CLARUS - ZEISS EXPERIENCE

Ultra-Widefield True Color Fundus Imaging

Centro di eccellenza Zeiss per la diagnostica

www.amedeolucente.it

Zeiss Reflex free Retinal Camera after Nordenson 1930

Price $ 768 f.o.b. N.Y. (free of board)
768 $ x 19,91 $ = 15.290 $
1 $ 1933 ~ 19,91 $ todey
1$ 1933 = 10 bottles of beer
Ford Model T ~ 850 $ 1911; ~ 300 $ 1927
Paga Operaio della Ford 5-8 $/giorno
by: https://scenarieconomici.it

La prima fundus camera era basata sull'ottica geometrica secondo i principi dell'oculista svedese Allvar Gullstrand (1862-1930), premio Nobel per la Medicina nel 1911

Progetto di J.W. Nordenson del 1925 (1883-1965)

Realizzata da Carl Zeiss nel 1926

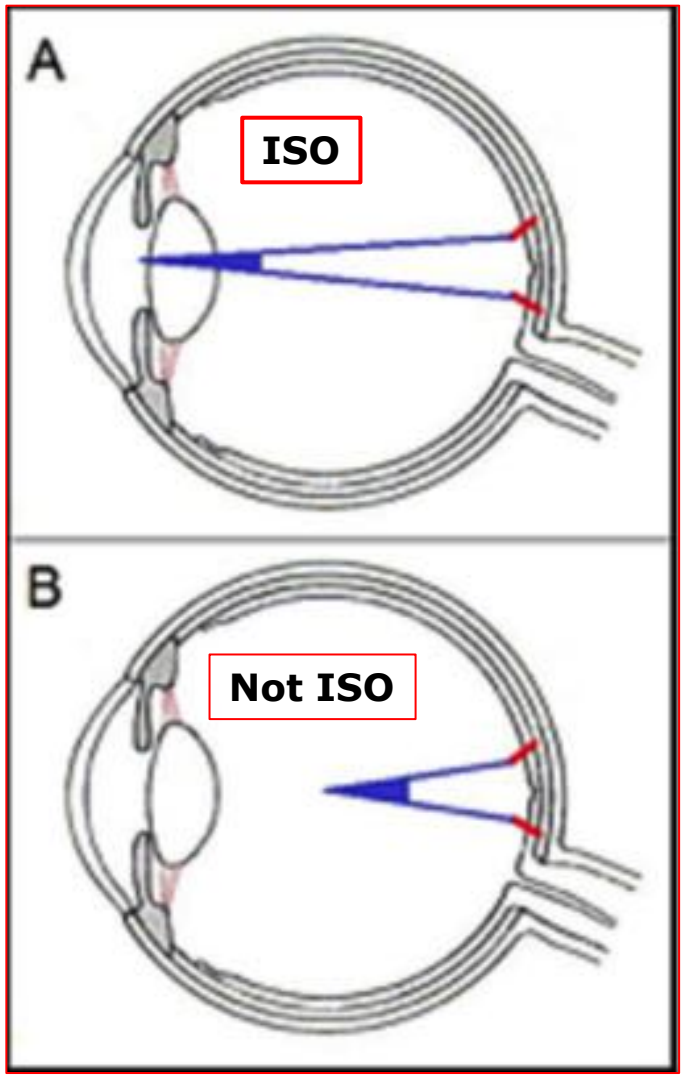
Commercializzata nel 1930

Apertura angolare di 10°, subito dopo di 20°

0,5 secondi esposizione, color film come pellicola

Dopo lunga elaborazione si passa a 30°, standard nella retinografia fino alla pubblicazione dell'ETDRS

Switch-off retinal imaging 45°/60° v/s WF & UWF
Clarus 500 Zeiss: Italia aprile 2018



FoV Fied of View
WF Widefield Imaging FoV ≥ 50°
UWF Ultra Widefield Imaging FoV ≥ 100°

ISO 10940 International Organization for Standardization
Centro dell'apertura angolare nell'area pupillare

90° ISO~133°not ISO

133° ISO~200°not ISO

WF & UWF

Ophthalmic Services Guidance Ophthalmic Imaging March 2021

Widefield imaging WF are considered to be **"single"** images depicting retinal anatomy **beyond the posterior pole, but posterior to the vortex vein ampulla in all 4 quadrants**

Ultra-Widefield UWF images depicting retinal anatomy **beyond the vortex vein ampulla**

Choudhry, N.; Duker, J.S.; Freund, K.B.; Kiss, S.; Querques, G.; Rosen, R.; Sarraf, D.; Souied, E.H.; Stanga, P.E.; Staurenghi, G.; et al. Classification and Guidelines for Widefield Imaging: Recommendations from the International Widefield Imaging Study **Group. Ophthalmol. Retin. 2019**, 3, 843–849.

Ultra-widefield imaging UWF as images showing retinal anatomic features **anterior to the vortex vein ampullae in all four quadrants.**

Mohamed Ashraf, Jerry D. Cavallerano, Jennifer K. Sun, Paolo S. Silva and Lloyd Paul Aiello.
Ultrawide Field Imaging in Diabetic Retinopathy: Exploring the Role of Quantitative Metrics.
J. Clin. Med. 2021, 10, 3300

- It is important to note that at present, both **Wide and Ultra-Wide Field** adjective descriptions **can be applied not only to colour, pseudo-colour and fundus autofluorescence but also to OCT cross-sectional, topographic and angiographic imaging**, all OCT imaging **with and without 3-D rendering**
(The Royal College of ophthalmologists London)

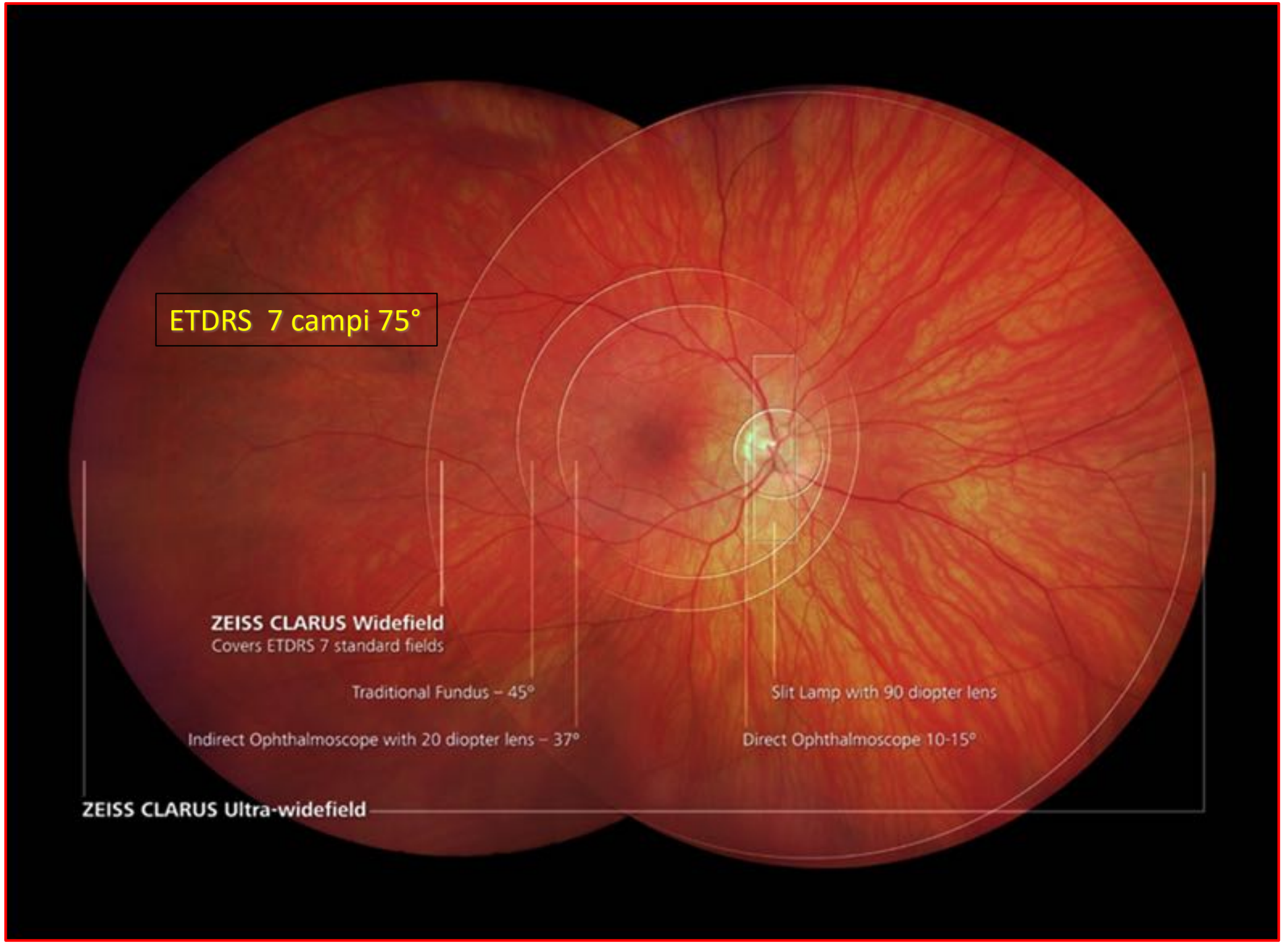
- UWF imaging allows the visualization of a substantially **greater area of the retina compared to the standard seven field Early Treatment Diabetic Retinopathy Study (ETDRS) fields (82% vs. 30%)**

- UWF allows the identification of **DR lesions predominantly outside the ETDRS seven-standard fields**, referred to as **predominantly peripheral lesions (PPL)**

- Several studies have demonstrated that **PPL are present in 30–40% of eyes with DR**

- PPL suggested a more severe DR level in 11% of eyes

- PPL have been associated with a 3.2 fold increased risk DR progression and a **4.7 fold increased risk for progression to proliferative DR over four years**



Early Treatment Diabetic Retinopathy Study

Studio clinico multicentrico sostenuto dal NEI National Eye Institute

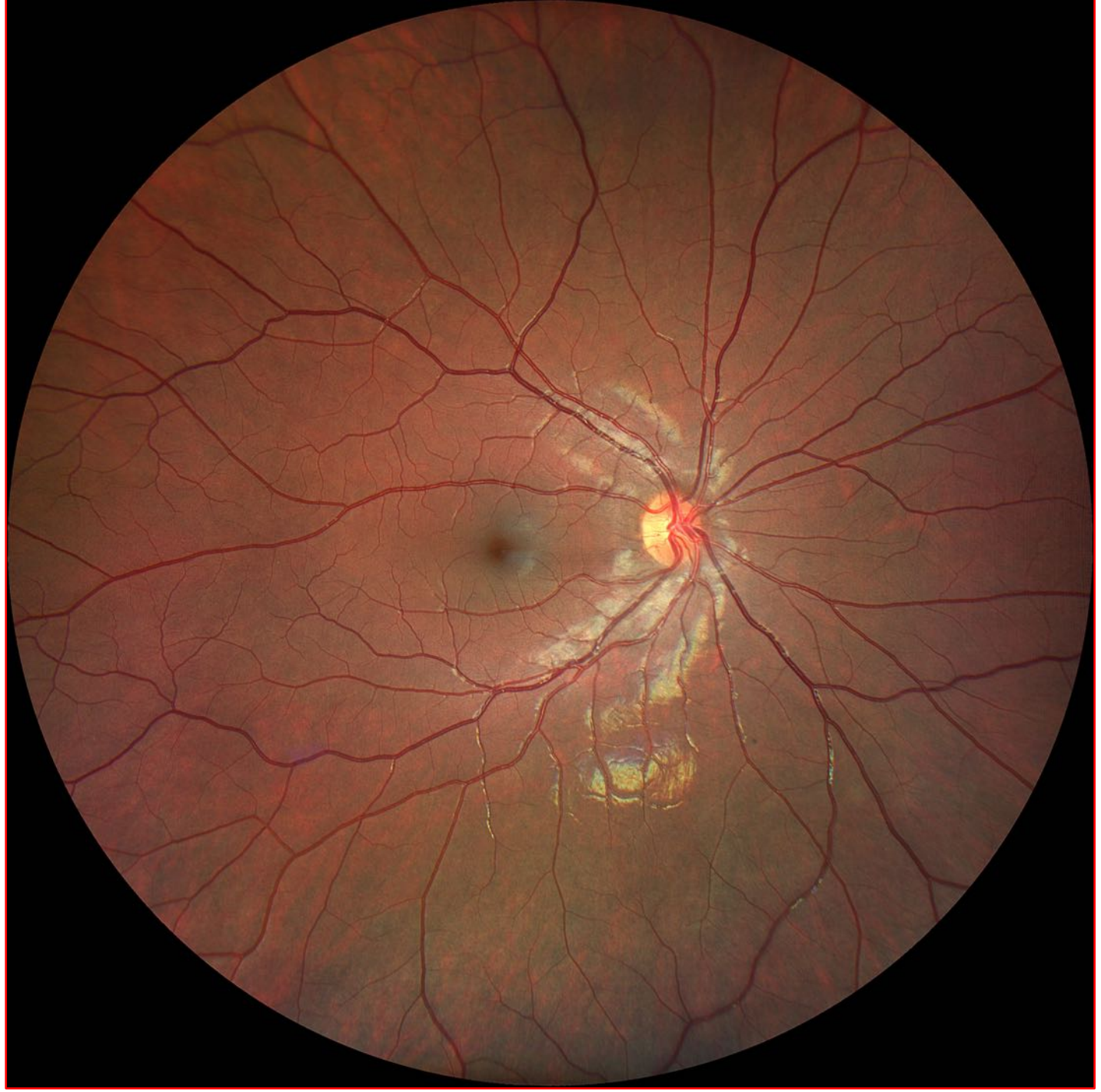
Question: efficacia fotocoagulazione argon laser v/s aspirina in NPDR Non-Proliferative Diabetic Retinopathy / HR-PDR High-Risk Proliferative Diabetic Retinopathy

