DIABETIC WIDE FIELD IMAGING

- James Talks
- Consultant Ophthalmologist
- Newcastle Upon Tyne Hospitals NHS Foundation Trust

WHAT IS THE GOLD STANDARD?

Eye (2015) 29, 416–423

www.nature.com/eye

OPEN

CLINICAL STUDY

Wide-field imaging and OCT *vs* clinical evaluation of patients referred from diabetic retinopathy screening

V Manjunath[1], V Papastavrou[1], DHW Steel[2], G Menon[3], R Taylor[4], T Peto[5] and J Talks[1]

[1]Newcastle Eye Centre, Royal Victoria Infirmary, Newcastle upon Tyne, UK

[2]Sunderland Eye Infirmary, Sunderland and Institute of Genetic Medicine, Newcastle Upon Tyne, UK

[3]Frimley Park Hospital, Frimley Park, UK

[4]Newcastle University, Newcastle upon Tyne, UK

[5]NIHR Biomedical Research Centre at Moorfields Eye Hospital NHS Foundation Trust and UCL Institute of Ophthalmology, London, UK

Correspondence:
V Manjunath, Newcastle Eye Centre, Royal Victoria Infirmary, Claremont Wing, Queen Victoria Road, Newcastle upon Tyne, Tyne and Wear NE1 4LP, UK
Tel: +44 (0)191 233 6161; Fax: +44 (0)191 282 6269.
E-mail: vinamanju@doctors.org.uk

Received: 26 August 2014
Accepted in revised form: 30 November 2014
Published online: 16 January 2015

Abstract

Purpose **Compare wide-field Optomap imaging and optical coherence tomography (OCT) with clinical examination in diabetic retinopathy (DR).**

Methods **Patients referred from Diabetic Eye Screening Programmes to three centres underwent dilated ophthalmoscopy and were assigned a DR grade. Wide-field colour imaging and OCT were then examined by the same clinician at that visit and a combined grade was assigned. Independent graders later reviewed the images and assigned an imaging-only grade. These three grades (clinical, combined, and imaging) were compared. The method that detected the highest grade of retinopathy, including neovascularisation, was determined.**

Results **Two thousand and forty eyes of 1023 patients were assessed. Wide-field imaging compared with clinical examination had a sensitivity and specificity of 73% and 96%, respectively, for detecting proliferative DR, 84% and 69% for sight-threatening DR, and 64% and 90% for diabetic macular oedema. Imaging alone found 35 more eyes with new vessels (19% of eyes with new vessels) and the combined grade found 14 more eyes than clinical examination alone.**

Conclusions **Assessment of wide-field images and OCT alone detected more eyes with higher grades of DR compared with clinical examination alone or when combined with imaging in a clinical setting. The sensitivity was not higher as the techniques were not the same, with imaging alone being more sensitive. Wide-field imaging with OCT could be used to assess referrals from DR screening to determine management, to enhance the quality of assessment in clinics, and to follow-up patients whose DR is above the screening referral threshold but does not actually require treatment.**

Eye (2015) **29,** 416–423; doi:10.1038/eye.2014.320; published online 16 January 2015

Introduction

Photographic screening in patients with diabetes has reduced the incidence of blindness in England.[1,2] The rising prevalence of diabetes and increased options for the treatment of diabetic retinopathy (DR) is causing significant problems with providing capacity for managing patients referred from diabetic eye screening.[3,4] The quality of clinical assessment after entering the hospital system may also be variable and is difficult to audit. Screening for DR moved from clinical assessment to photography, so could the hospital service do the same?

The prevalence of referable grade DR in the screened population is between 6 and 20%,[5–7] although only about 10% of referred patients are treated. Treatment options have changed to include intravitreal injections, which require more frequent visits and monitoring than that required for laser. The total number of people with diabetes globally is projected to rise from 171 million in 2000 to 366 million in 2030.[8] In 2011–2012, 2.59 million people in England aged 12 years and over were identified with diabetes, and 2.36 million were offered screening, of whom 1.91 million received screening (http://diabeticeye.screening.nhs.uk/statistics (last accessed 30 May 2014)). This calls for

- Comparing doctor, doctor plus images in a clinic, to reading the images alone, more pathology was found by examining the images alone.

PATHWAY FROM SCREENING

- Virtual clinic: R2; M1

- VA
- Undilated
- Optos, one image
- OCT macular

New vessels detected on wide-field imaging compared to two-field and seven-field imaging: implications for diabetic retinopathy screening image analysis

Stephen James Talks,[1] Vina Manjunath,[1] David H W Steel,[2] Tunde Peto,[3] Roy Taylor[4]

[1]Newcastle Eye Centre, Royal Victoria Infirmary, Newcastle upon Tyne, UK
[2]Sunderland Eye Infirmary, Sunderland and Institute of Genetic Medicine, Newcastle upon Tyne, UK
[3]NIHR Biomedical Research Centre at Moorfields Eye Hospital NHS Foundation Trust and UCL Institute of Ophthalmology, London, UK
[4]Magnetic renounce centre, Campus for ageing and vitality, Newcastle University, Newcastle upon Tyne, UK

Correspondence to
Stephen James Talks, Newcastle Eye Centre, Royal Victoria Infirmary, Queen Victoria Road, Newcastle upon Tyne NE1 4LP, UK; james.talks@nuth.nhs.uk

Received 1 February 2015
Revised 23 March 2015
Accepted 21 May 2015
Published Online First 13 August 2015

To cite: Talks SJ, Manjunath V, Steel DHW, *et al*. *Br J Ophthalmol* 2015;**99**:1606–1609.

ABSTRACT

Introduction Wide-field retinal imaging (Optomap), used for detecting diabetic retinopathy (DR), has been shown to compare well with seven-field early treatment diabetic retinopathy study (ETDRS) photographs. An Optomap 200° image covers 80% of the retinal surface, compared with the standard seven-field, 30° images, covering 30% of the retinal surface. In England, DR screening is performed by grading two, 45° images per eye, by the DR screening service (DRSS).

Purpose To assess how often retinal new vessels (NVs) are observed on Optomap imaging, outside the DRSS two fields and standard seven-field photography, in a cohort of patients referred by the DRSS.

Method A consecutive series of treatment naïve patients with DR, referred from DRSS with pre-proliferative or proliferative DR or diabetic maculopathy, were imaged with Optomap colour images, within 3 months of DRSS referral. The incidence and distribution of NVs were recorded in relation to two-field and seven-field areas.

Results NVs were found in 102 of 1562 treatment naïve eyes (6.5%) of 781 patients. Of these, 72 were referred from DRSS as having NVs, but an additional 30 eyes (29% of NVs detected) from 25 patients were referred with a lesser degree of DR. In 25 of the 30 eyes without NVs reported on referral, NVs were located outside the standard two fields taken at DRSS, and in 12, NVs were outside the area covered on seven-field imaging (11.7% of eyes with NVs).

Conclusions Wide-field imaging with Optomap detected approximately 30% more NVs than standard two-field imaging in patients referred from a UK DRSS.

INTRODUCTION

Wide-field retinal imaging (Optomap), used for detecting diabetic retinopathy (DR), has been shown to compare well with seven-field early treatment diabetic retinopathy study (ETDRS) photographs.[1–3] As it provides a wider field of view, it would not be surprising that more DR is seen; however, it is thought that most potentially sight-threatening pathology occurs between the posterior pole and retinal mid-periphery. Silva *et al*[4] reported that 10% of a cohort of 206 eyes were given a higher DR grade on Optomap images compared to seven-field images, predominantly due to the finding of more haemorrhages per quadrant. In his study, the patients were chosen from a tertiary eye clinic to represent a range of DR severity, and so, incidence rates of previously not recorded findings in a population referred from the community could not be assessed. Grading is based on the ETDRS studies that related retinal findings to the likelihood of progression of the retinopathy and is based on seven-field colour imaging. It is still unknown how often more severe DR changes are found outside the standard seven-field, in particular new vessel (NV) formation. In the English DR screening service (DRSS) two images with nominal 45° fields are taken per eye, one centred on the fovea and the other on the disc. This is said to have a sensitivity of 80.2% and specificity of 92.9% for detecting referable DR compared to slit lamp biomicroscopy.[5] In this study, we aimed to assess how often NVs were seen with wide-field Optomap imaging when compared to the areas covered by DRSS's two-field and standard seven-field photography, in a cohort of patients referred from a DRSS.

METHOD

A consecutive series of treatment naïve patients, referred from two DRSS in England, were imaged with Optomap colour images, within 3 months of referral. Referral from DRSS occurs if 'referable' DR is detected on analysis of two standard 45° photographs. At DRSS images are graded for the level of DR, and diabetic maculopathy (DMac): no DR is denoted as R0; mild DR as R1; pre-proliferative DR as R2; proliferative DR as R3. Potentially clinically significant DMac is represented by the M1 grade. R2, R3 and M1 are then subsequently referred to hospital eye services.

At the hospital eye clinic, certified medical photographers took three wide-field Optomap images per eye after mydriasis, using the Optomap P2000 scanning laser ophthalmoscope; straight-ahead and up and down, with eye steering, which involves the patient following a fixation target (figure 1).

The images were then graded by an independent reading centre and the number of eyes with NVs, R3, recorded. The R3 images were then further assessed to map the distribution of NVs in relation to two-field and seven-field standard images using a standard field map (figure 2). If there was more than one area of NVs and any were located inside either the two-field or seven-field areas, then they were counted as being detected by that method. In a few cases, where the distinction between haemorrhage, intra-retinal microvascular abnormalities (IRMA) and small NVs was uncertain, a fundus fluorescein angiogram (FFA) was performed, at the examiners discretion, on a second visit.

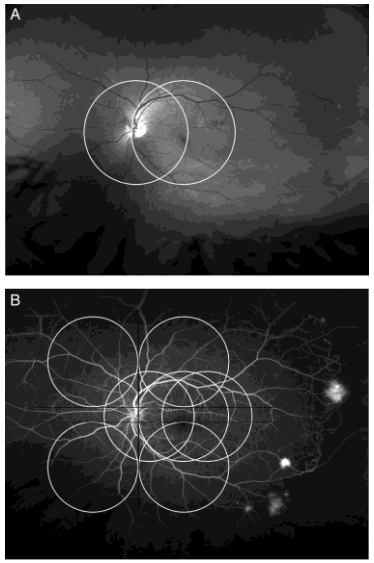


Figure 2 Red free Optomap and fundus fluorescein angiogram of the left eye of a diabetic referred due to maculopathy, (R1, M1 right; R1, M1 left), showing new vessels outside standard two-field (A); and seven-field (B) in the left eye.

patient and on the photographer to use this protocol in everyday clinical practice. In the Eurodiab paper justifying the use of 45° imaging criteria only 48 eyes were compared.[6] The findings supported the use of two-field imaging as a practical method, with the agreement for correct DR between several examiners, ranging between 28 and 43 of the 48 eyes, mean of 37 eyes. The kappa for interobserver and intraobserver comparisons was good at 0.83 and 0.85, respectively. Two-field imaging, where approximately 80% of patients are imaged yearly, using this protocol meets the appropriate sensitivity and specificity required for a screening programme and was therefore rolled out with scale, as shown by the England DRSS.[7]

In one study, seven-field ETDRS stereo images were ungradable by strict grading criteria in 31.6% and in 15.3% with a more lenient approach.[5] The same paper reported good agreement for detecting the difference between referable and non-referable retinopathy between slit lamp biomicroscopy, 2×45° field and 7×30° field photography. However, there was only agreement on finding proliferative DR in 51/88 (58%) patients when comparing seven-field ETDRS stereo images with slit lamp examination. It is not clear how many had already had laser which may have lead to confusion on definitions between active or inactive NVs. In two cases, the clinician found NVs outside seven-field. For the comparison of two-field to seven-field only correlations between detecting referable from non-referable DR were presented.

Our study shows that on two-field DRSS imaging there is only a small risk of missing NVs, 30/1562 (1.9%), but these represented 29% of the total number of eyes graded as having NVs. The NVs were found outside even the seven-field area in 11.7%. This is a higher rate than previously reported. In a study of 206 eyes of 103 patients, 10% were given a more severe DR grade with wide-field imaging, using one image per eye.[4] In relation to our findings, 46 had NVs, but only two of these were found outside the seven-field area (4% of NVs). Our study population was much larger and represents a consecutive series referred from DRSS, rather than a group from a highly specialised clinic.

A study using wide-field FFA on 118 patients found a total of 22 eyes (10%) had pathology visible only outside a simulated seven-field boundary. Of those eyes, 13 had peripheral retinal non-perfusion (8%) and 9 of 54 cases (17% of NVs) had peripheral NV outside seven-field. While using a different technique for identification of cases with NVs, this study draws a similar conclusion to ours on the relative proportion of NVs found outside seven-field.[8] In the cases where we did use FFA some changes were made in the grading and eight additional cases of NVs were found.

One factor that may have led us to detect this rate of NVs was the use of three images per eye, using eye steering, as less pathology is likely to be missed due to defocus or masking from eyelashes.[9] The Optos camera can take a 200° image, but the resolution is best in a central band between the two arcades. The focus for the top and bottom areas of the retina is better by taking the image with the patient looking up and down.

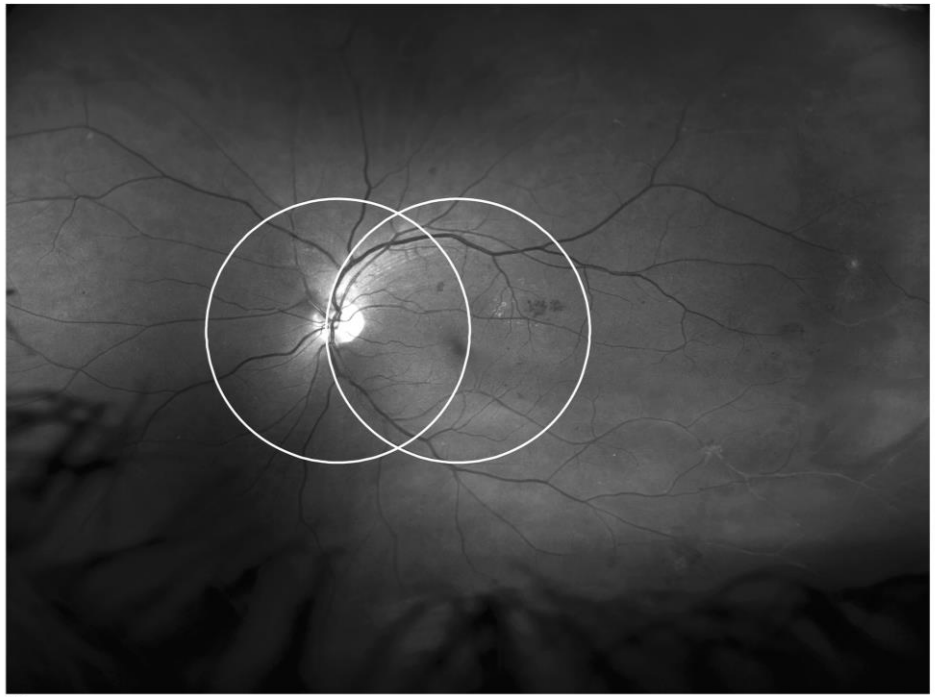
Looking at three images per eye takes extra time compared to one. Montage software is being developed to merge three pictures, which will help with analysis, but is not commercially available yet.

A study comparing wide-field photographs, taken with undilated and dilated pupils, found that this did not statistically change the agreement with seven-field imaging, but reduced the ungradable rate from 4.5% to 0%.[4] We had an ungradable rate of 1.4% using dilation and three images per eye.

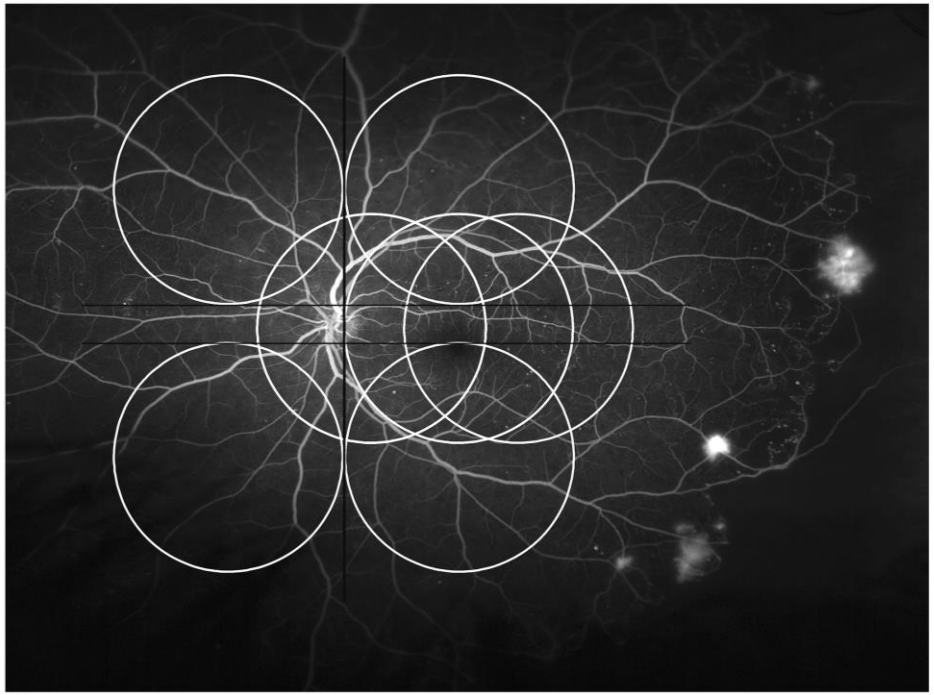
Our patients with NVs not detected on DRSS images were not 'missed' cases, as they were correctly referred for further medical assessment. All registered patients with diabetes are offered annual DRSS photography in England and this has led to fewer patients being referred from DRSS with severe NVs, and so, our incidence figures of more peripheral pathology may be higher than in unscreened populations. It is possible that if patients had small NVs outside the two-field images they would have been eventually referred as more posterior pathology developed.

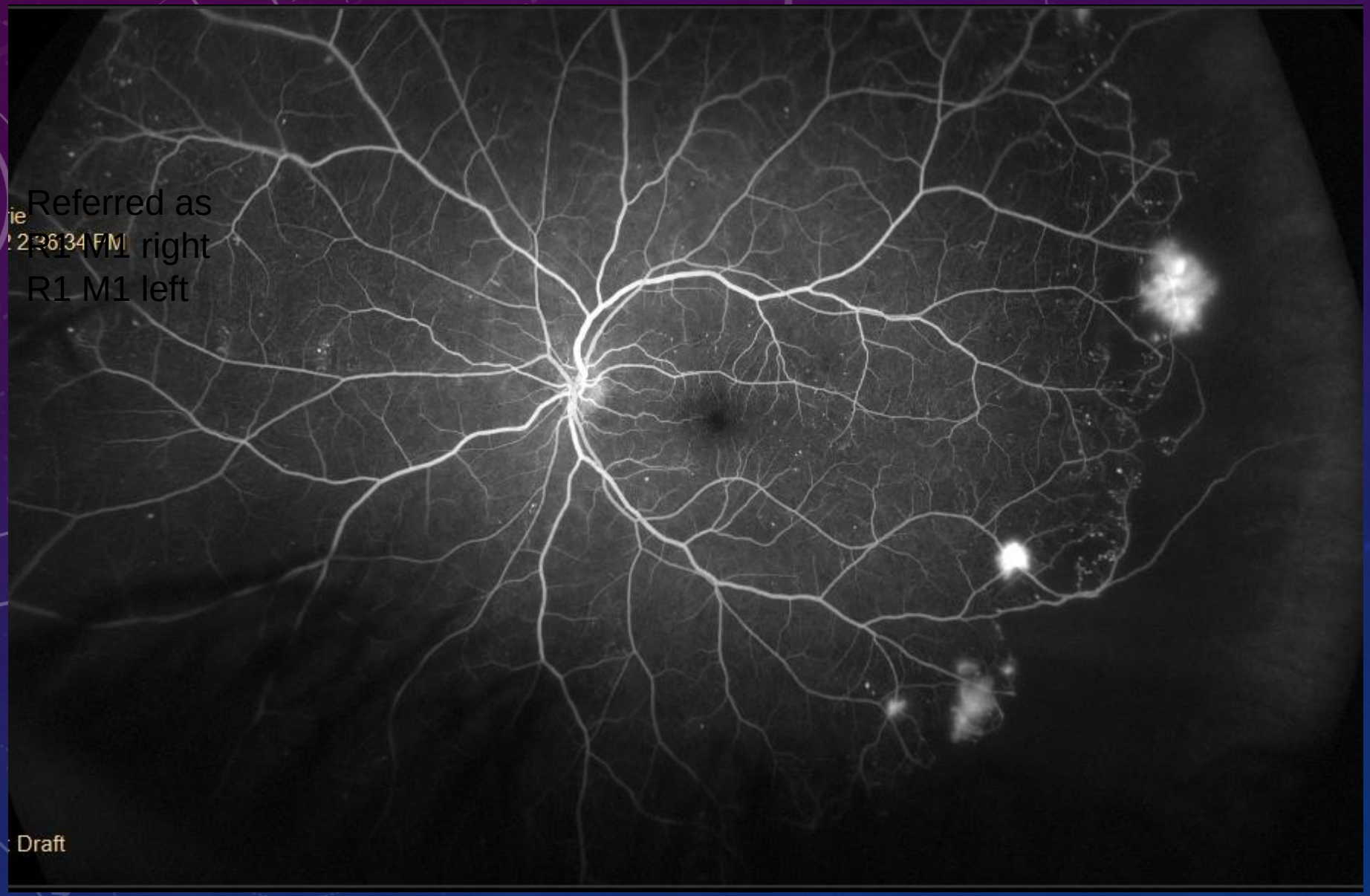
This study also does not clarify how much risk there is in missing peripheral NVs, as they were not detected as a result of a patient presenting with the complications of proliferative DR, rather as a result of imaging a cohort of patients. However, if NVs are missed on DRSS images, and the patient is referred because of Dmac, appropriate management depends on the clinician detecting these NVs, which may not occur in a busy streamlined macular service. We would therefore advocate the use of steered wide-field images in ophthalmology clinics, and in the future hope that automated software can be developed to allow for fast, reliable and valid identification of abnormal vessels.

