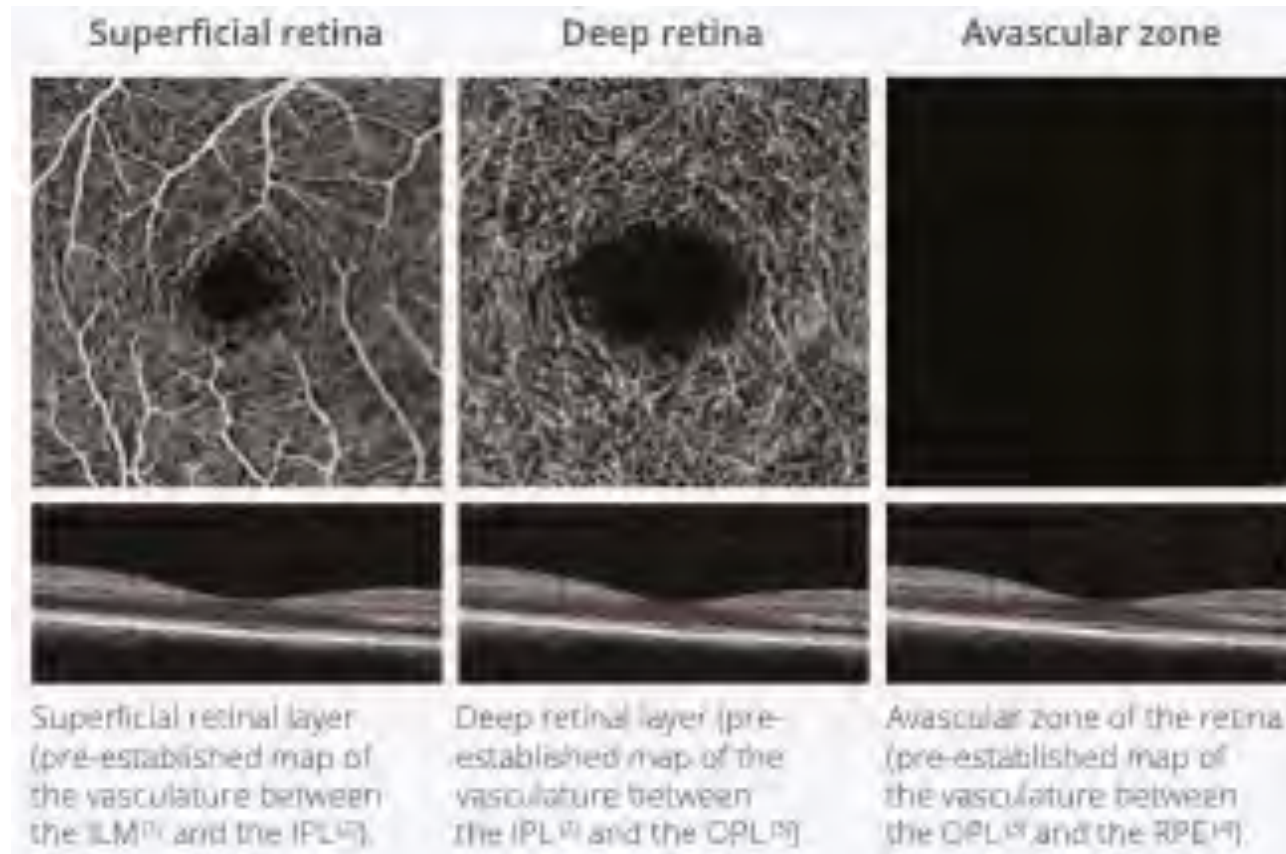
As every OCTA obtained is essentially a cube scan, it is a three-dimensional (3D) assessment of the retinal vasculature unlike traditional fluorescein or ICG angiography, which is two dimensional.

Evaluate the scans from the inner retinal surface right down to the choroid in a continuous manner

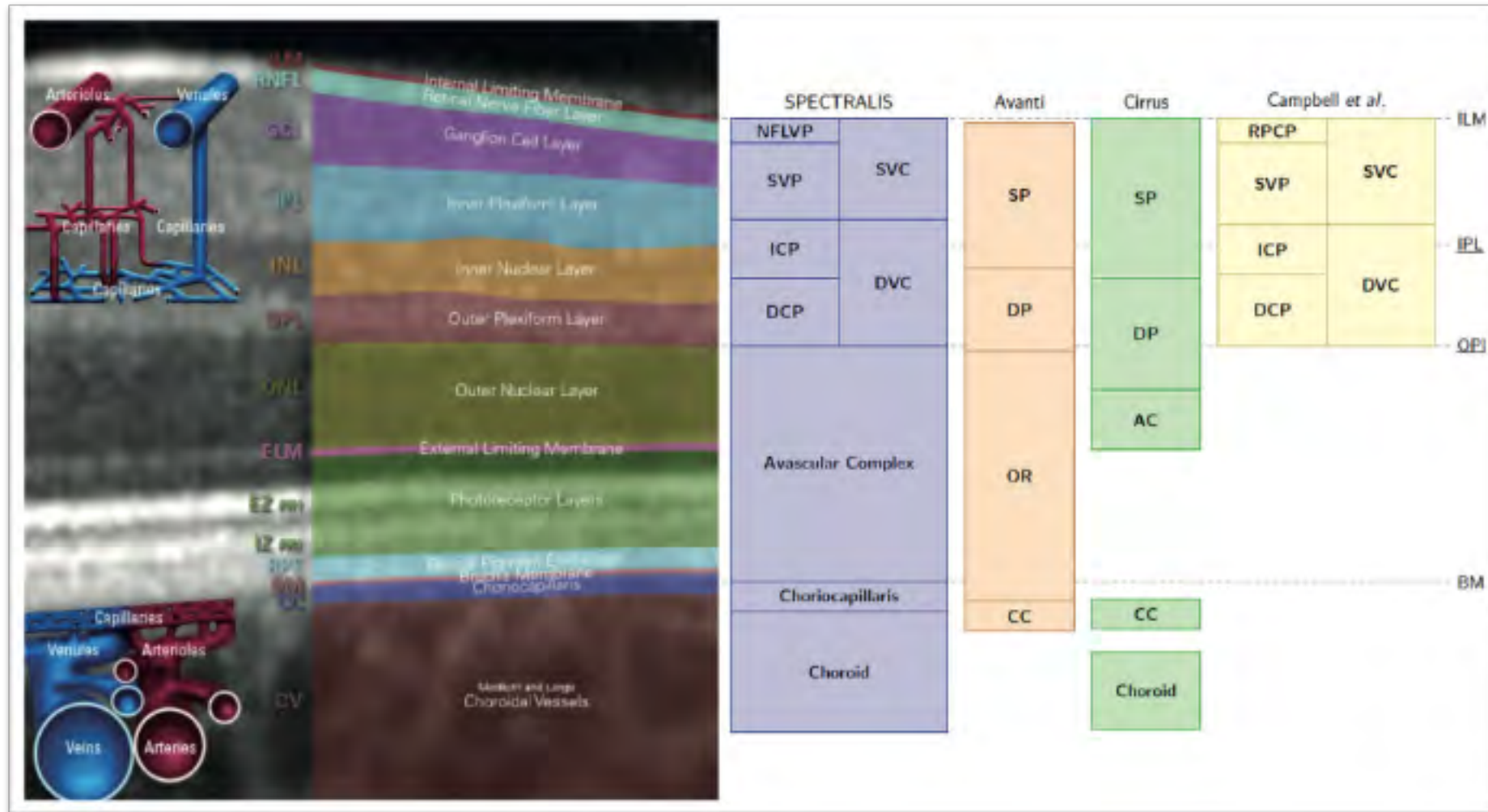
OCTA machines have taken the cube and split it into slabs to reflect a known anatomic layer of the retinal vasculature, referred to as auto-segmentation