Strat: 1979
End: 1985
Follow-up: 1988
Published: 1991

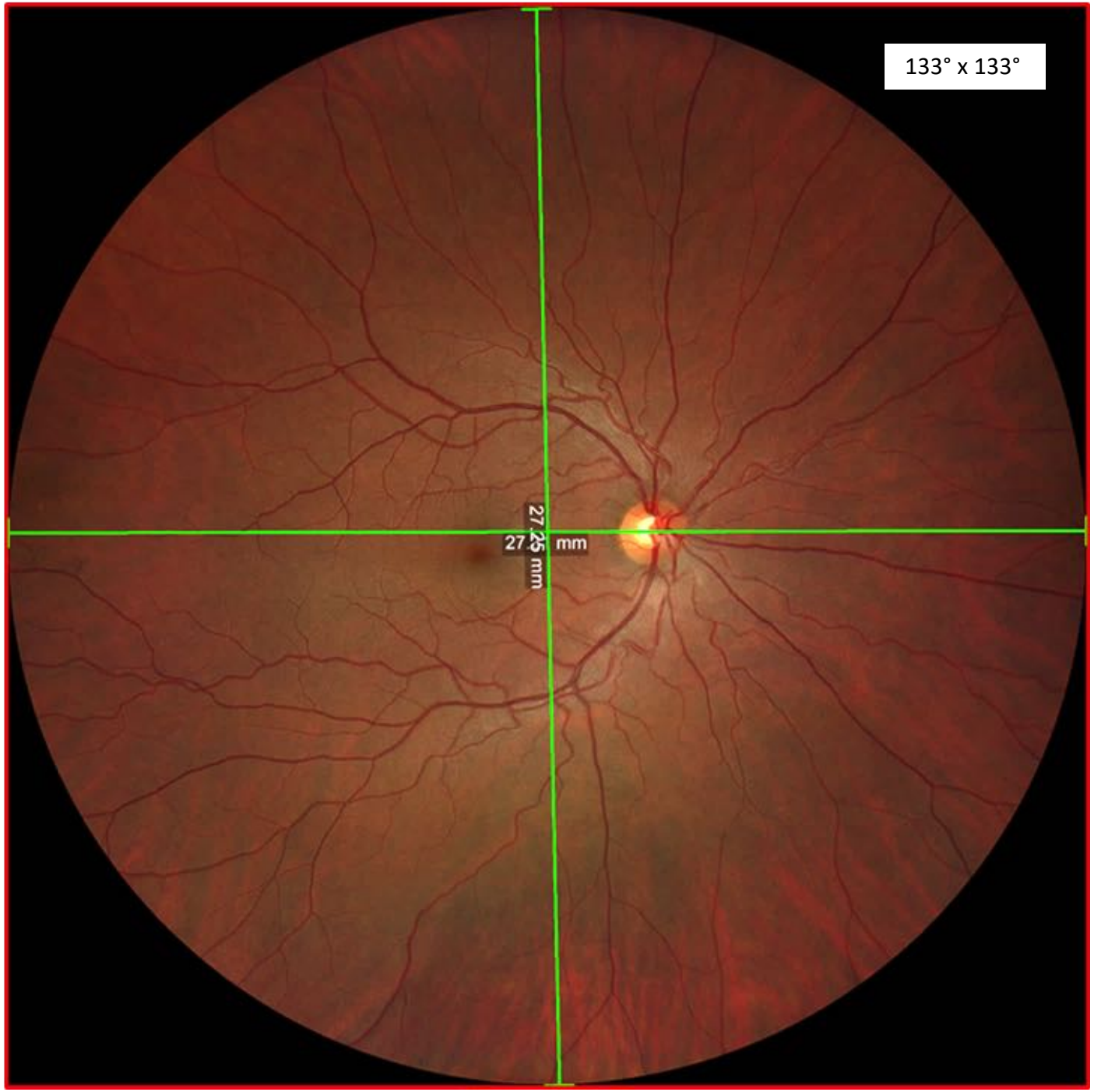
22 centri
3.711 pazienti 18 →70 aa ♀♂

period 4 years
not laser teratment
visus ≥ 20/40

Imaging 7 campi oltre le arcate vascolari



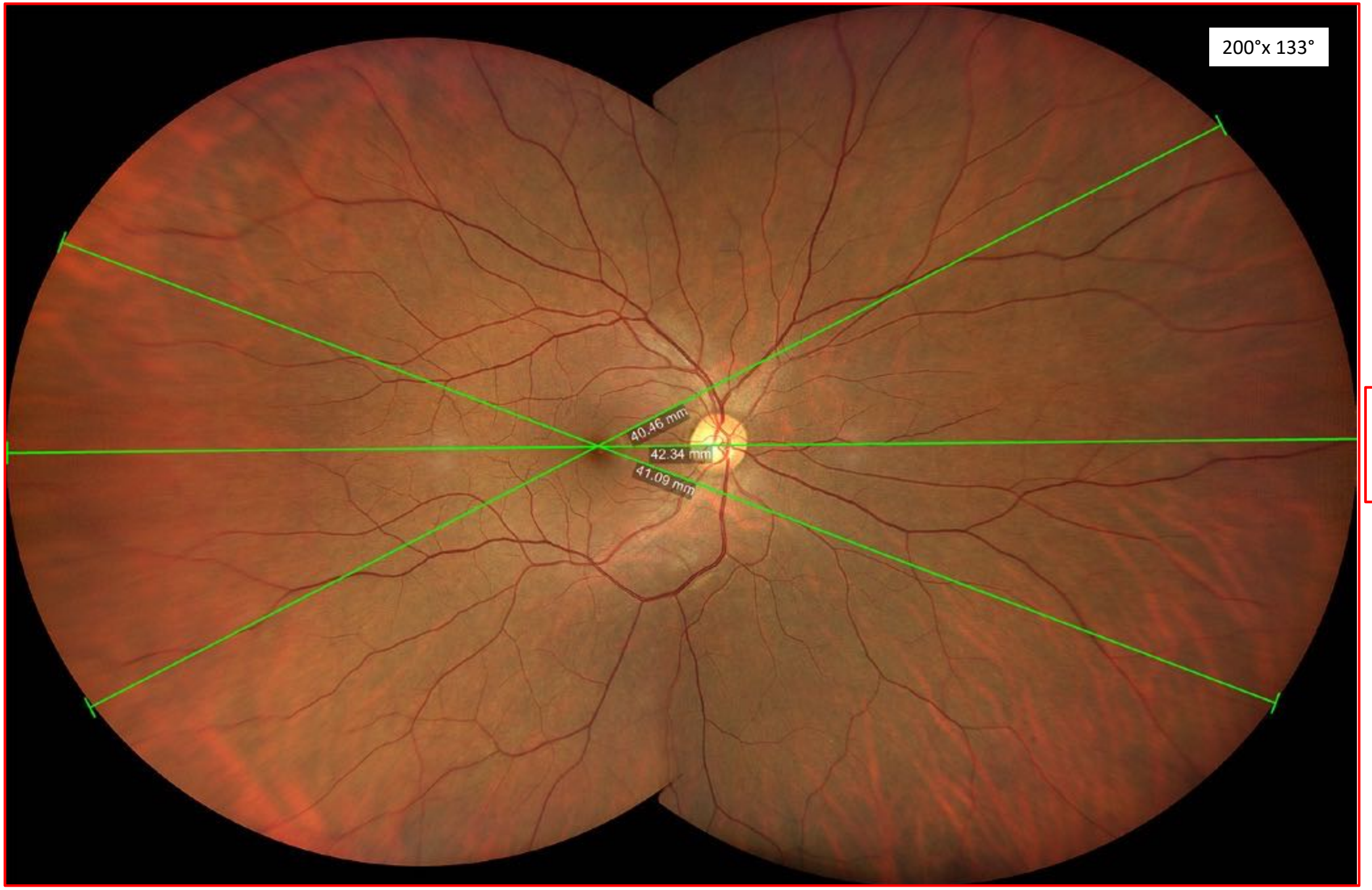
? 82%
? 267°



1 Shot WF

FoV 133°x 133°

~ 27 mm SINT



UWF 2 Shots

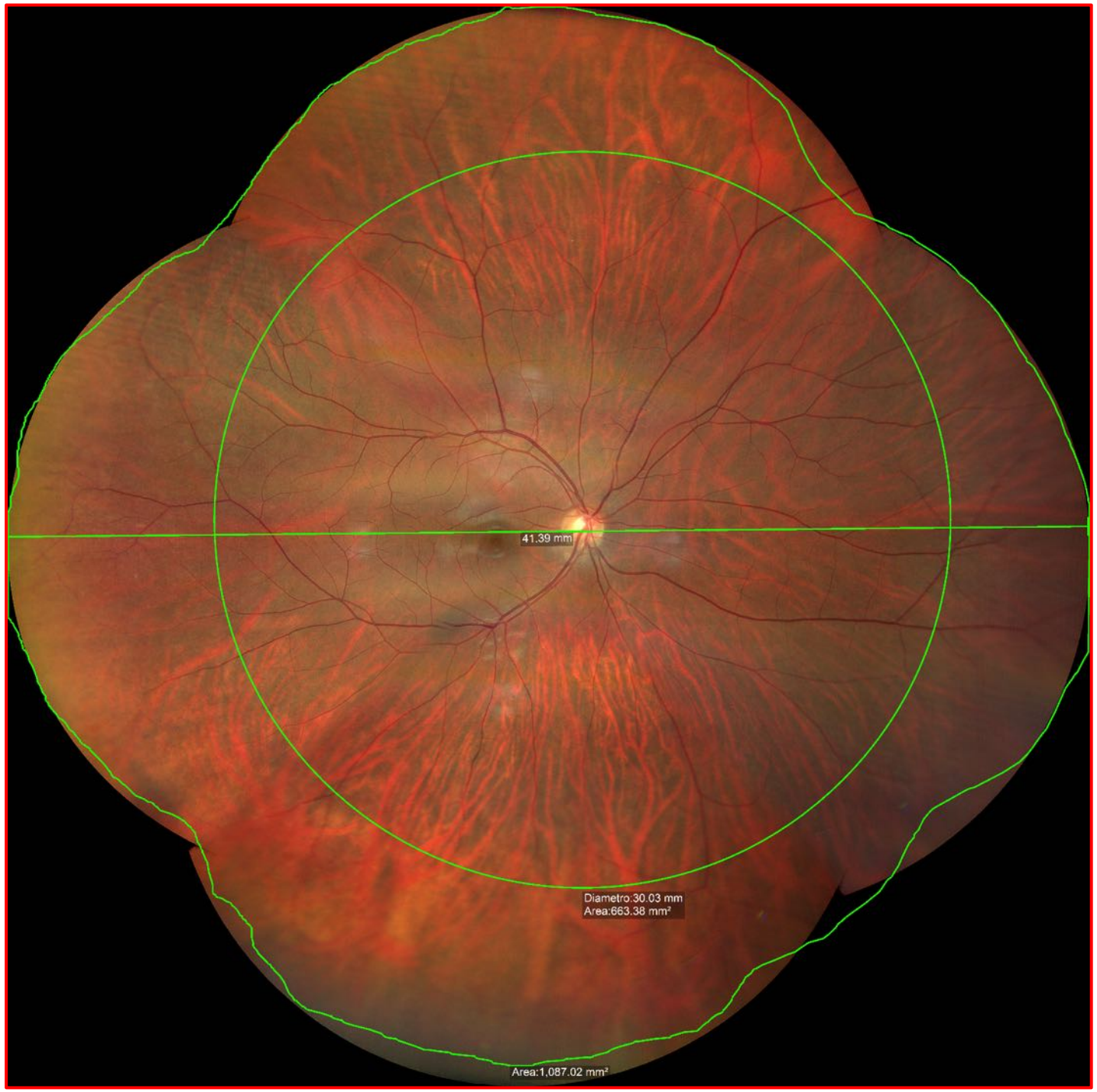
200° wide by 133° high
~ 41mm

UWF 4 Shots

automatic montage

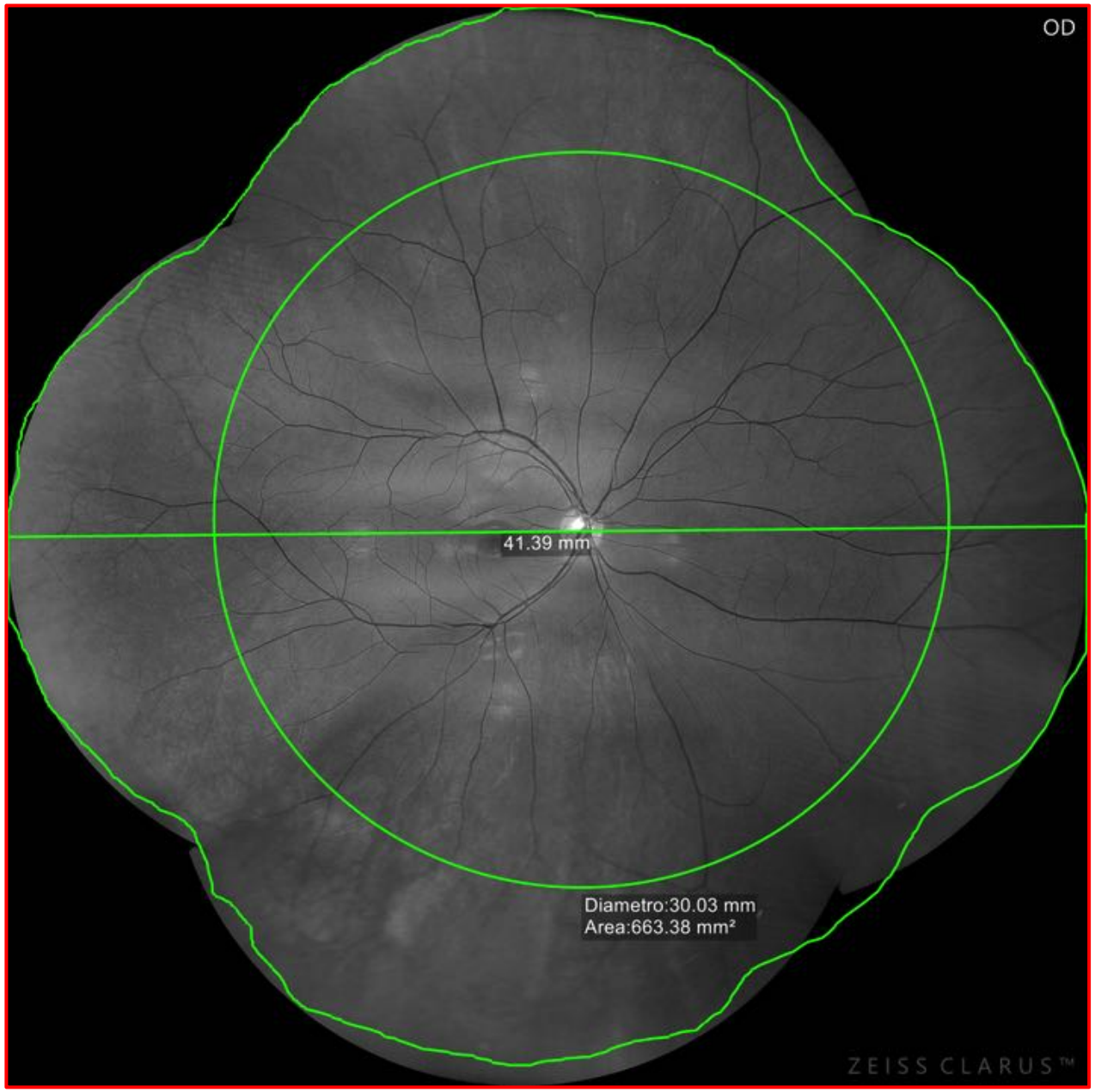
FoV 200° x 200°

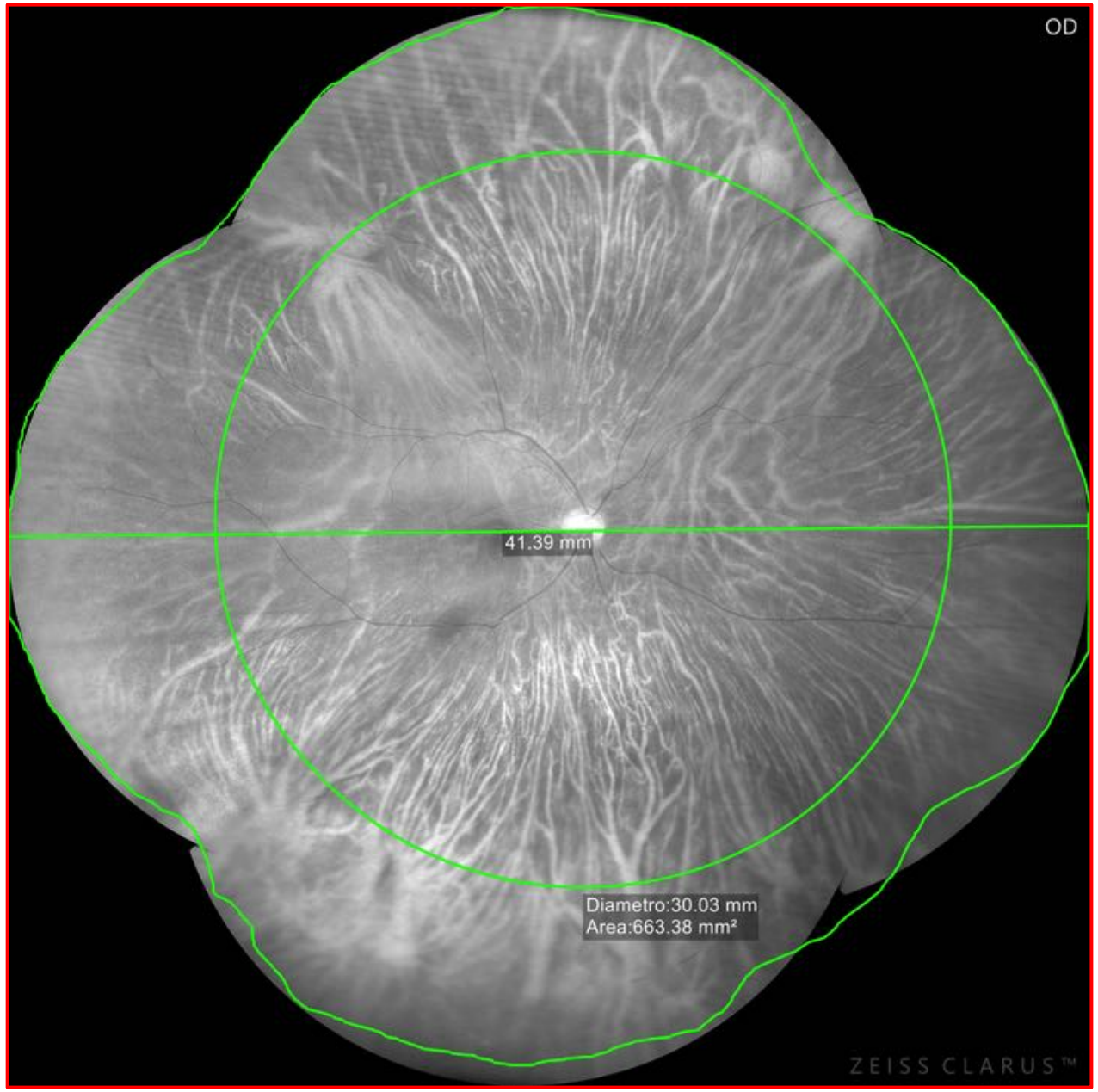
wide by tall ~ 41 mm



WF v/s UWF
vortex vein ampulla ~ 30mm
real area ± 670mm²

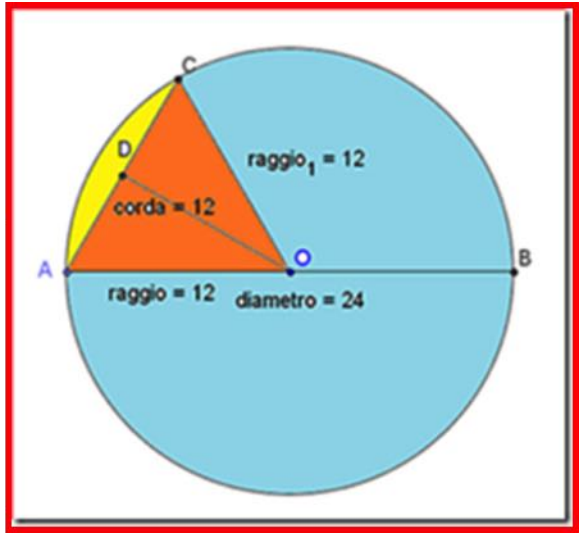
wide by tall ~ 41 mm
real area ± 1100mm²


OD
41.39 mm
Diametro:30.03 mm
Area:663.38 mm²
ZEISS CLARUS™


OD
41.39 mm
Diametro:30.03 mm
Area:663.38 mm²
ZEISS CLARUS™

SFERA IDEALE

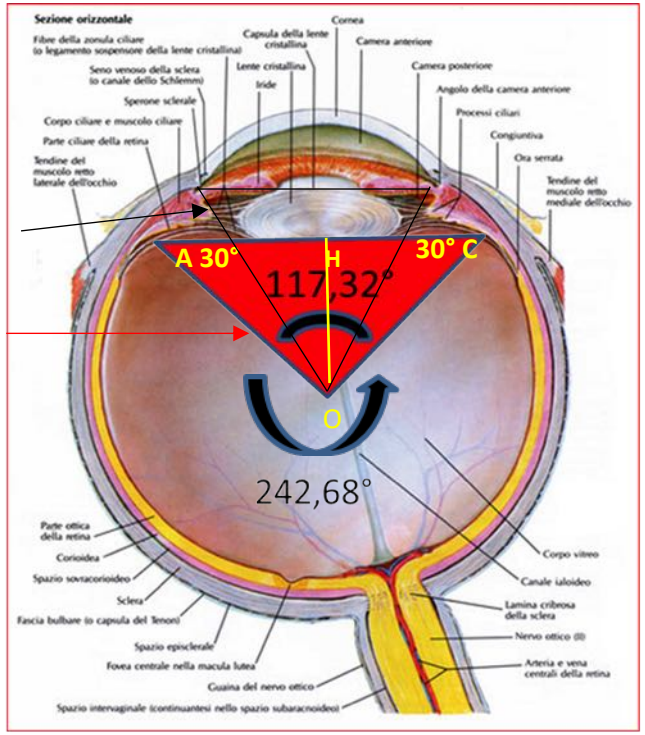
AB ~ 24 mm
AO ~ 12 mm
AC ~ 12 *mm*
AC arco
~ 12, 56*mm*
AOC Triangolo
Equilatero ~ 60°



Equilatero
12mmx3/60°

Isoscele AOC
12x2/20mm
30°x2/60°

117,32°+ 242,68°= 360°



Testut, Zaccheo, Bonnet, Orzalesi, le dimensioni del bulbo oculare umano sono:
diametro trasverso 23,5 mm
diametro verticale 23 mm
diametro antero-posteriore 25-26 mm
Forma ricalca un ellissoide triassiale

Misure bulbo teorico Testut, Zaccheo, Bonnet, Orzalesi

Diametro trasverso latero-laterale **d ~ 24mm;** raggio ideale **r ~ 12mm**

Lunghezza circonferenza **C = 2 π r = 2 x 3,14 x 12mm ~ 75.36mm**

Corpo ciliare bulbo **~ 6mm**; **2 corpi ciliari = 2 x 6mm ~ 12mm**

Corda bianco-bianco **~ 12mm**

Arco corneale sotteso alla corda bianco- bianco **± 1/6 C = 75,36/6 ~ 12,56mm**

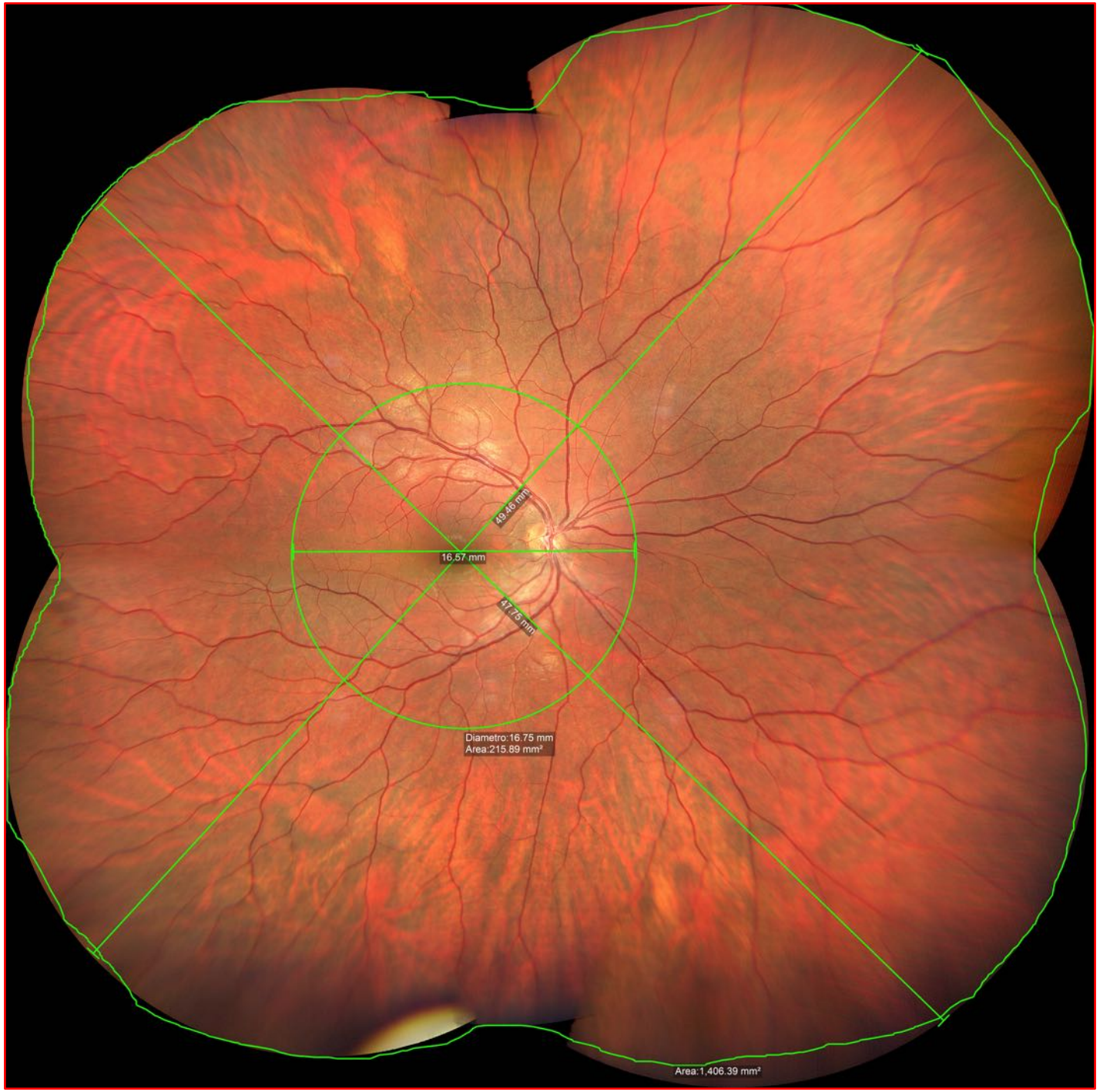
Arco circ- ora serrata/ora serrata **12,56+2 corpi ciliari=12,56+12 ~ 24,56mm**

Lungh. lineare seg. post. fotografabile **75,36mm – 24,56mm ~ 50,80mm**

Seg. ant. non fotografabile in **φ 75,36mm : 360 = 24,56 : X ~ 117,32°** $\cos 30° \frac{\sqrt{3}}{2}$

Seg. post. fotografabile in **φ 360°- 117,32° ~ 242,68°**

AO=CO =12; AC = 2 x AH; AH = AO cos 30°= 12 cos 30° = $6\sqrt{3}$; **AC** = 2 x $6\sqrt{3}$ **± 20,5mm**
OH= $\sqrt{AO^2 - AH^2} = \sqrt{12^2-10^2} = \sqrt{144 -100} = \sqrt{44}$ = **6,7mm**
Superficie area retinica sfera perfetta **4 x π r² = 4 x 3,14 x 12² ~ 1808mm²**
Superficie area retinica emisfera perfetta ½ **4 x π r² ~ 1808/2 ~ 904mm²**
Seg. post fotografabile in mm² **1808 : 360° = X : 242,68 ~ 1218,8mm²**