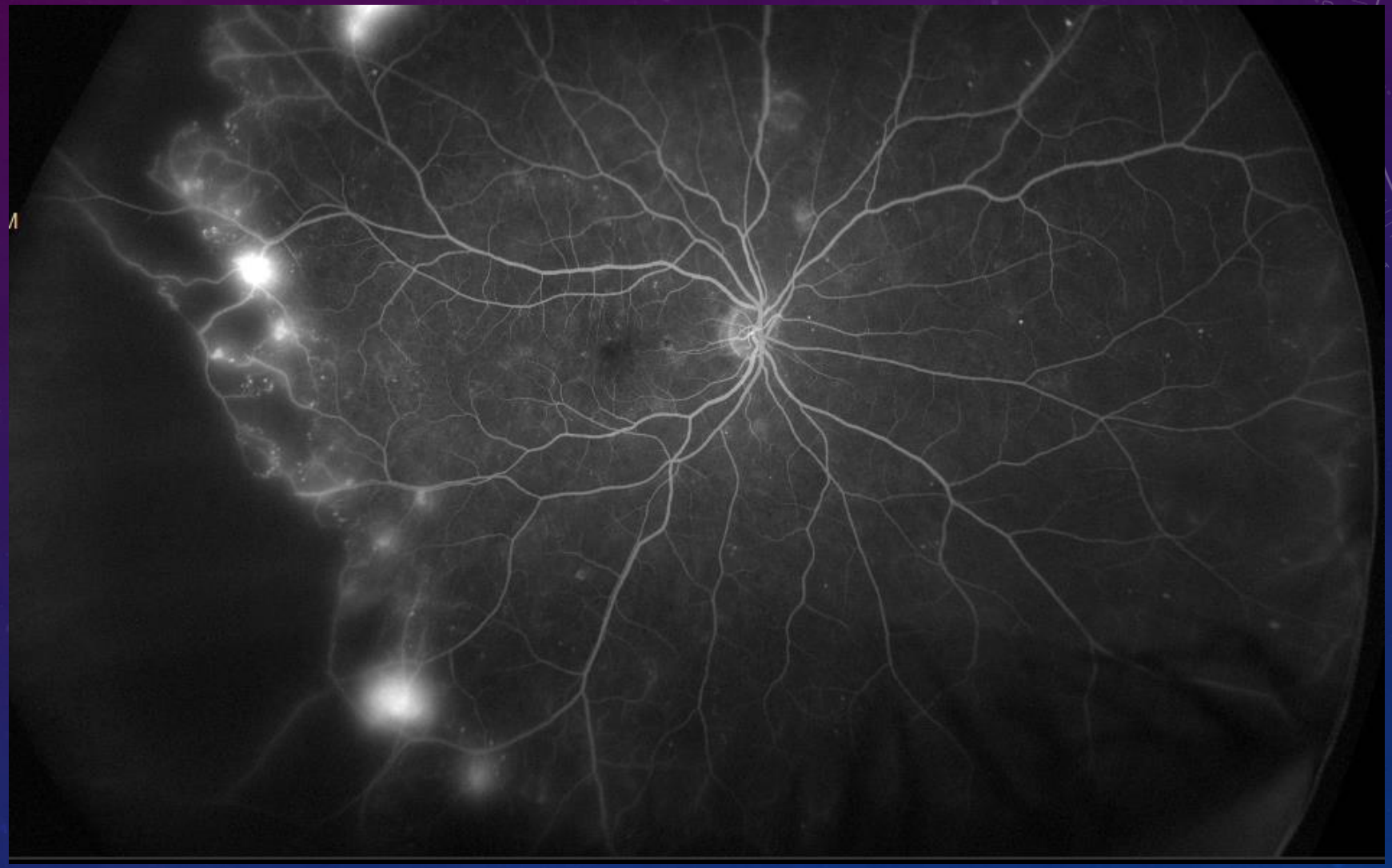
Acknowledgements This article presents independent research funded by the National Institute for Health Research (NIHR) under its Research for Patient Benefit (RfPB) Programme (Grant Reference Number PB-PG-0609-19117). The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health. We thank the photography departments at Royal Victoria Infirmary, Newcastle upon Tyne and Sunderland Eye Infirmary for their



2a



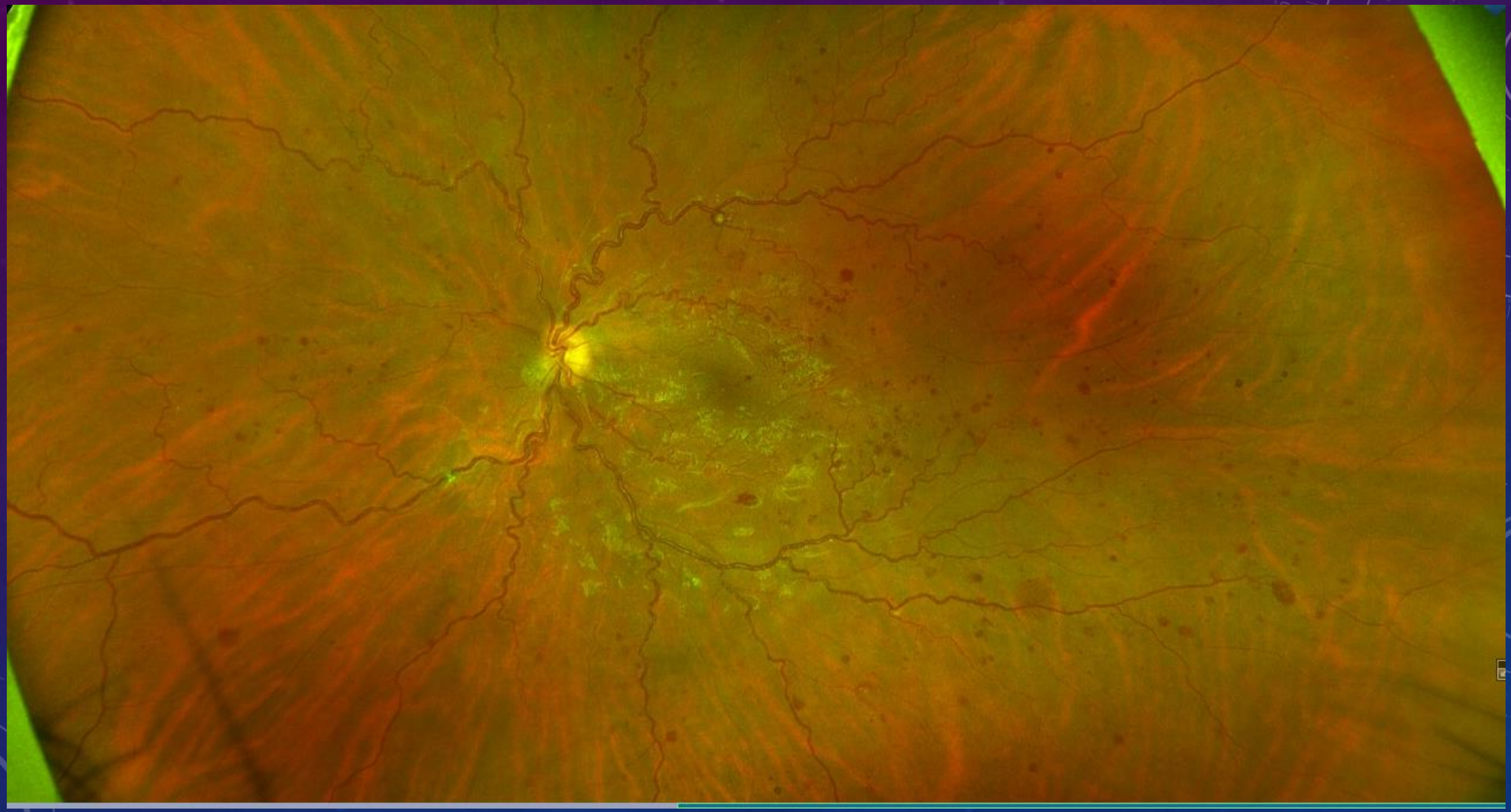

Referred as
R1 M1 right
R1 M1 left
Draft

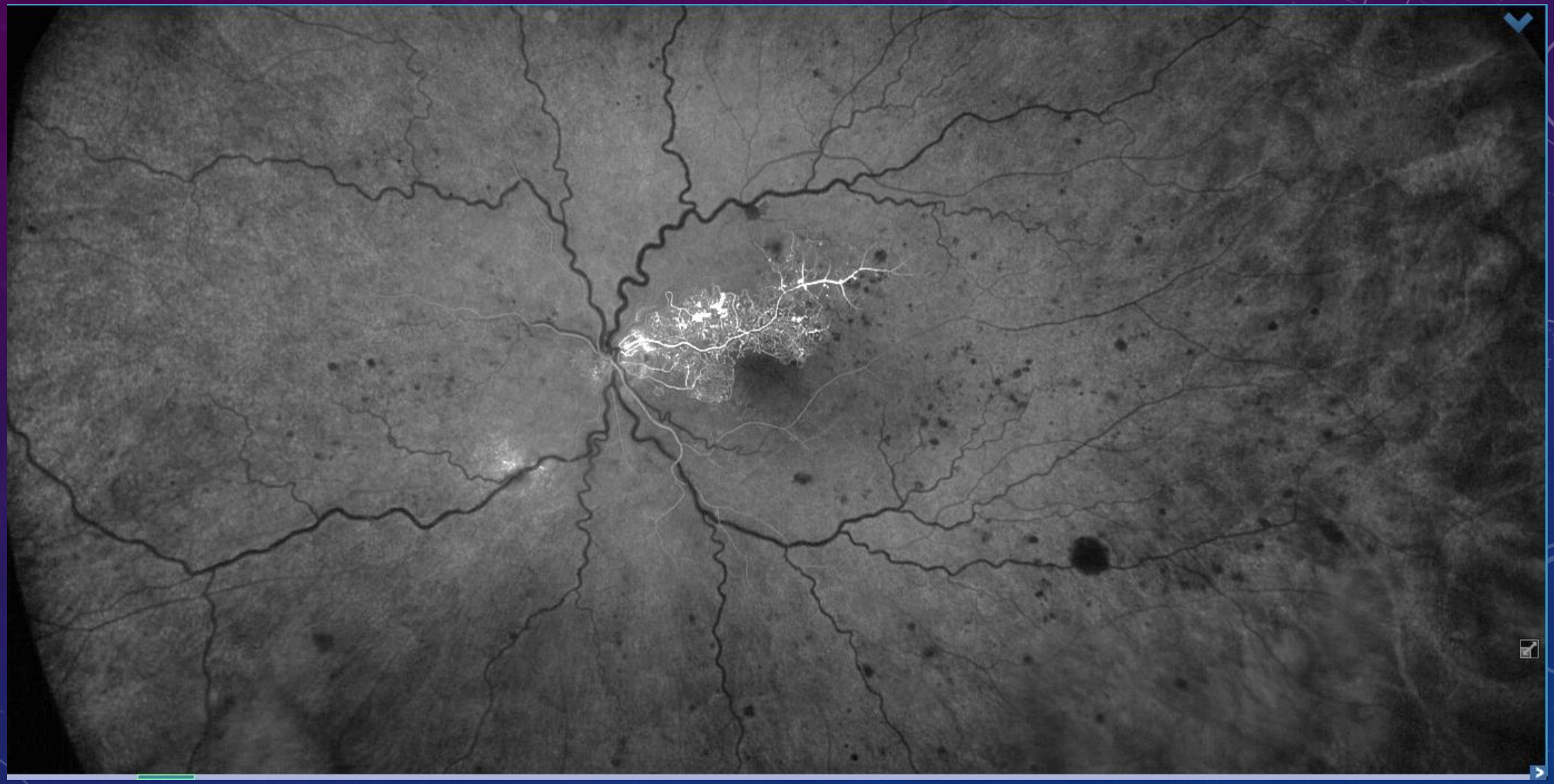


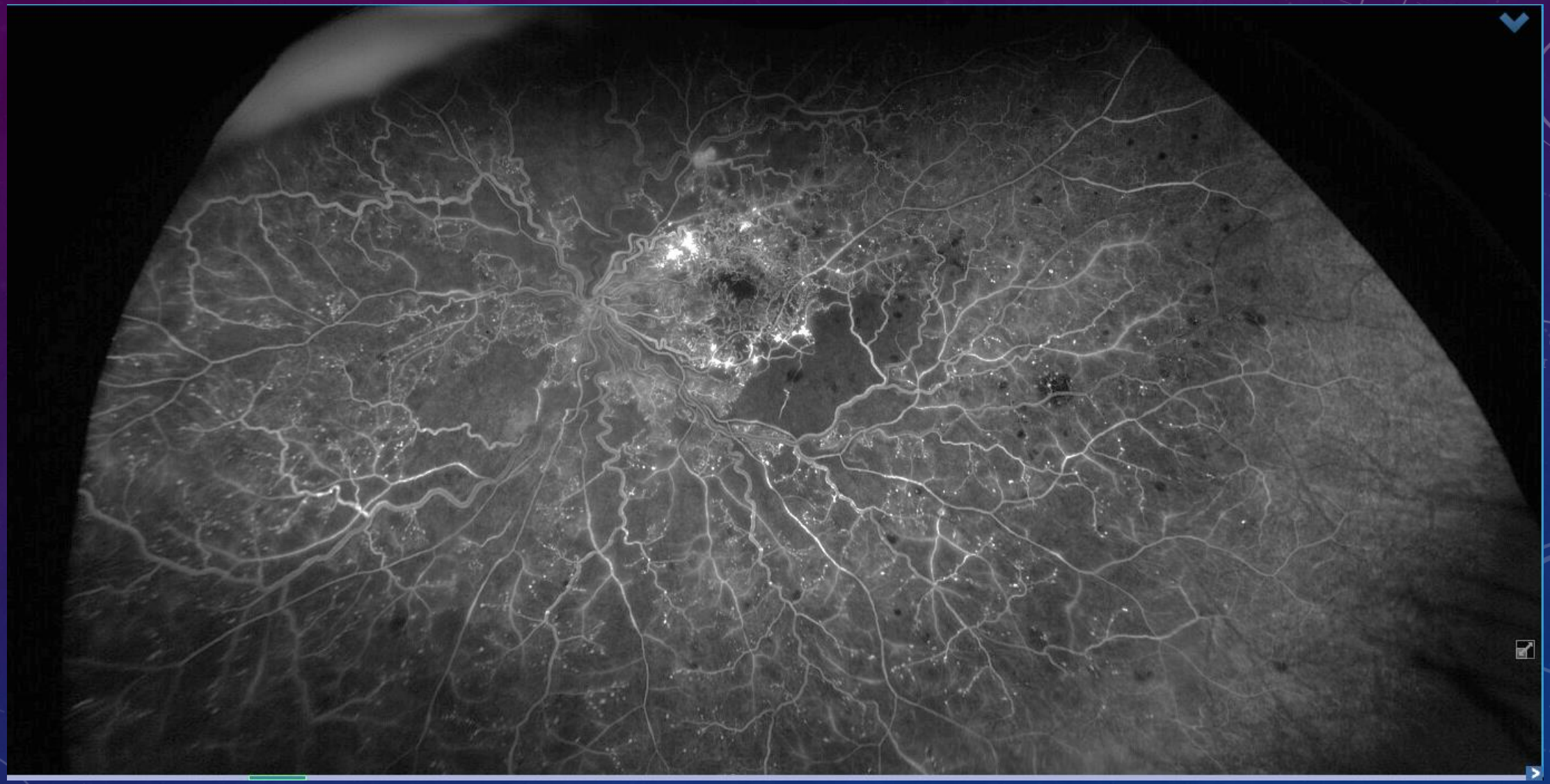
DISTRIBUTION OF NVS (FROM COLOUR OPTOS)

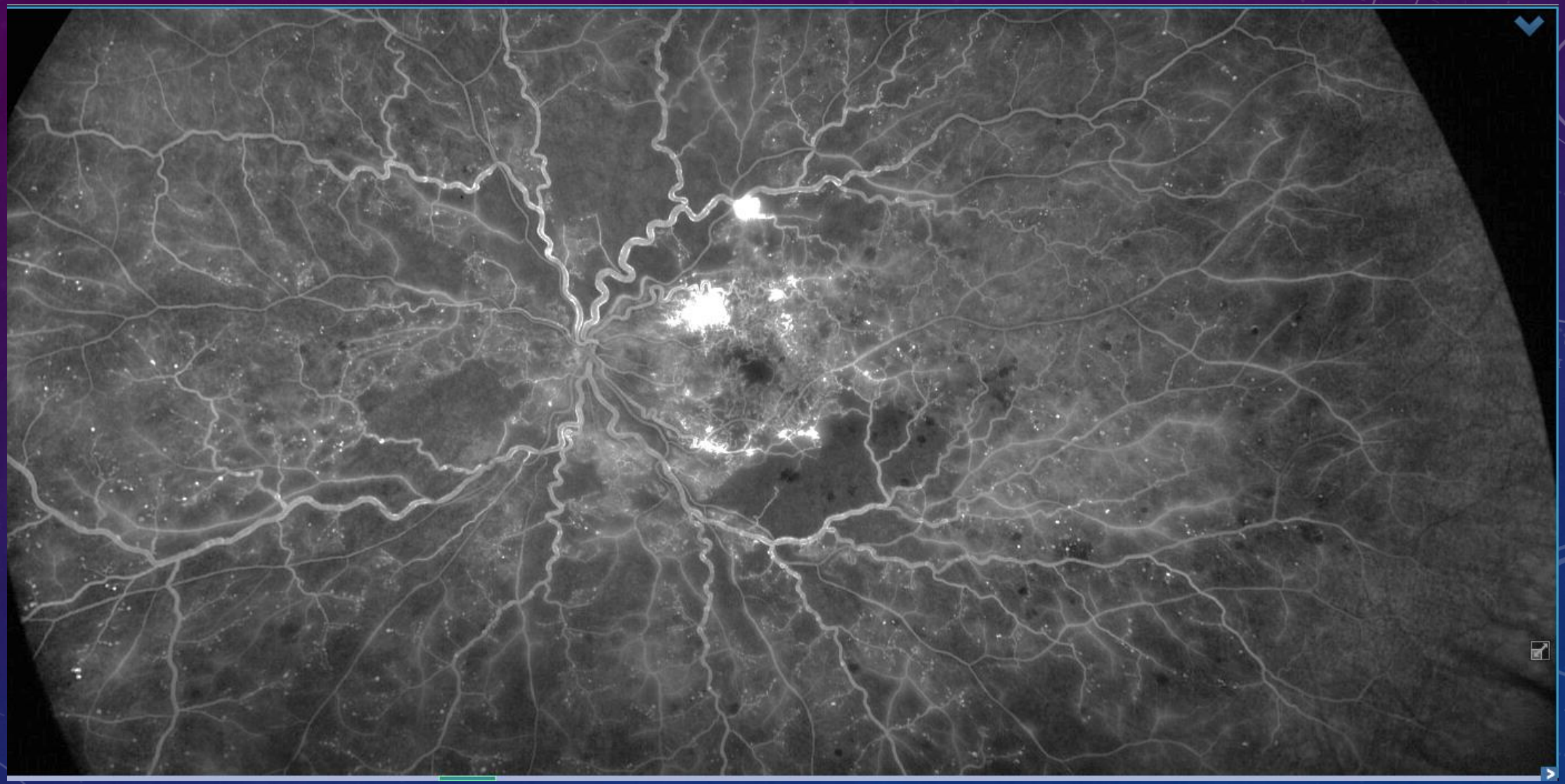
- New vessels (NVs) were found in 102 of 1562 treatment naïve eyes (6.5%) of 781 patients, with DRSS grades.
- 72 were referred from DRSS as having NVs.
- An additional 30 eyes (29% of NVs detected) from 25 patients were referred with a lesser degree of DR.
- In 25 of the 30 eyes without NVs reported on referral, NVs were located outside the standard 2 fields taken at DRSS, and in 12, NVs were outside the area covered on 7 field imaging (11.7% of eyes with NVs).
- (All were referred from diabetic screening)