# Principles



# Principles





# Devices

Zeiss Angioplex<sup>®</sup>

Optovue Angiovue<sup>®</sup>

Topcon Triton / Maestro 2

Heidelberg Spectralis



# **CASE STUDIES**

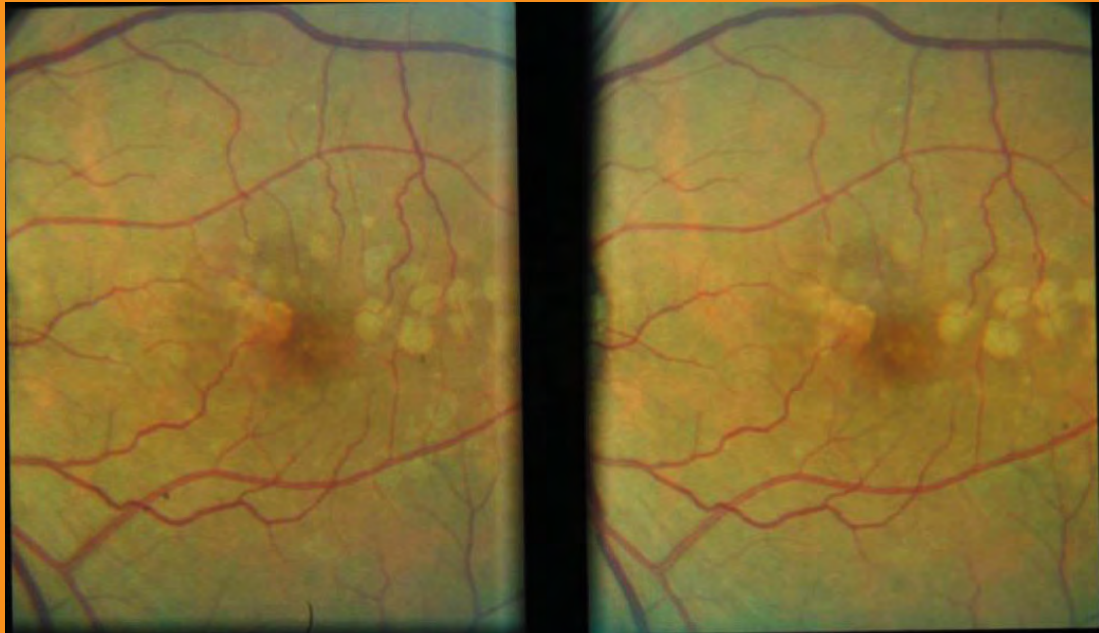
# Case #1

76 yo male

C/o Blurry vision BE

POHx: Known dry AMD BE

BCVA 6/9 BE

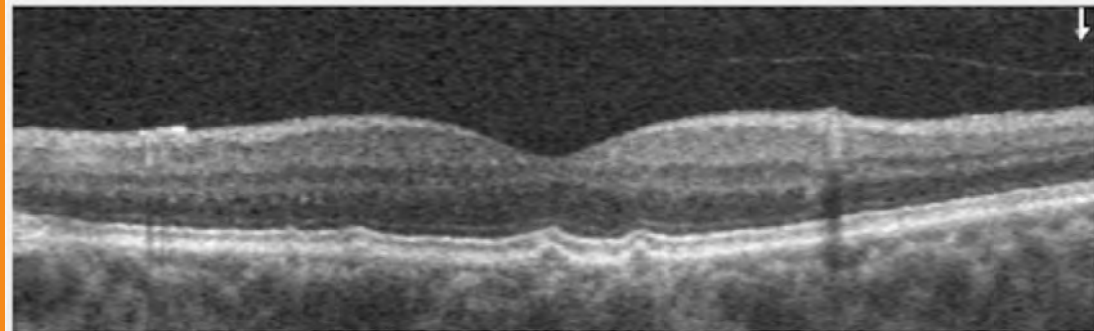
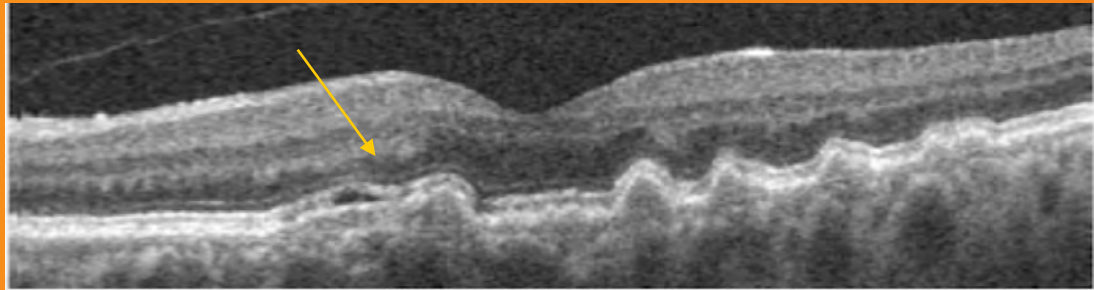


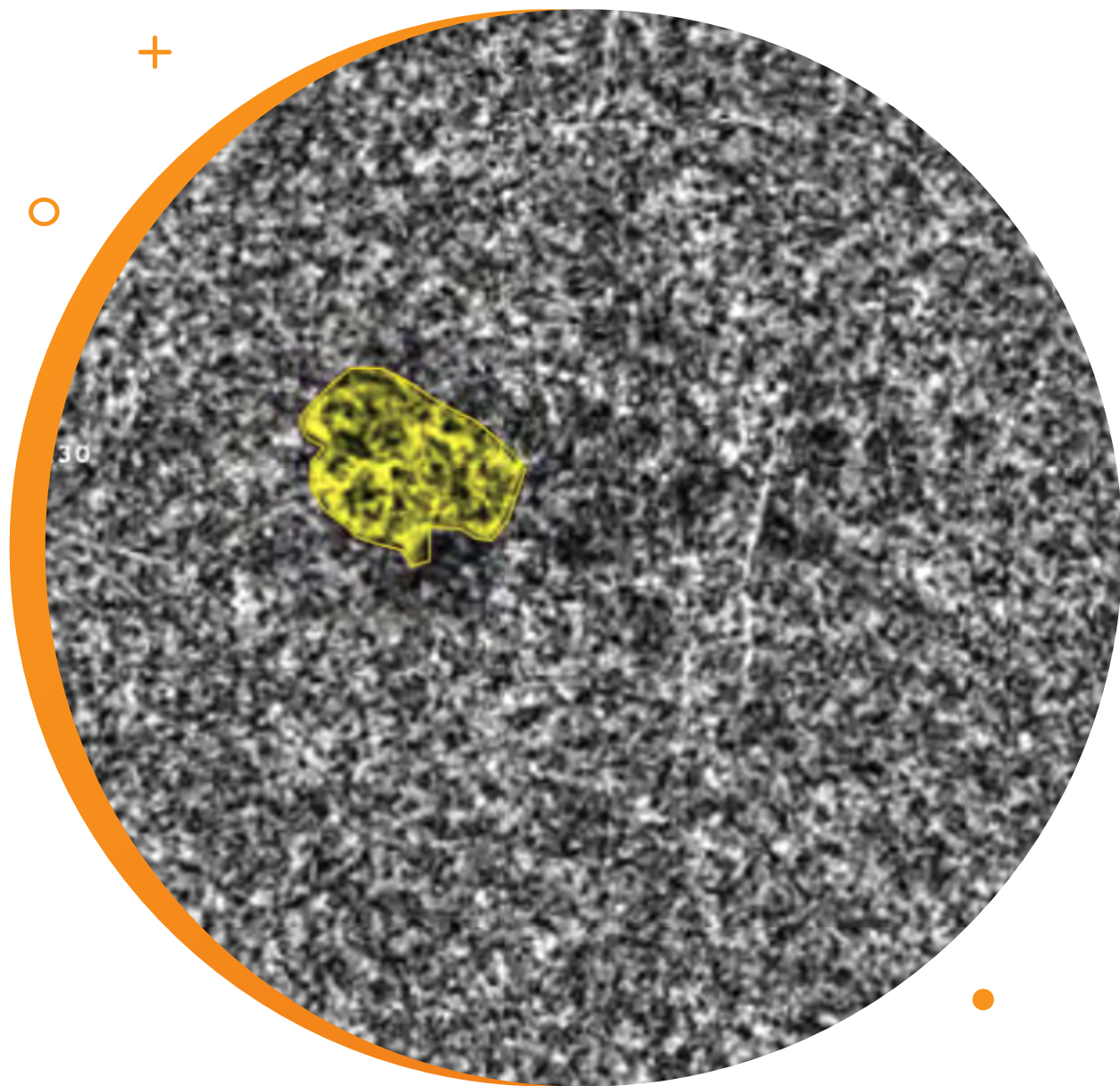
# Case #1

Colour photograph shows an irregular elevated lesion nasal to macula

Confluent soft drusen

OCT shows a sub-RPE hyper-reflective lesion with minimal SRF





# Case #1

OCTA shows small CNV in the choriocapillaris

Diagnosis: Type 1 (occult) CNV

OCTA showed conversion of dry AMD to Wet in the early phase

# Case #2

63 yo male

C/o Reduced vision in the right eye

BCVA 6/12 RE



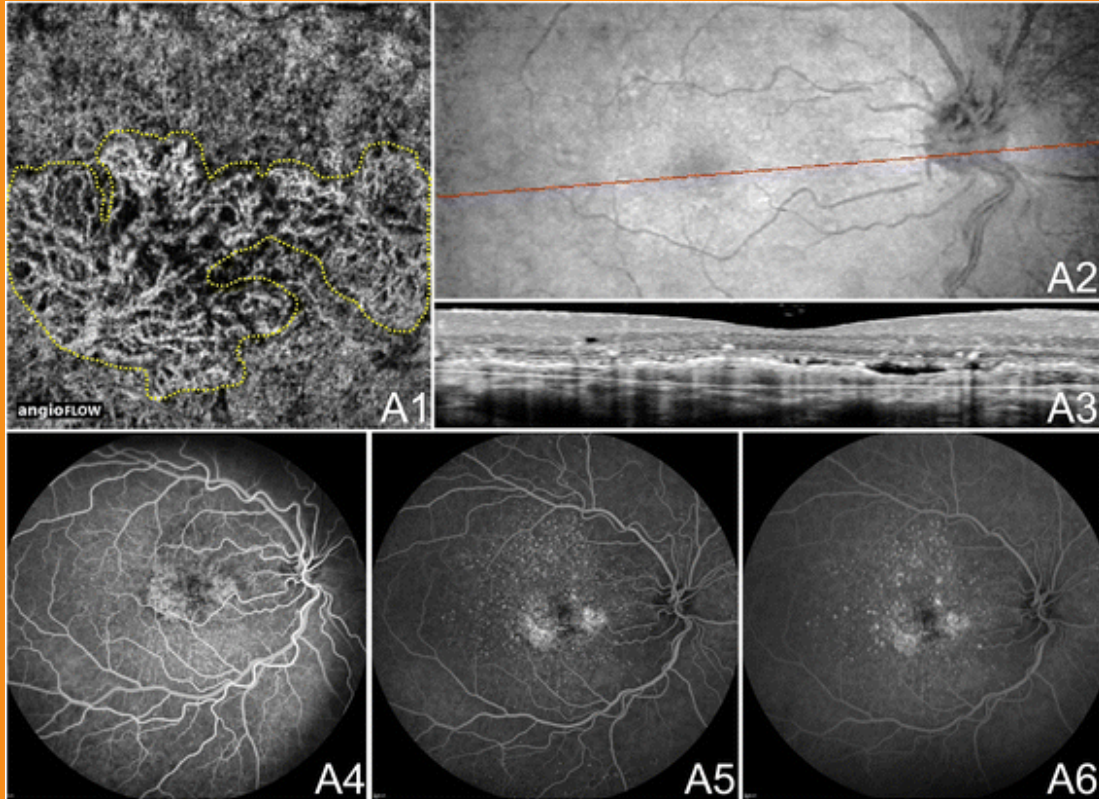
# Case #2

OCT shows PED, sub-retinal fluid, intra-retinal fluid and hyper-reflective material

Angiogram shows early leak with late leakage and staining

OCTA shows network of abnormal choroidal neovascular tissue in the choriocapillaris