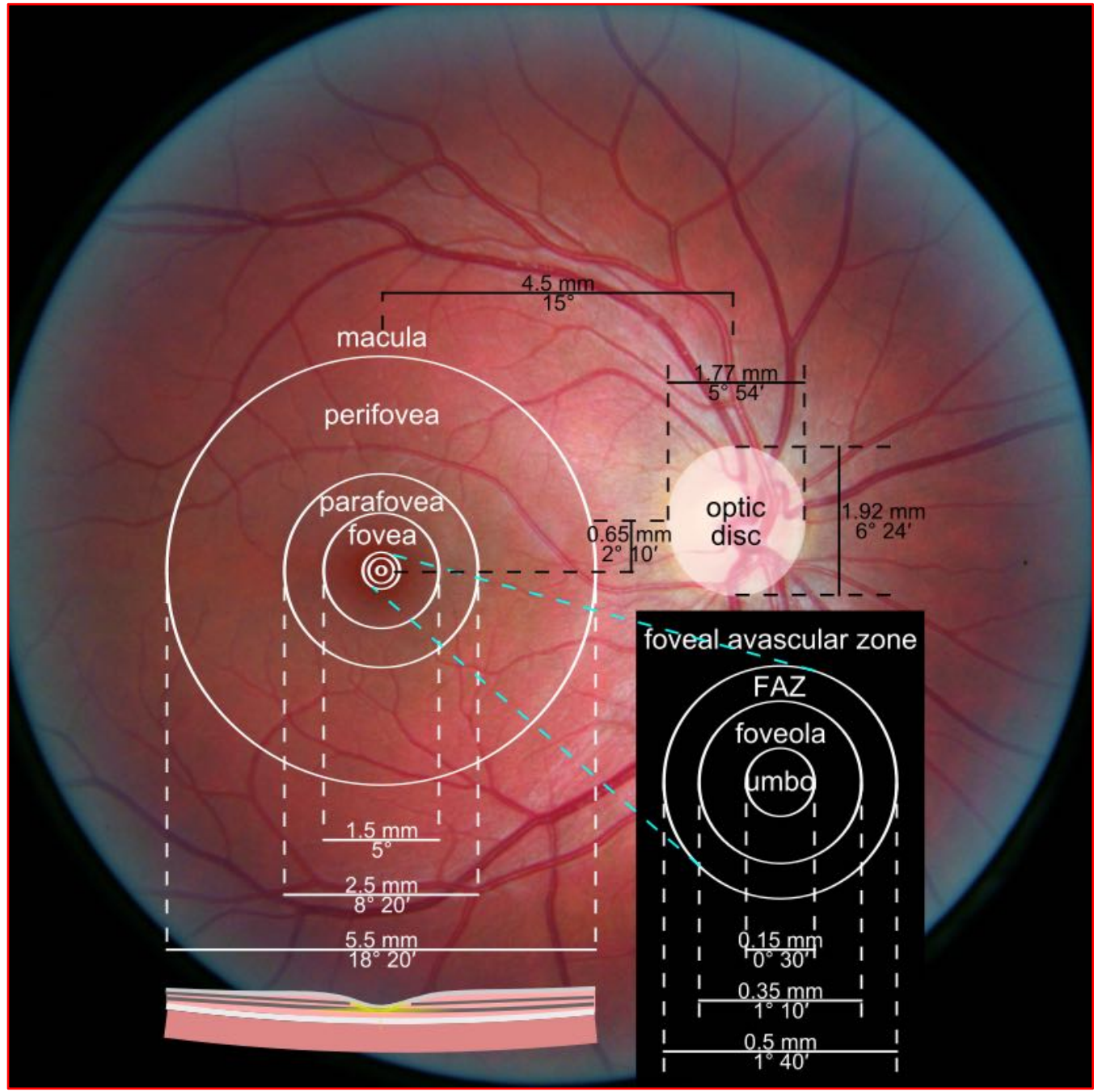
UWF 6 Shots
semiautomatic montage
wide by tall ~ 50mm

central circle
~ FoV 45°
diameter ±16mm (radius ± 8mm)
area ~ 200 mm²

site to site full imaging
FoV 242°≠ 267°

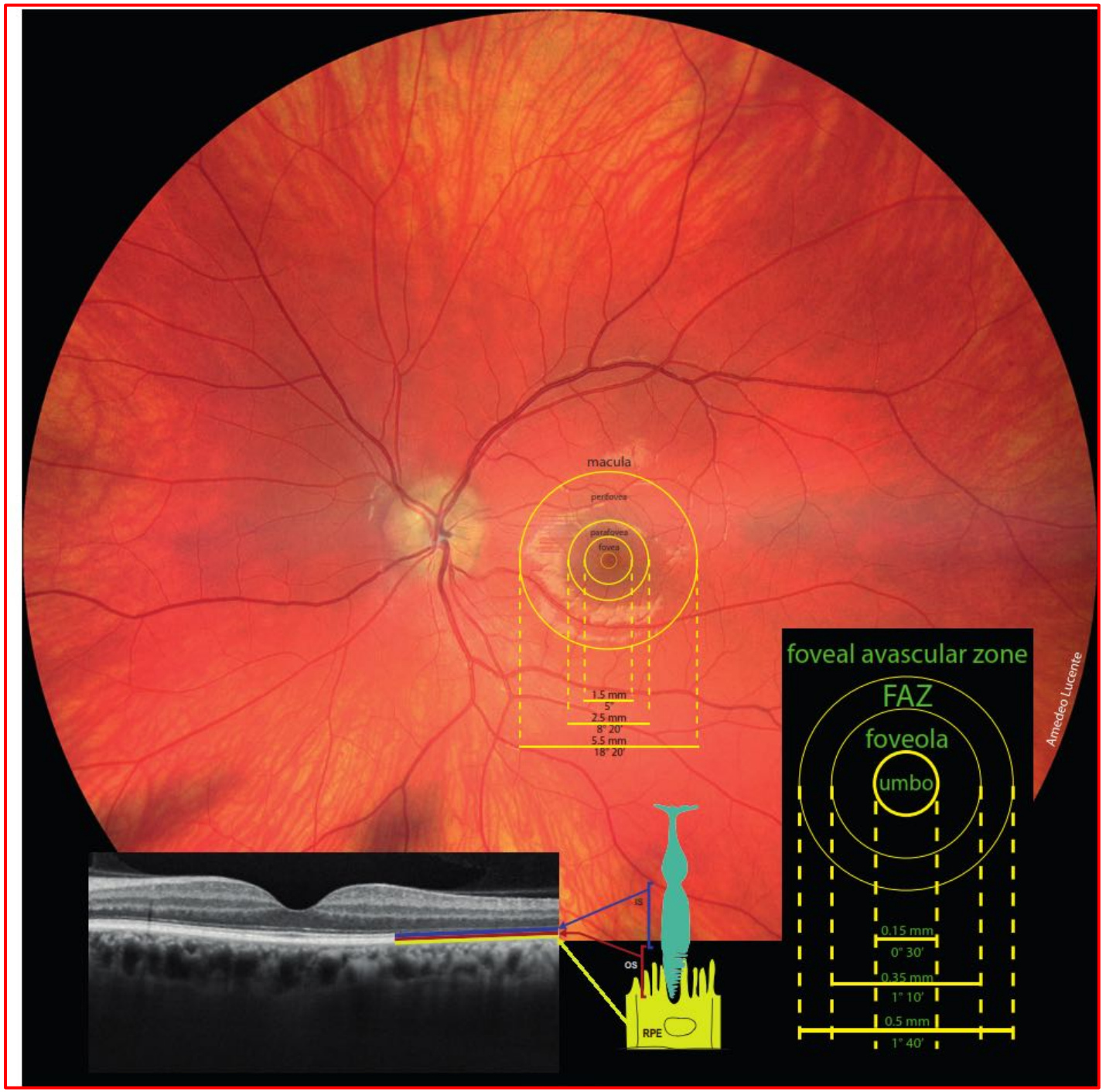
real imaging ~ 1400mm²

1808:100=1400:X; X = 77,5%



by Wikipedia

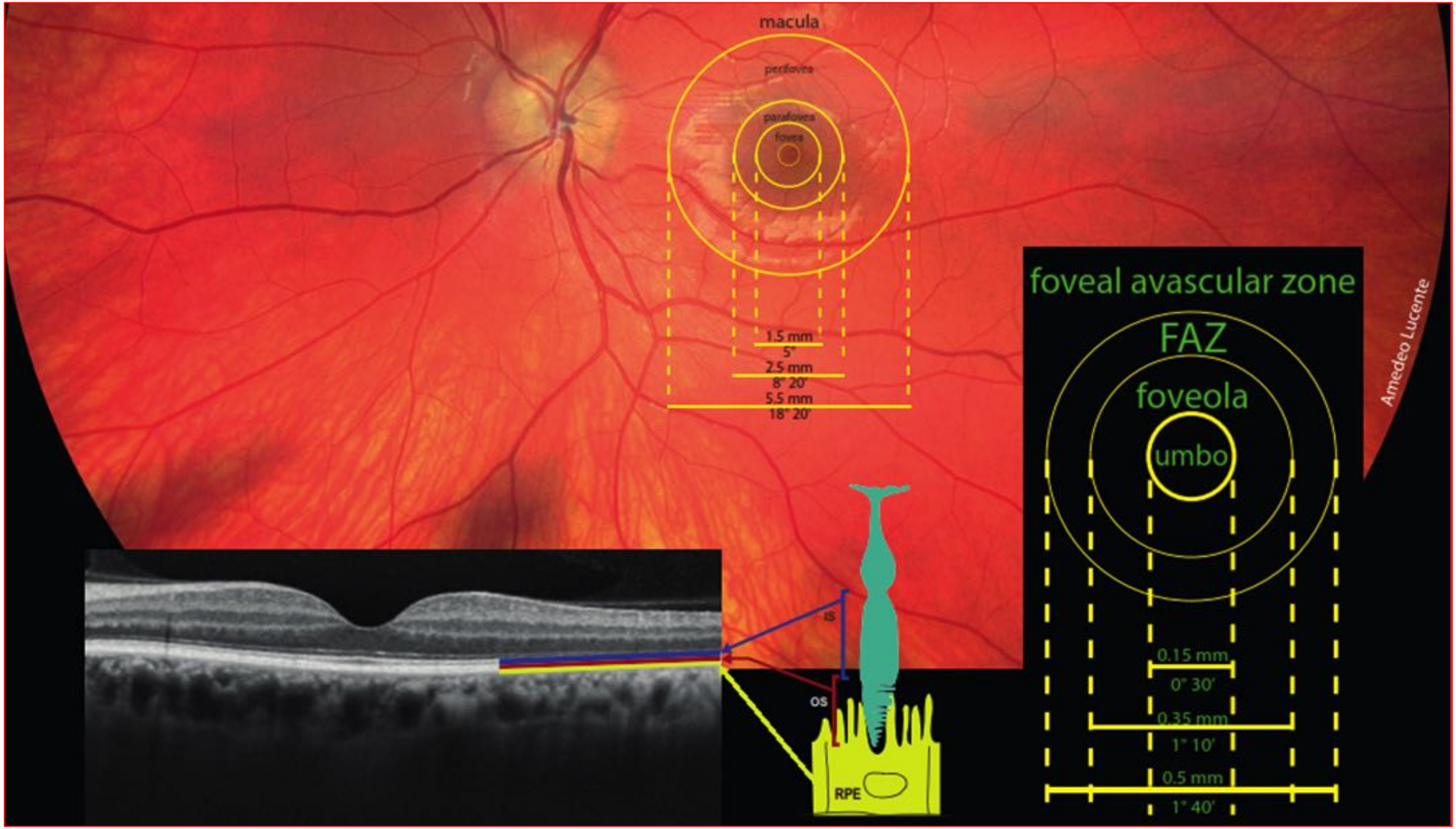
by Clarus Zeiss

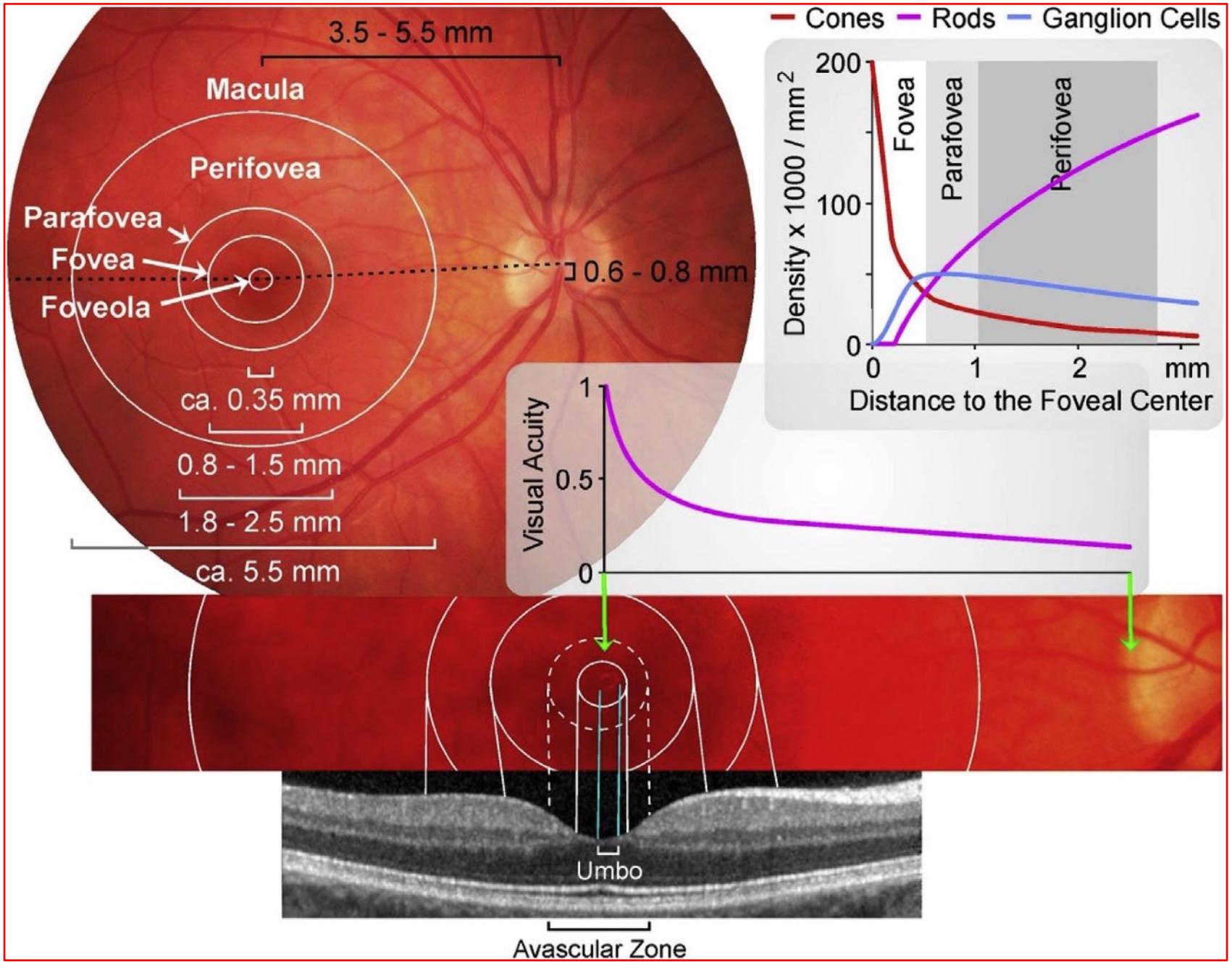


Macula
Diameter 5,5mm
Radius 2,75mm
Area π r² = 23,8mm²

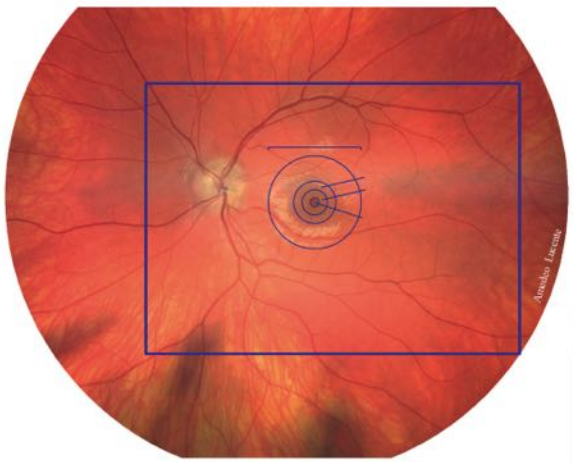
Parafovea
Diameter 2,5mm
Radius 1,25mm
Area π r² = 4,90mm²

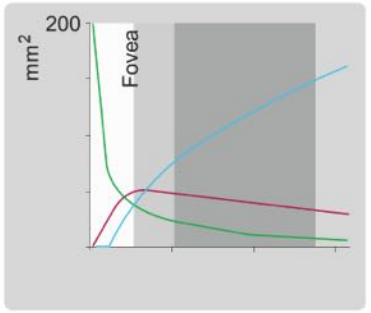
Fovea
Diameter 1,5mm
Radius 0,75mm
Area π r² 1,77mm²

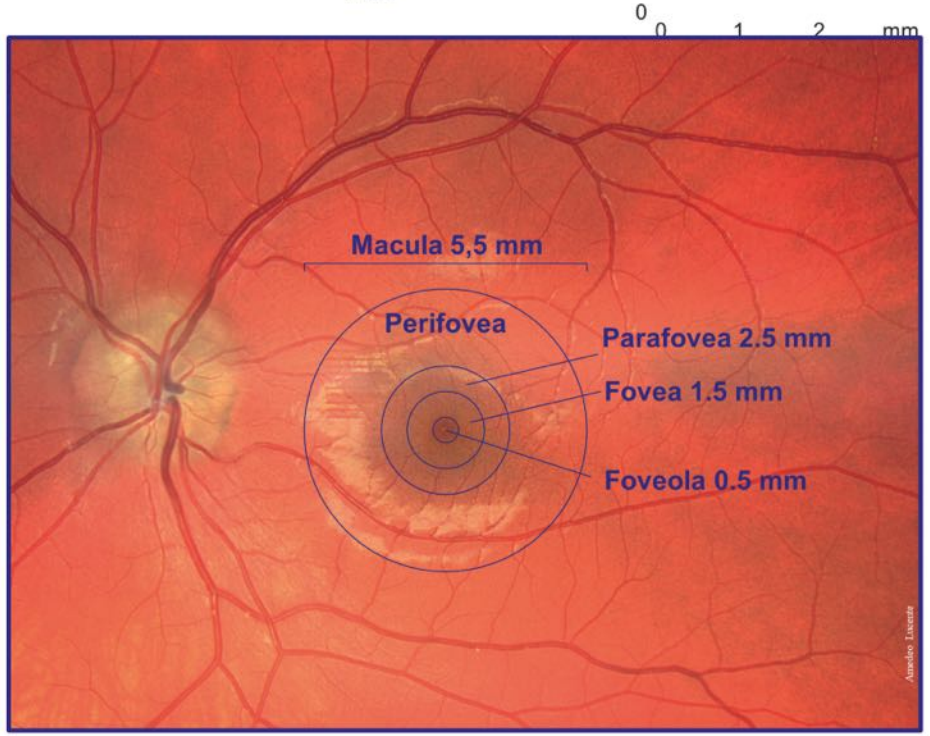

macula
perifovea
parafovea
fovea
1.5 mm
5°
2.5 mm
8° 20'
5.5 mm
18° 20'
foveal avascular zone
FAZ
foveola
umbo
0.15 mm
0° 30'
0.35 mm
1° 10'
0.5 mm
1° 40'
IS
OS
RPE
Amedeo Lucente