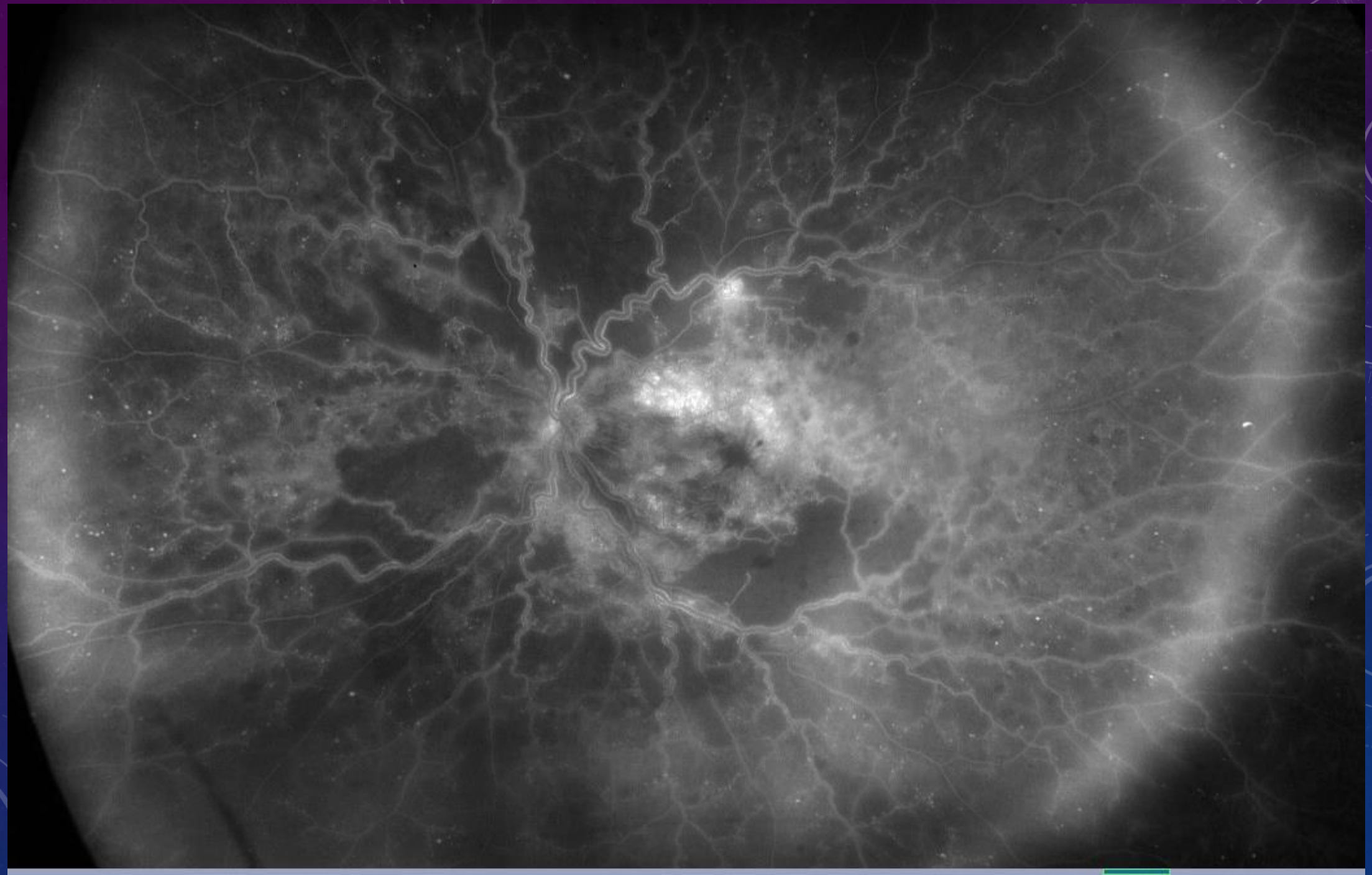
FFA USES IN DIABETICS: ASSESSING THE RETINAL CIRCULATION PERFUSION



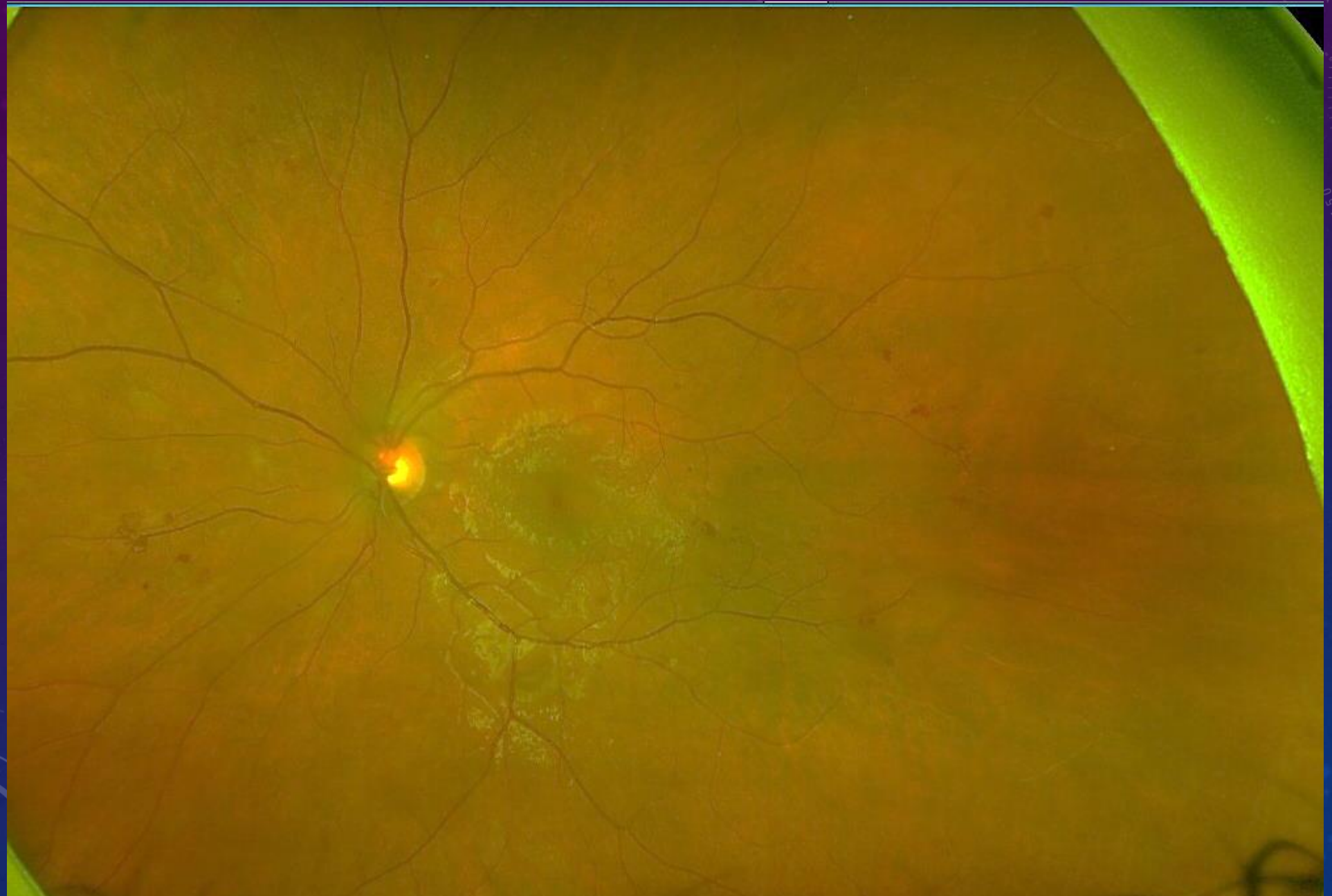


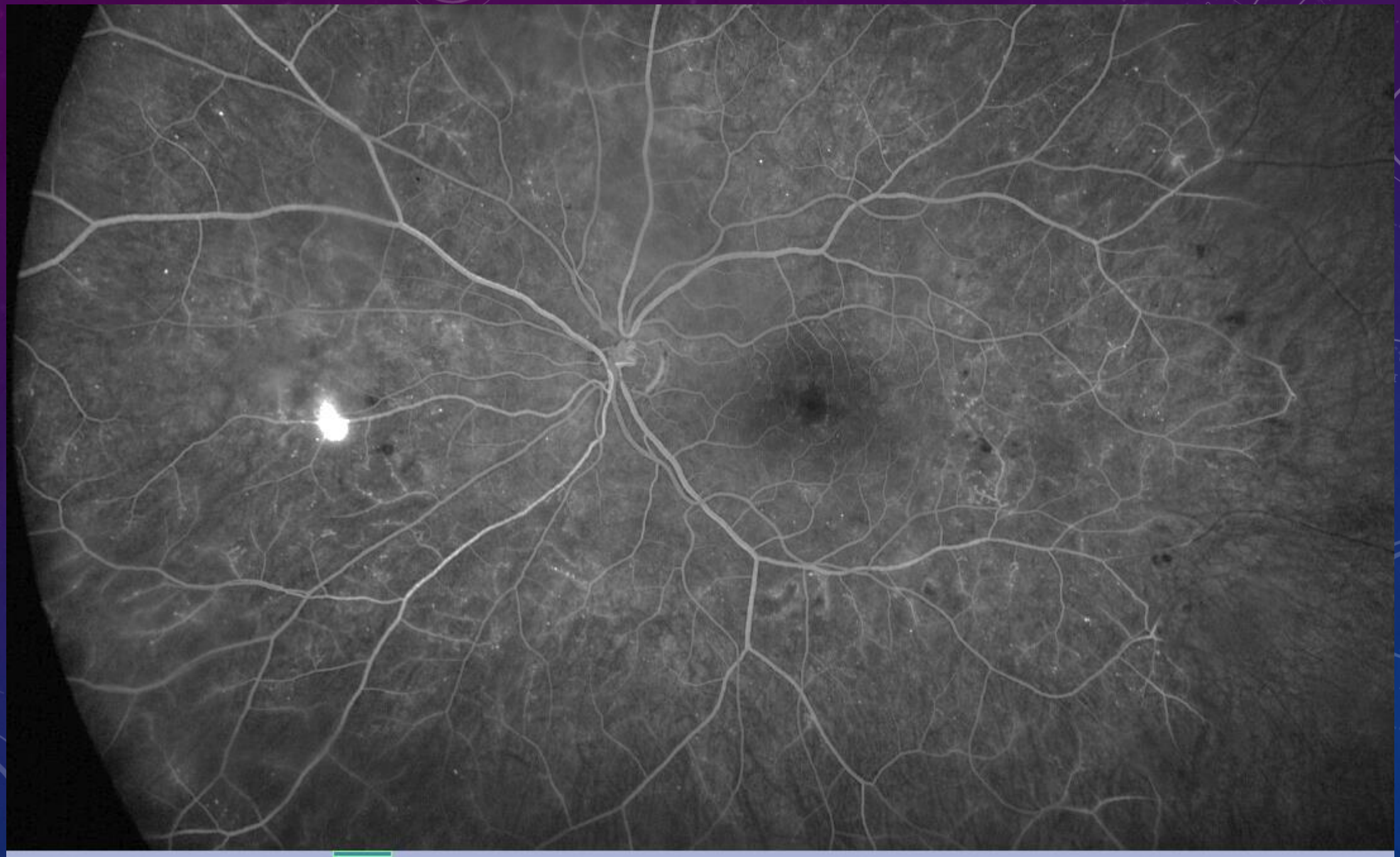


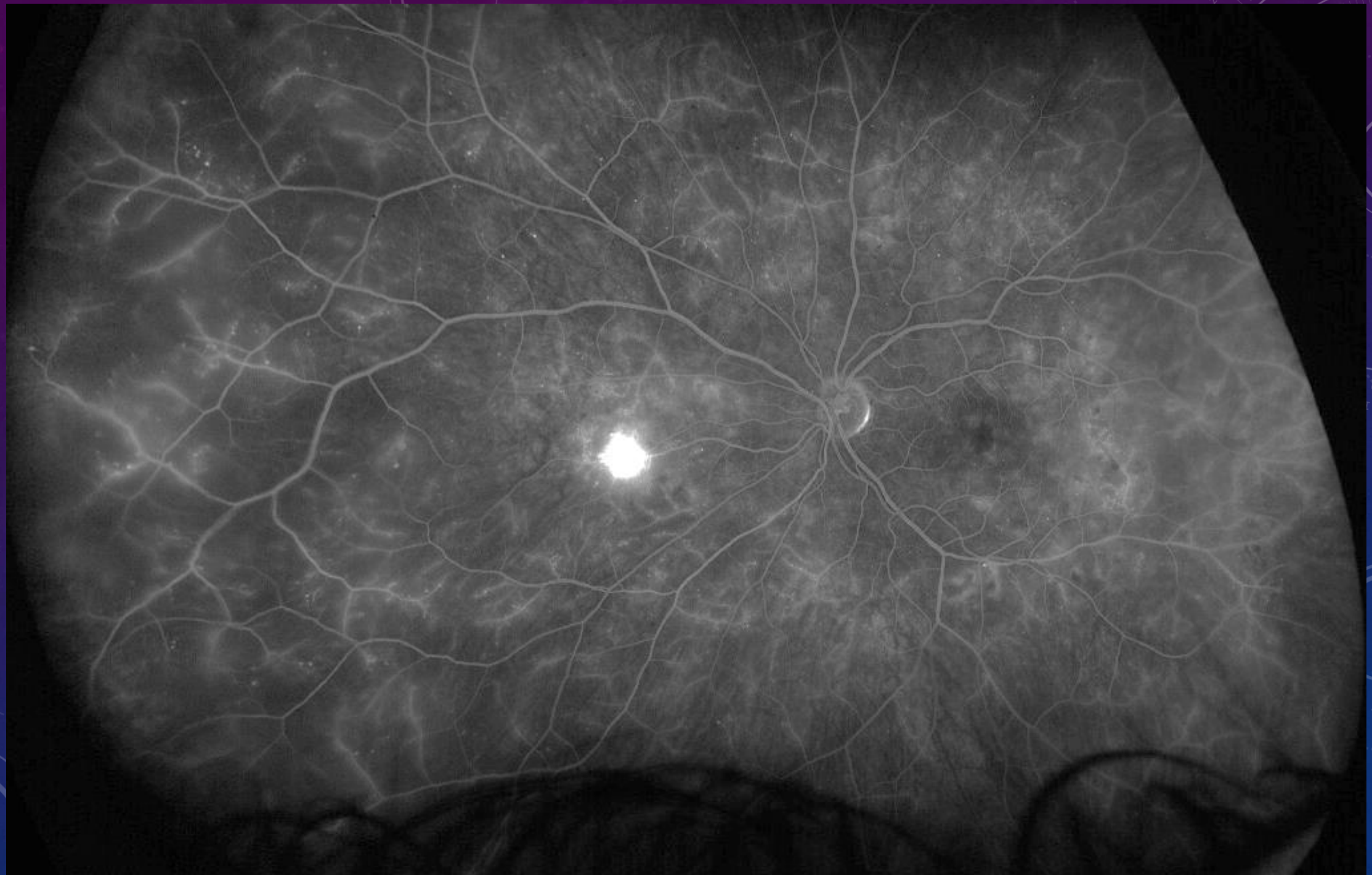


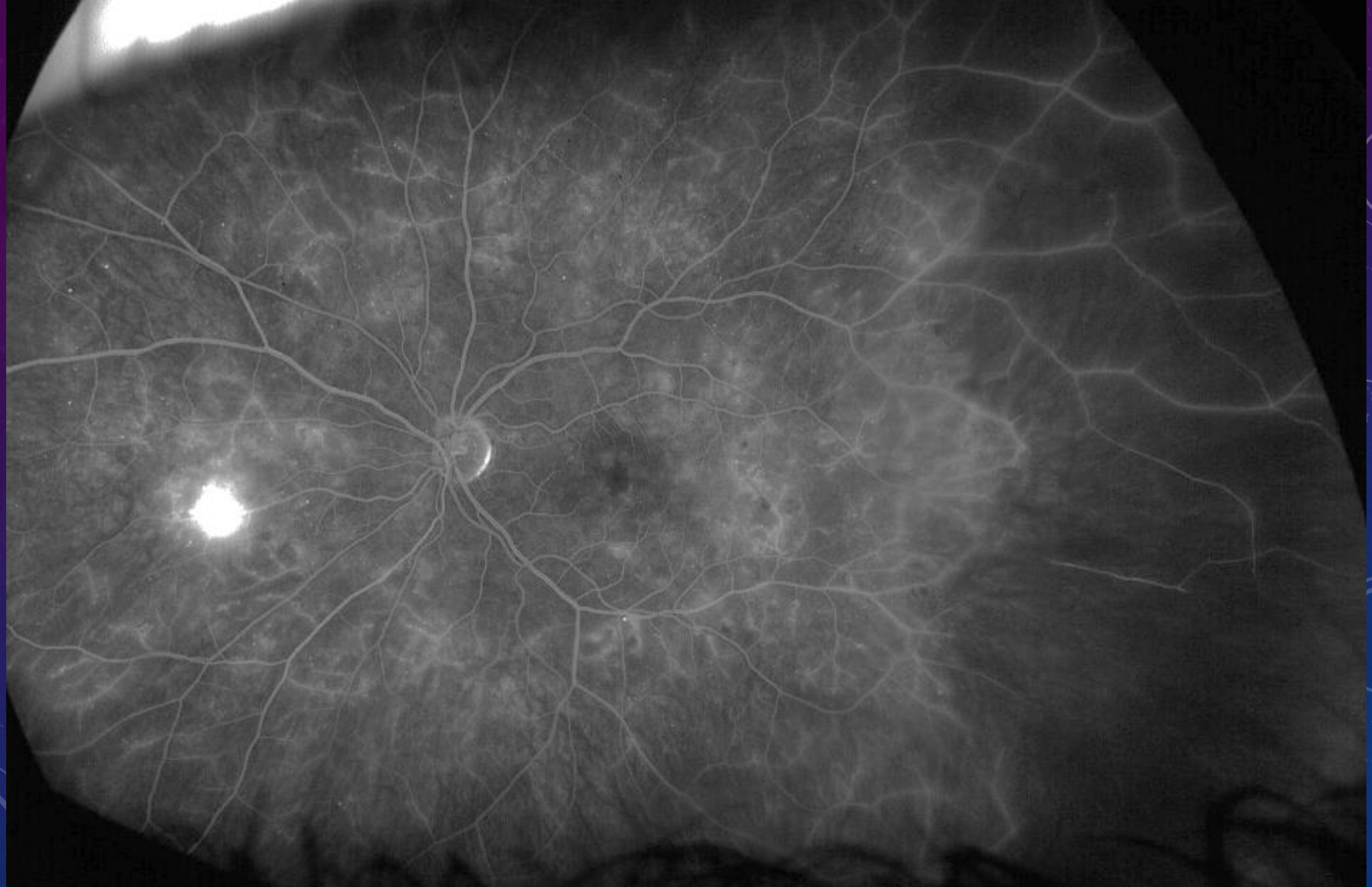