Diagnosis: Classic CNV / Type 2



# Case #3

89 yo lady

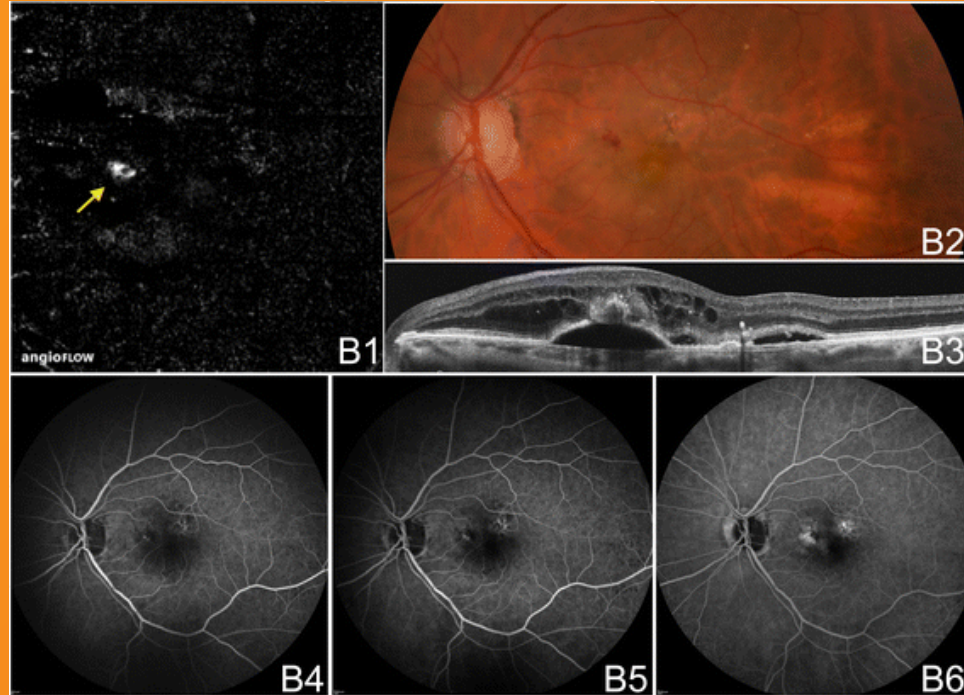
C/o Blurred vision in the left eye

Vision 6/24 left eye

Previous cataract surgery – Both eyes

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## Case #3

Colour pic shows intra-retinal haemorrhage left eye

OCT shows sub-retinal fluid, intra-retinal fluid and hyper-reflective tissue in the centre on top of the PED

Angiogram shows increasing hyper-fluorescence with leakage and pooling

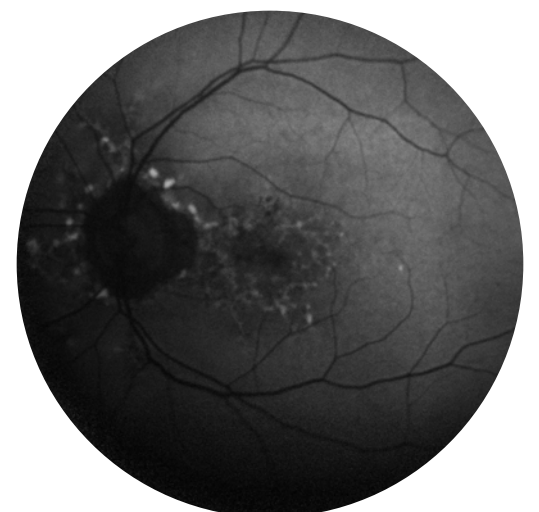
OCTA show feeder vessel of the Retinal Angiomatous Proliferation – RAP in the outer retina

# Case #4

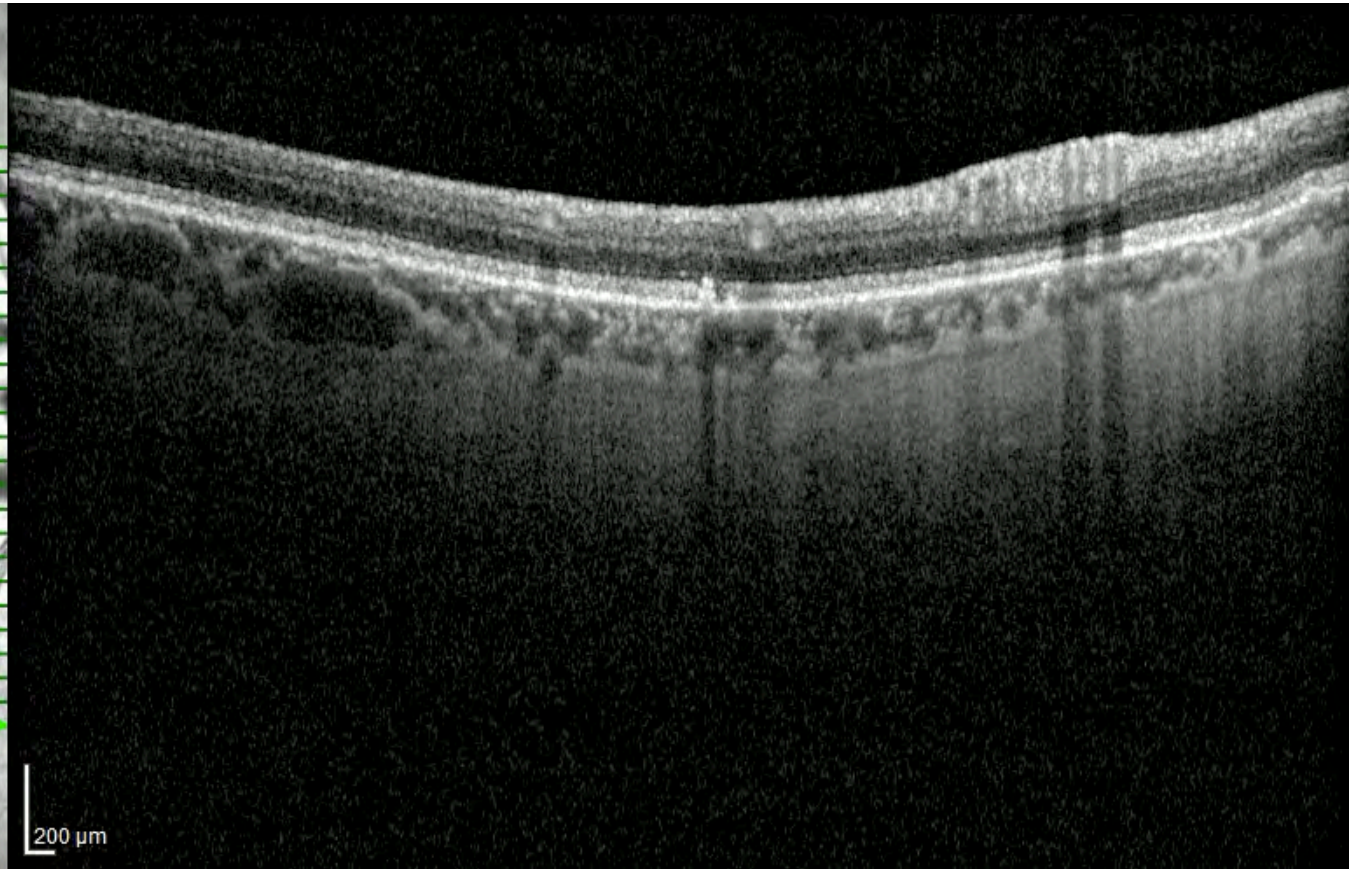
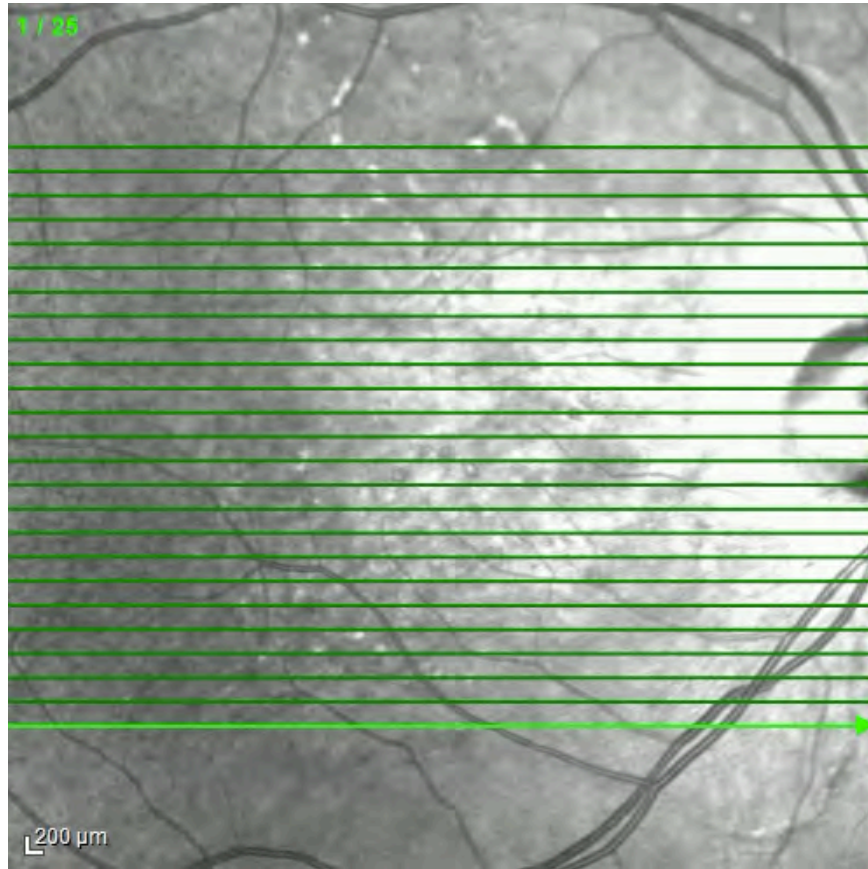
56 yo lady