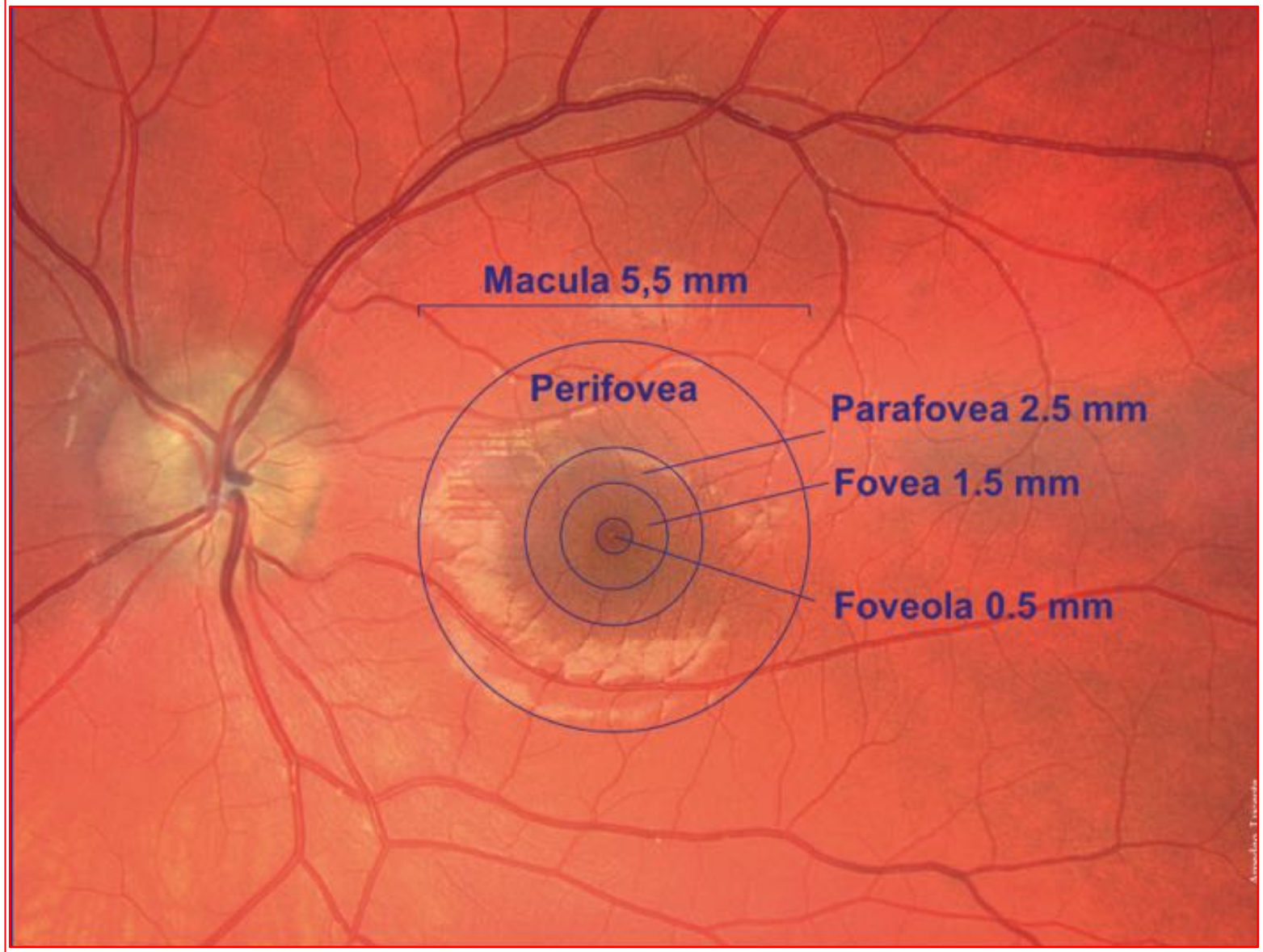
by Andreas Bringmann et al.
Progress in Retinal and Eye Resarch
Vol 66, September,2018, Pages 49-84

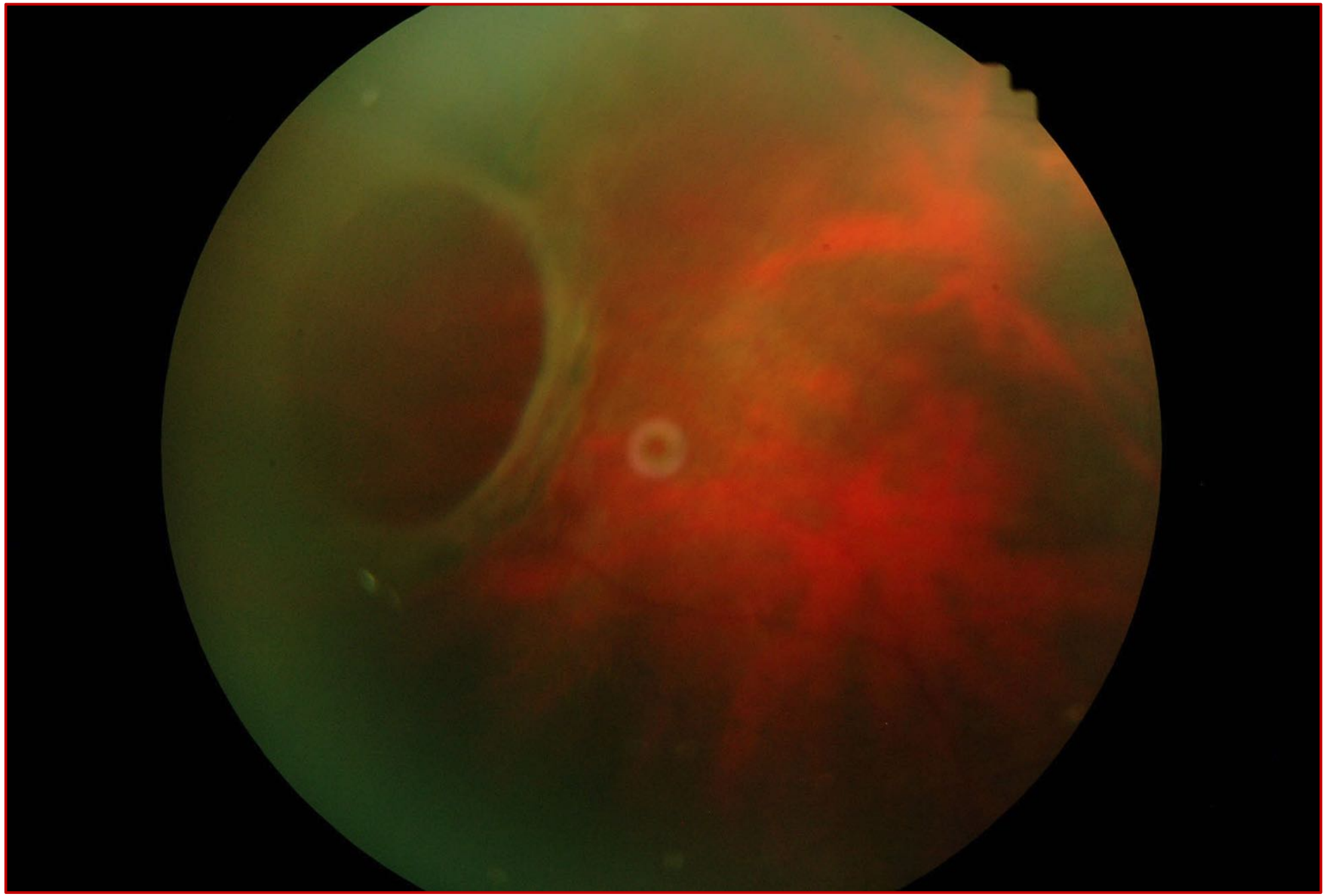


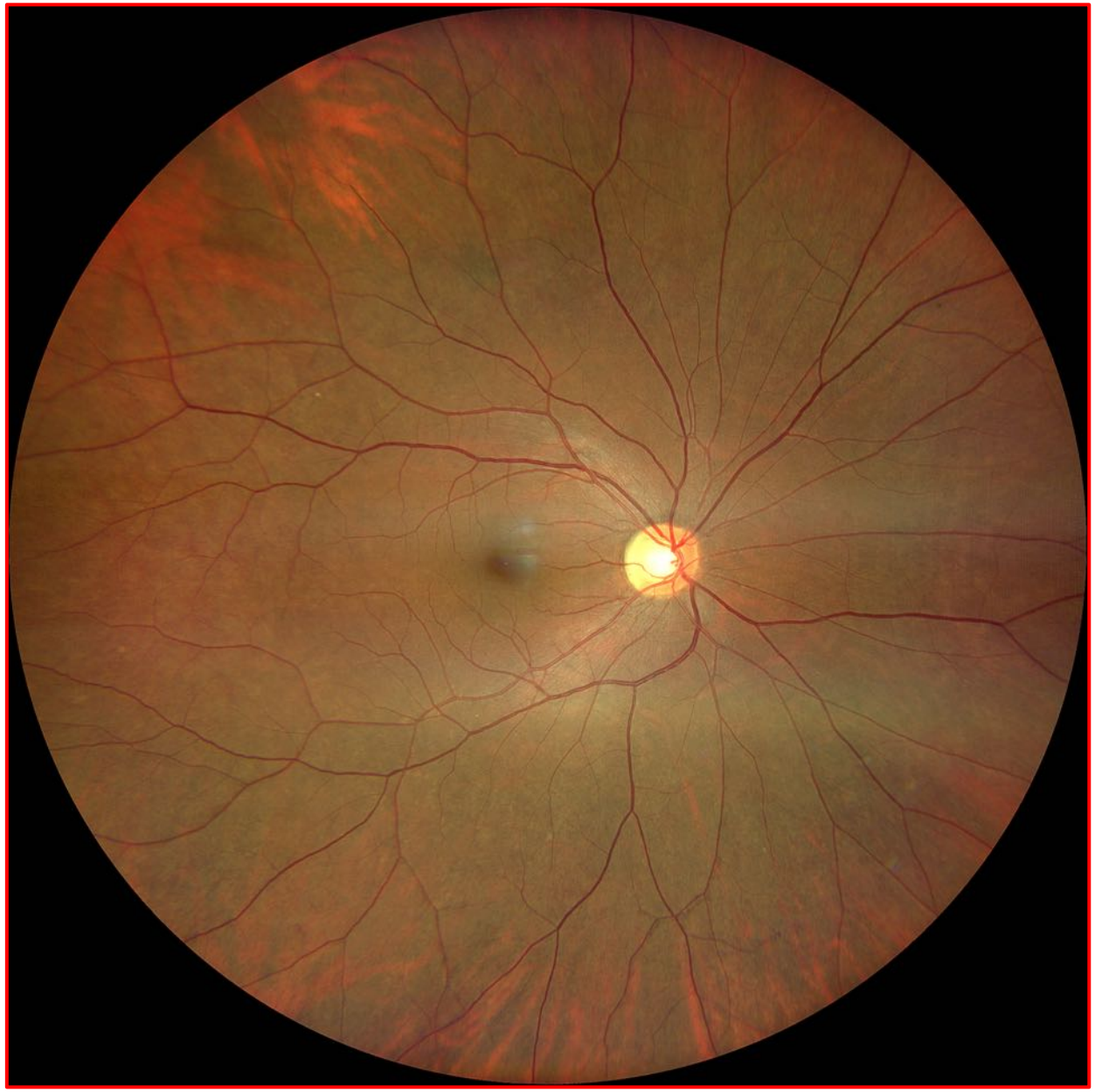


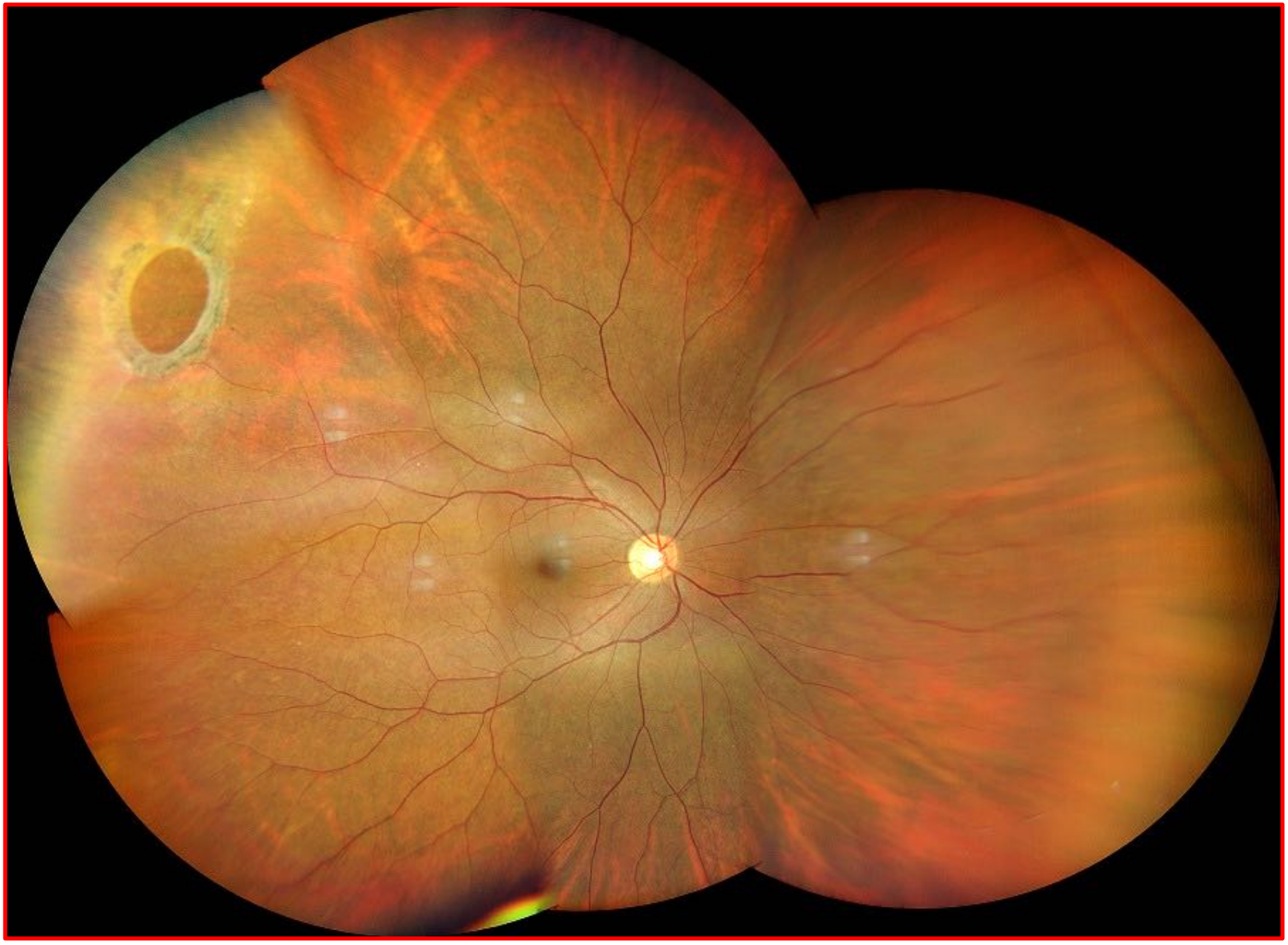


by Clarus Zeiss









Foro retinico periferico gigante: Consensus Conference

di Amedeo Lucente

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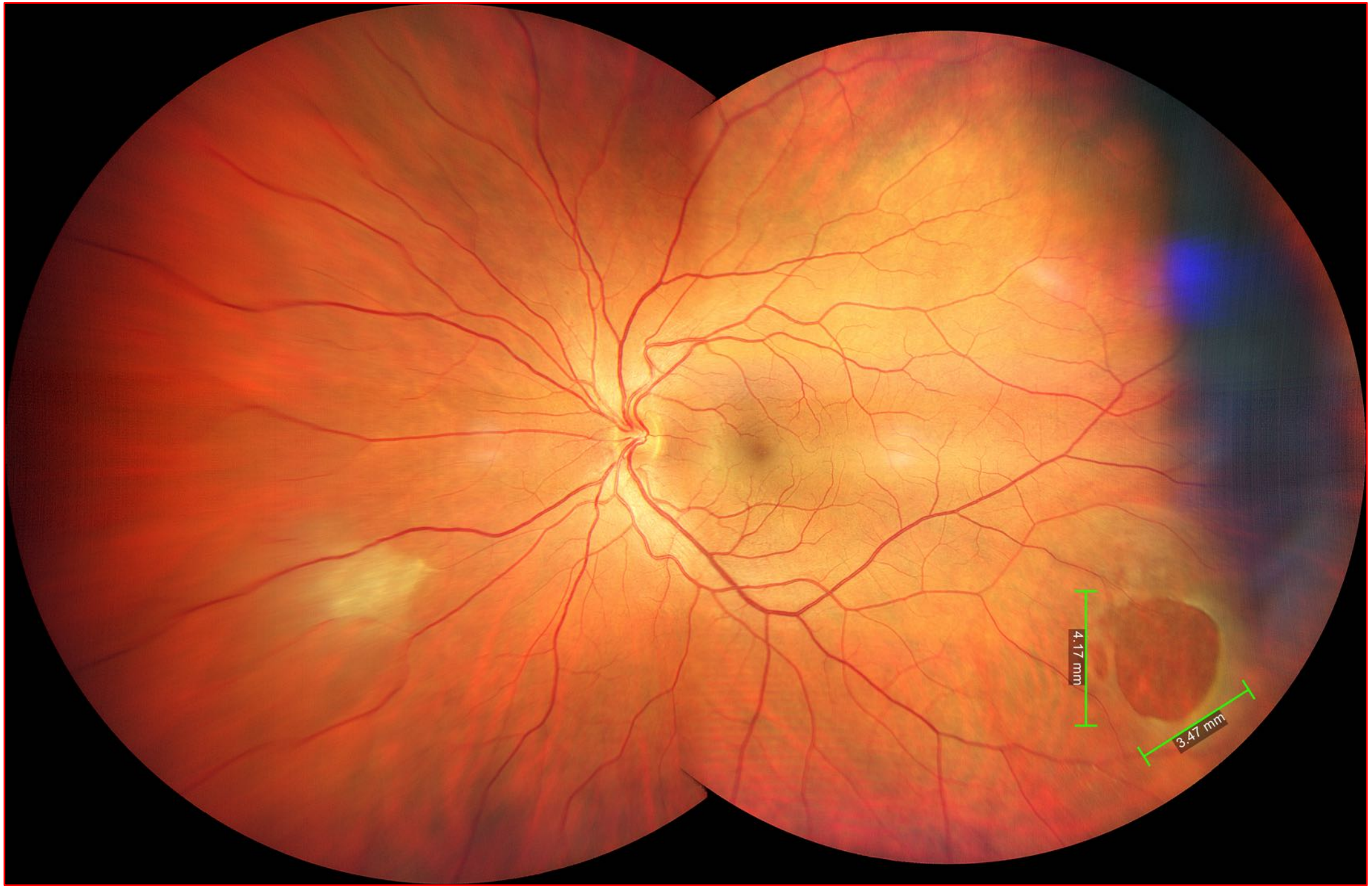
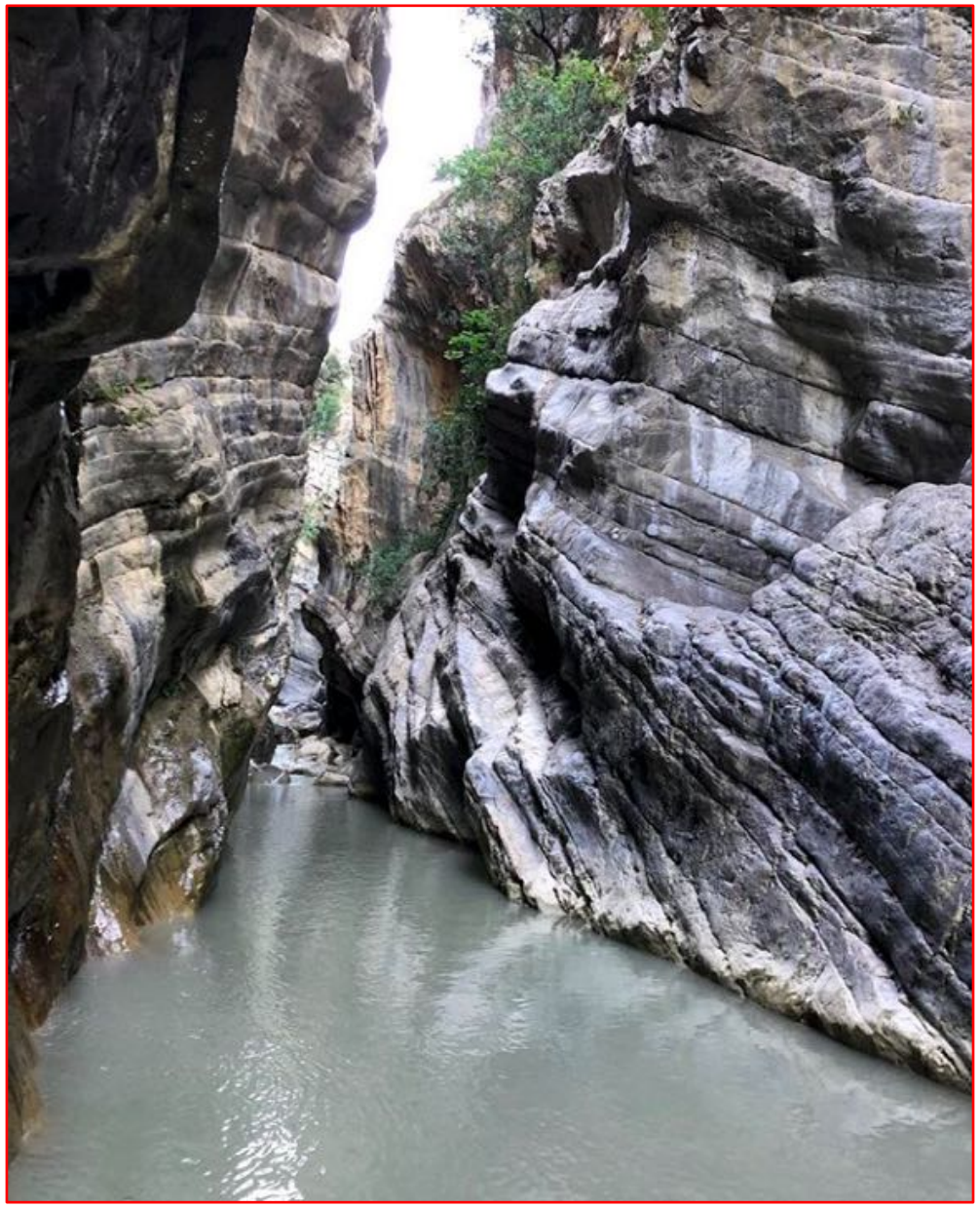
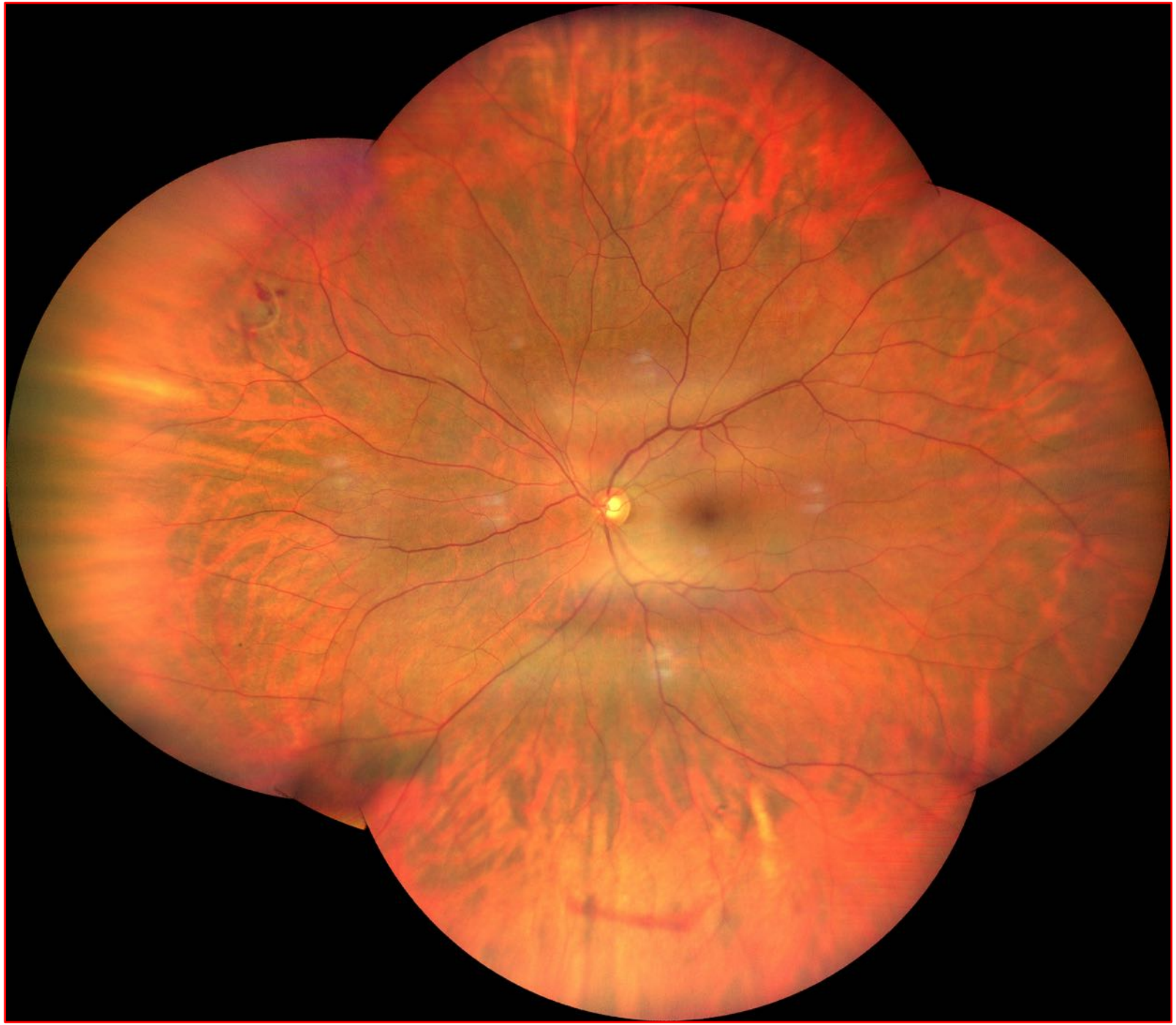