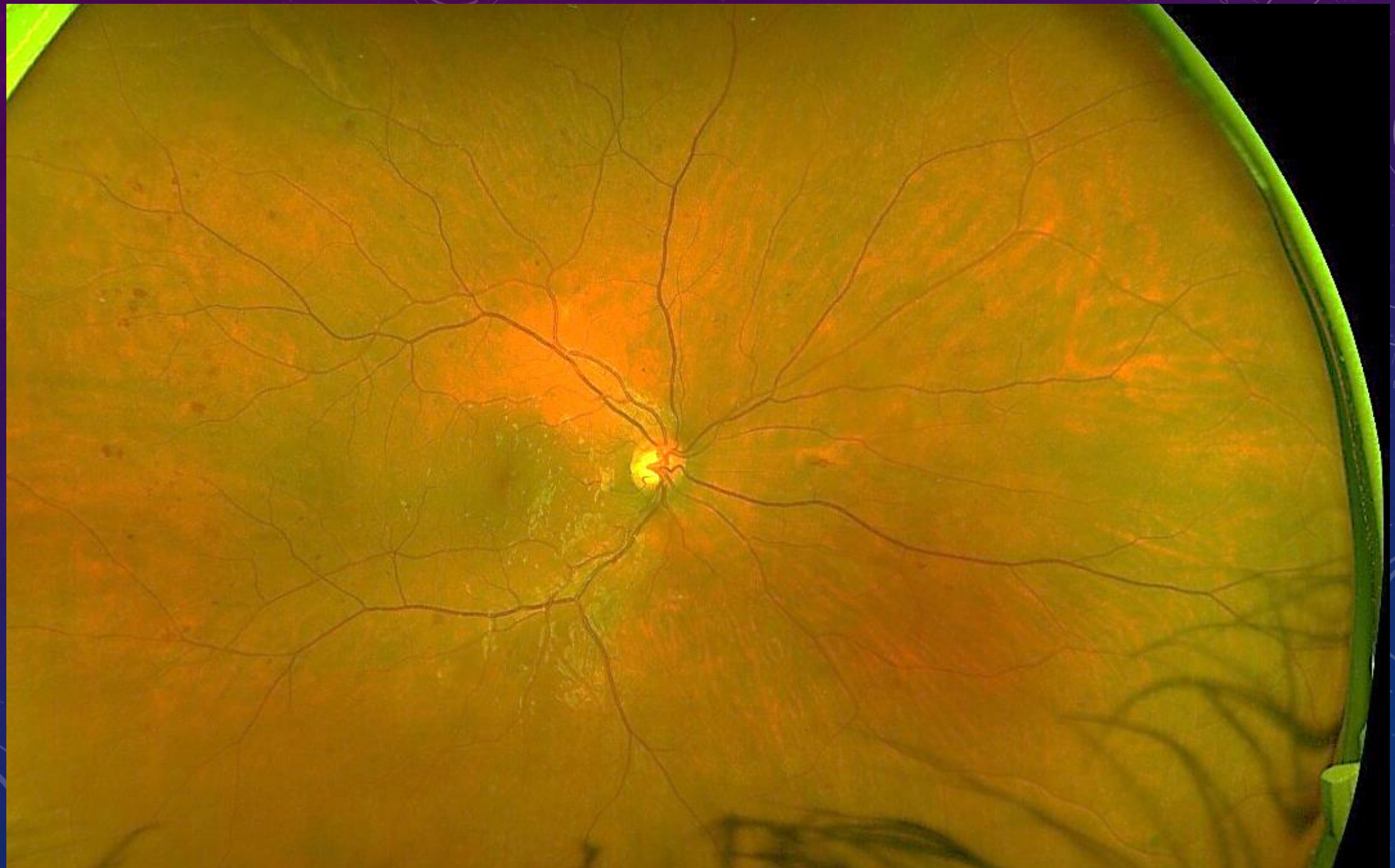
FFA IN HELPING PLAN LASER AND FOLLOW UP

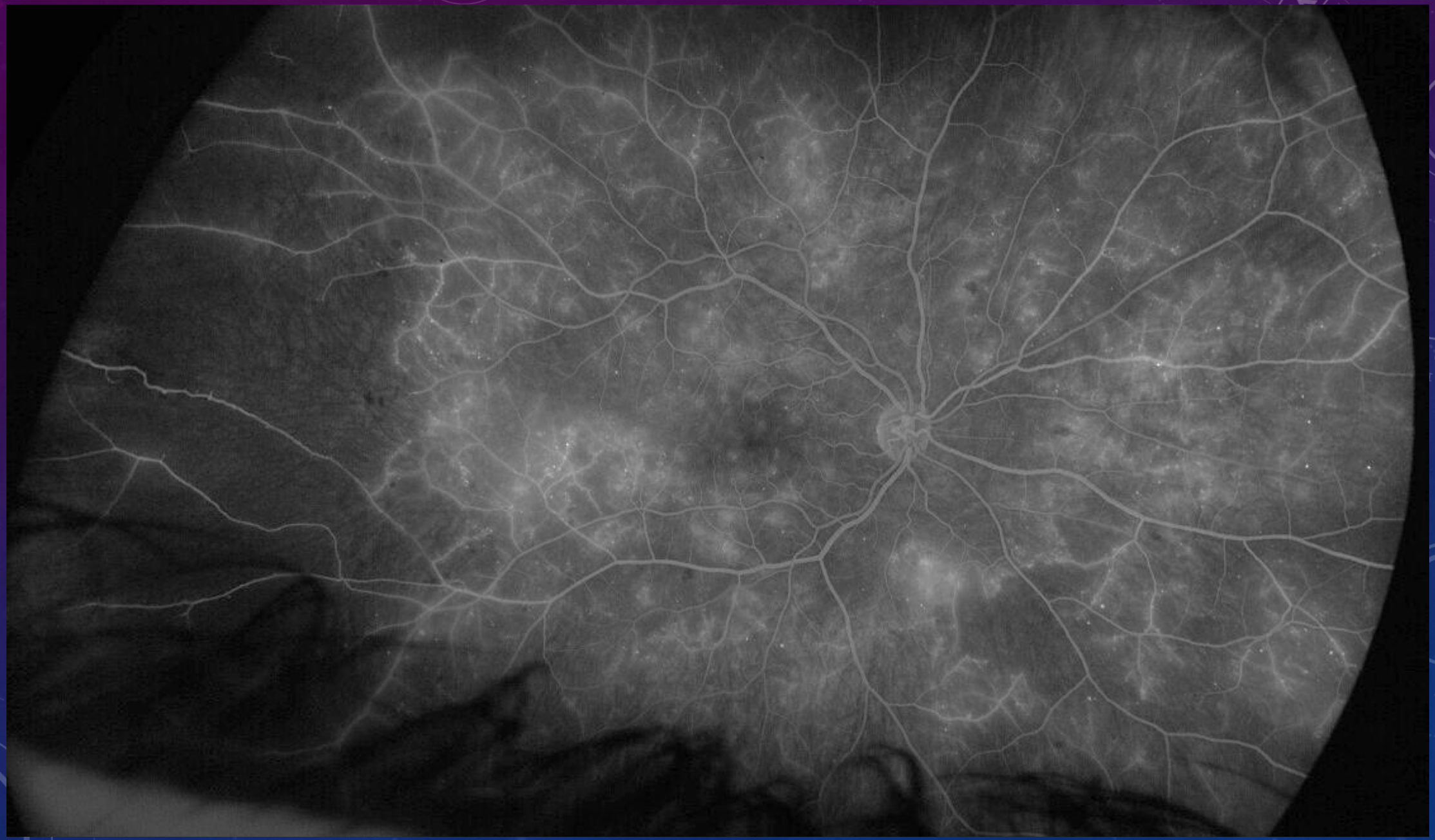




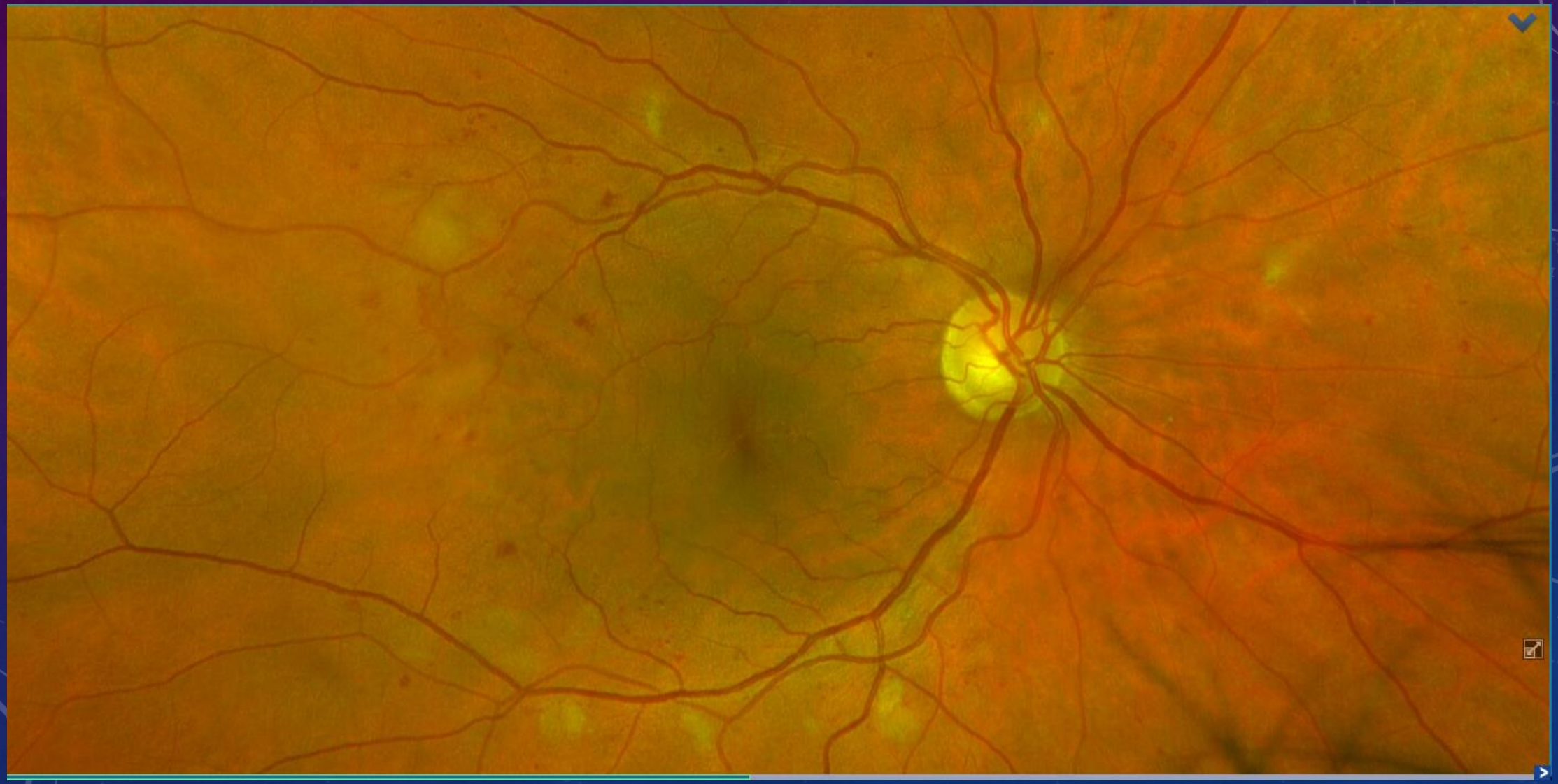


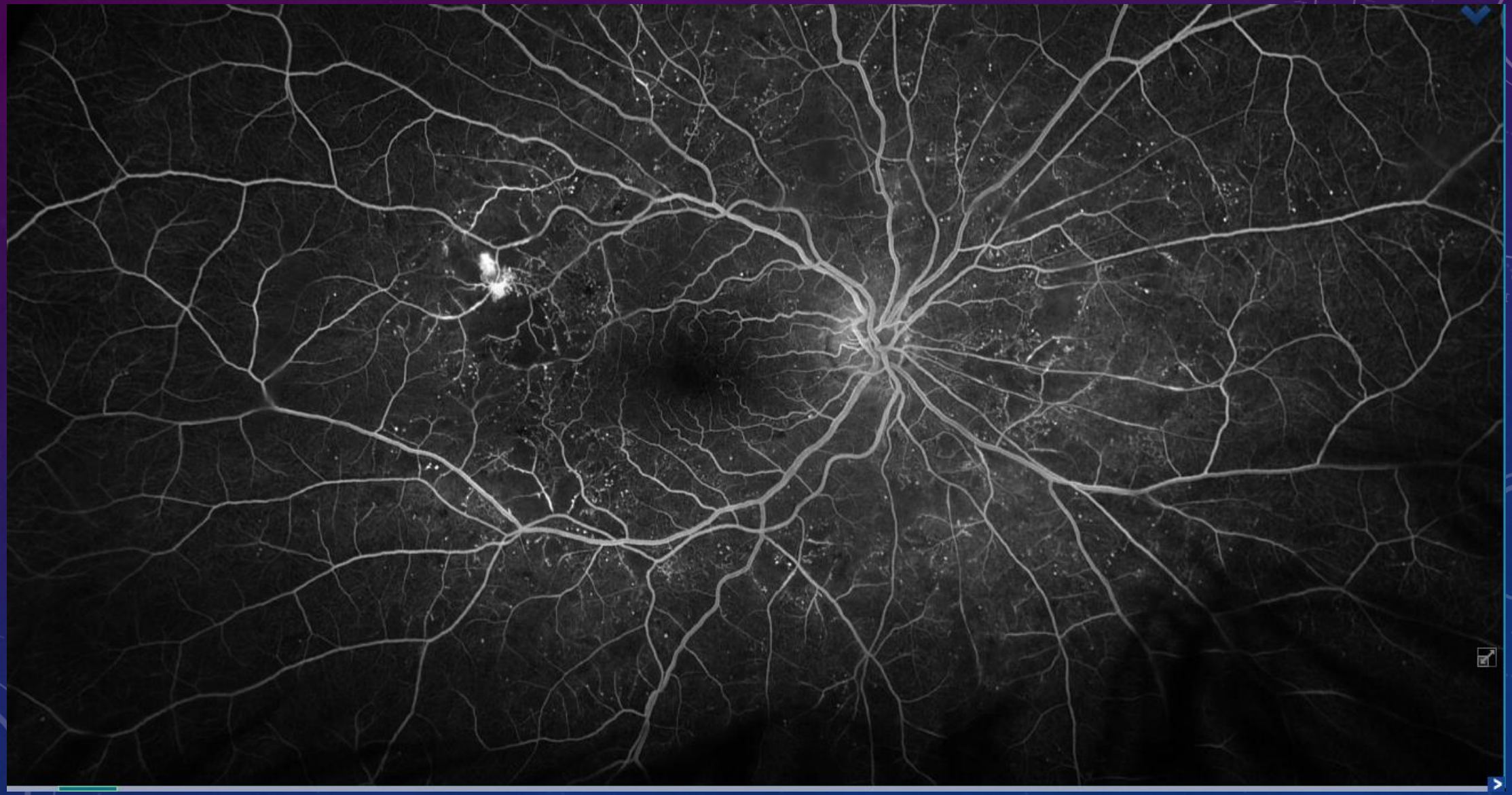




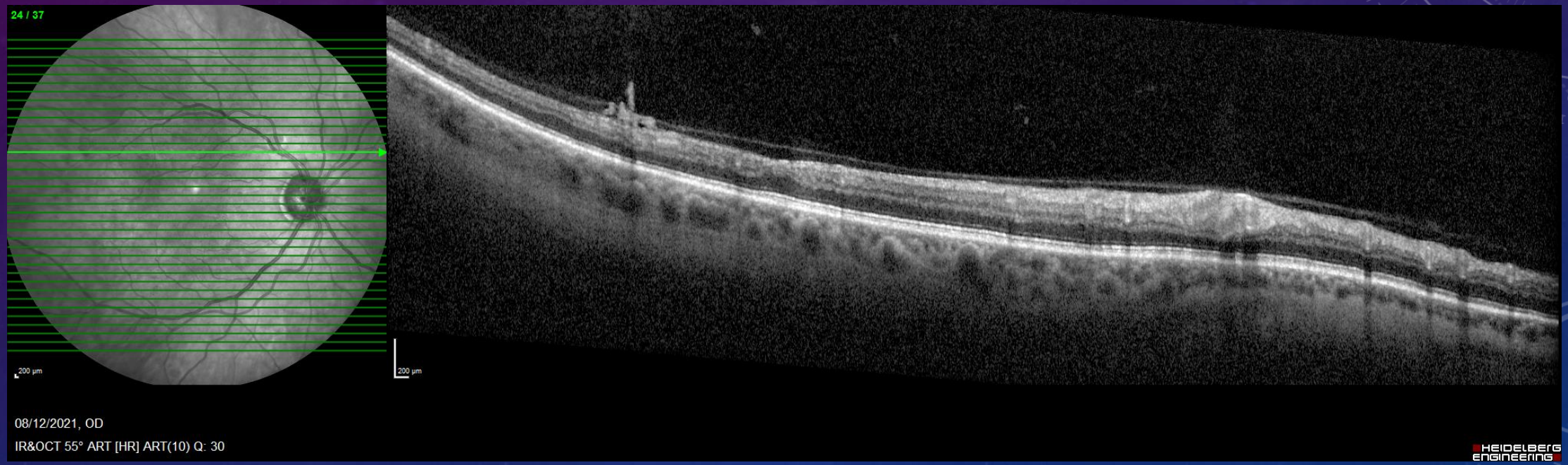


FFA MAKING THE DIAGNOSIS OF NVS; NVE?