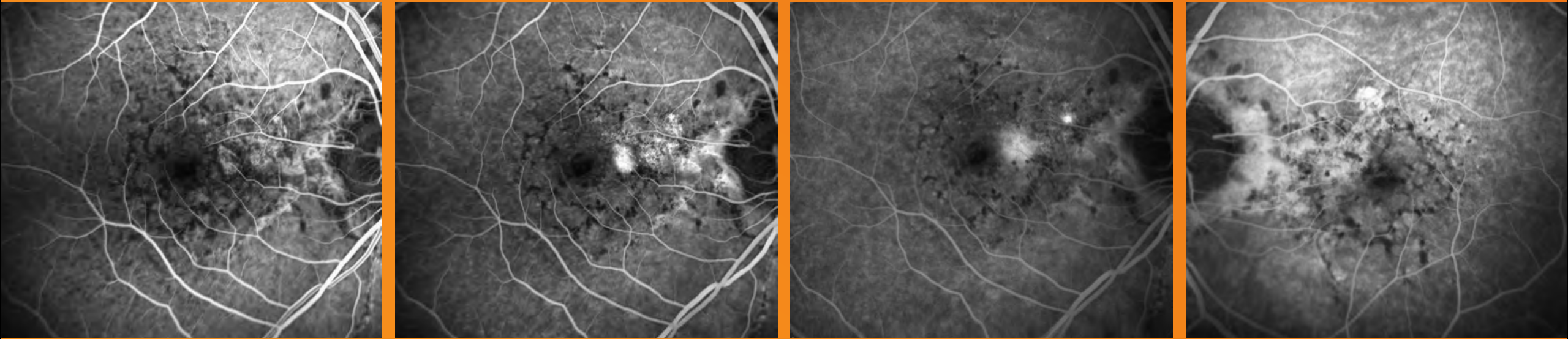
C/o Blurry vision RE

Vision 6/18 RE



# OCT



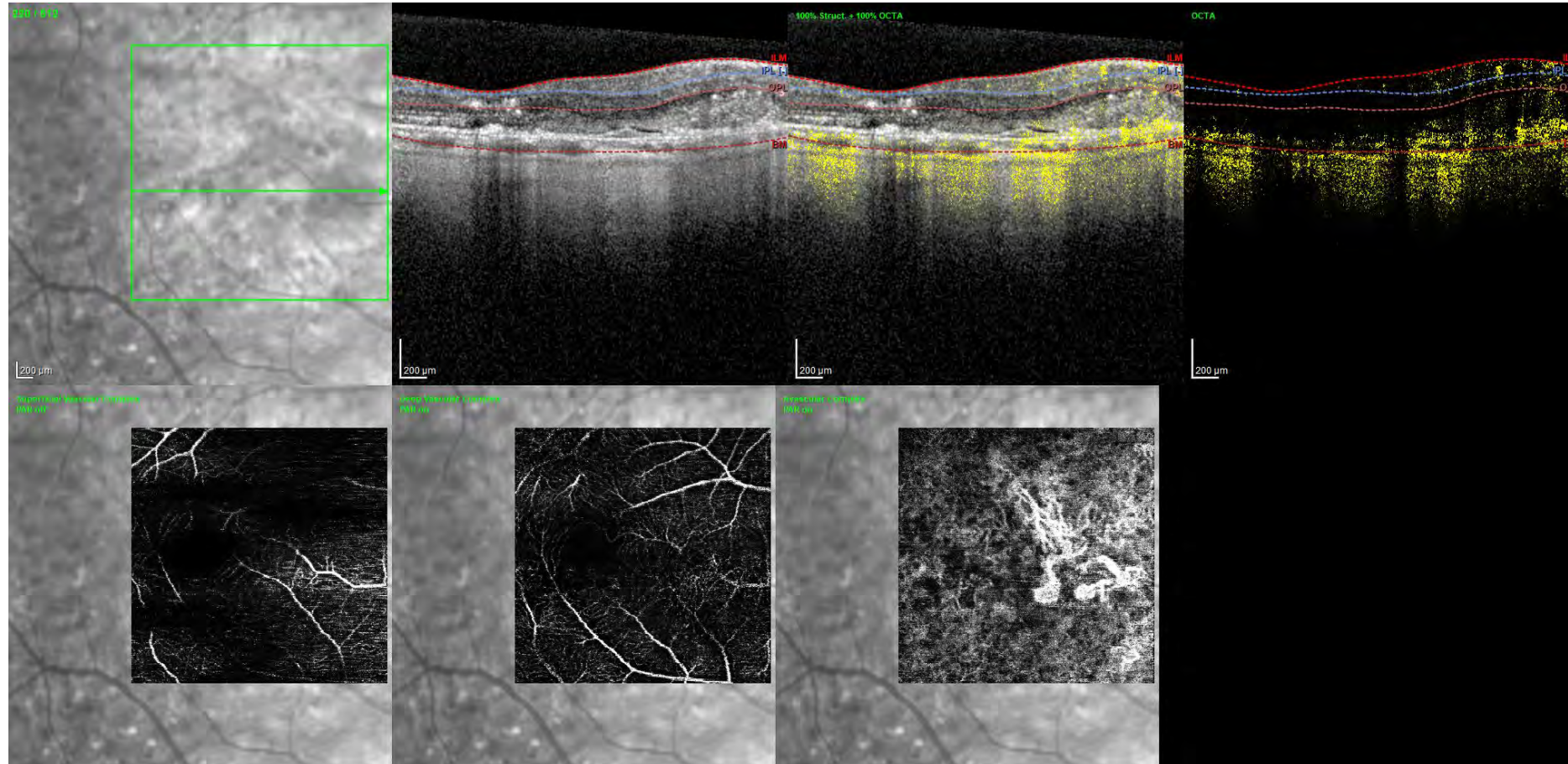


- **FA SHOWS CLASSIC CNV  
RIGHT EYE**

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# OCTA shows CNV secondary to Angioid streaks





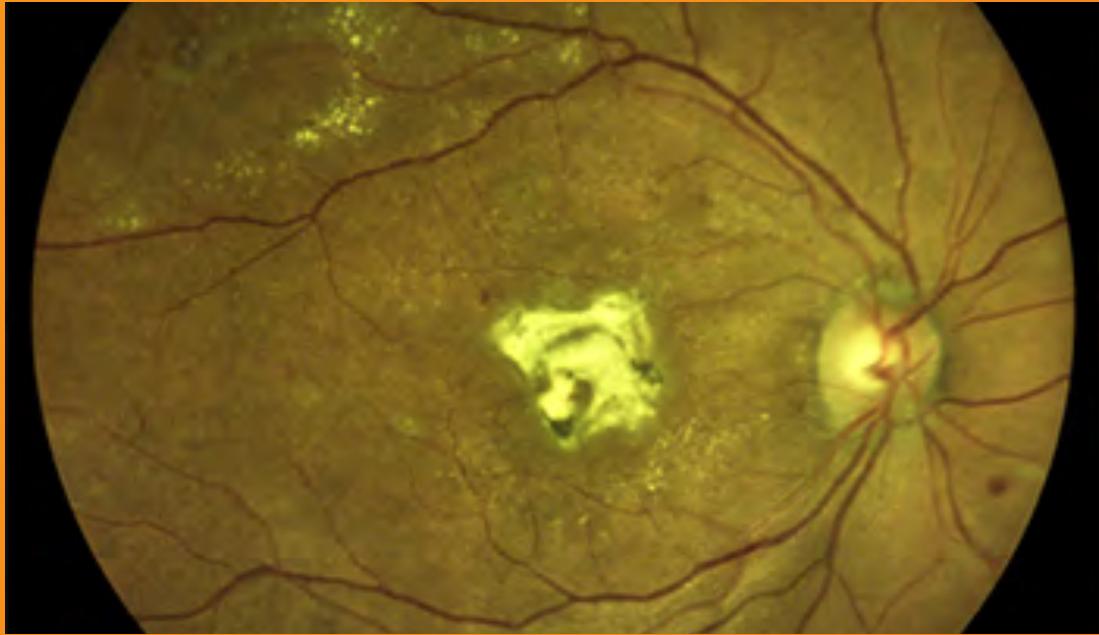
# Case #5

72 yo diabetic lady

C/o Reduced vision for 2-3 years RE

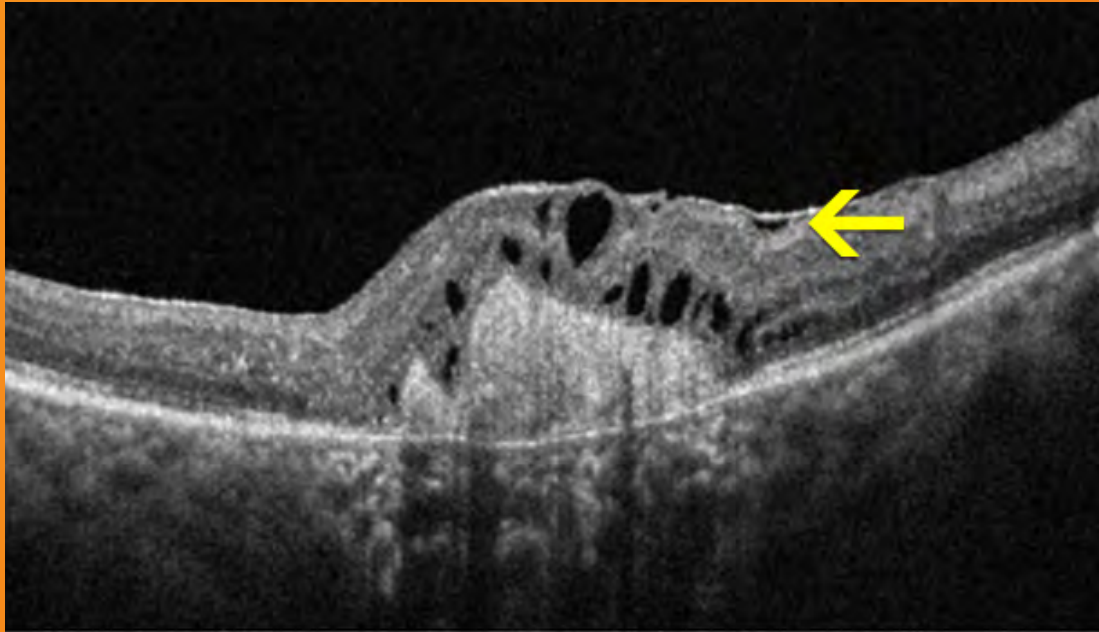
Known diabetic

Vision HM RE

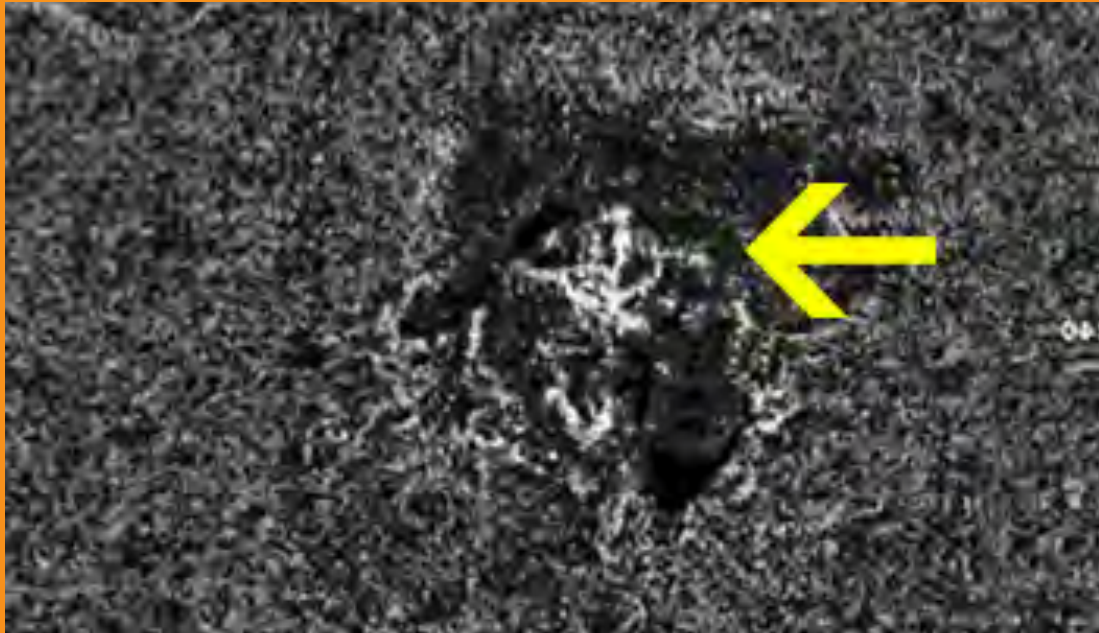


## Case #5

Colour fundus shows yellow scarred lesion in right macula with moderate-severe NPDR