Giant peripheral retinal hole

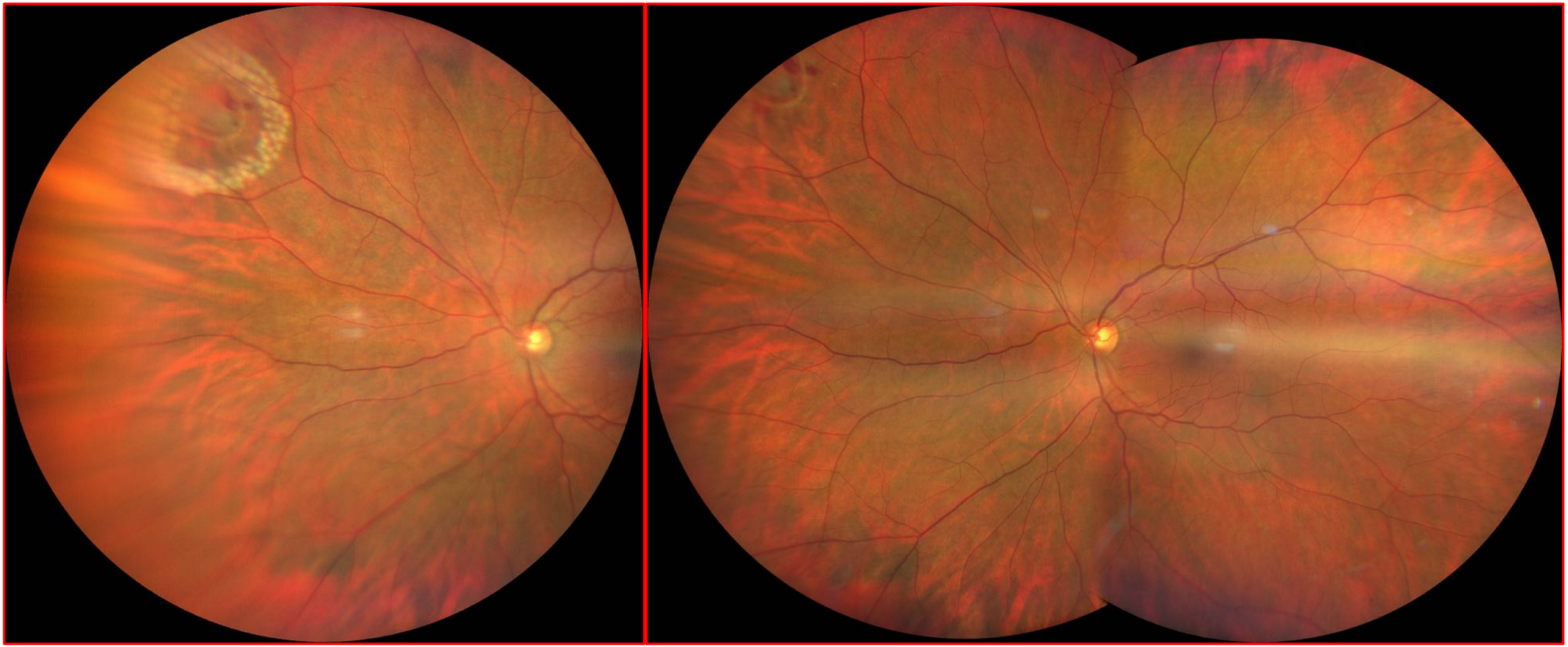


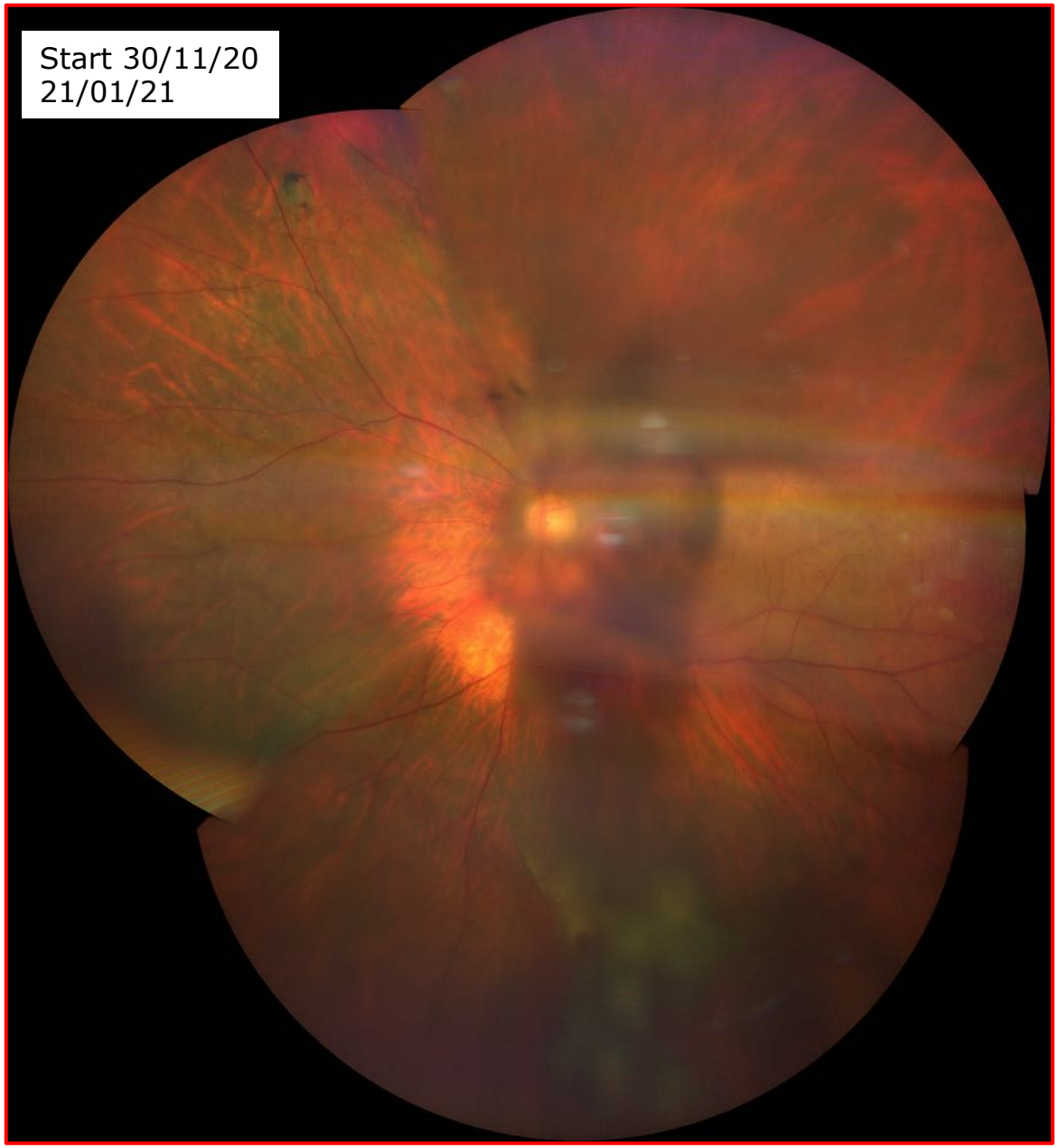


4 shots
Horseshoe-shaped retinal tear with emovitreo six o’clock

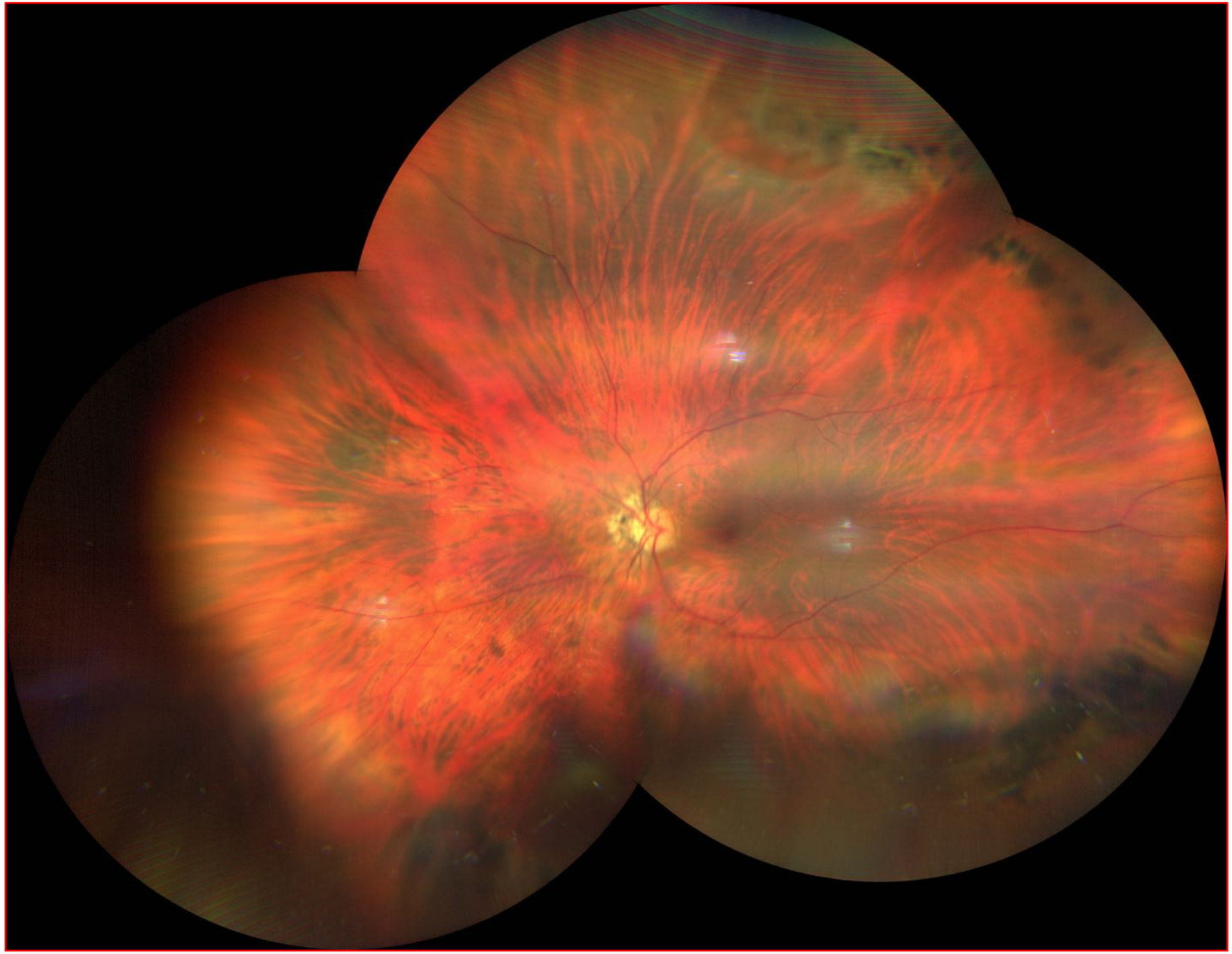
Horseshoe-shaped retinal tear: before and after argon laser treatment