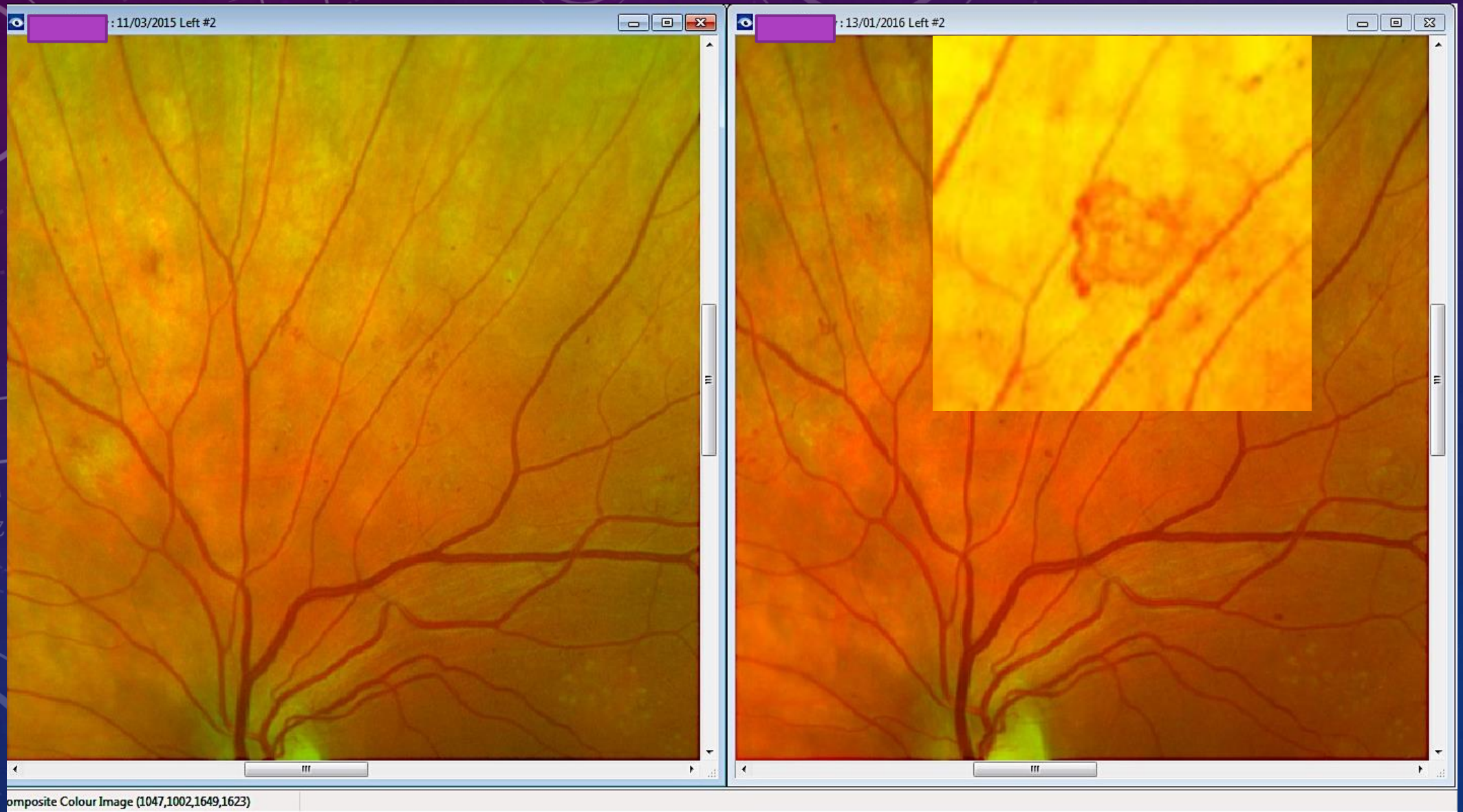




IF THE QUESTION IS ‘IS IT A NEW VESSEL?’ THEN OCT MAYBE ALL THAT IS NEEDED

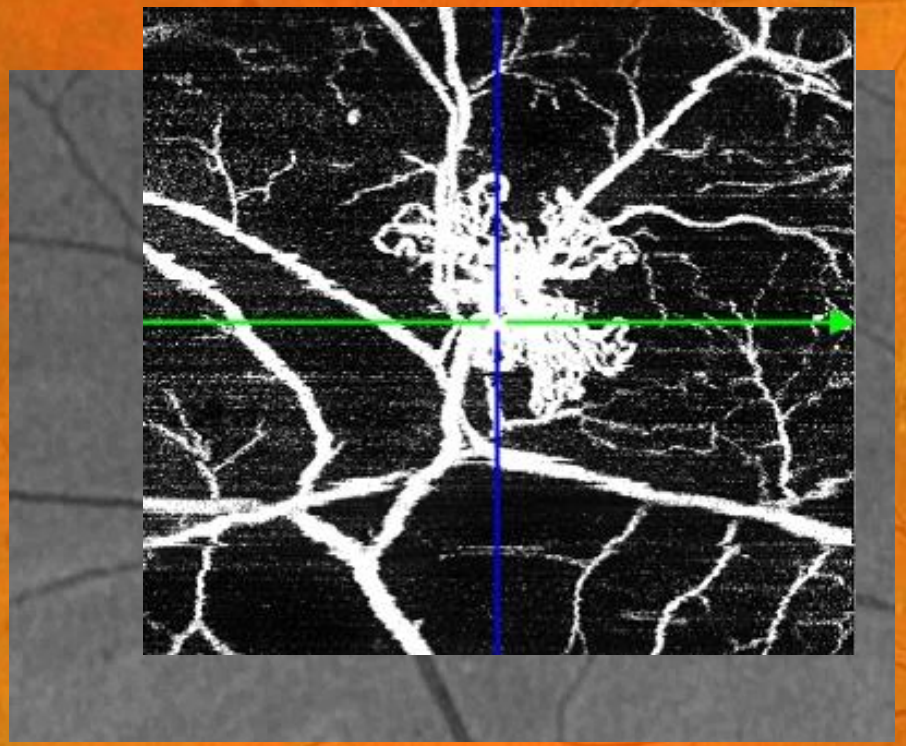


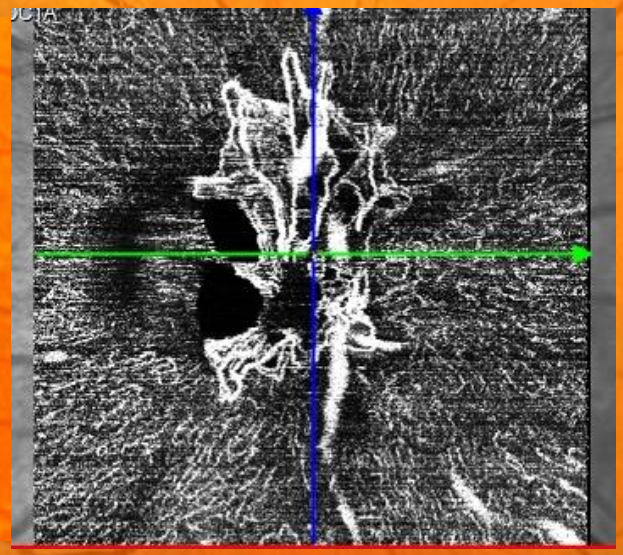
Excellent for follow up



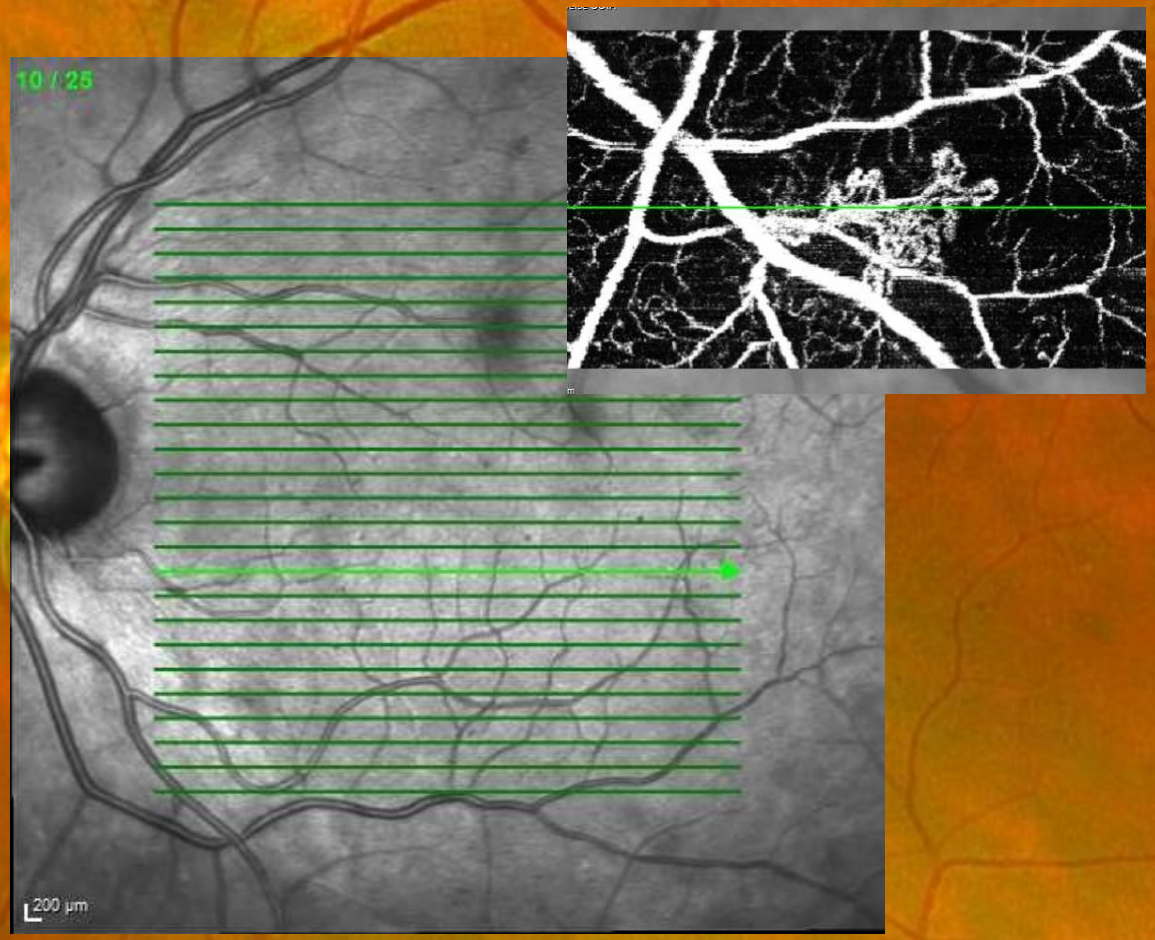
DaCosta, J., Bhatia, D., Crothers, O. *et al.* Utilisation of optical coherence tomography and optical coherence tomography angiography to assess retinal neovascularisation in diabetic retinopathy. *Eye* (2021).

OCTA for assessing new vessels

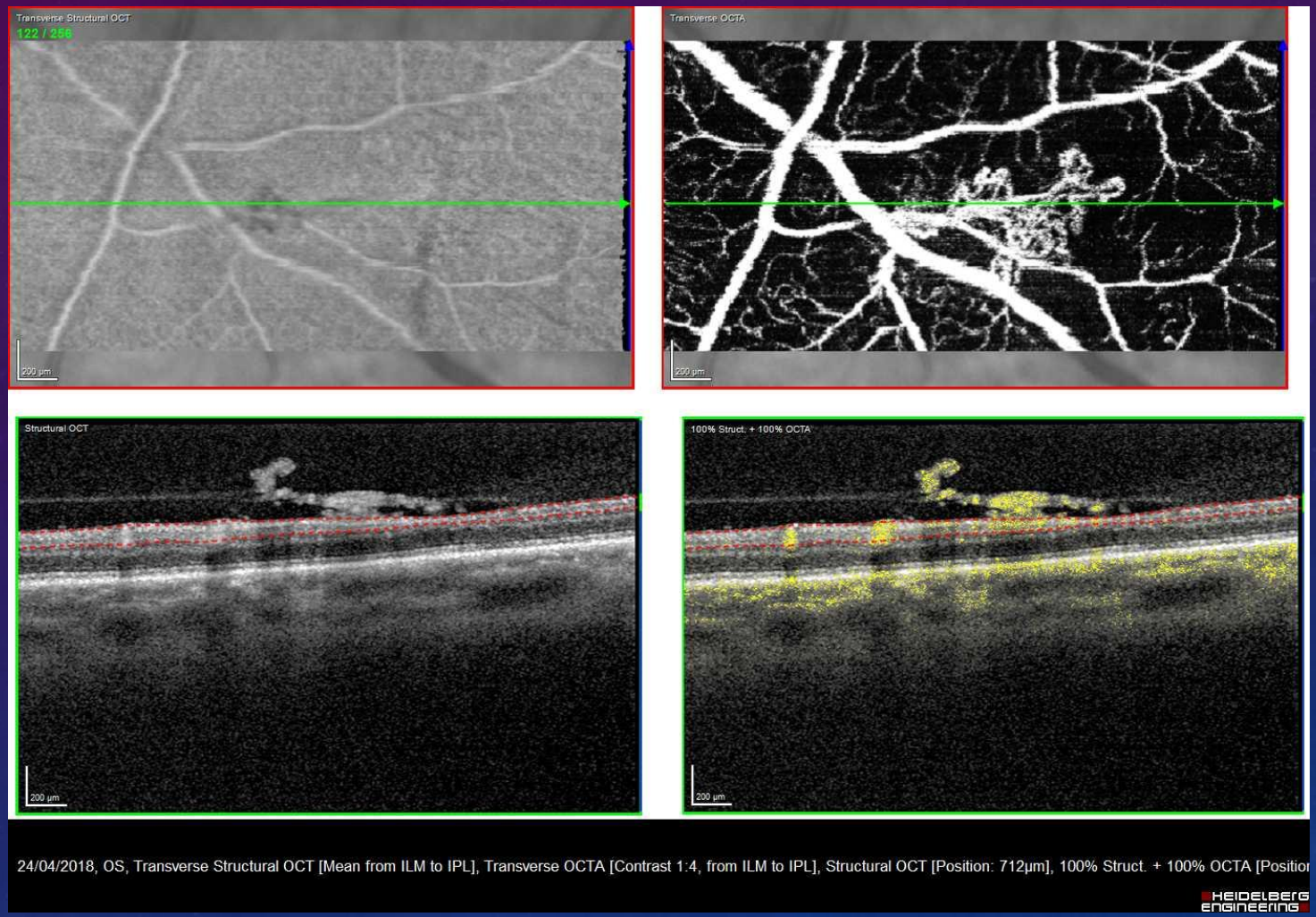




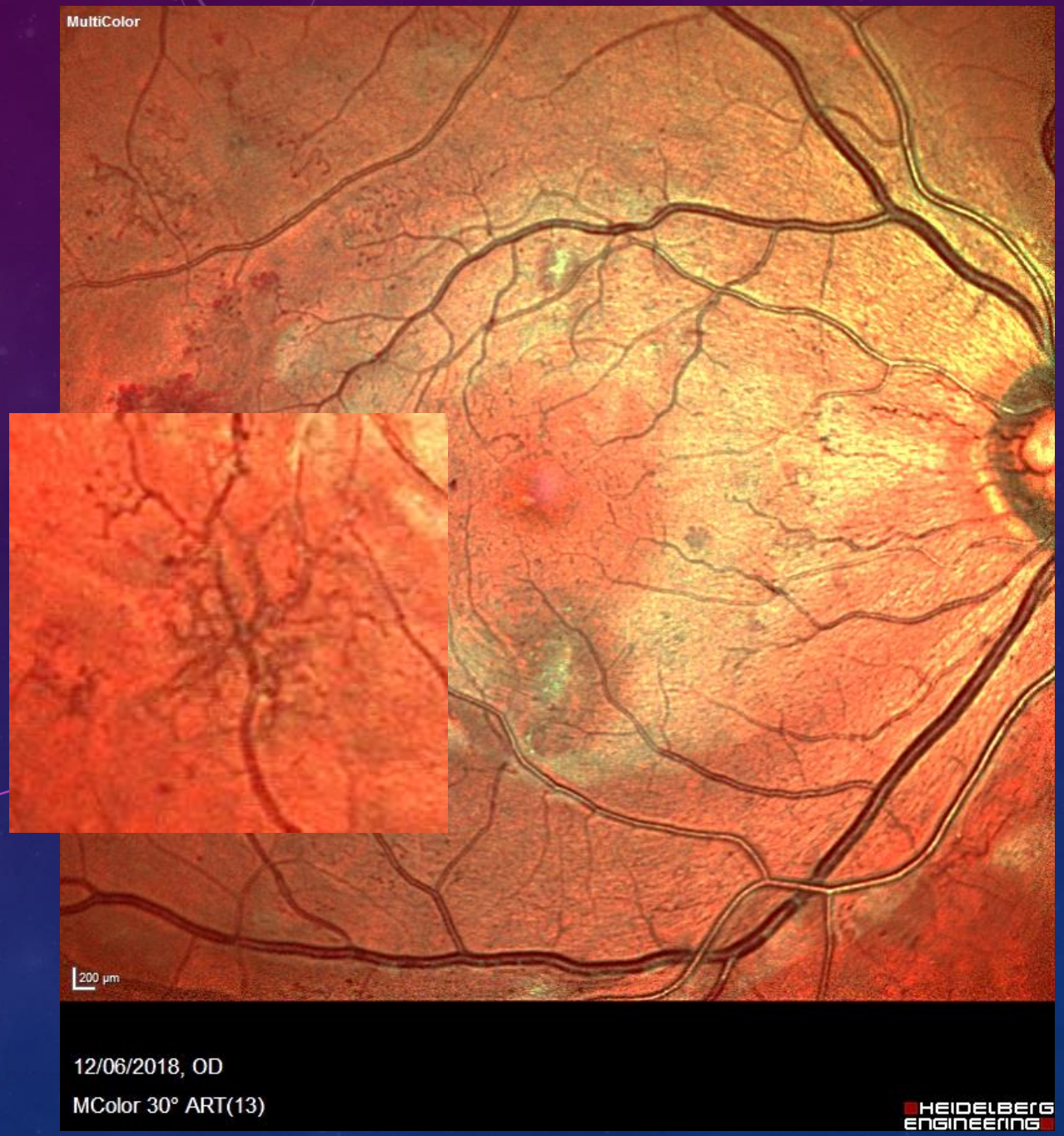
NVE <1/2 disc, is there a risk of bleeding?



OCTA OF NVE

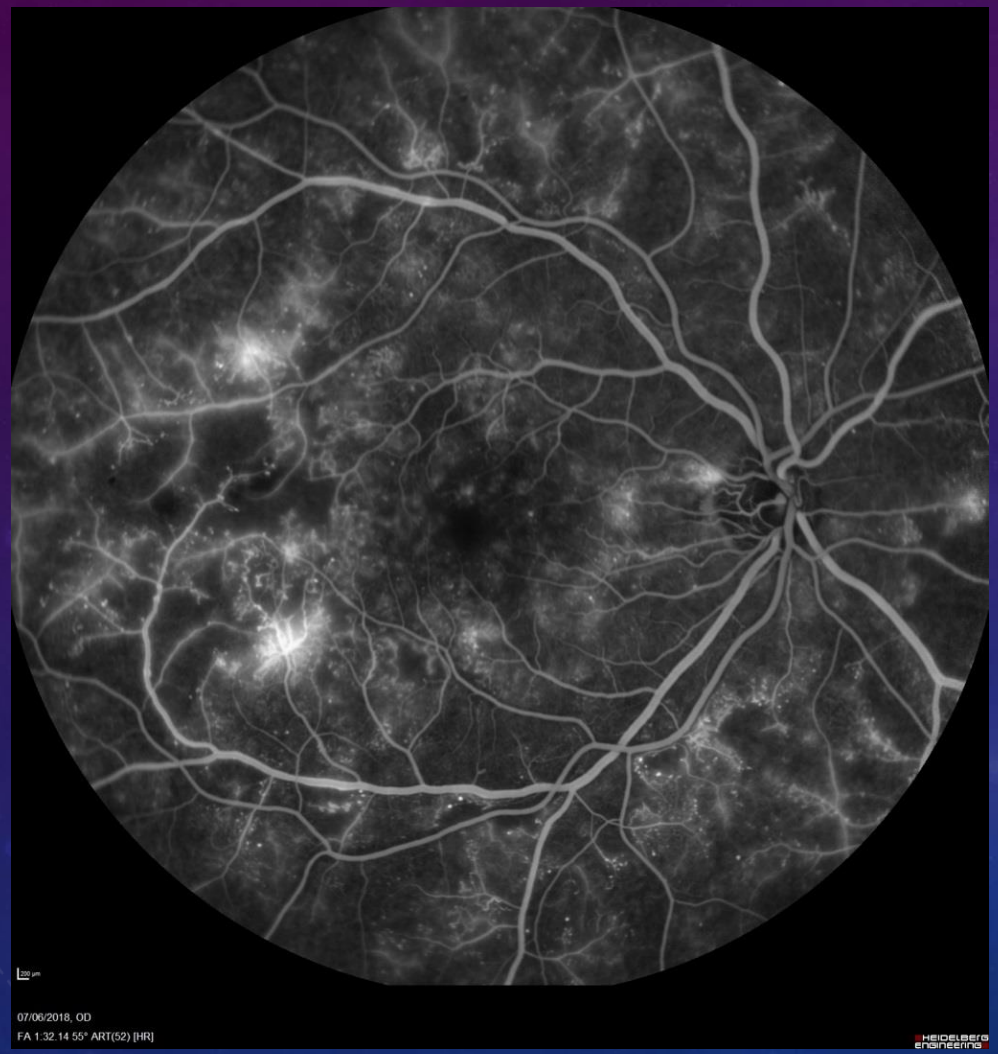


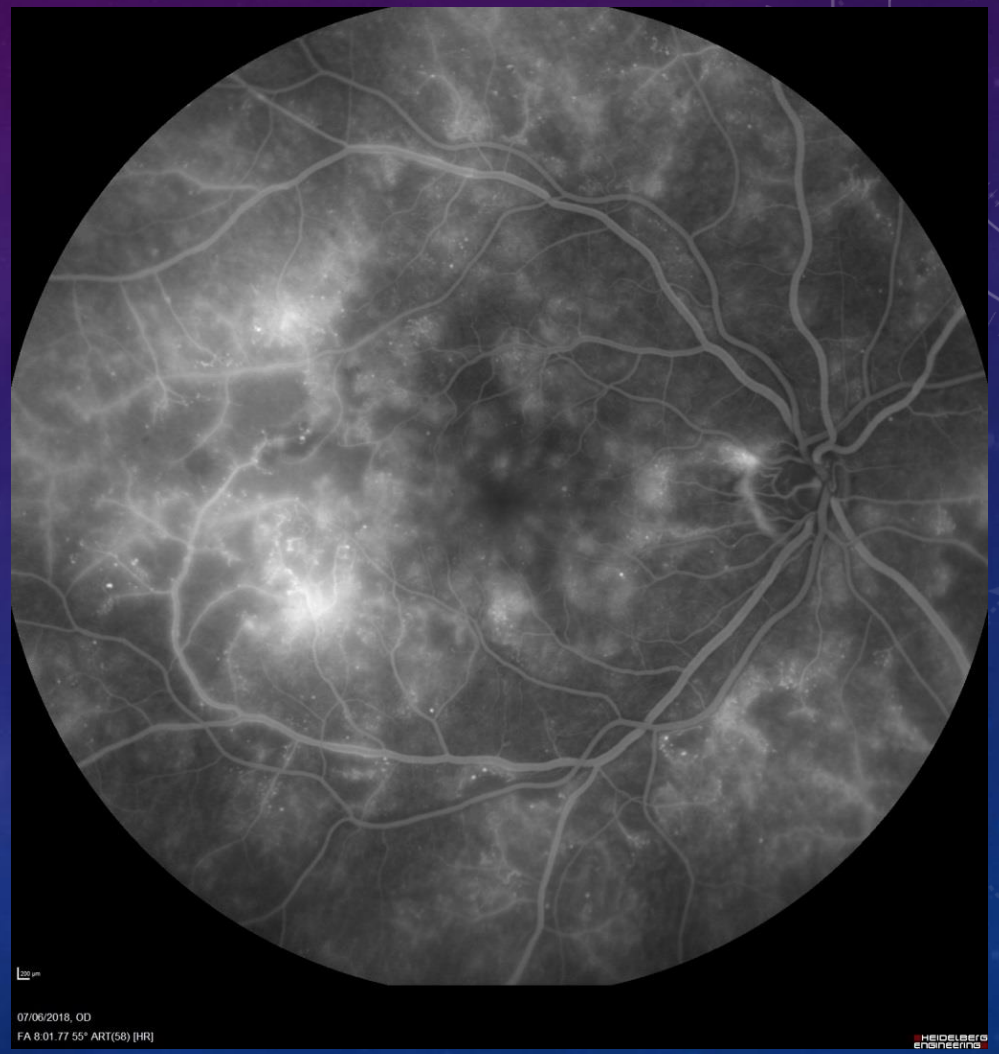
OCTA shows network in good detail; Cross sectional OCT demonstrates elevation