OCT shows sub-retinal hyper-reflective lesion, intra-retinal fluid and epi-retinal membrane



# Case #5

OCTA shows hypo-intense halo around neovascular network of CNV – dead tree appearance indicates quiescent CNV

Halo represents localized RPE atrophy

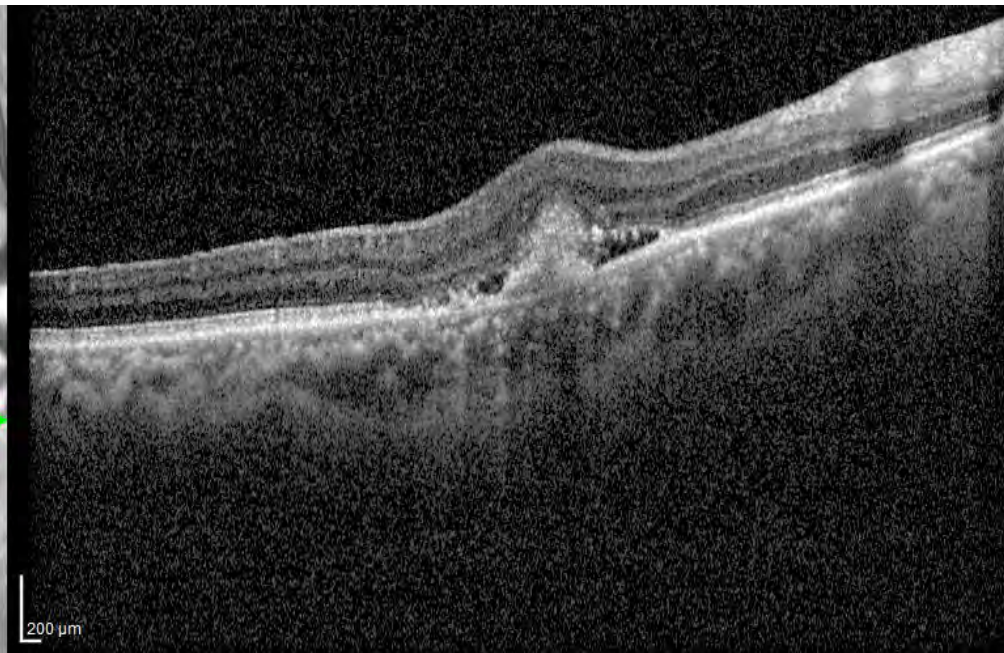
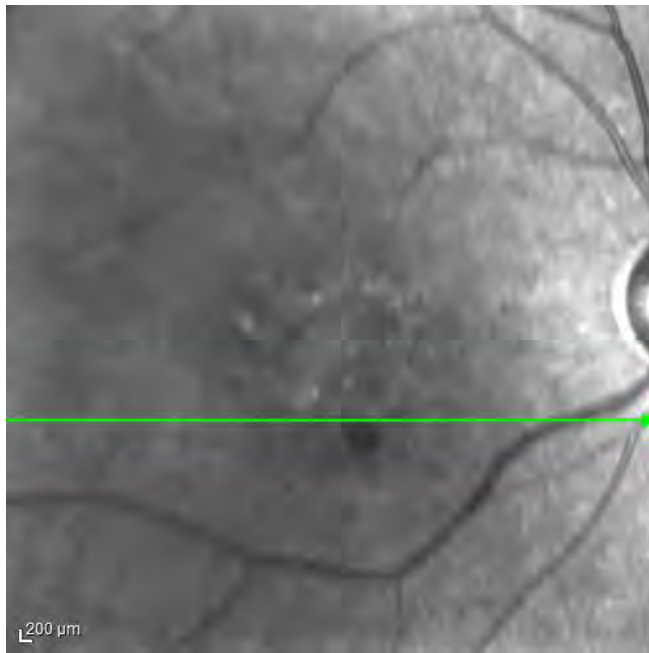
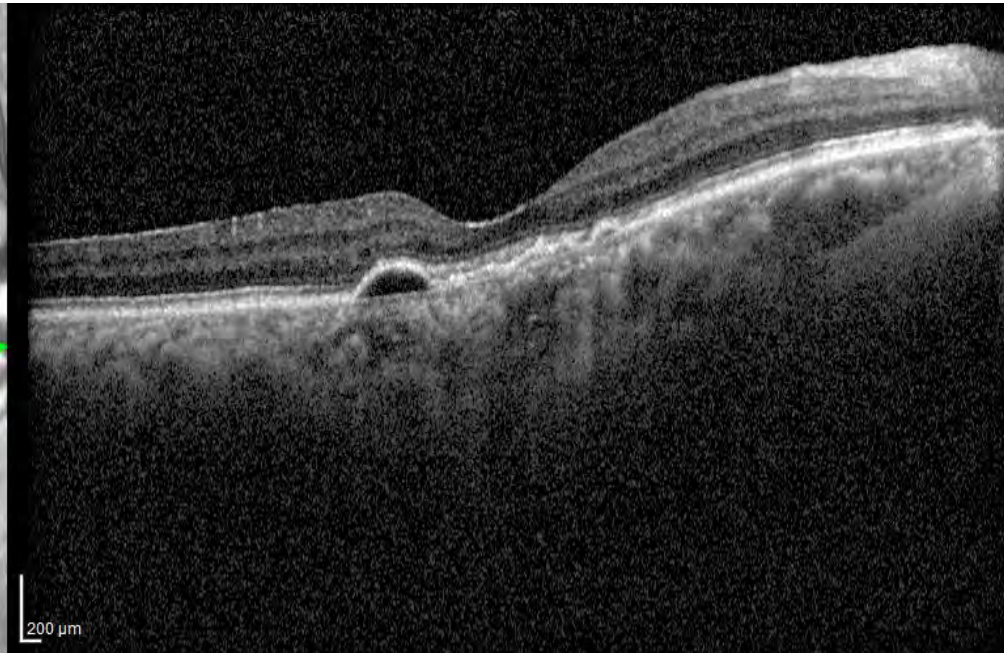
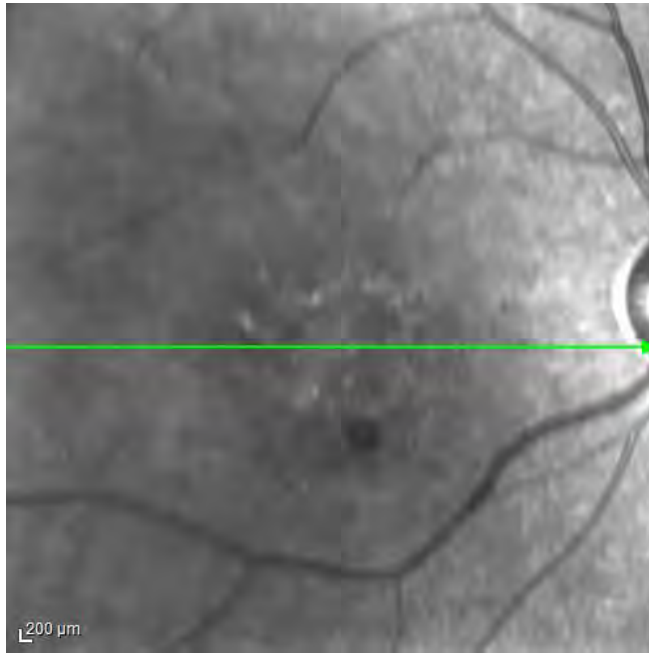
Diagnosis: Scarred CNV with Moderate NPDR