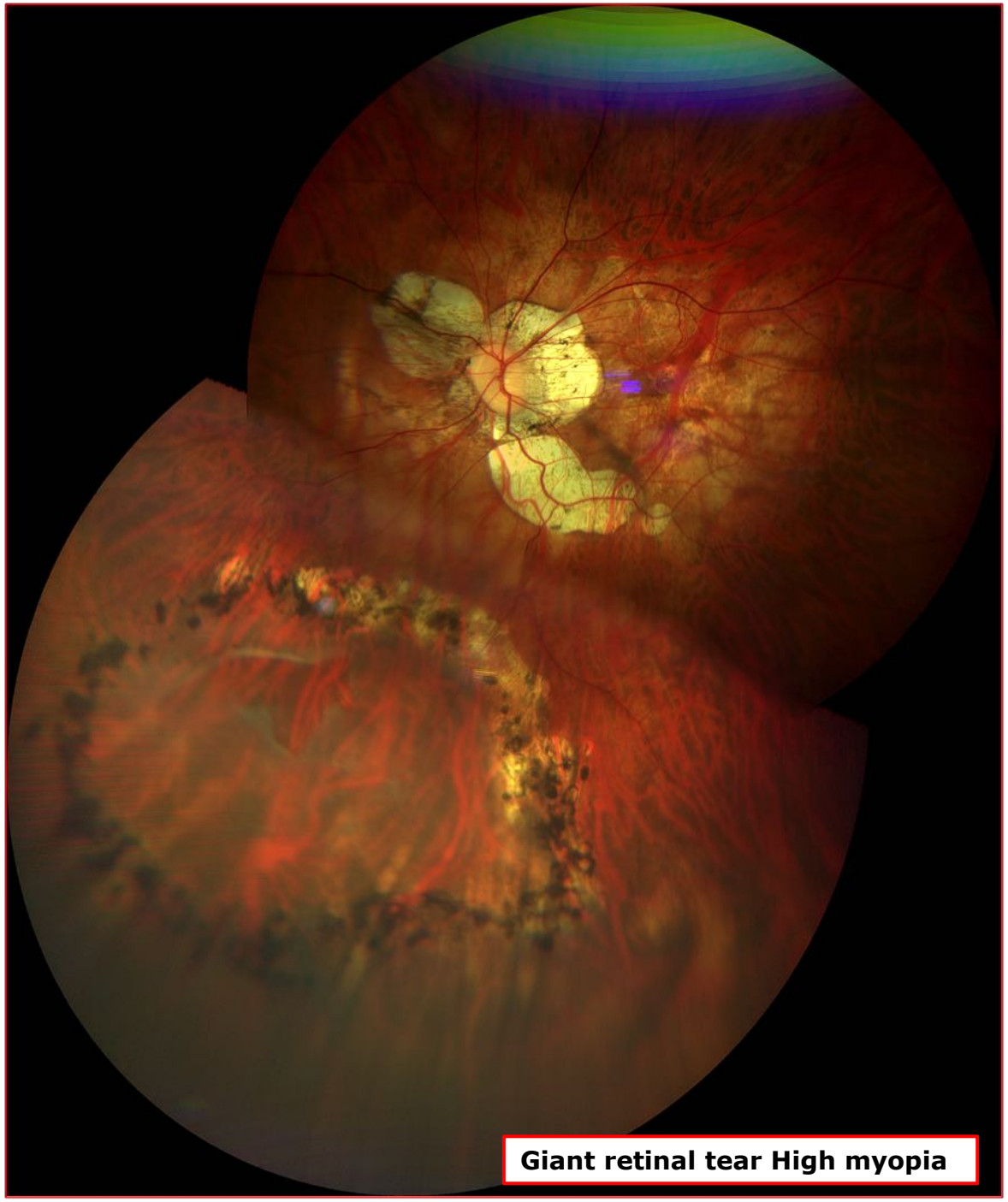
1 shot
2 shots





Argon Laser treatment horseshoe-shaped retinal tear follow-up after hemovitreus




Giant retinal tear High myopia

Hypertensive vasculopathy

Incipient CRVO Central Retinal Vein Occlusion

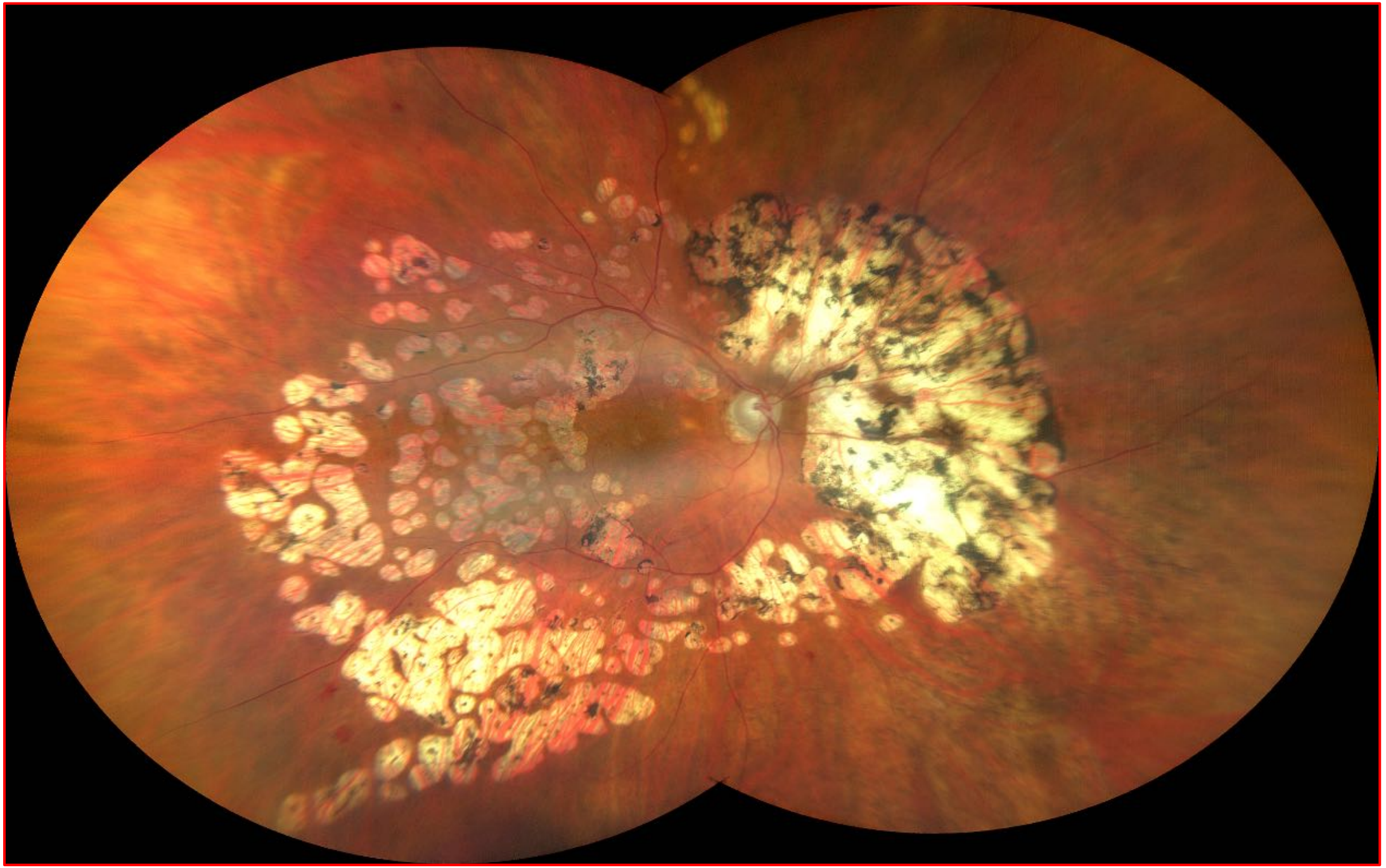
Visus 10/10

RVO
Retinal Vein Occlusion
5.2/1000

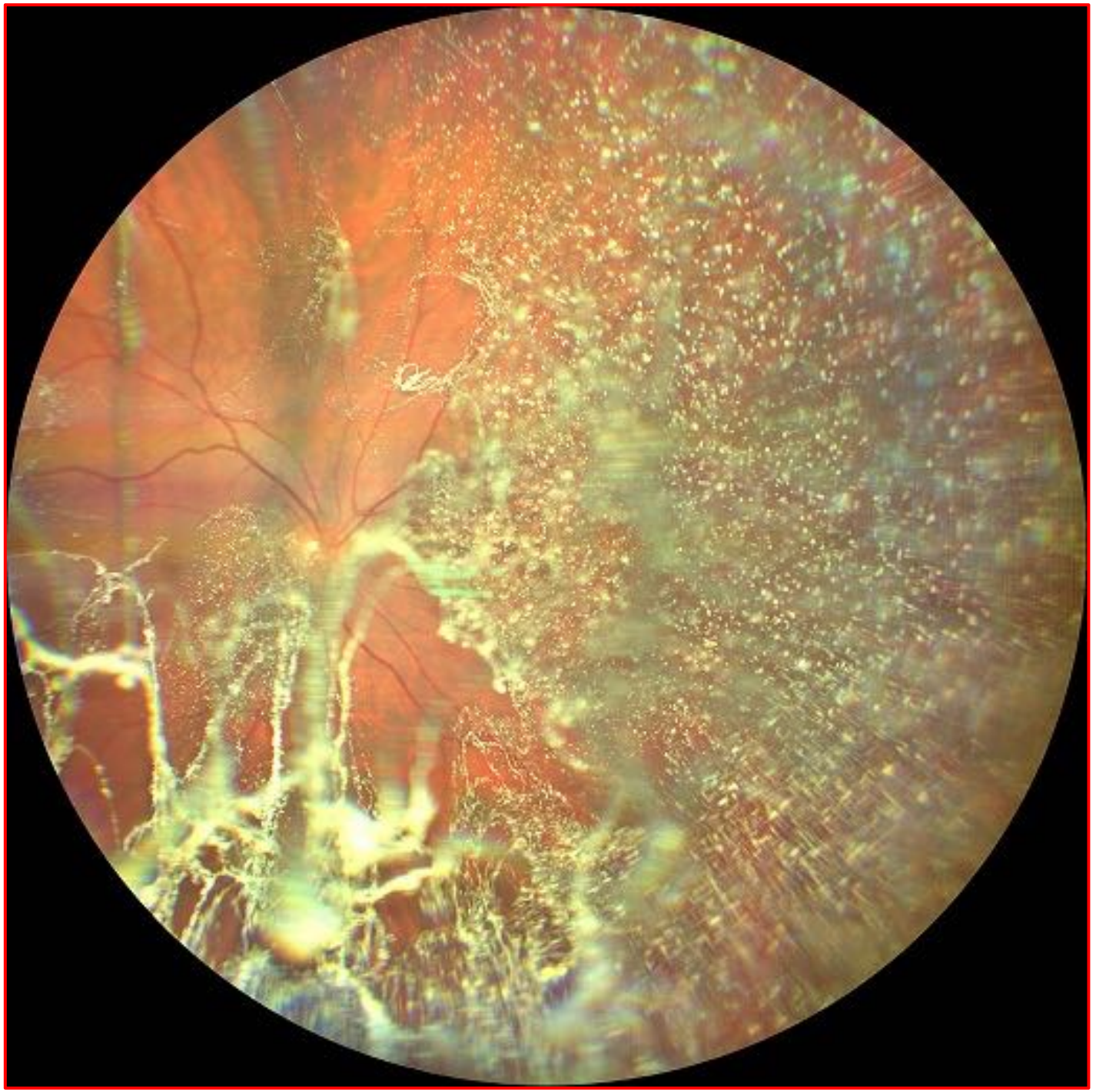
CRVO
Central Retinal Vein Occlusion
0.80/1000

BRVO
Branch Retinal Vein Occlusion
4.42/1000

Background Diabetic Retinopathy v/s HR-PDR High-Risk Proliferative Diabetic Retinopathy



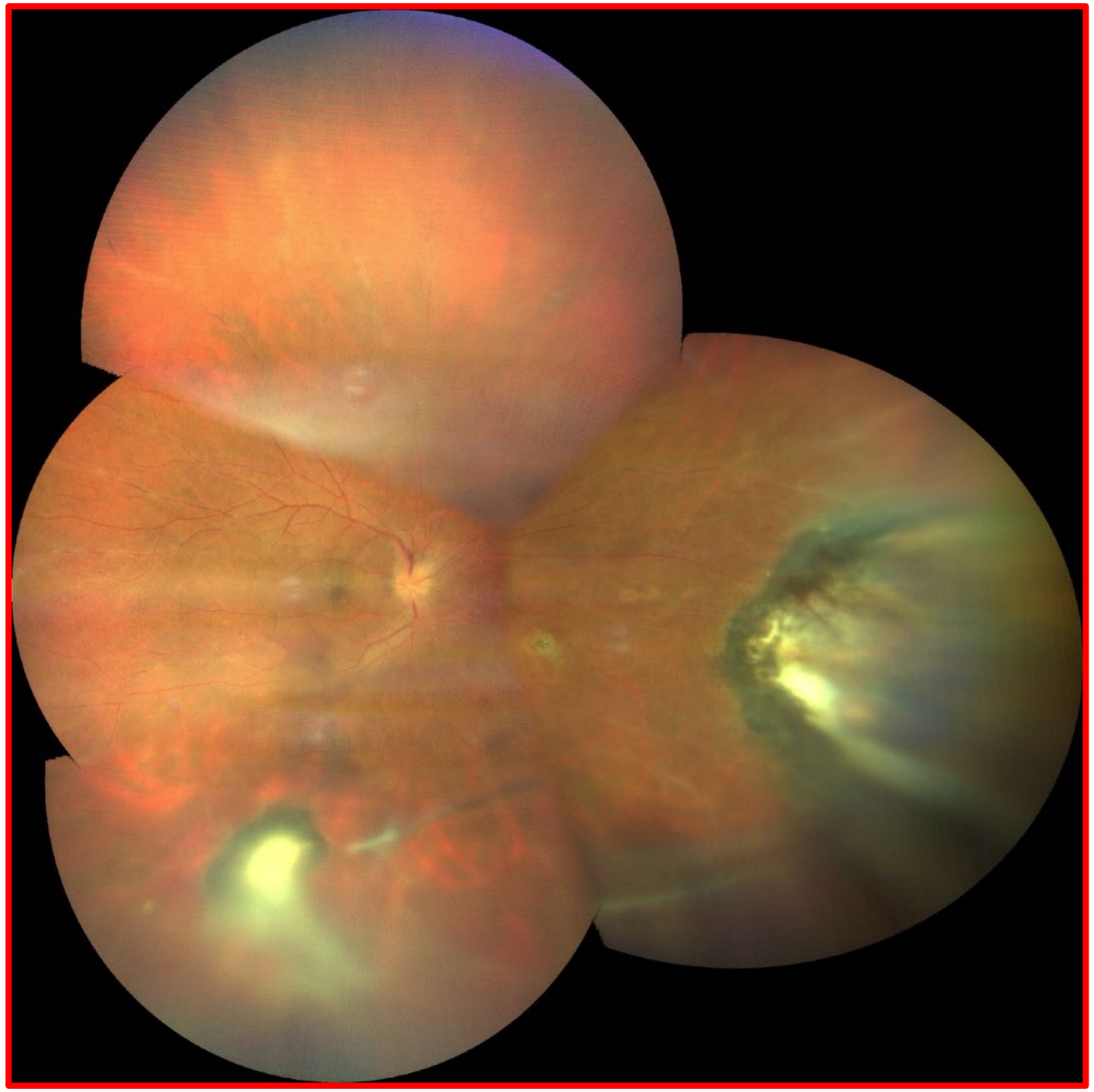
Diabetic Retinopathy Excessive Argon Laser Treatment



Asteroid vitreopathy
Prevalenza 0,15%-0,9%
Unilaterale 75%
calcio-fosfolipidi

Sinchisi: cristalli di colesterolo
cholesterolis bulbi


Calabria
Scoprire



TOXO Recidiva

Giovane maschio
Buona salute
Primo episodio 20 aa fa

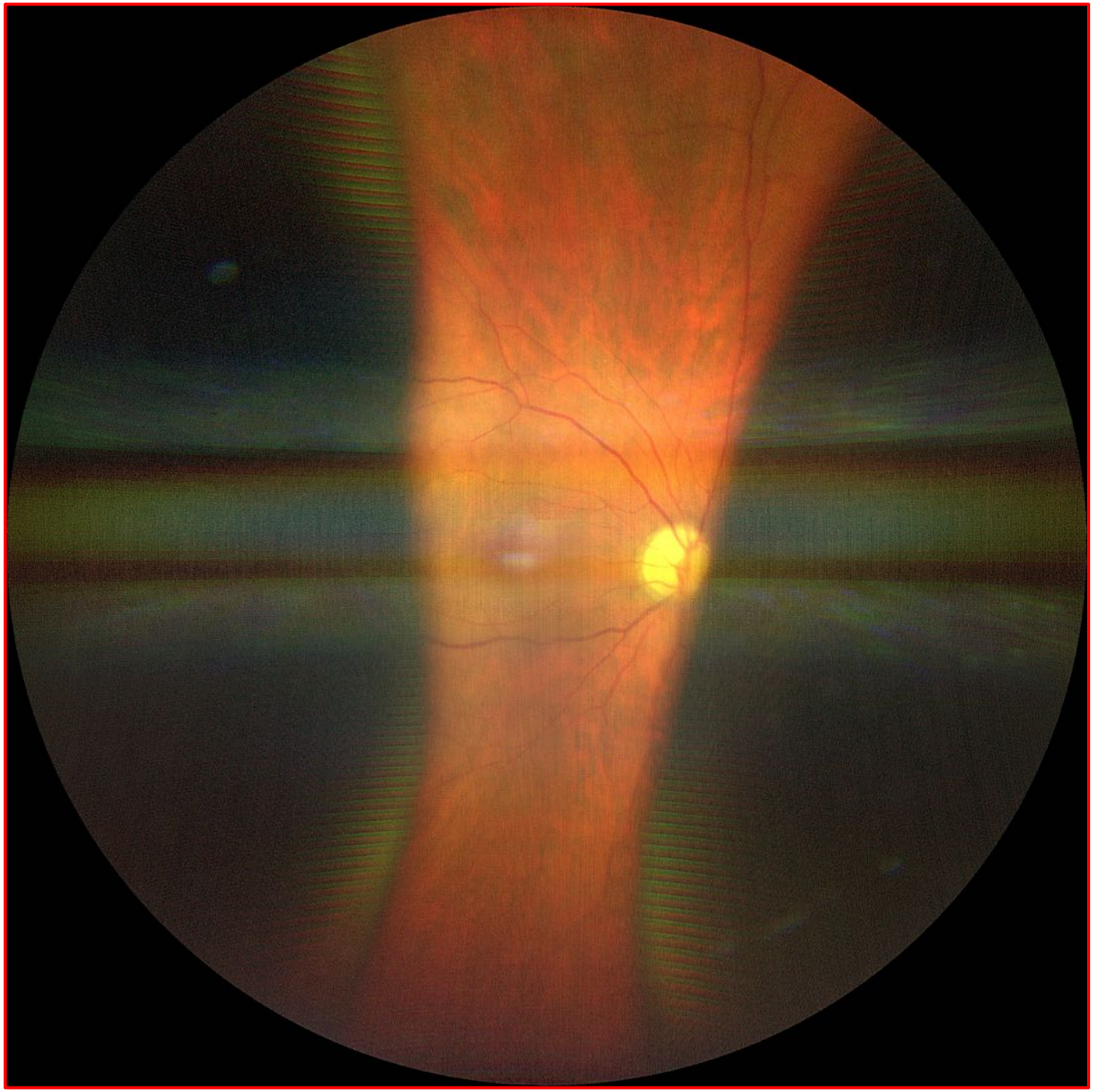
Seconda osservazione, settembre 2020

Visus 4-5/10, tyndall +, cellule +
iperemia cogiuntiva bulbare +

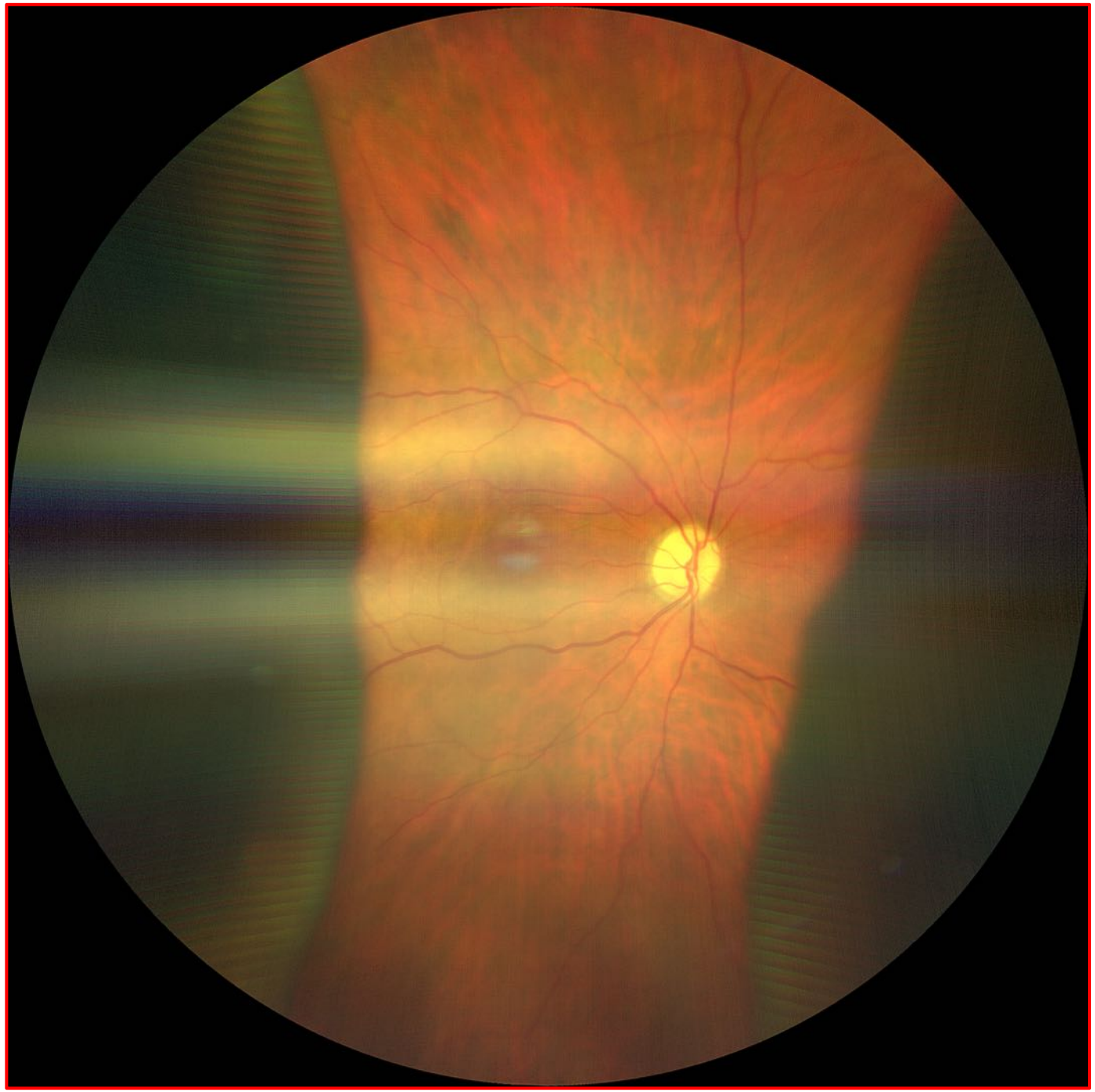
Accertamenti sistemici di routine
Terapia d'attacco: Prednisolone 100 mg/die a scalare (terapia iniziale 80 mg al Moorfields Eye Hospital, Carlos Pavesio)
Atropina 1% x 2 v die
Betametasone + Cloramfenicolo collirio x 6 v die
Clindamicina 1.200 mg/die a scalare
Protezione gastrica