MultiColor
200 µm
12/06/2018, OD
MColor 30° ART(13)
HEIDELBERG ENGINEERING

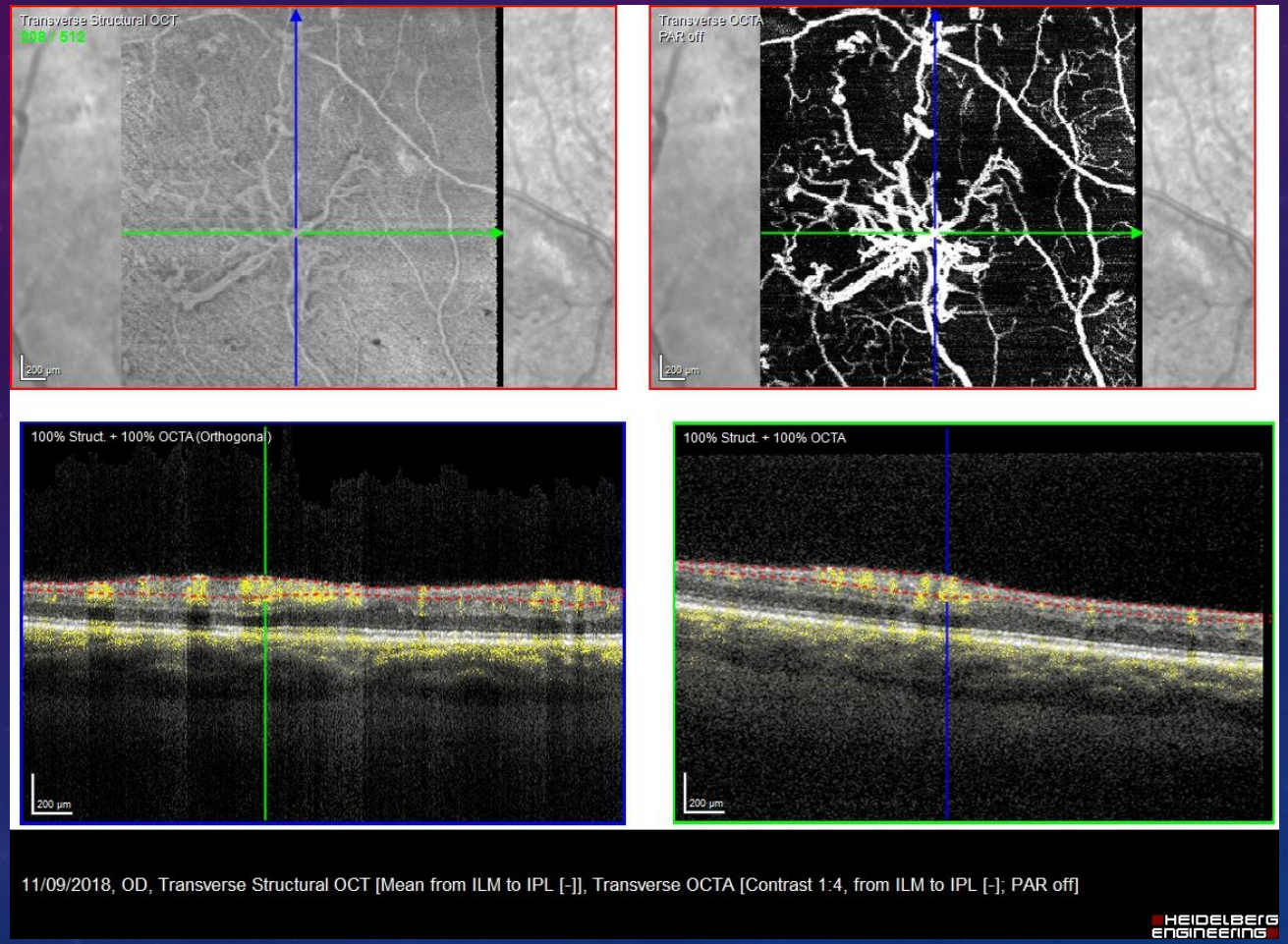
Irma/NVE?

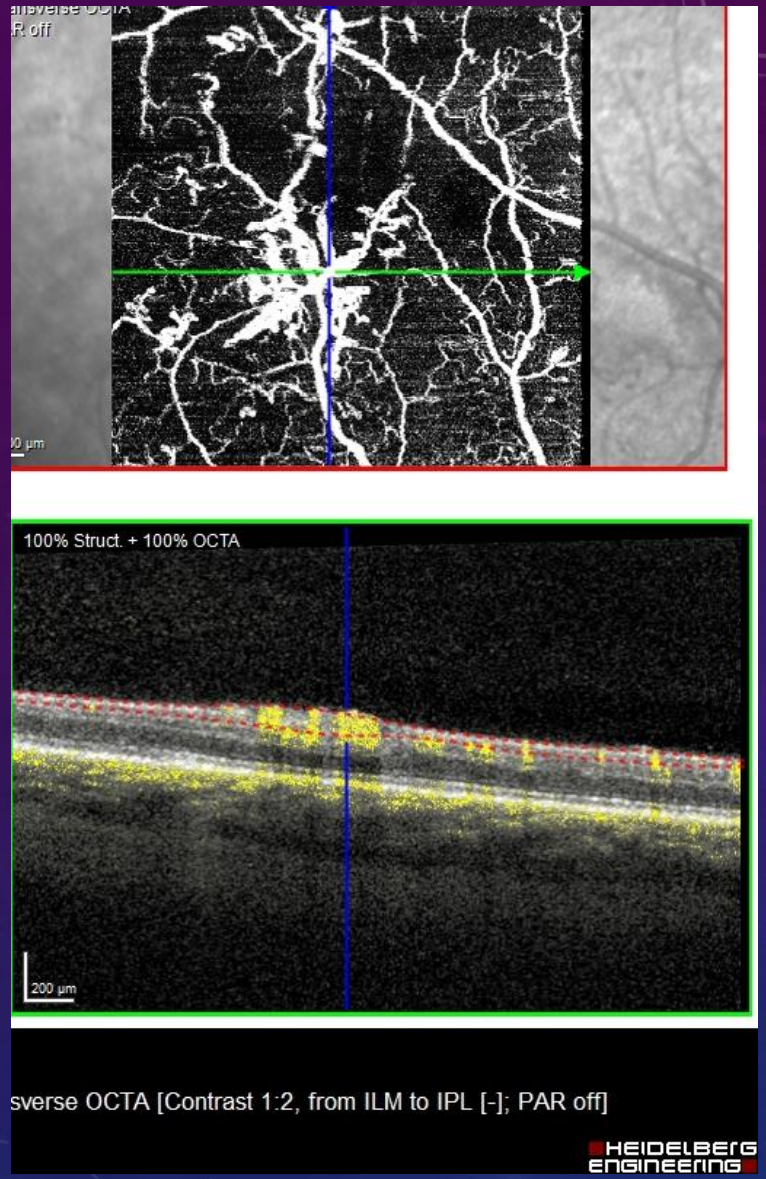
ONE DEFINITION: IRMA DON'T LEAK ON FFA; NVS DO IRMA INTRA-RETINA; NVE THROUGH ILM

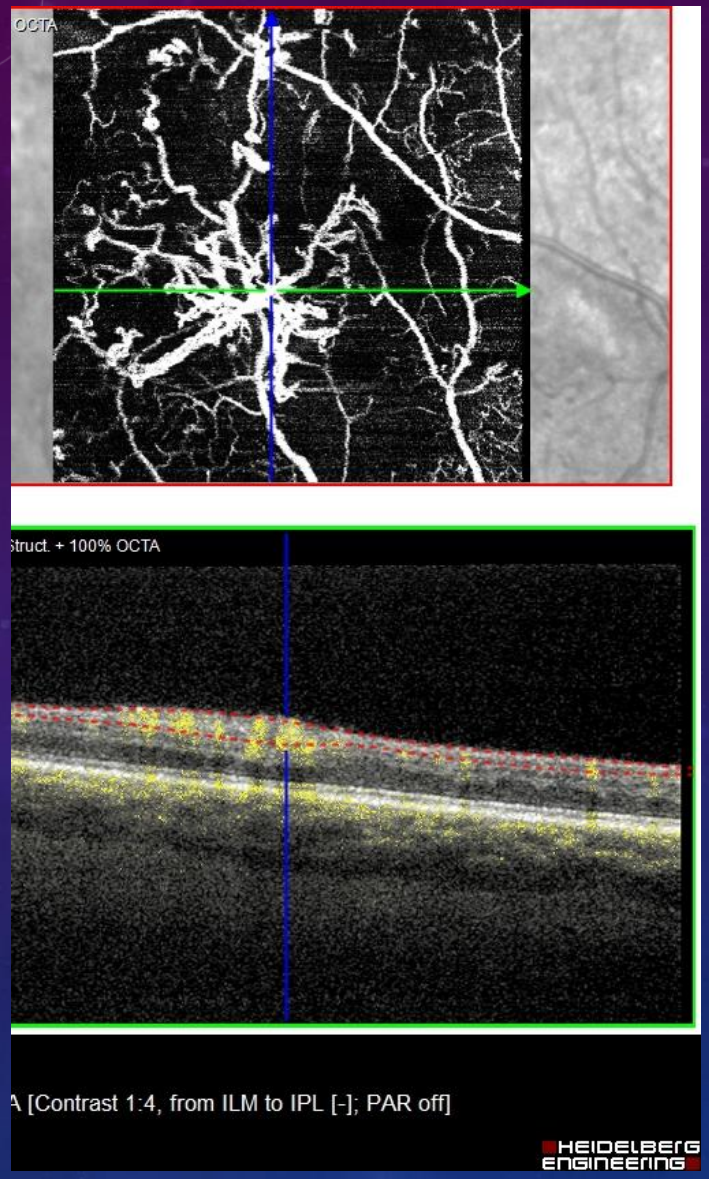


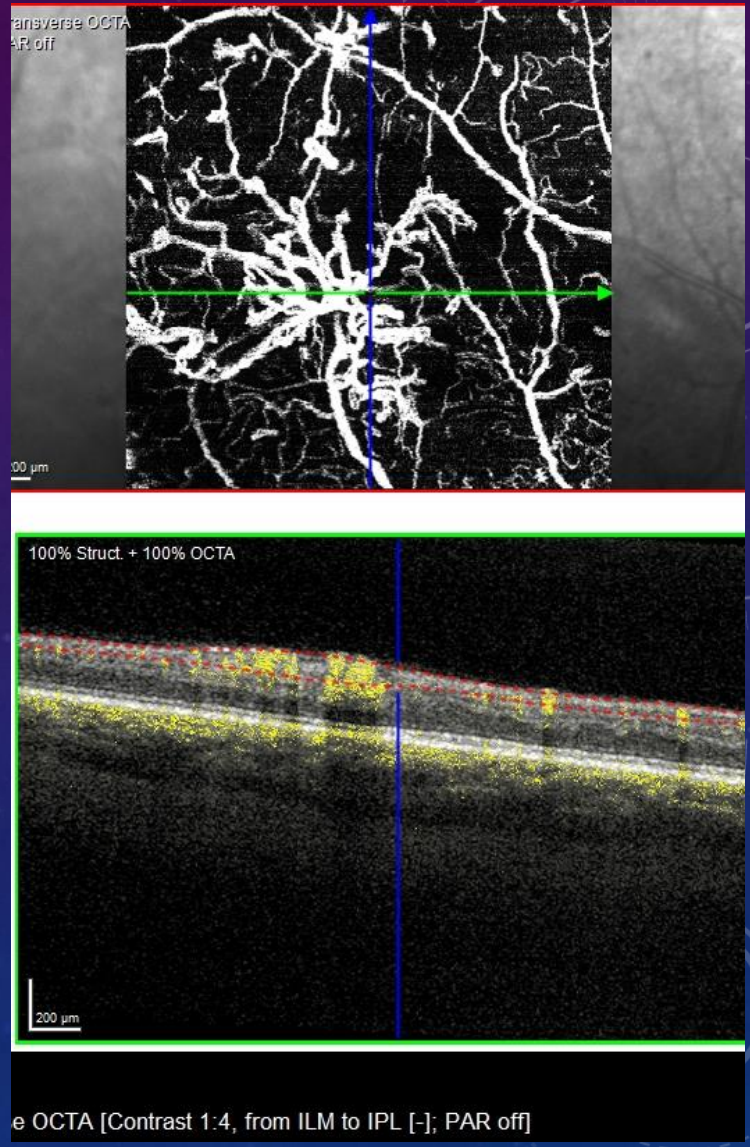


LEAKS ON FFA BUT INTRARETINAL; NVE OR IRMA?



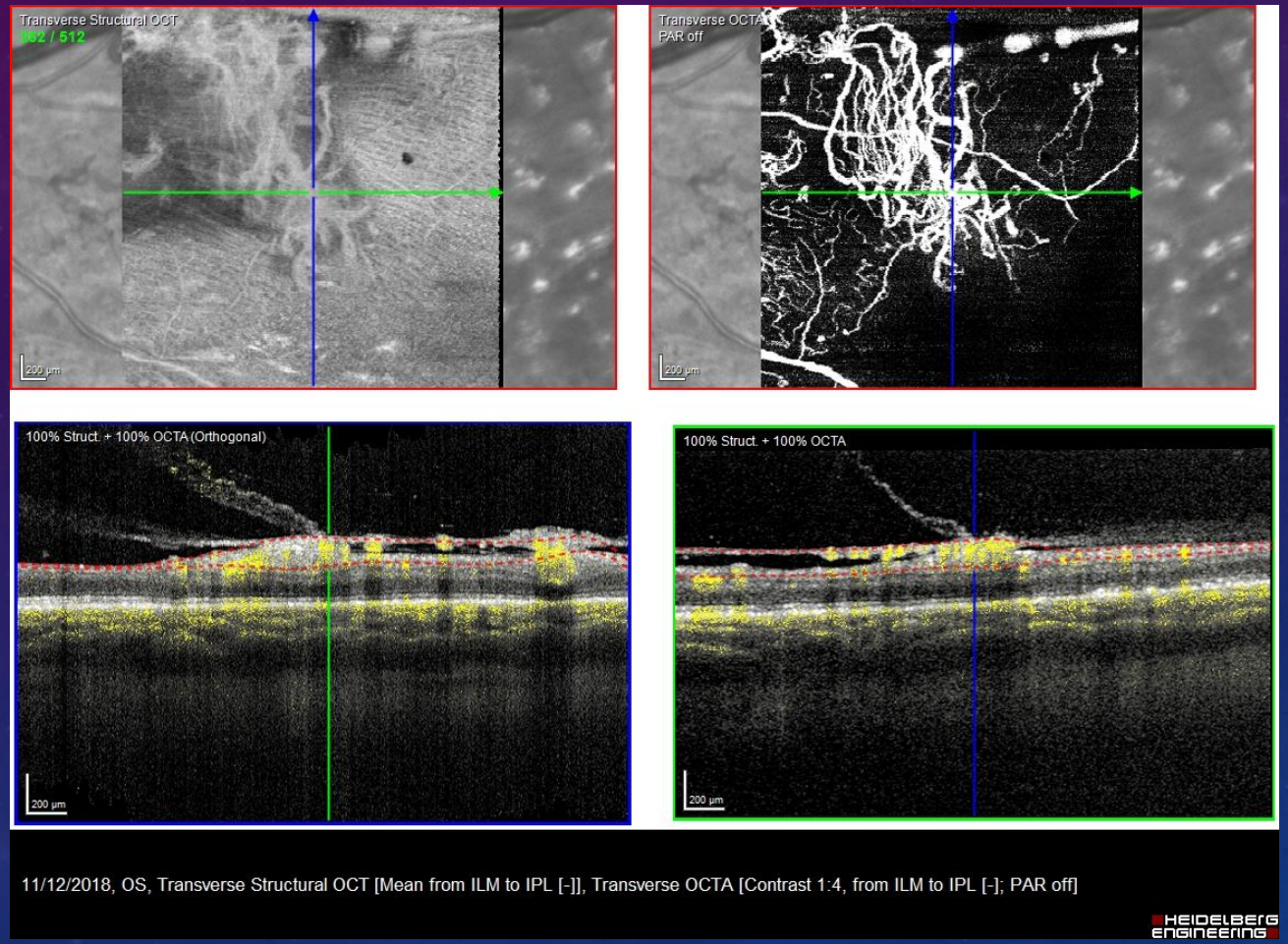




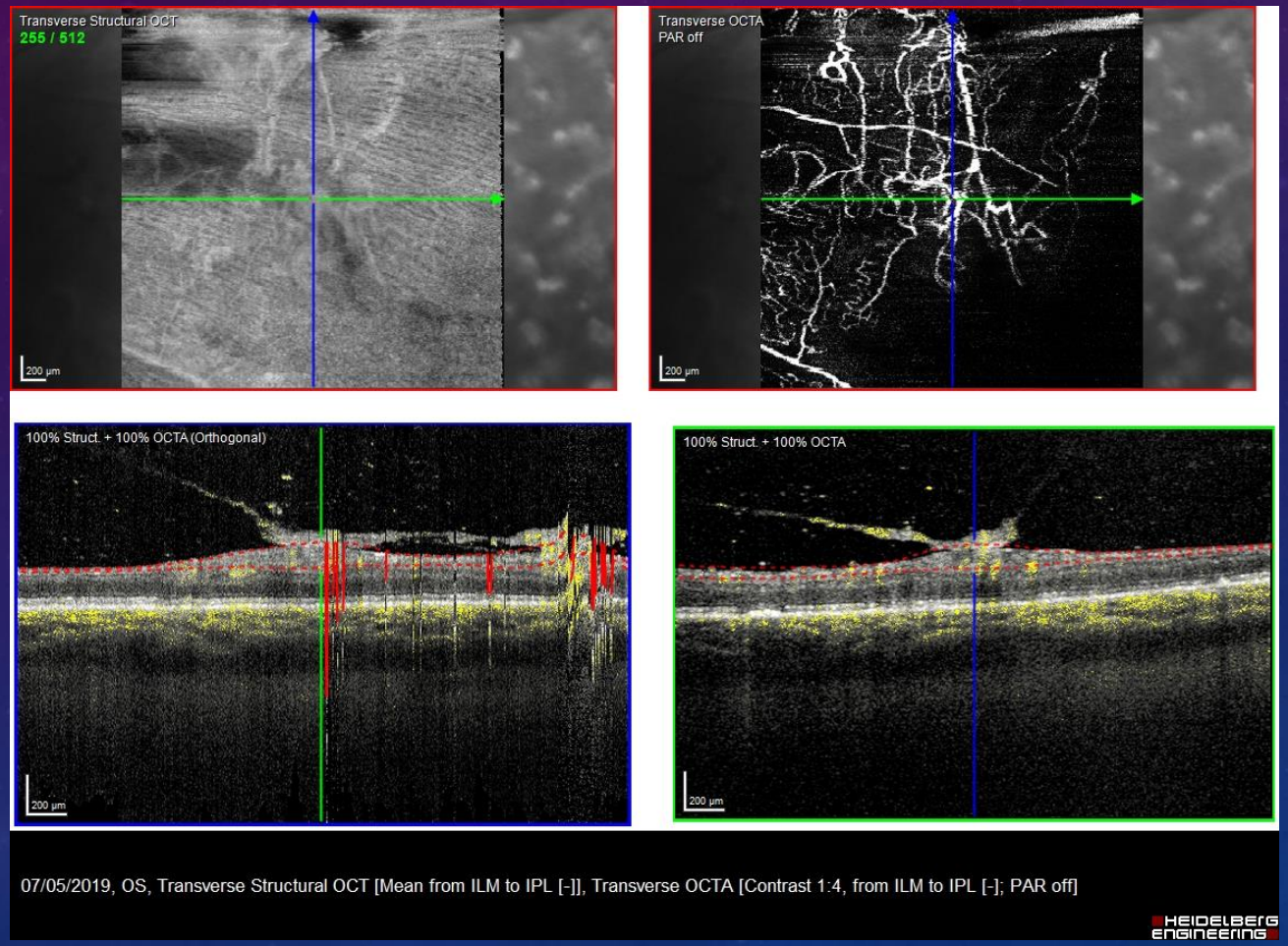


JUNE 2018: SEPT 2018: MAY 2019

SOME PRP BUT STILL NVE ‘ACTIVE,’ IV AFLIBERCEPT GIVEN



NVE LESS PERFUSED, ALTHOUGH SIGNAL LESS CLEAR DUE TO VITREOUS HAEMORRHAGE, CAN SEE CHANGE IN TRACTION, CAUSE OF VITREOUS HAEMORRHAGE



RANDOMISED TRIAL OF WIDE-FIELD GUIDED PRP FOR DIABETIC MACULAR OEDEMA TREATED WITH RANIBIZUMAB.