# Case #6

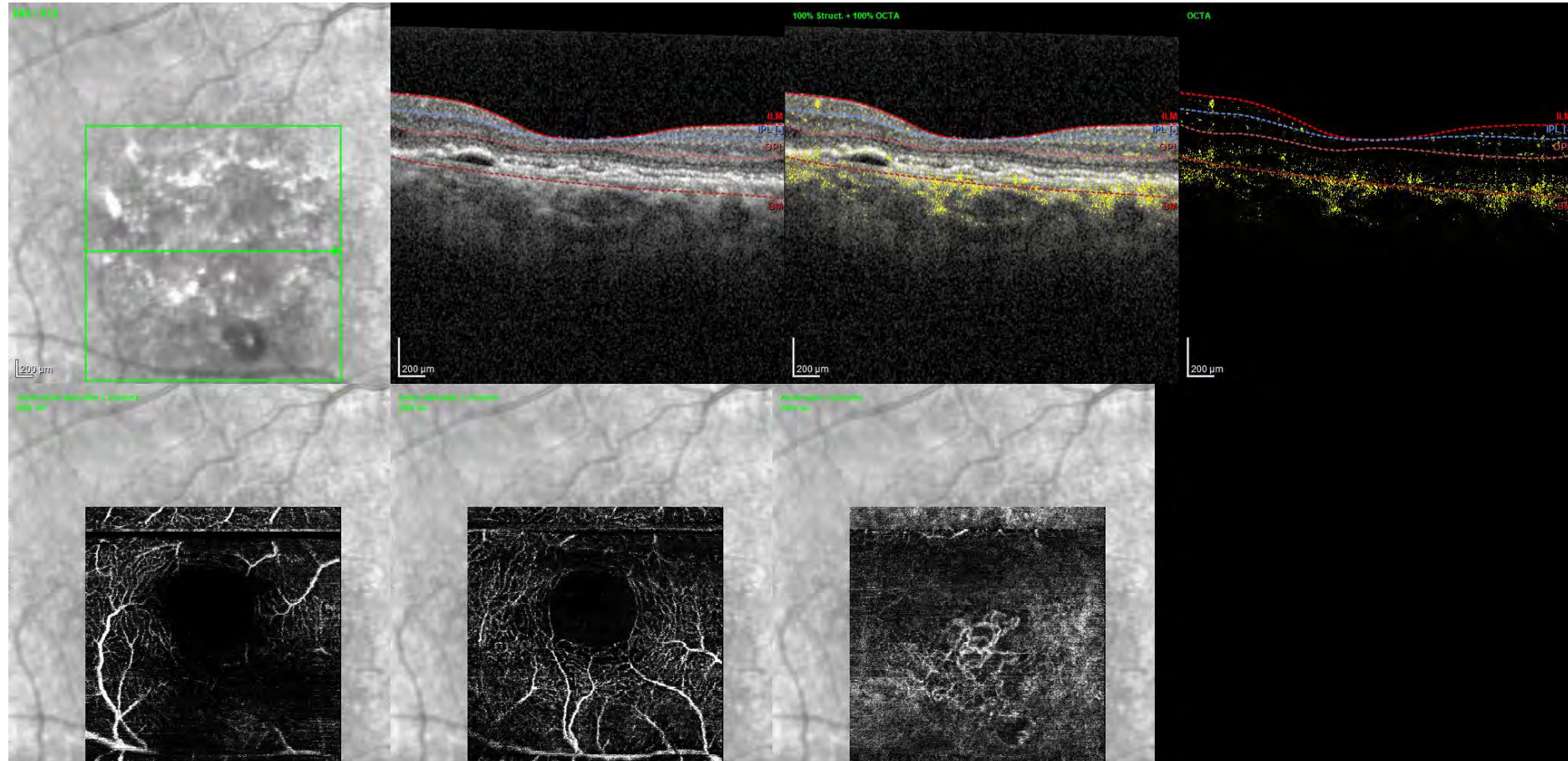
66 yo male

Previous Hx of CSR

Monitoring of retina annually

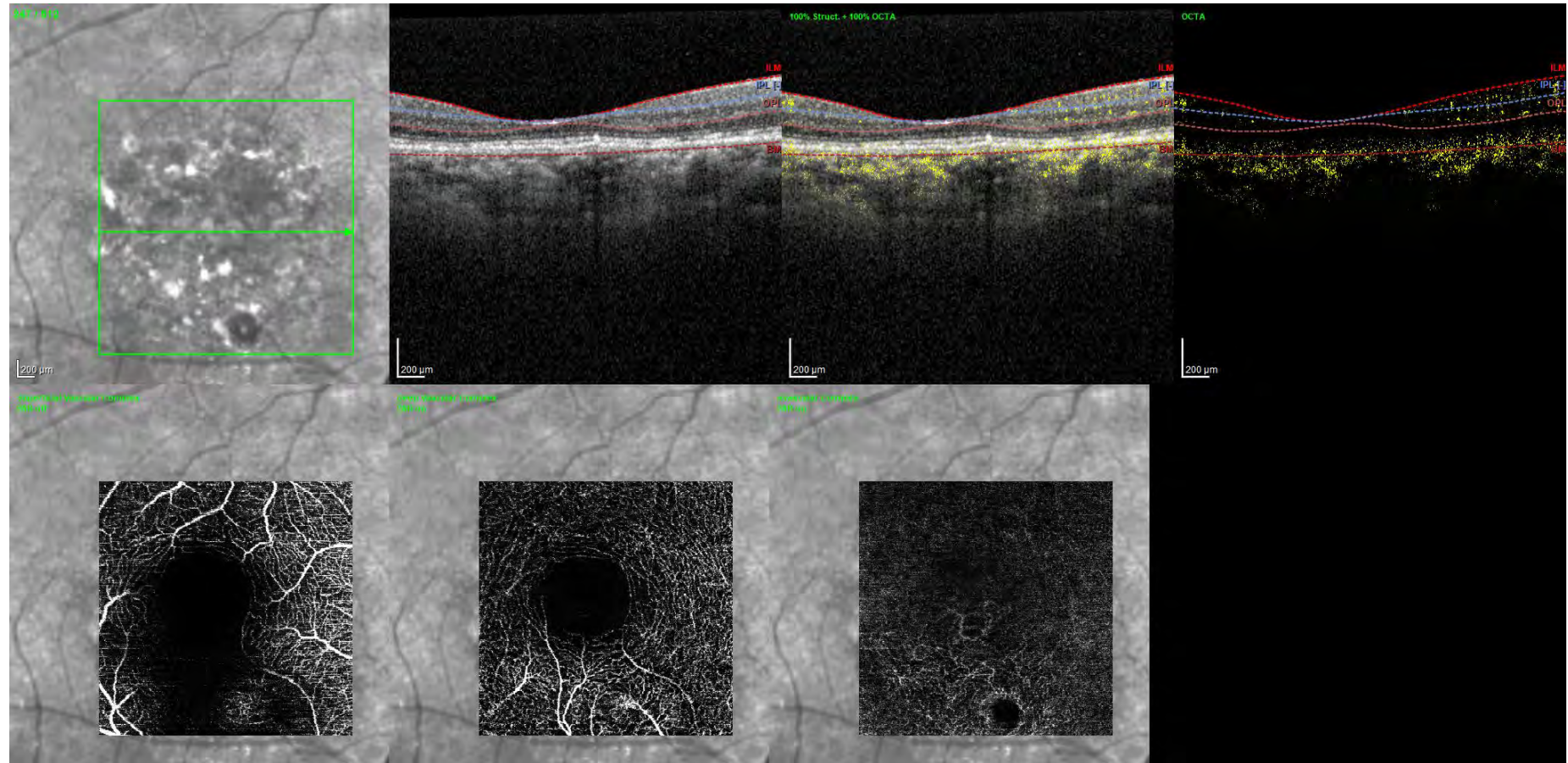


# OCTA



# Case #6

- Confirms CNV post CSR
- Treated with Lucentis®
- Nice regression after 1 inj



# Case #7

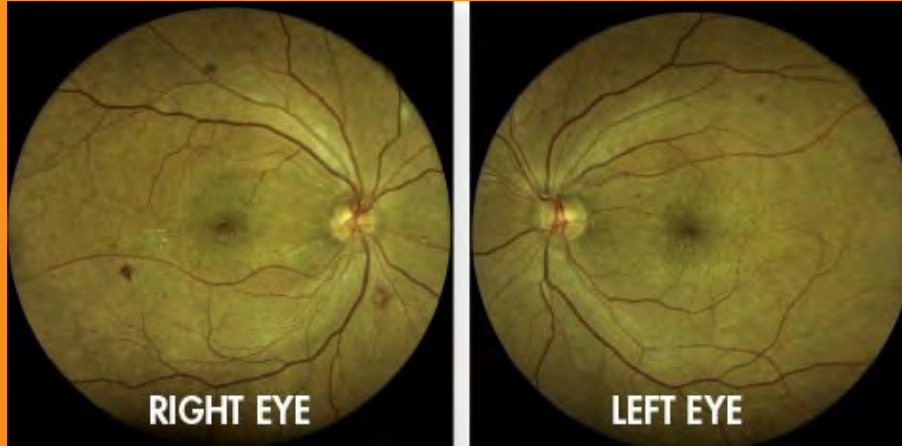
53 yo male

Presented for diabetic screening

Known DM x 14 years – poorly controlled

VA – 6/9 BE





# Case #7

Mod NPDR with dot-blot  
haemorrhages - both eyes

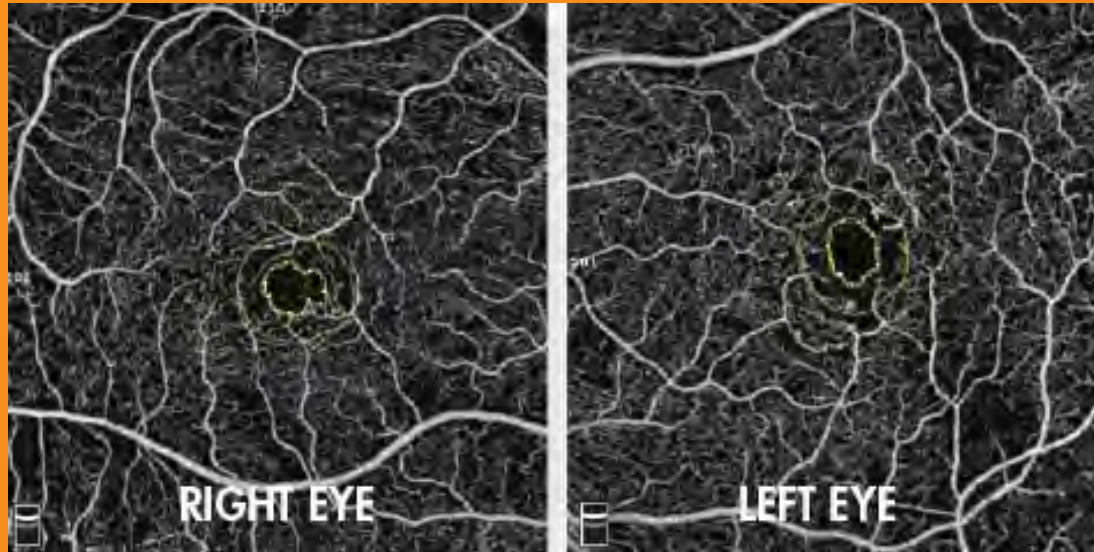
Drusen seen

OCT shows intra-retinal haemorrhages  