Dopo 2 mesi di terapia

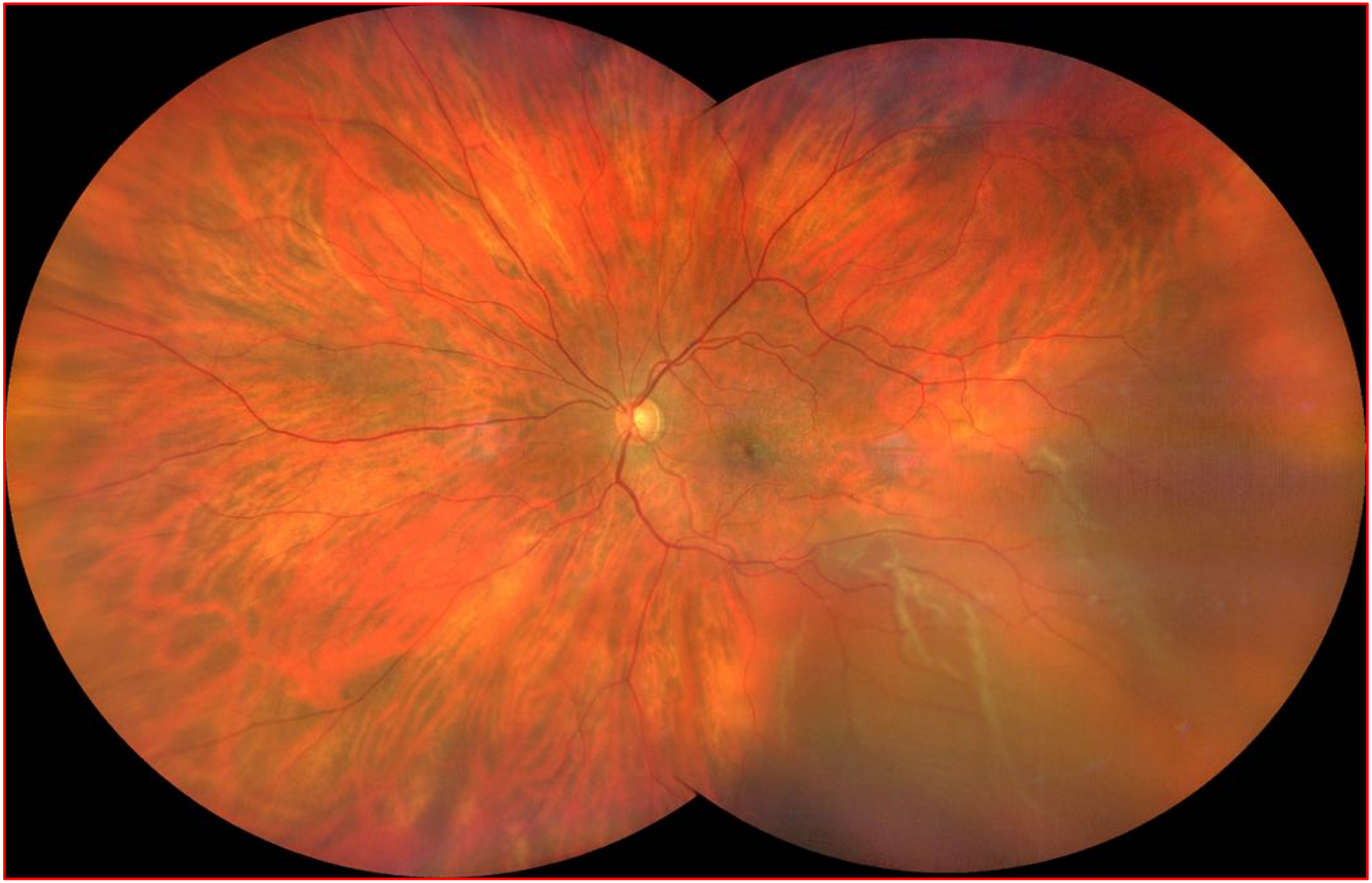
Peripherical chorioretinitis



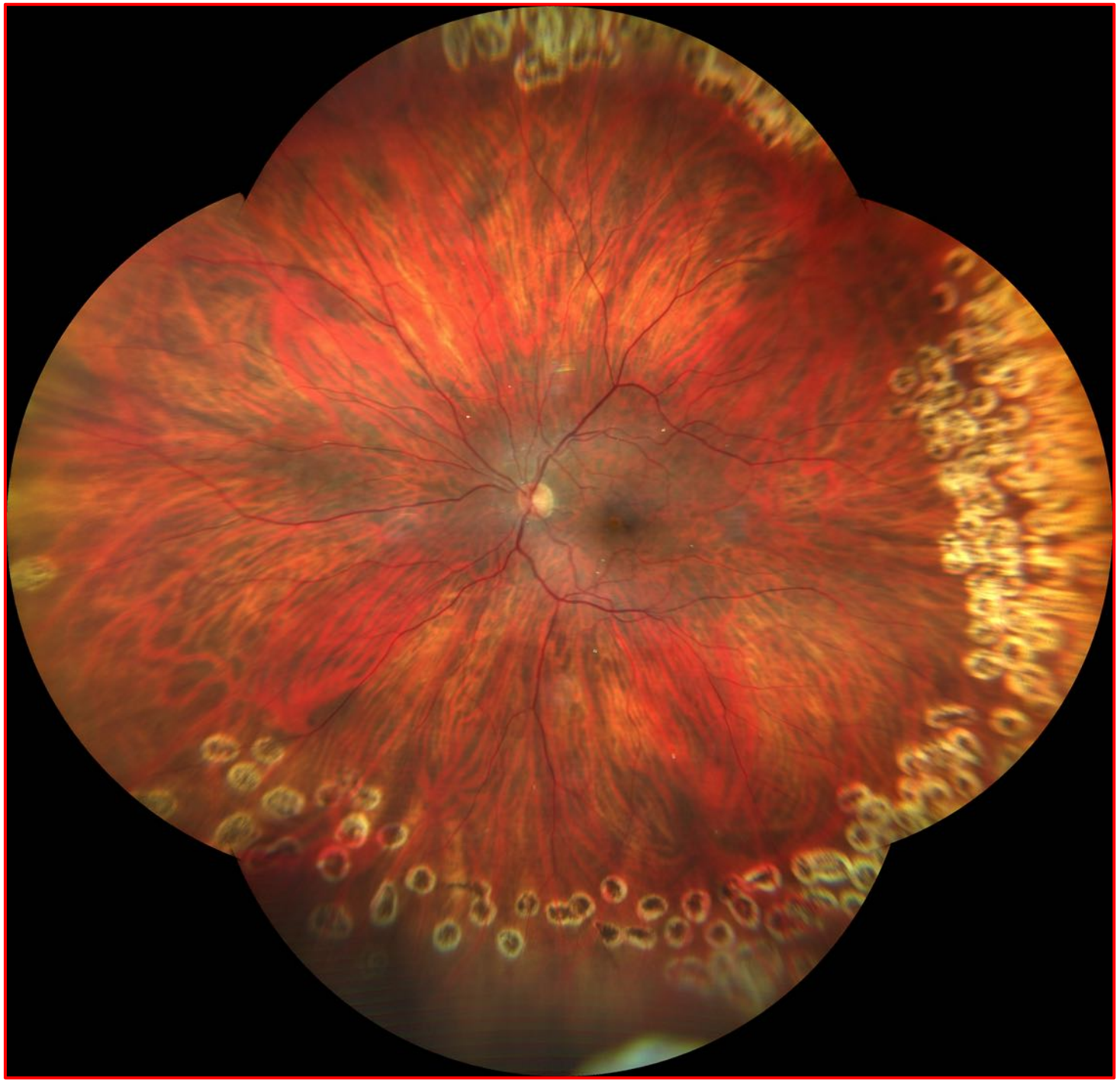
Large chronic choroid detachment after glaucoma surgery with MIGS
Minimally Invasive Glaucoma Surgery
MicroShunt PreserFlo (8,5 mm)
Tonometry 4/6 mmH
Visus 5/10; 31/05/21



Large chronic choroid detachment after glaucoma surgery with MIGS
Minimally Invasive Glaucoma Surgery
MicroShunt PreserFlo (8,5 mm)
Tonometry 6/8 mmHg
Visus 5/10; 10/11/21



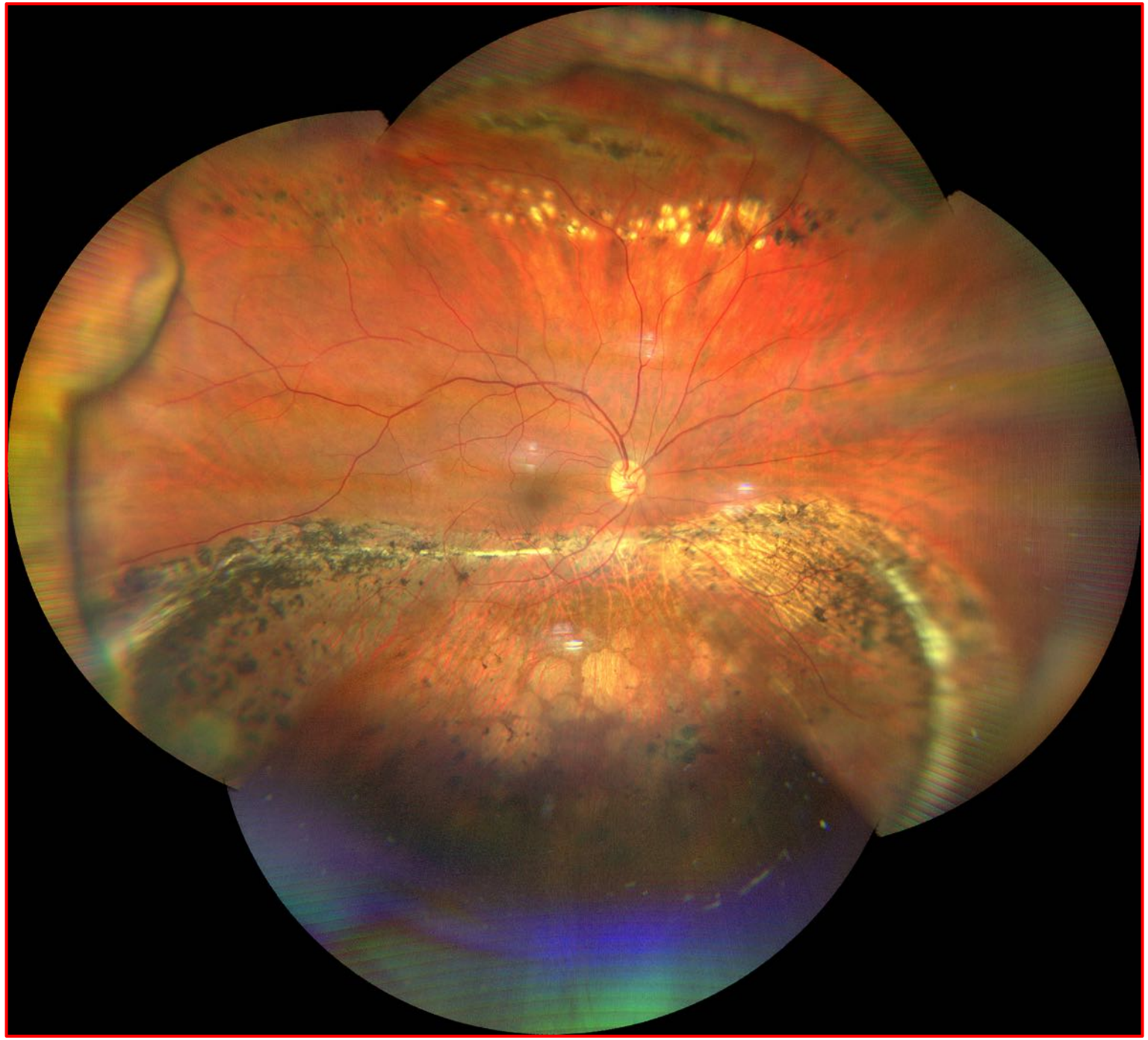
Rapidly evolving monocular retinal detachment in a young woman 14/09/2020



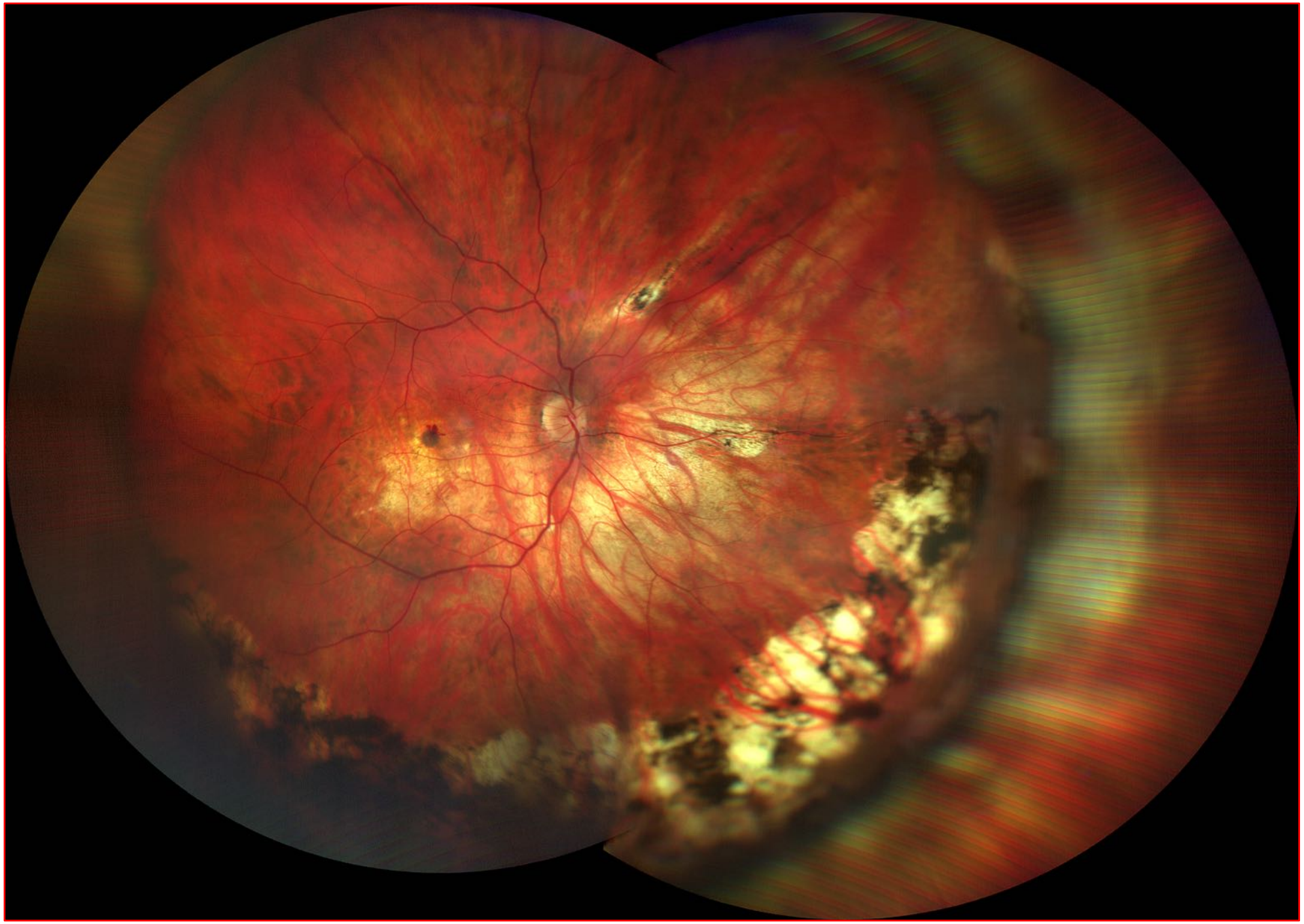
After treatment

rapidly evolving monocular retinal detachment in a young woman

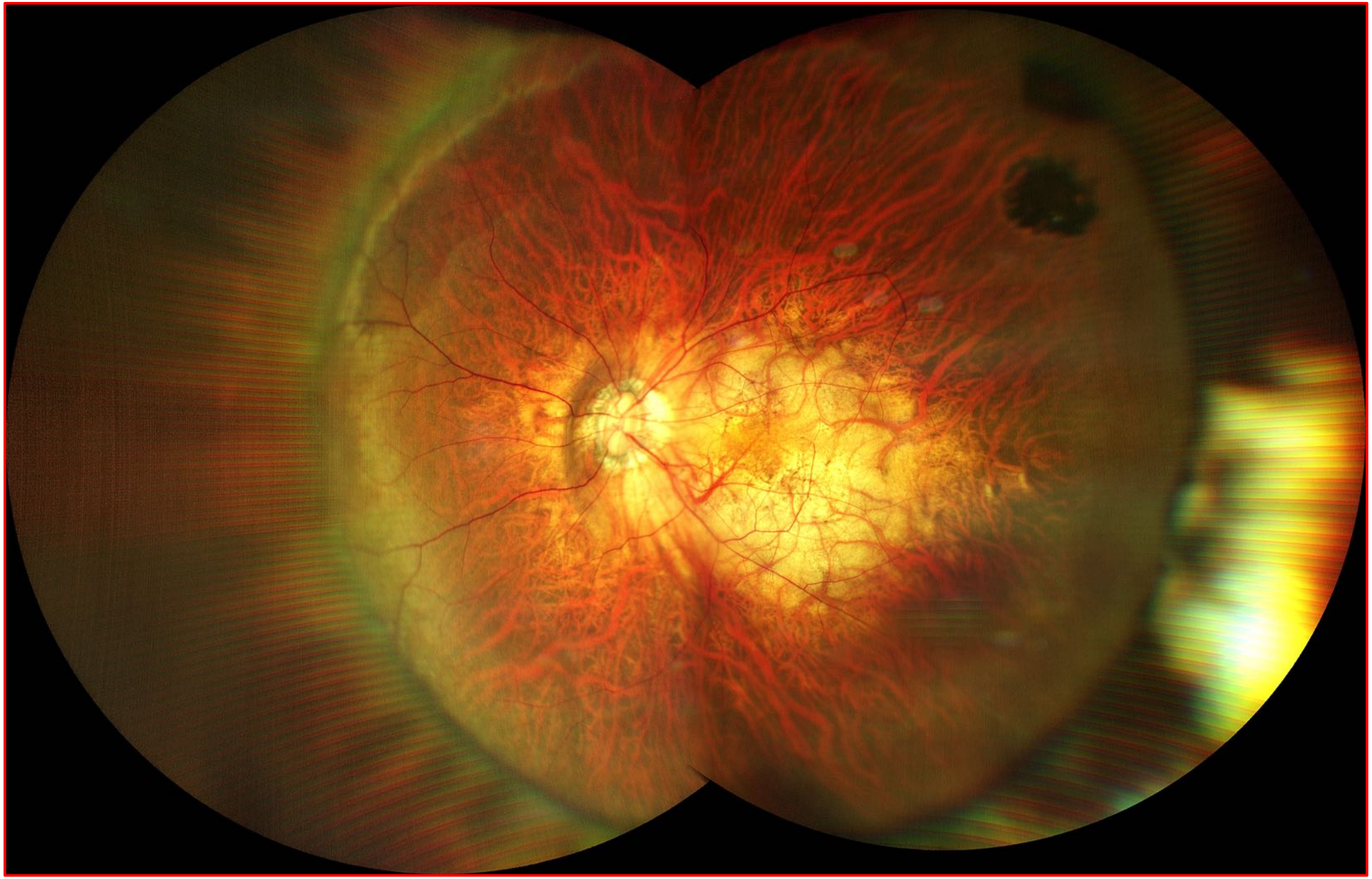

GRUPPO B
DECATALDO



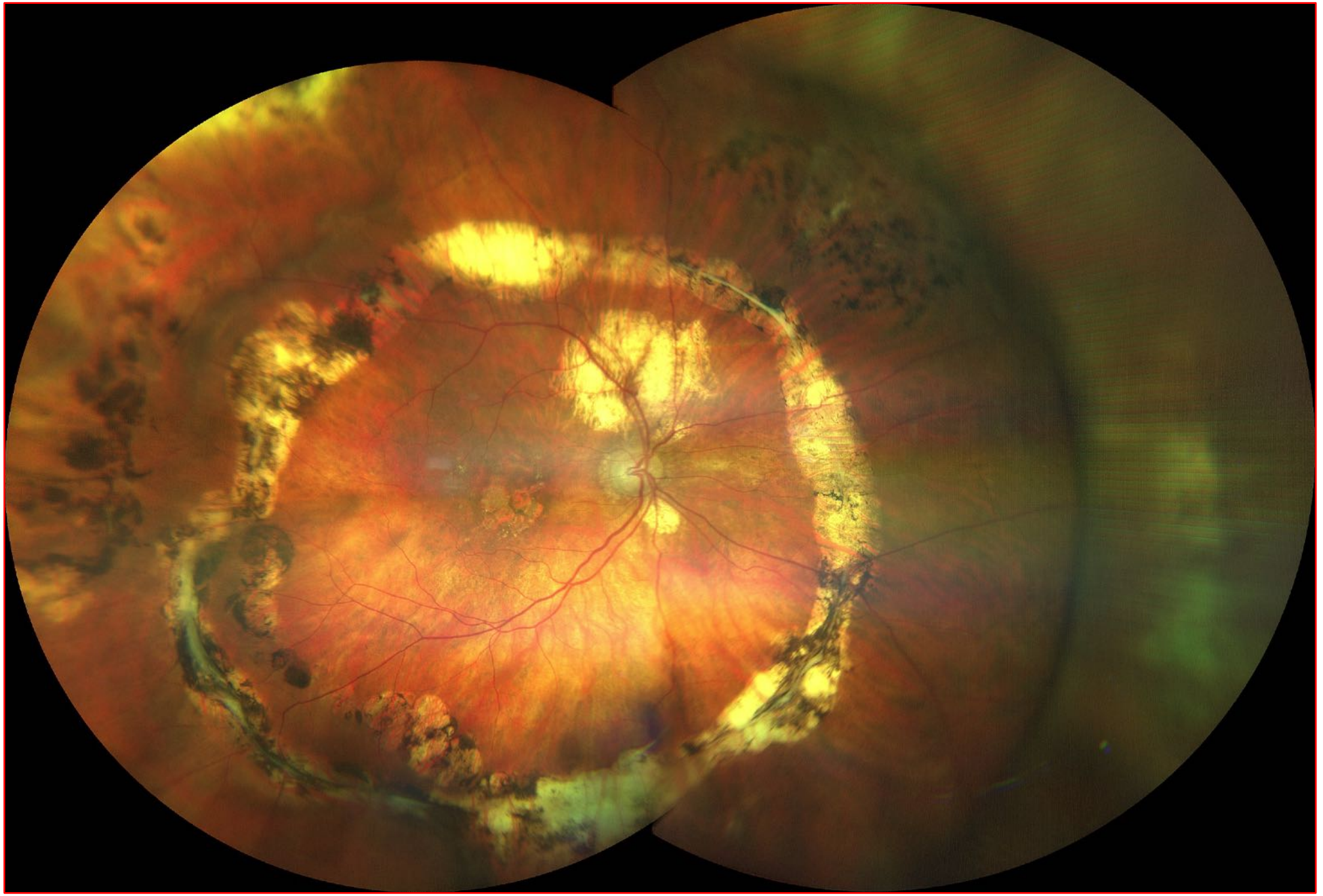
Rhegmatogenous retinal detachment with retinal pigmentation