(RANIBIZUMAB FOR DMO PRP TRIAL) RDP TRIAL

Talks, S.J., Bhatia, D., Menon, G. *et al.* Randomised trial of wide-field guided PRP for diabetic macular oedema treated with ranibizumab. *Eye* **33,** 930–937 (2019)

(REC reference 13/NE/0197; IRAS 121940)

clinical trial register (ISRCTN84503751).

Funding: This study received funding and ranibizumab drug product support from Novartis Pharmaceuticals UK Ltd. Novartis had no role in the study design, collection, analysis, or interpretation of the data or decisions regarding this study.

RESULTS: PATIENT NUMBERS

- 49 patients recruited from 7 centres, 25 in the ranibizumab only group and 24 in the ranibizumab + PRP group.
- Eighty seven percent completed one year follow up.
  - Three patients in the ranibizumab only arm did not complete the study, one did not want to remain under follow up and two died.
  - Three did not complete in the combined arm, two did not want to remain under follow up and one died.

INJECTION NUMBERS

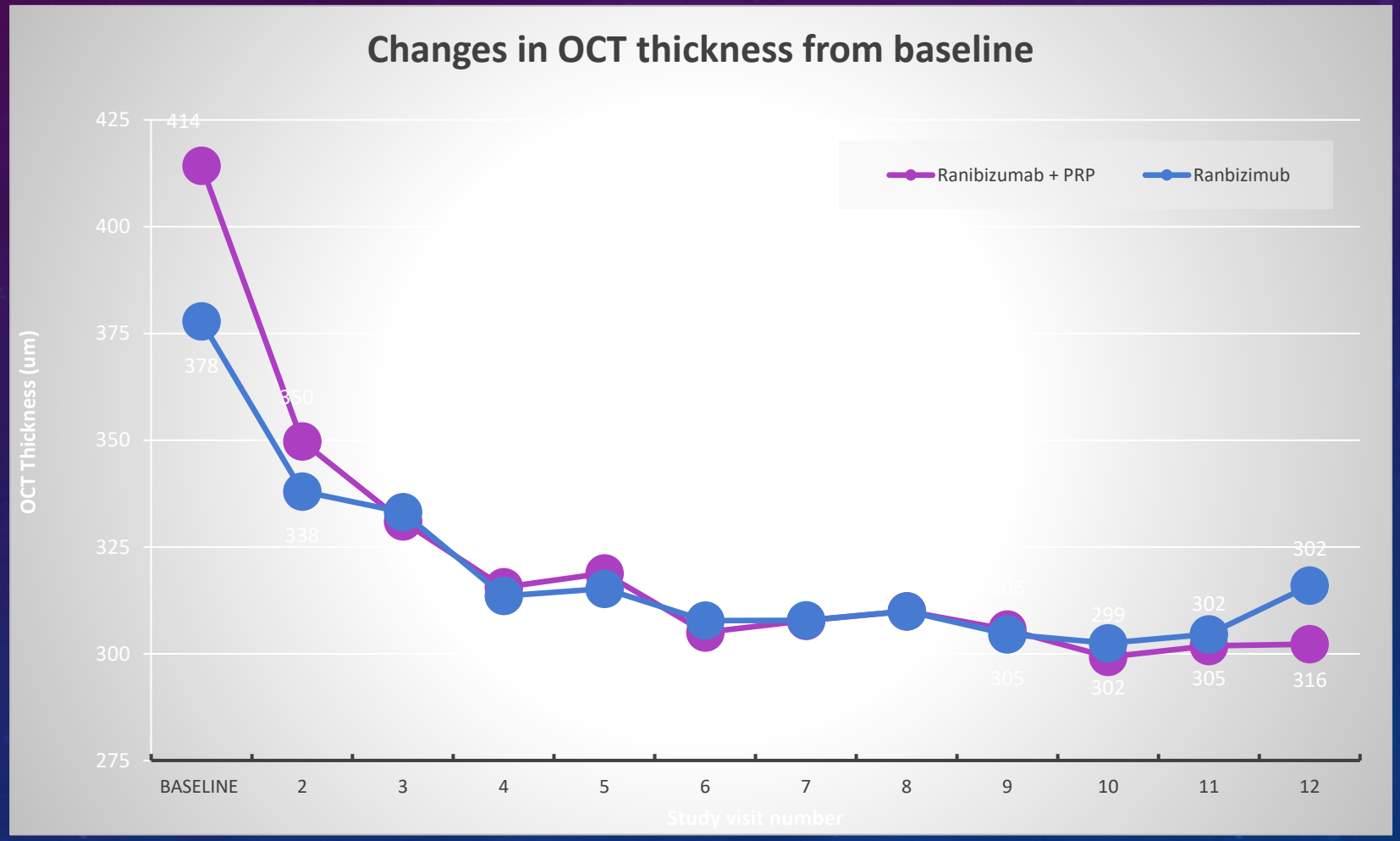
- Ranibizumab only arm 6.84 at one year: 6-12 months 2.52
- Combined arm 6.67, 1.92
- For the primary outcome, comparing the number of 6-12-month injections, the result was not statistically significant (p=0.33).

- Comparing the total number of injections in both groups, the differences were not statistically different (p=0.84).

RELATIONSHIPS TO AREA OF ISCHAEMIA:

- No significant difference was found in either group comparing:
- OCT thickness at baseline (ranibizumab arm p= 0.72, combined arm p=0.17);
- OCT thickness at baseline of all the patients (p=0.17).
- Reduction of OCT thickness at year one (ranibizumab arm p=0.15, combined arm p=0.32);
- Total number of injections and initial ischaemia (ranibizumab arm p=0.65, combined arm p= 0.28);
- Total number of injections and improvement in ischaemia (ranibizumab arm p=0.79, combined arm p=0.98).

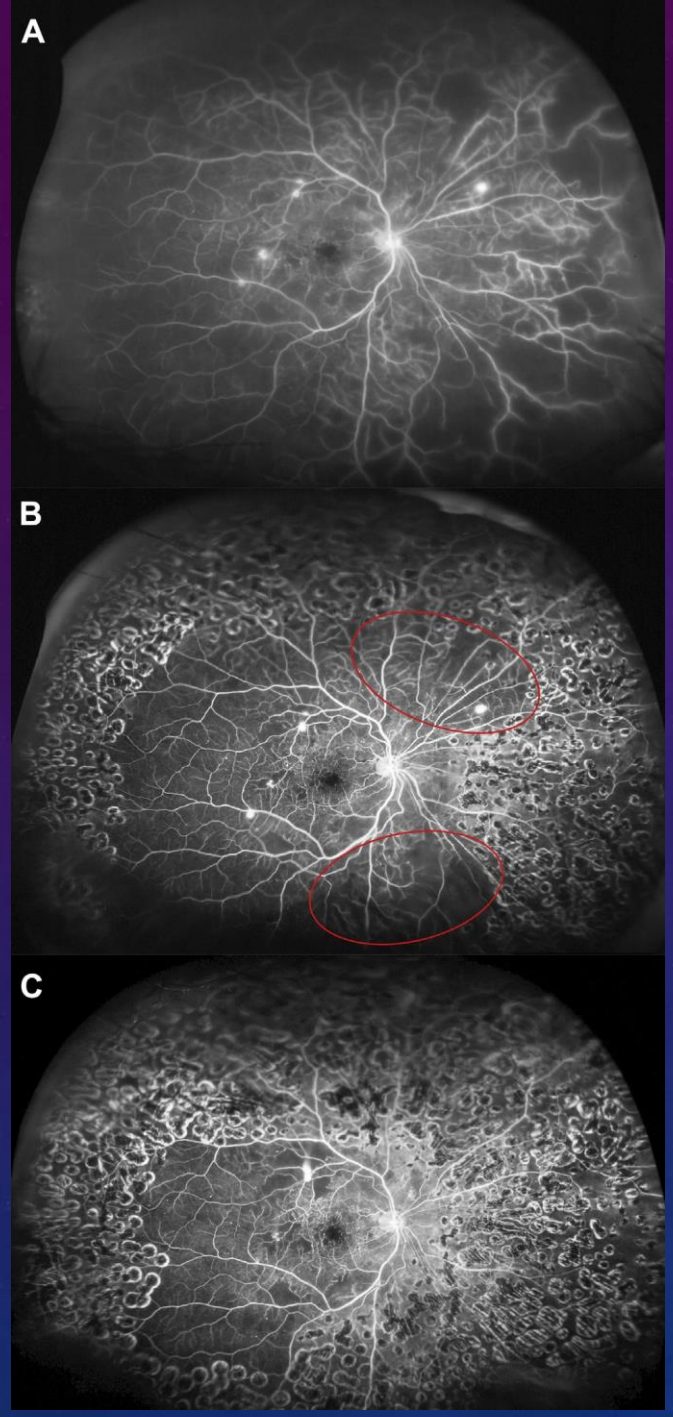
THE SPEED OF REDUCTION OF THE OCT THICKNESS DID NOT VARY BETWEEN THE TWO ARMS.



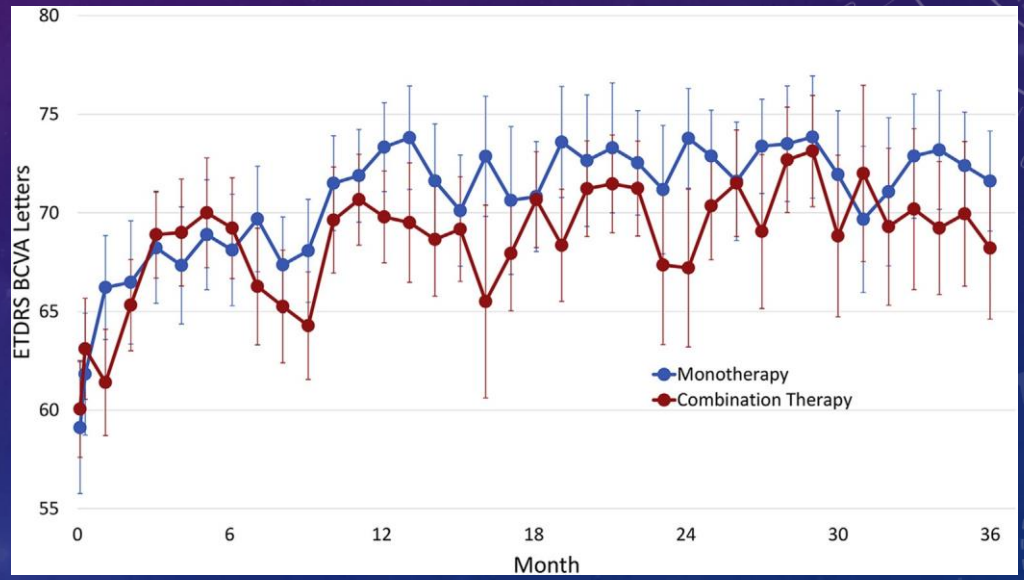
BROWN DM, OU WC, WONG TP, ET AL. TARGETED RETINAL PHOTOCOAGULATION FOR DIABETIC MACULAR EDEMA WITH PERIPHERAL RETINAL NONPERFUSION: THREE-YEAR RANDOMIZED DAVE TRIAL. *OPHTHALMOLOGY* 2017; 125: 683–690.

- Did not find a reduction in the number of injections required over three years. This study evaluated 40 eyes of 29 patients and performed several sessions of PRP to ensure all the ischaemic areas of retina were treated.
- The non-perfused area and total retinal area visible was used to calculate an ischaemic index in different retinal zones and correlated to the severity of diabetic macular oedema. The ischaemic index increased with increasing distance from the fovea but the severity of the oedema did not correlate with the overall non-perfused area or ischaemic index

Fan W, Wang K, Ghasemi Falavarjani K, et al. Distribution of Nonperfusion Area on Ultra-widefield Fluorescein Angiography in Eyes With Diabetic Macular Edema: DAVE Study. *Am J Ophthalmol* 2017; 180: 110–116.

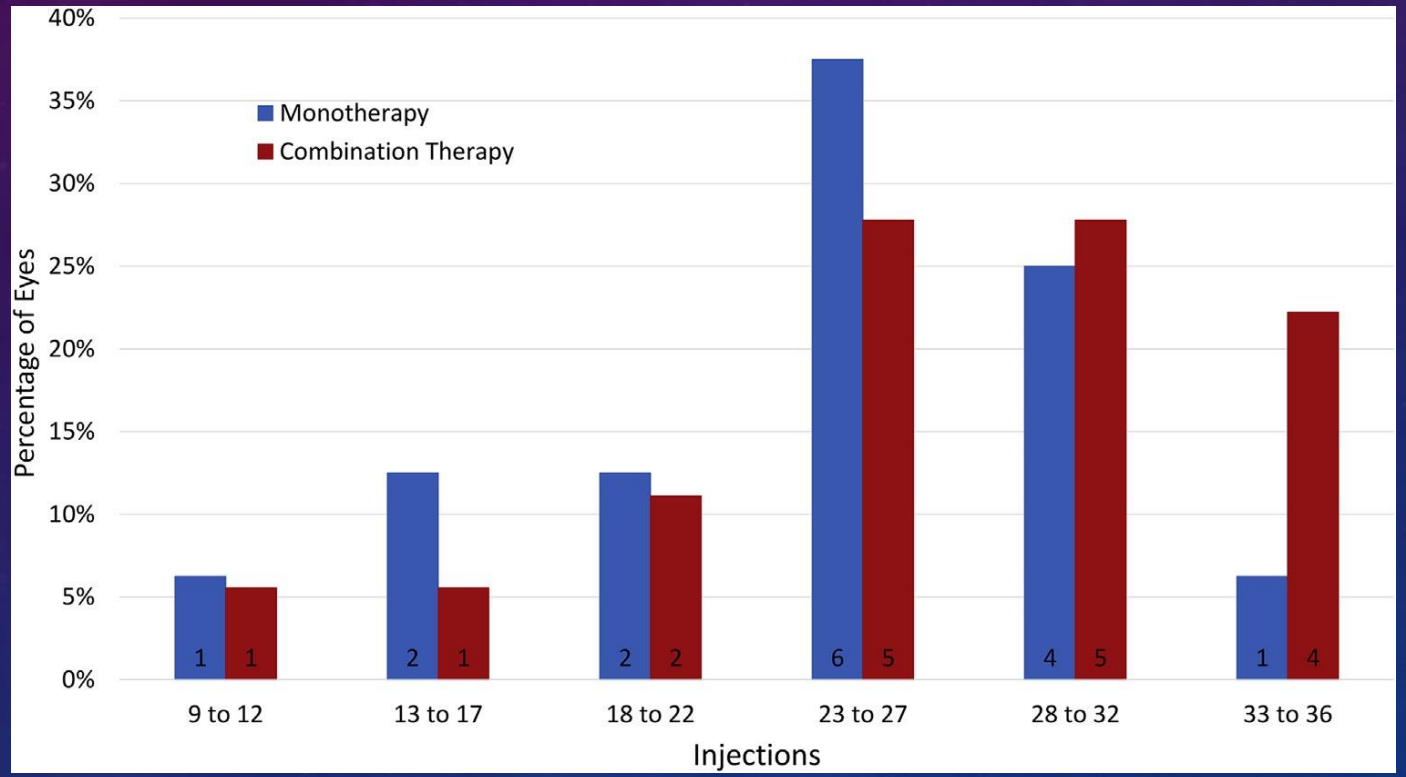


DAVE STUDY



Suggestion that VA outcome worse in combined arm

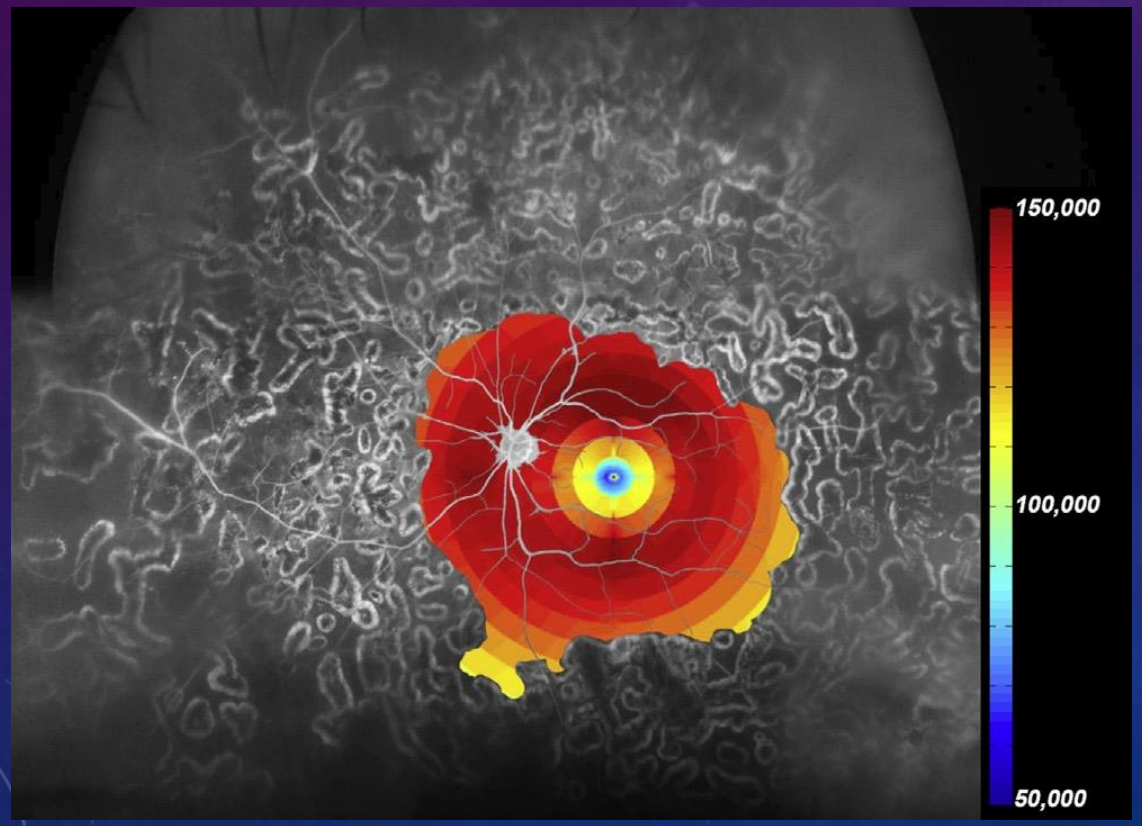
Month 36, a mean of 24.4 ranibizumab injections (range, 10-34 injections) were administered in the monotherapy arm and a mean of 27.1 ranibizumab injections (range, 12-36 injections) were administered in the combination therapy arm



DAVE study

NO reduction in injection numbers even in 2nd and 3rd year

(DAVE STUDY IMAGE)
WIDEFIELD FLUORESCEIN ANGIOGRAPHY (FA) IMAGE DEMONSTRATING DENSE TARGETED RETINAL PHOTOCOAGULATION TO APPROXIMATELY 78% OF THE TOTAL RETINAL SURFACE. OVERLYING ROD AND CONE PHOTORECEPTOR DENSITY DATA, ADAPTED FROM CURCIO ET AL, OF THE RETINA POSTERIOR TO THE ABLATION ZONE REVEALED THAT THIS REMAINING 22% OF SURFACE AREA ACTUALLY REPRESENTS 47% OF THE 96.6 MILLION TOTAL PHOTORECEPTORS IN THE AVERAGE RETINA.