in the right eye

No DMO seen



# Case #7



OCTA shows enlargement of FAZ with capillary non-perfusion

Truncated, telangiectatic vessels and microaneurysm seen

Vessel density of the superficial capillary plexus predicts DME development

FAZ area and vessel density of the deep capillary plexus predict DR progression

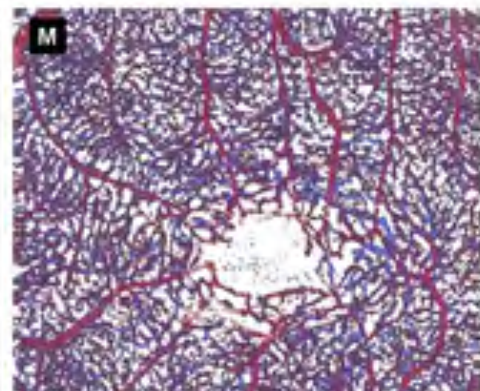
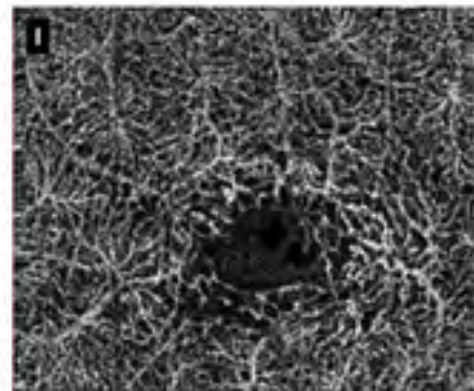
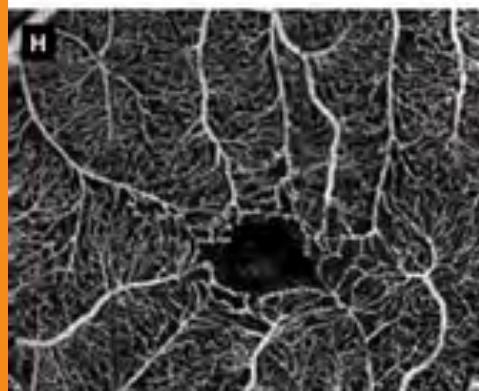
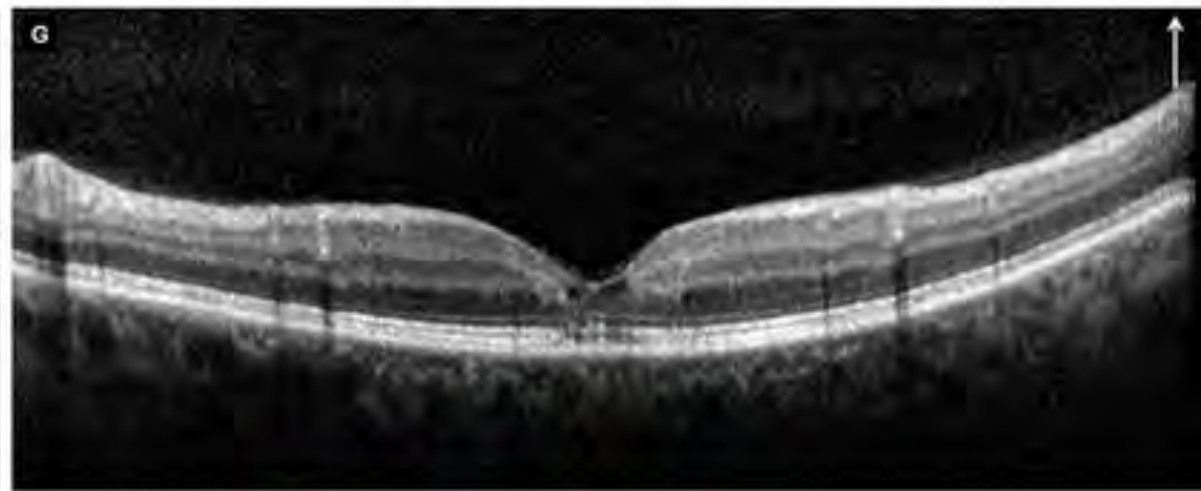
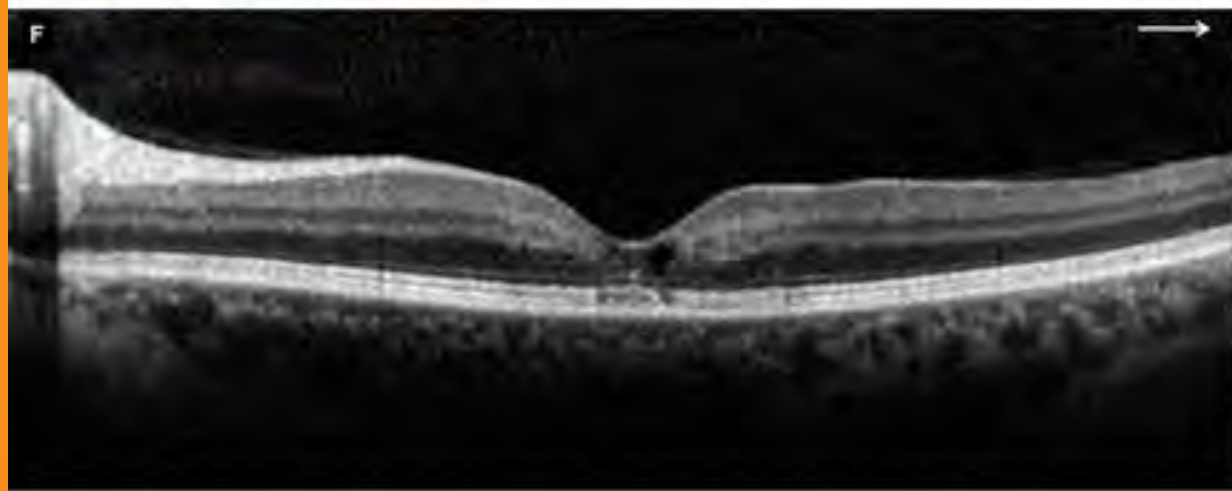
# Case #8

63 yo male

Referred for evaluation of macular pigment mottling changes – left eye

BCVA – 6/9 both eyes

Not known DM / AMD



# OCTA Mactel

Reduced vessel density and telangiectatic vessels seen in deep capillary plexus

Earlier than superficial vascular complex

New vessels can be seen in outer retinal layers and choroid vascular network

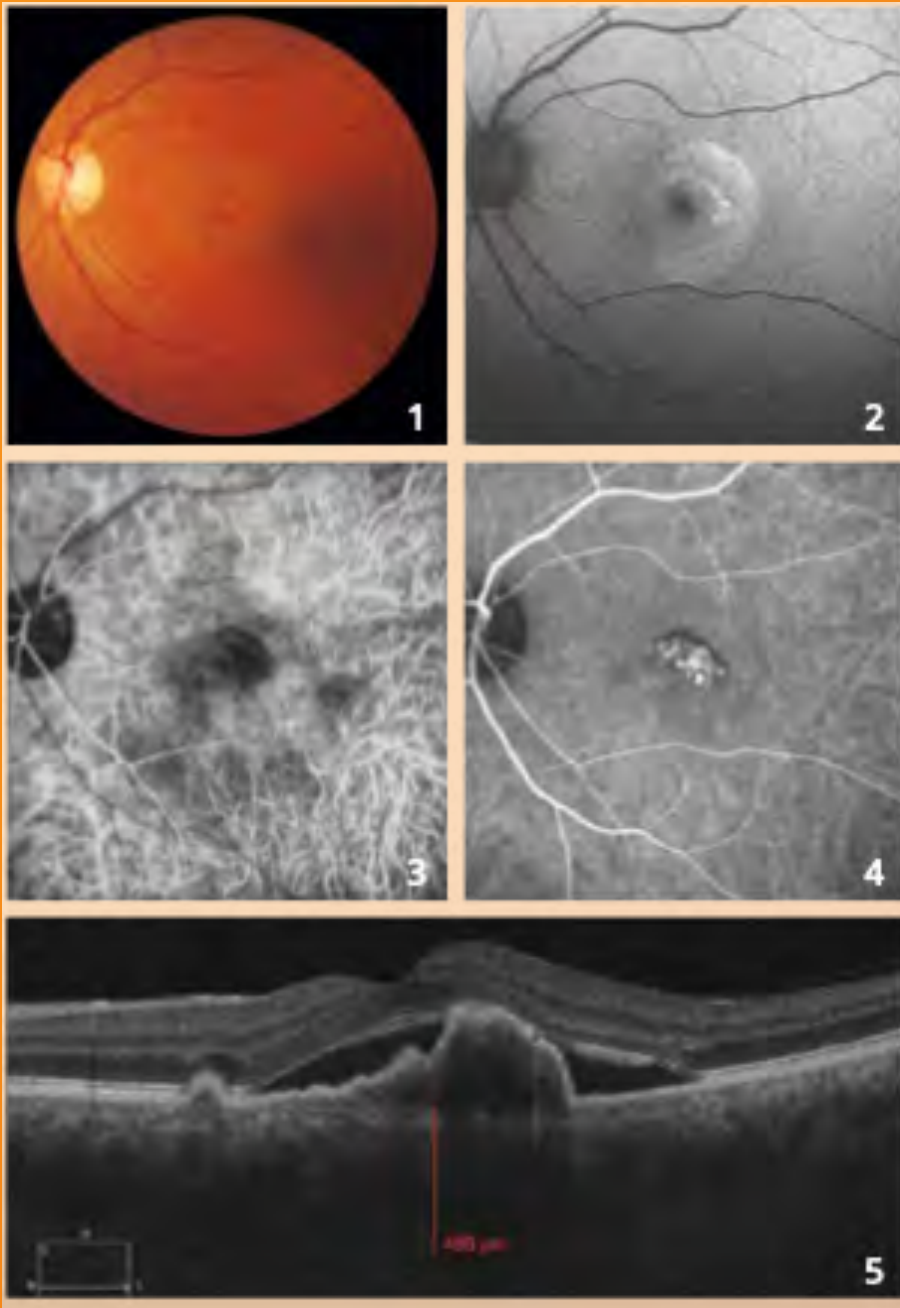
# Case #9

63 yo Asian lady

Referred for evaluation of fluid in macula - left eye

Vision: 6/18

No drusen in either eye

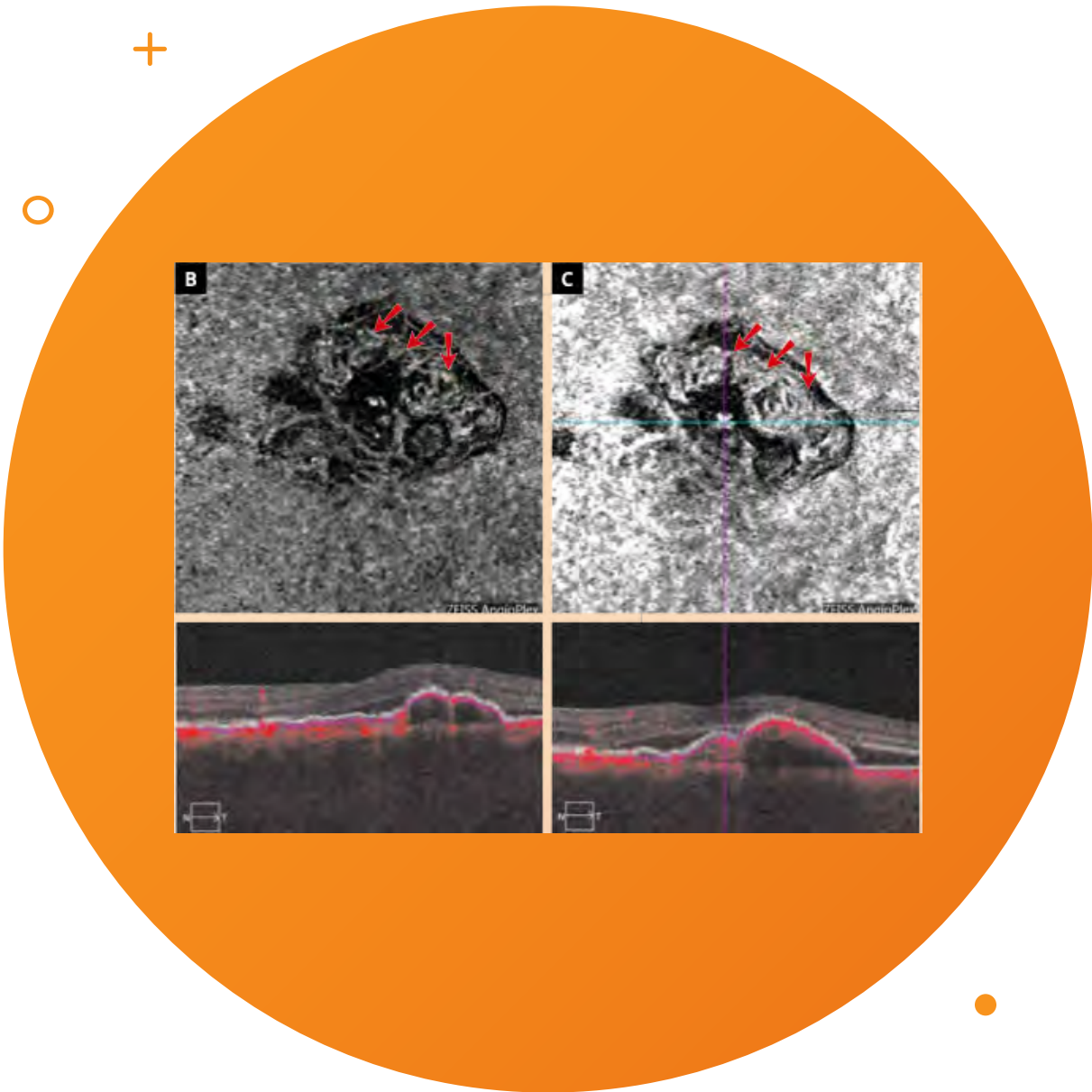


# Case #9

Colour shows fluid in left macula

ICG shows hot spot in choroid

OCT shows irregular, conical, bilobed PED with thick choroid with SRF



# Case #9

OCTA shows branching vascular network in the choriocapillaris and choroid

Usually seen at the edge of the PED

High flow signal seen

Diagnosis: Choroidal Polyp



# Case #10

34 yo male

C/o Blurred vision – left eye

Known high myope

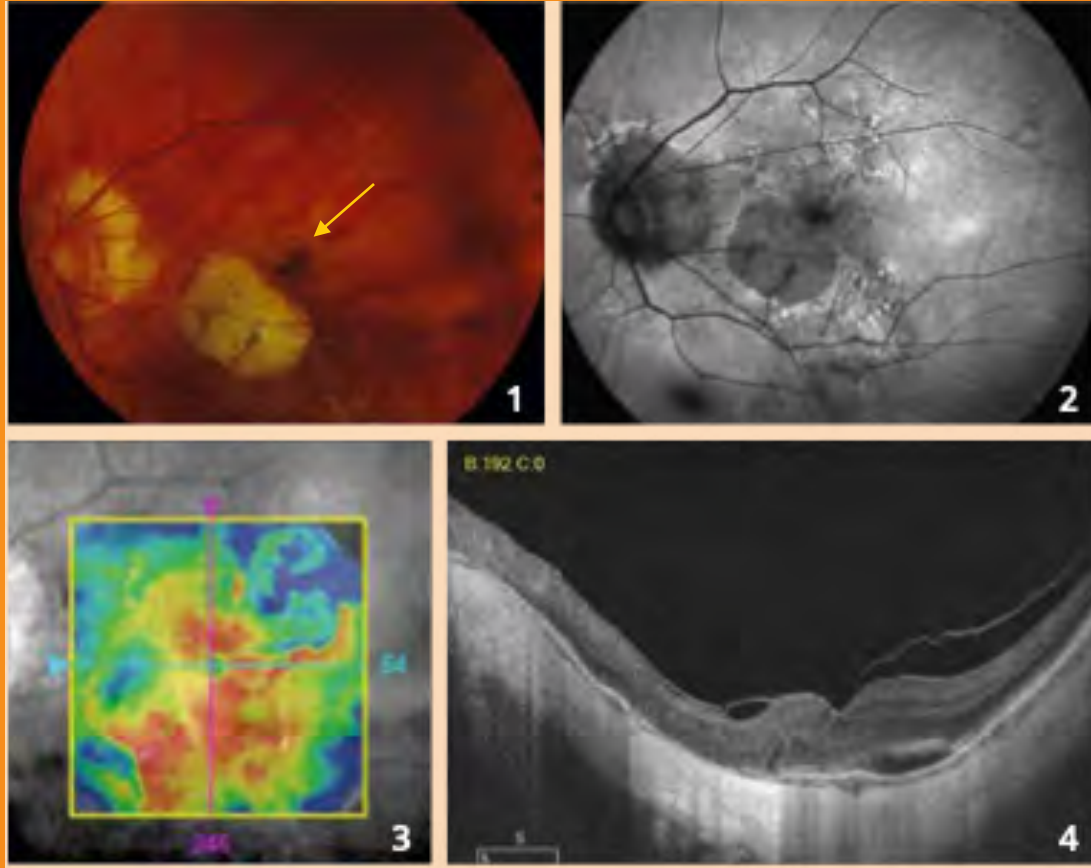
-16 D both eyes

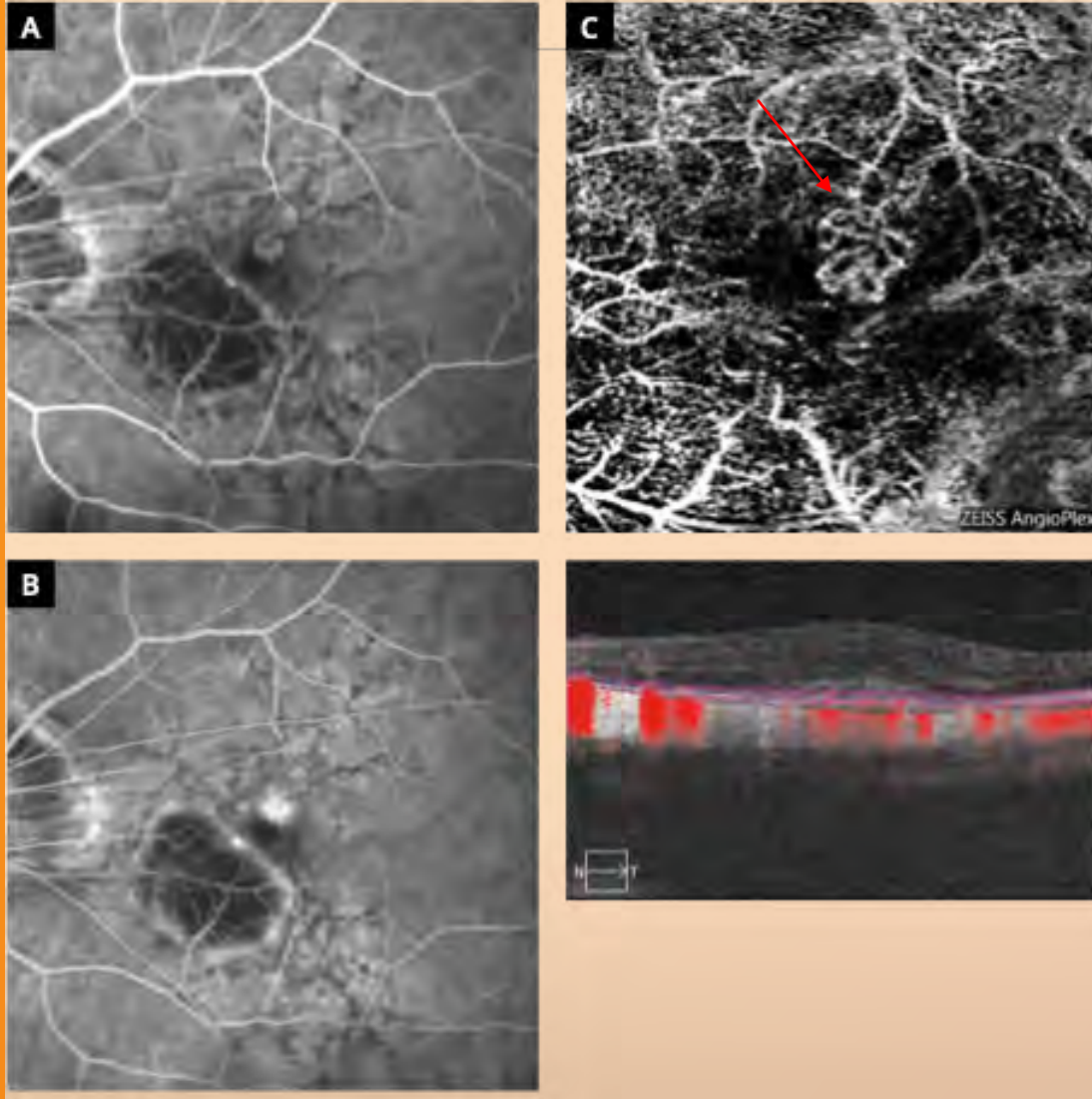
# Case #10

Colour shows highly myopic fundus with parafoveal circular dark haemorrhage

FAF shows atrophy with hypofluorescence

OCT shows thickening of the retina with sub-retinal fluid and hyper-reflective lesion





# Case #10

Angiogram shows classic choroidal neovascular membrane

OCTA shows high flow signal with choroidal neovascular membrane

Diagnosis consistent with Myopic CNV

Treated with a single injection of Lucentis®

# Limitations

Restricted field of view –  $3\text{mm}^2$  to  $12\text{mm}^2$

Media opacities causes signal attenuation and shadowing artefacts

Inability to show leakage

Very low blood flow is undetectable if below the device threshold

Extremely motion sensitive and requires patient co-operation – challenging to do in visually impaired

Errors in automated segmentation like PED / ERM

# Take Home Message

Never rely on any single imaging modality

Use multi-modal imaging

Always examine periphery as field of view restricted in OCT technology

Nothing beats a thorough clinical examination



**THANK YOU**