Why doesn't laser help?

Most metabolic demand across the retina is within the posterior pole, within retina that is too valuable for visual function to consider laser ablation .

Additionally, nonperfusion on widefield FA in some cases may correspond with tissue that is dead rather than under hypoxic stress

Curcio CA, Sloan KR, Kalina RE, Hendrickson AE. Human photoreceptor topography. J Comp Neurol. 1990;292(4): 497e523.

BOTH STUDIES ARE SMALL BUT DO SUGGEST THAT THE ADDITION OF LASER TO NON PERFUSED AREAS OF PERIPHERAL RETINA TO RANIBIZUMAB MONOTHERAPY IS NOT BENEFICIAL IN DIABETIC MACULAR OEDEMA.

LADAMO study from Australia 2022; aflibercept monotherapy vs aflibercept plus PRP laser; also no benefit

- Related to leaking areas not non perfused areas?

CLASSIFICATIONS OF REGIONS OF NONPERFUSION ON ULTRA-WIDEFIELD FLUORESCEIN ANGIOGRAPHY IN PATIENTS WITH DME

ARVO 2019: 2805. M FANG; Y SHI…S SADDA

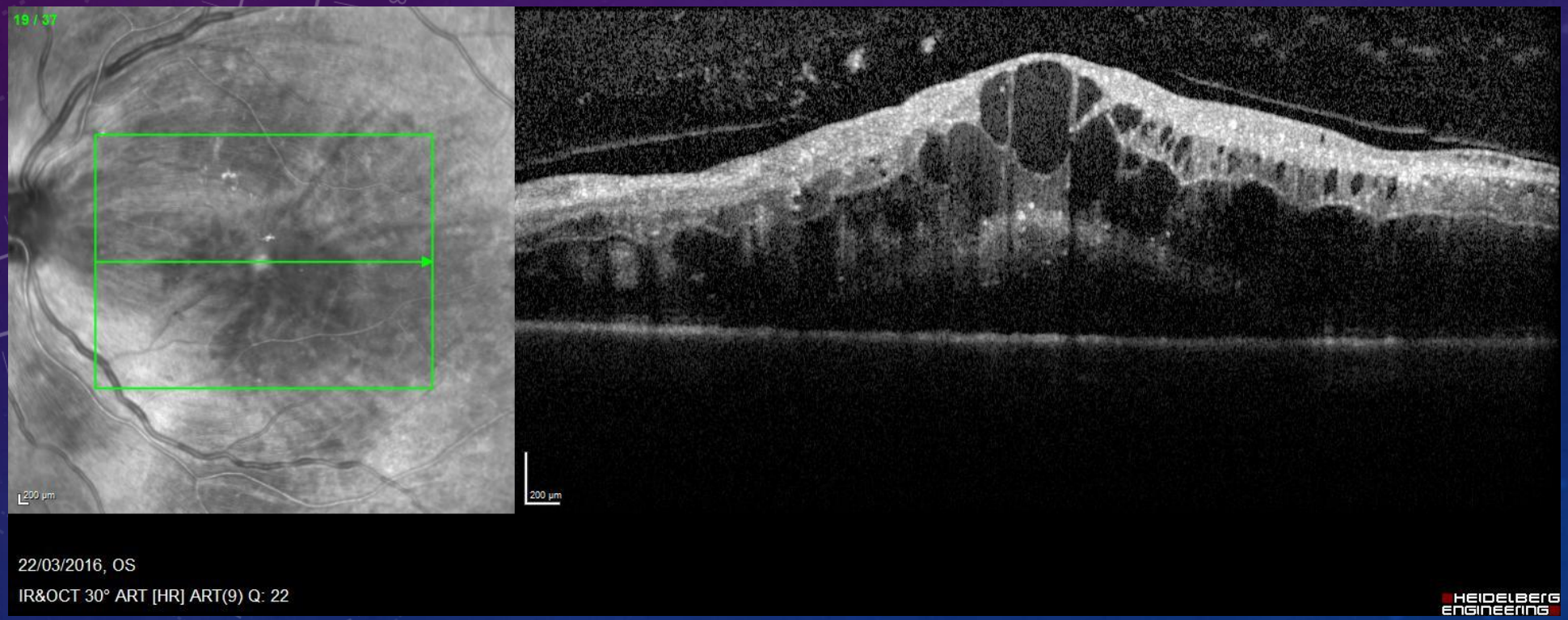
- DAVE study 40 eyes 29 patients, base line images
- Non perfusion with leakage was associated with DME; whereas non perfusion with out was not.
- Non perfusion with leakage was more in the posterior pole compared to mid and far periphery.
- Leakage, measured at mid phase, shades of grey, compared ‘black’ to grey.
- Leak from vessels; muller cells; RPE?

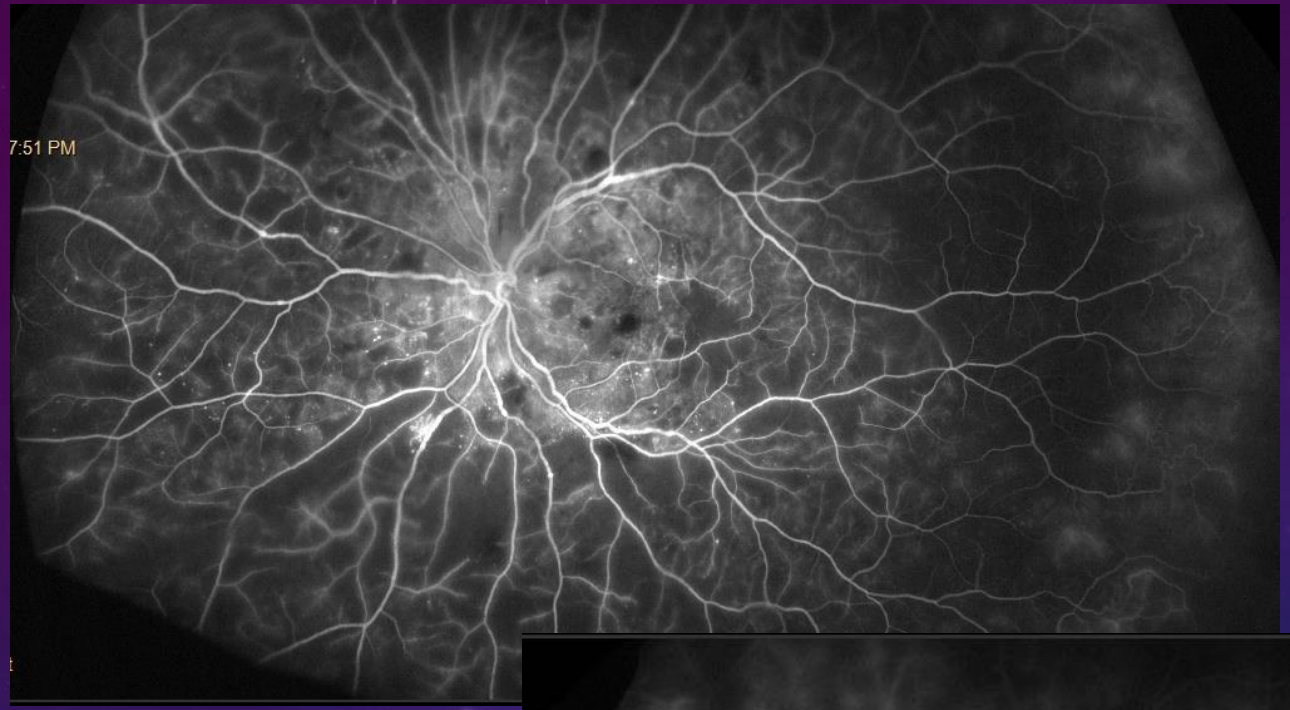
EVALUATION OF QUANTITATIVE ULTRA-WIDEFIELD FLUORESCEIN ANGIOGRAPHY METRICS AND DIABETIC EDEMA FEATURES

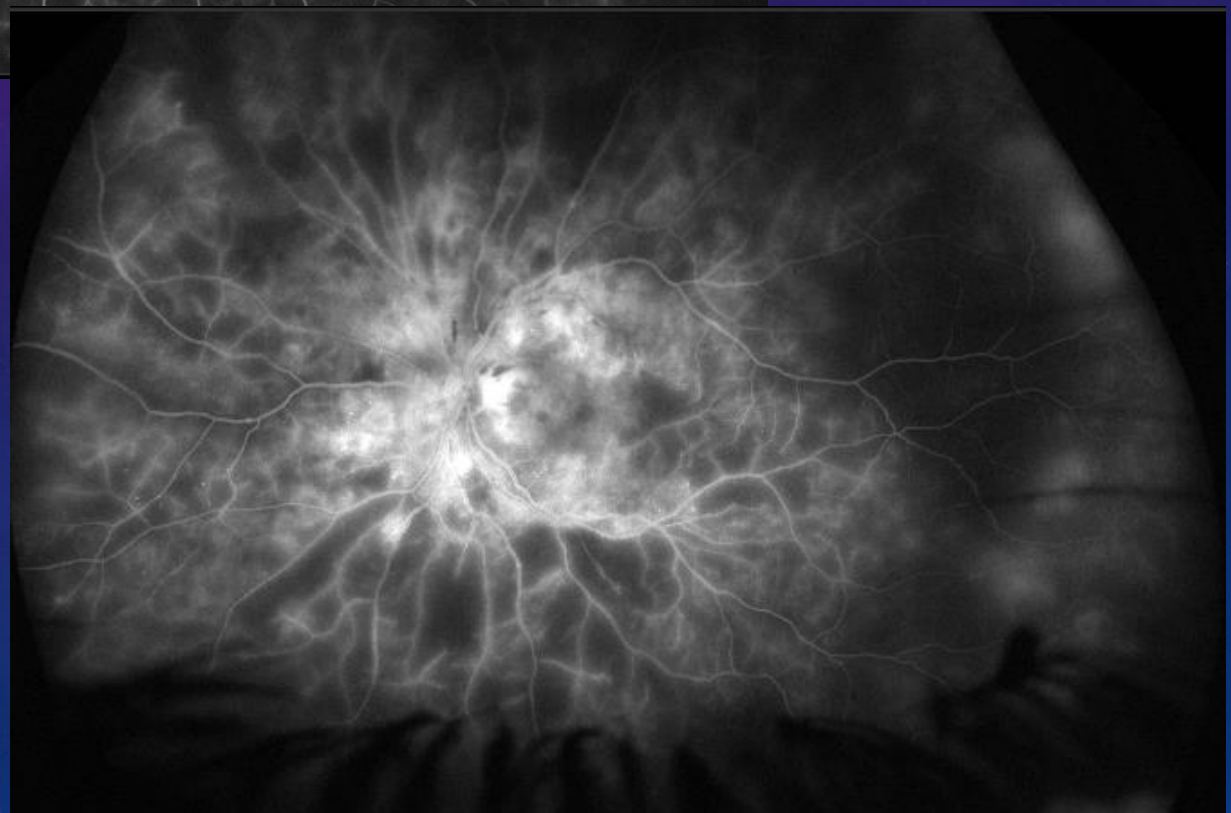
ARVO 2019: 2804; A JIANG, S SRIVASTAVA ET AL

- 304 eyes: 161 DME –ve: 143 DME +ve
- Automated measurement of Ischaemic area; quantitative leakage; microaneurysm count.
- Pan retinal leakage index, MA count and ischaemic index **not** associated with DME.
- DME presence; amount of thickening and SRF; associated with posterior pole leakage but not post pole MA count.

EXAMPLE: 57 FEMALE: VA 55; 1000MM

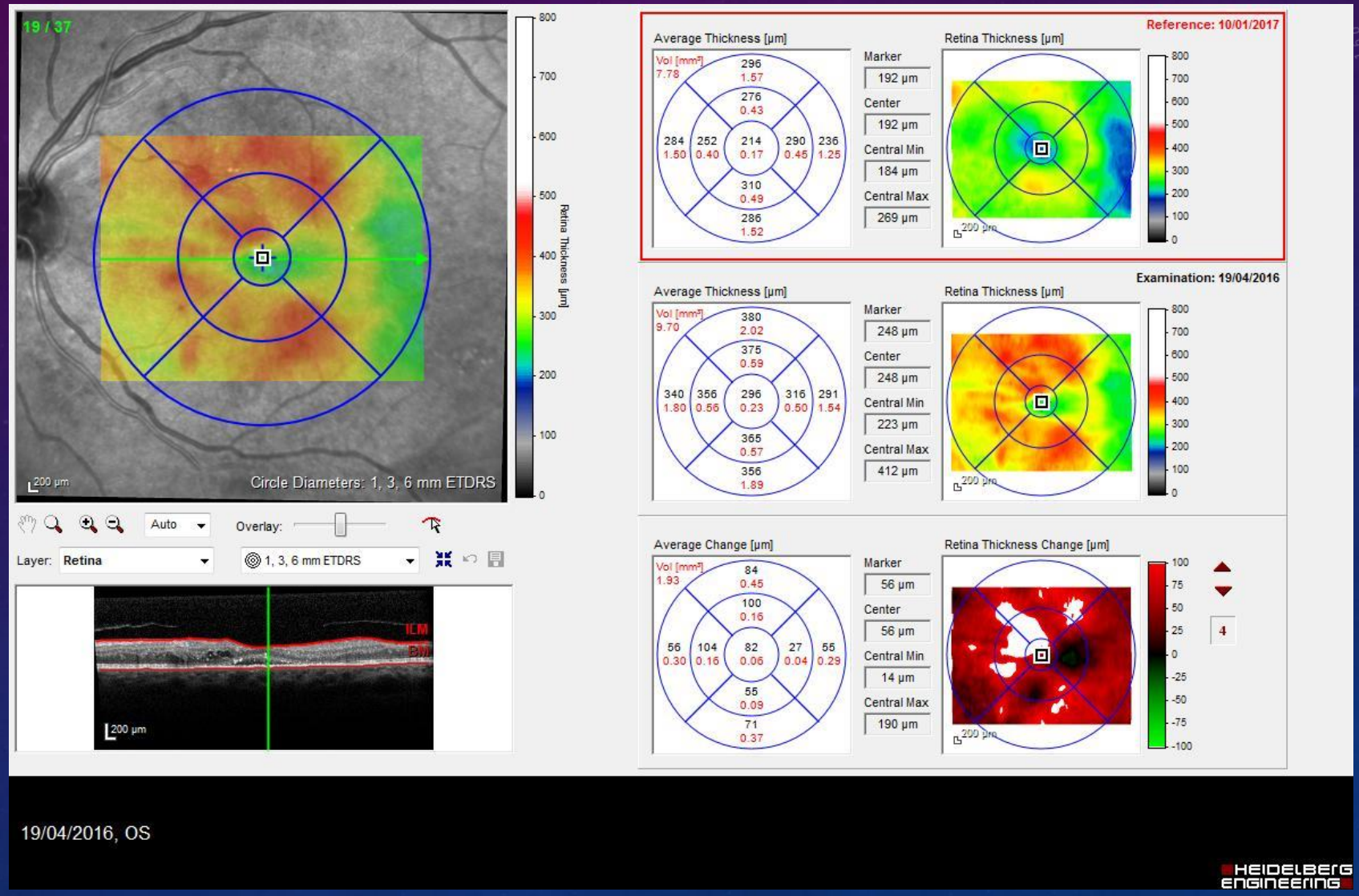






Most active leak is in the posterior pole

6 LUCENTIS OVER 6 MONTHS; AT 10 MONTHS 79 LETTERS



RETINAL NONPERFUSION CHARACTERISTICS ON ULTRA-WIDEFIELD ANGIOGRAPHY IN EYES WITH SEVERE NONPROLIFERATIVE DIABETIC RETINOPATHY AND PROLIFERATIVE DIABETIC RETINOPATHY

LUKE NICHOLSON, FRCOPHTH[1]; JAYASHREE RAMU, MBBS[1]; ERROL W. CHAN, FRCOPHTH[1]; ET ALJAMES W. BAINBRIDGE, PHD[1]; PHILIP G. HYKIN, MD[1]; STEPHEN J. TALKS, MD[2]; SOBHA SIVAPRASAD, MD[1]

JAMA OPHTHALMOL. PUBLISHED ONLINE APRIL 11, 2019.

- The current risk estimates of progression from nonproliferative diabetic retinopathy (NPDR) to PDR are based on the baseline grading of NPDR on color fundus photographs and systemic risk factors.[2]
- more accurate determinates of risk of PDR are required to personalize new treatment options
- The location of retinal capillary nonperfusion on fluorescein angiography (FA) is related to the presence of retinal neovascularization in eyes with PDR.[3]
- The threshold of nonperfusion required for conversion from NPDR to PDR remains unclear.

PATIENTS

- 92 patients: 59 in the PDR group (from Clarity study):
- 33 eyes NPDR (From RDP study)
- 59 eyes PDR; 40 NVE and 19NVD.
- RDP: Ranibizumab for Diabetic Macular Edema Panretinal Photocoagulation study
- CLARITY: Clinical Efficacy of Intravitreal Aflibercept vs Panretinal Photocoagulation for Best Corrected Visual Acuity in Patients With Proliferative Diabetic Retinopathy at 52 Weeks (CLARITY) study

- The main difference between NV and NPDR was increased peripheral non perfusion.
- NVD had a larger amount of non perfusion and increased posterior non perfusion
- NVE alone tends to occur on the edge of an area of non perfusion
- Threshold for NV 118 disc areas

MARCUS DM, SILVA PS, LIU D, ET AL.

ASSOCIATION OF PREDOMINANTLY PERIPHERAL LESIONS ON ULTRA-WIDEFIELD IMAGING AND THE RISK OF DIABETIC RETINOPATHY WORSENING OVER TIME.

JAMA OPHTHALMOL. PUBLISHED ONLINE AUGUST 18, 2022. DOI:10.1001/JAMAOPHTHALMOL.2022.3131

- **Question** Does detection of predominantly peripheral diabetic retinopathy lesions (PPLs) outside the 7 standard Early Treatment Diabetic Retinopathy Study fields on ultra-widefield imaging improve the ability to predict rates of disease worsening (diabetic retinopathy progression or receipt of treatment) beyond the risk associated with baseline severity level?
- **Findings** In this cohort study, presence of fluorescein angiography PPL at baseline, independent of baseline diabetic retinopathy severity level, was associated with greater risk of disease worsening over 4 years, while presence of color PPL was not.
- **Meaning** Peripheral findings on ultra-widefield fluorescein angiography allow more accurate identification of eyes with nonproliferative diabetic retinopathy at a greater risk for future disease worsening than provided by baseline severity level alone.

CONCLUSIONS

- UWColour and OCT used as next step to assess the retina from screening
- UWFFA can help demonstrate the overall perfusion of the retina, risk of progression, distinguish Irma from NVE and help in planning laser. NVs outside standard 7 fields may be detected.
- OCT/ OCTA can help distinguish NVs and the need for treatment.
- Both the RDP and DAVE study have not shown evidence that adding peripheral targeted laser to areas of non perfusion alter the number of ranibizumab injections or improve outcomes.
- Evidence suggests that posterior pole leakage as seen on FFA is the main association with DMO