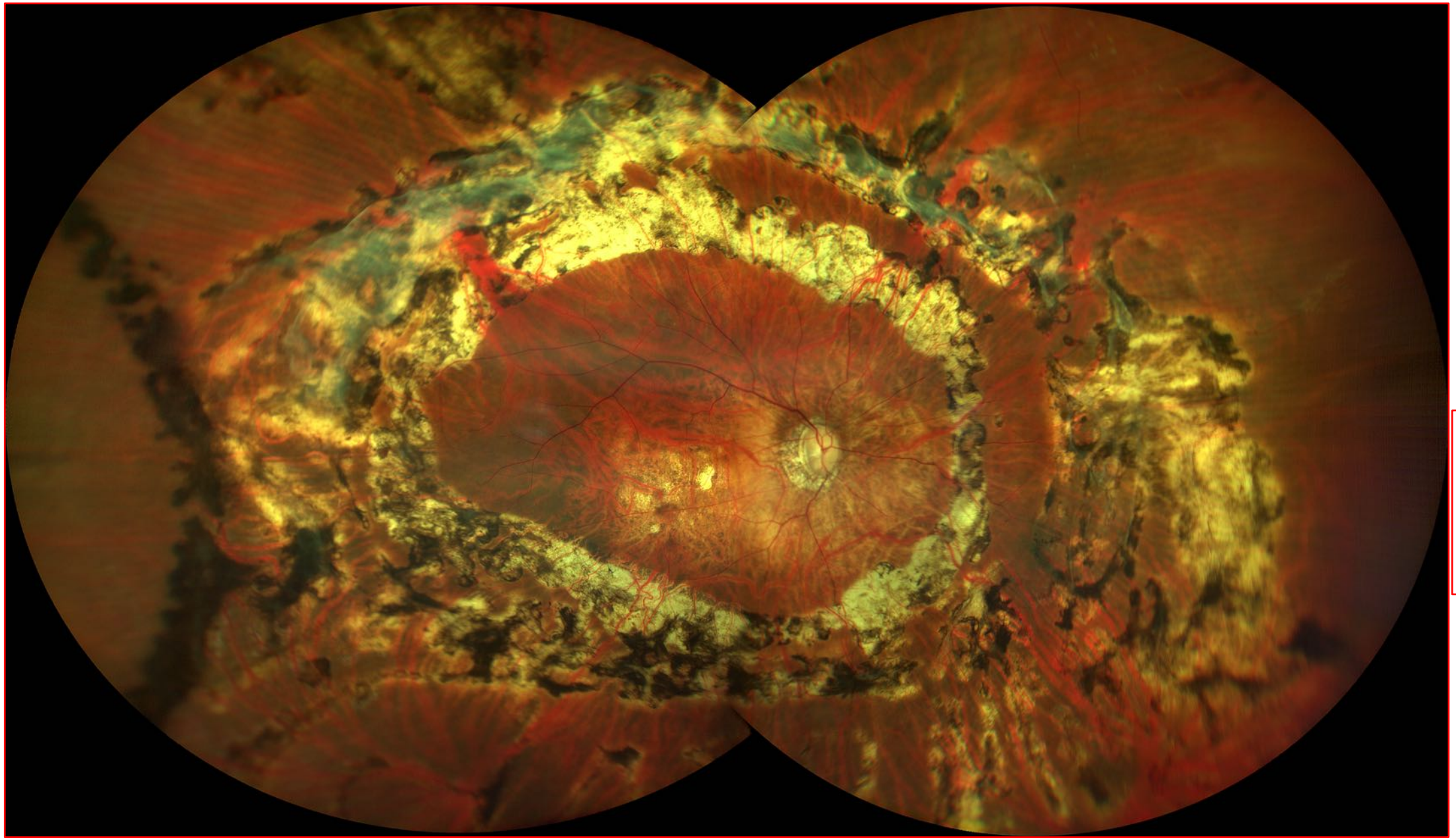
Eyball cerclage for rhegmatogenous retinal detachment and cryotreatments with macular CNV



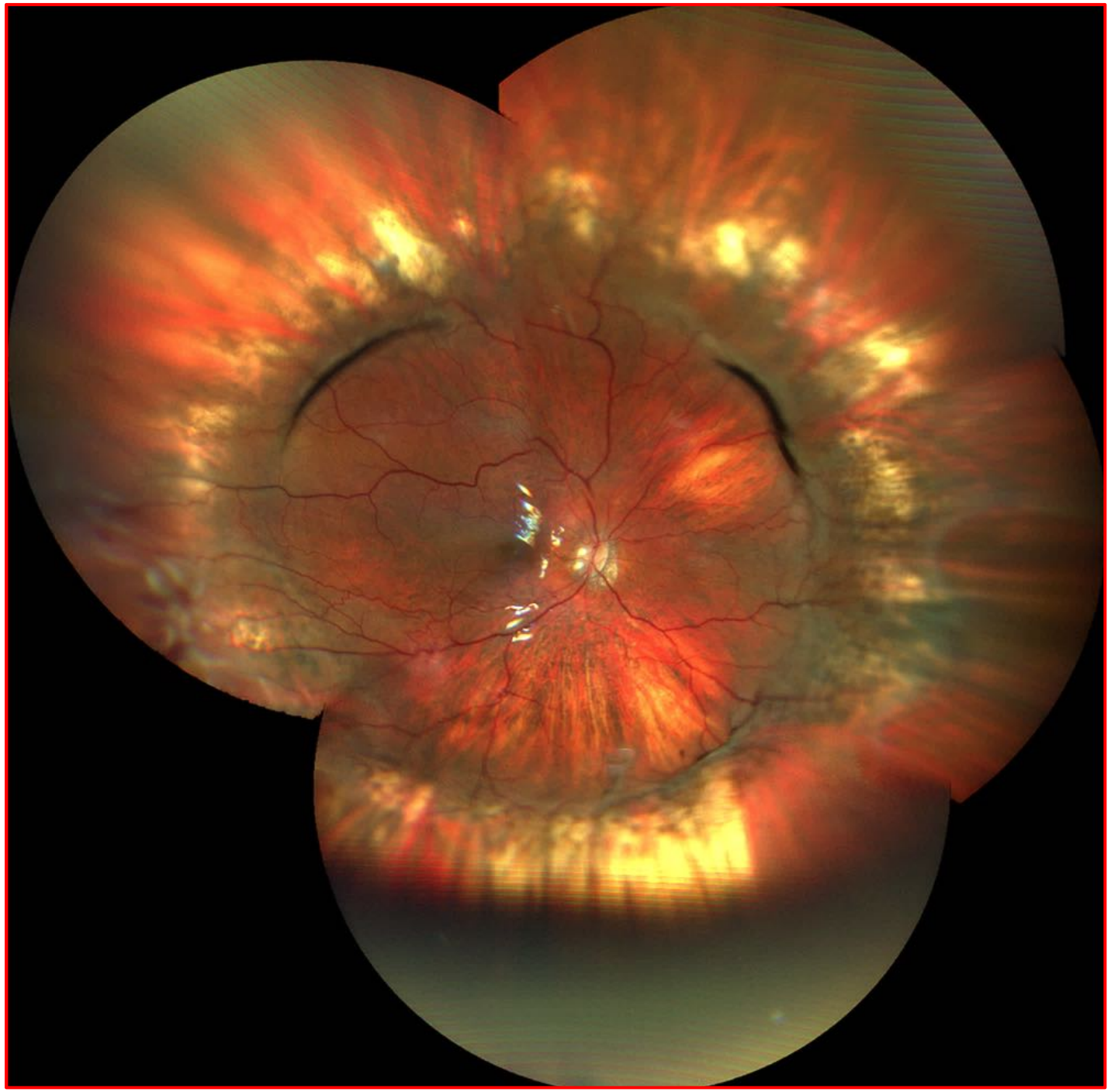
Cerclage for rhegmatogenous retinal detachment in high myopic eye with large are of atrophy



Cerclage for rhegmatogenous retinal detachment



Retinal detachment with argon laser treatment



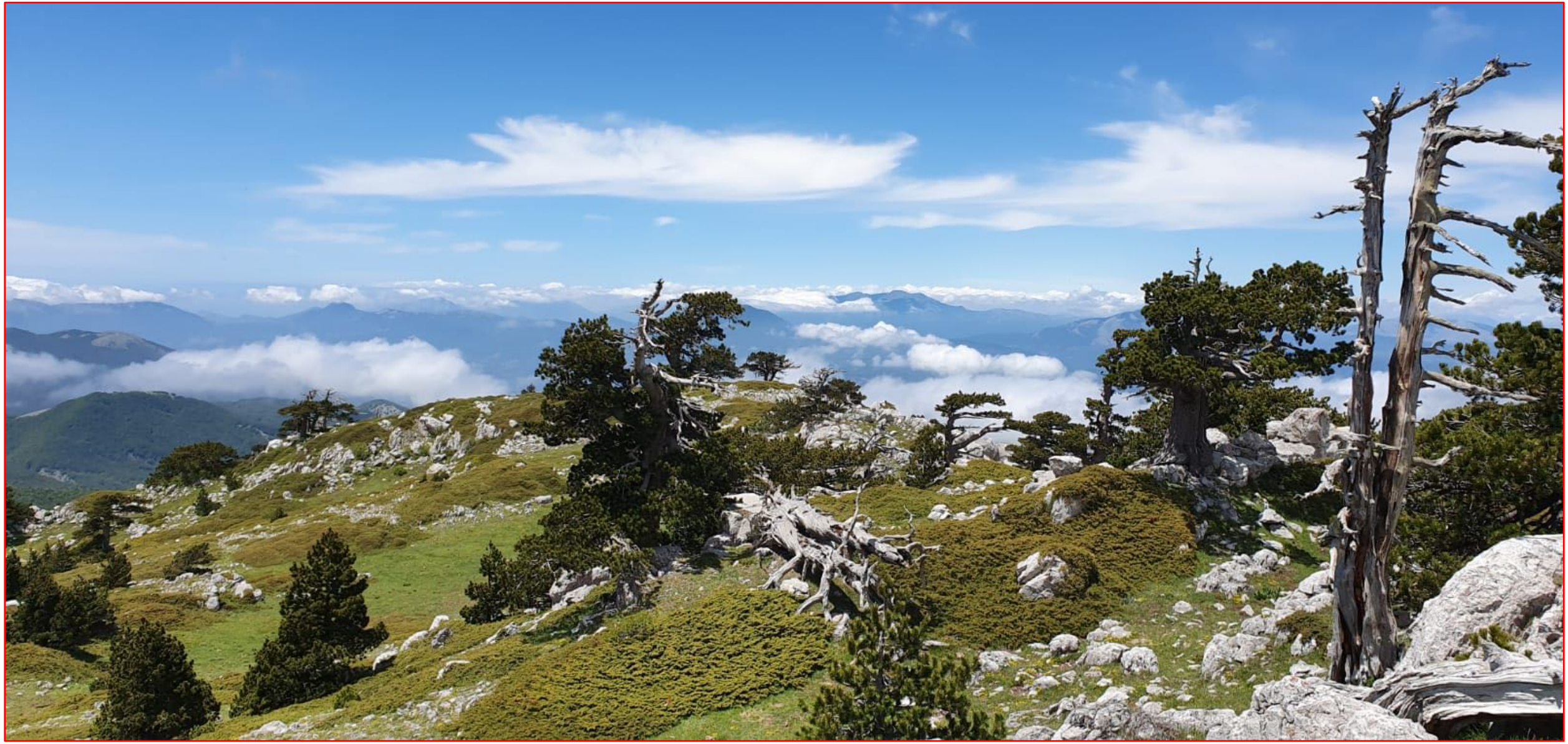
Eyball cerclage for rhegmatogenous retinal detachment

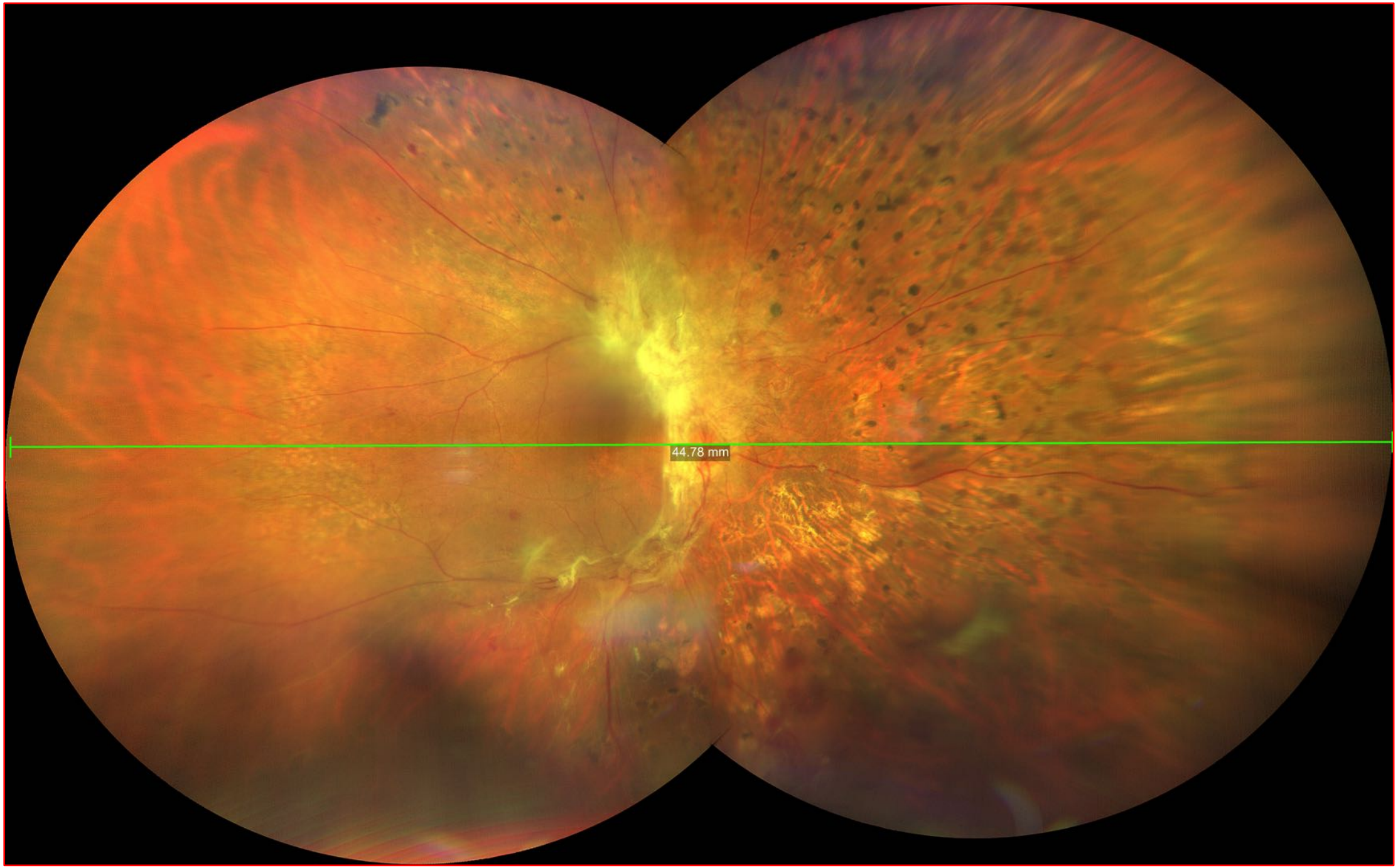
Extensive post-trauma retinal pigmentation
Visus 5/10

Dramatic retinal picture in oncological patient with positive Batonella test fallowed elsewhere; Visus 1/20

Unnecessary argon laser treatment

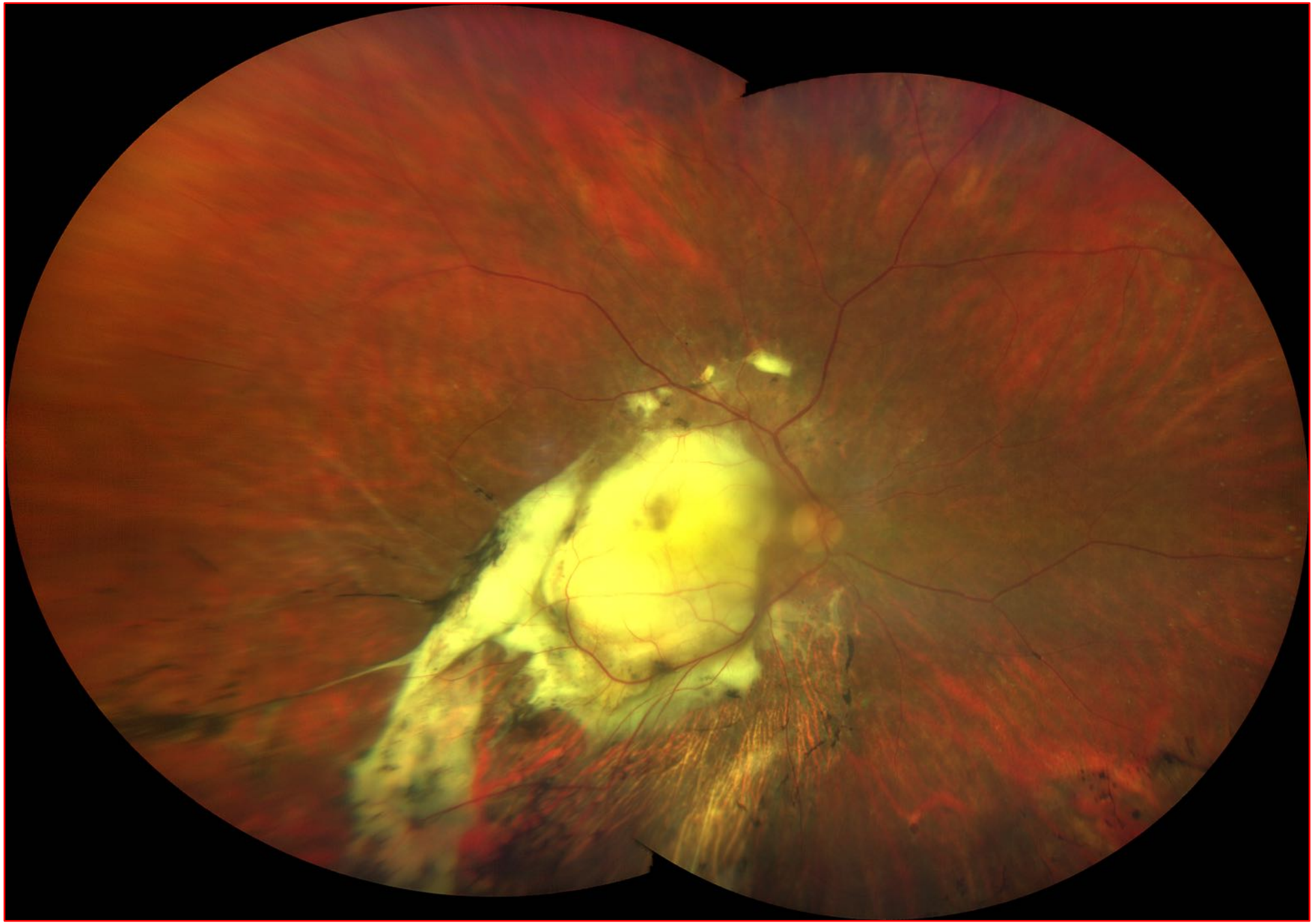
High myopia



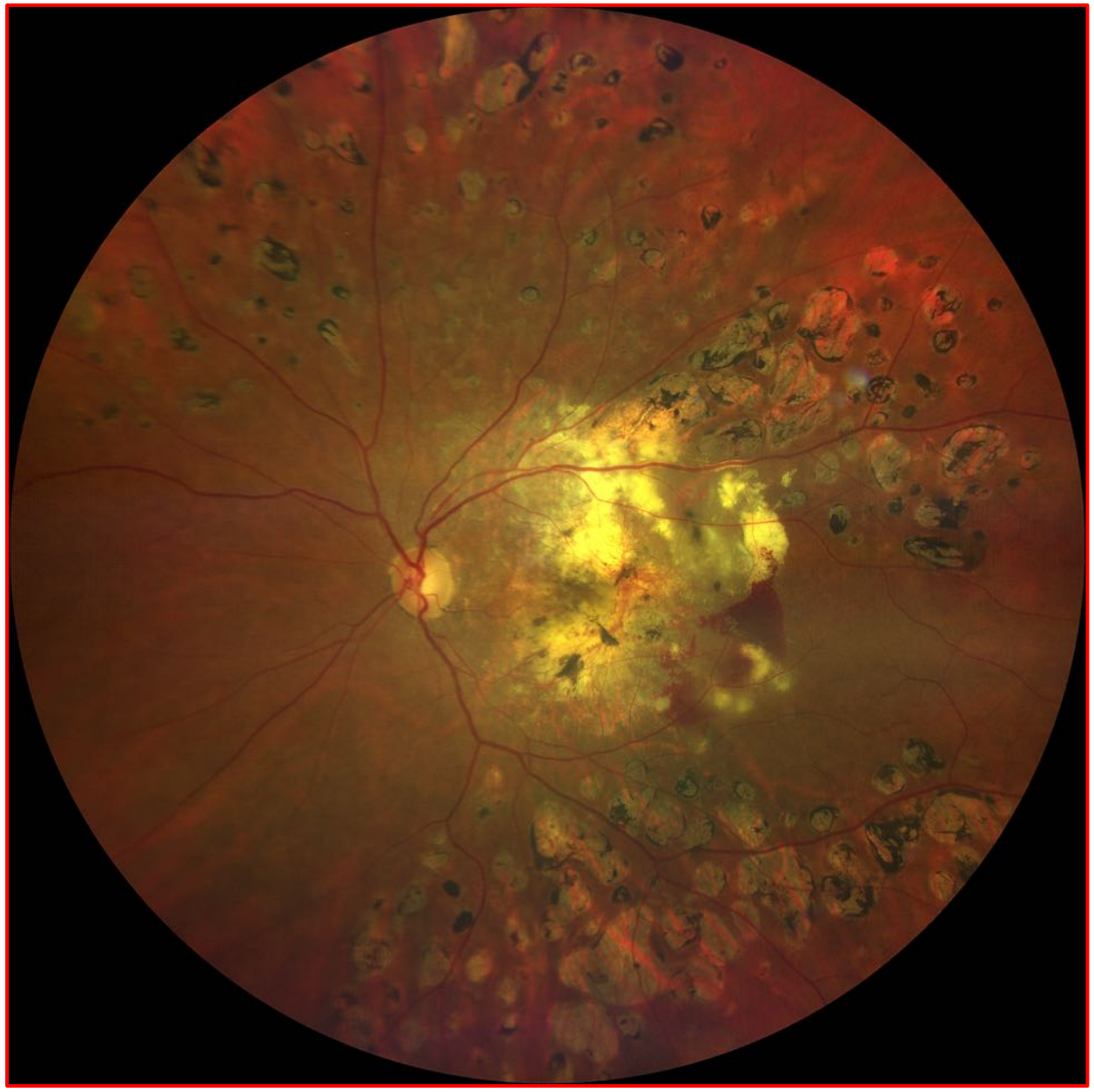


PDR
Proliferative
Diabetic
Retinopaty

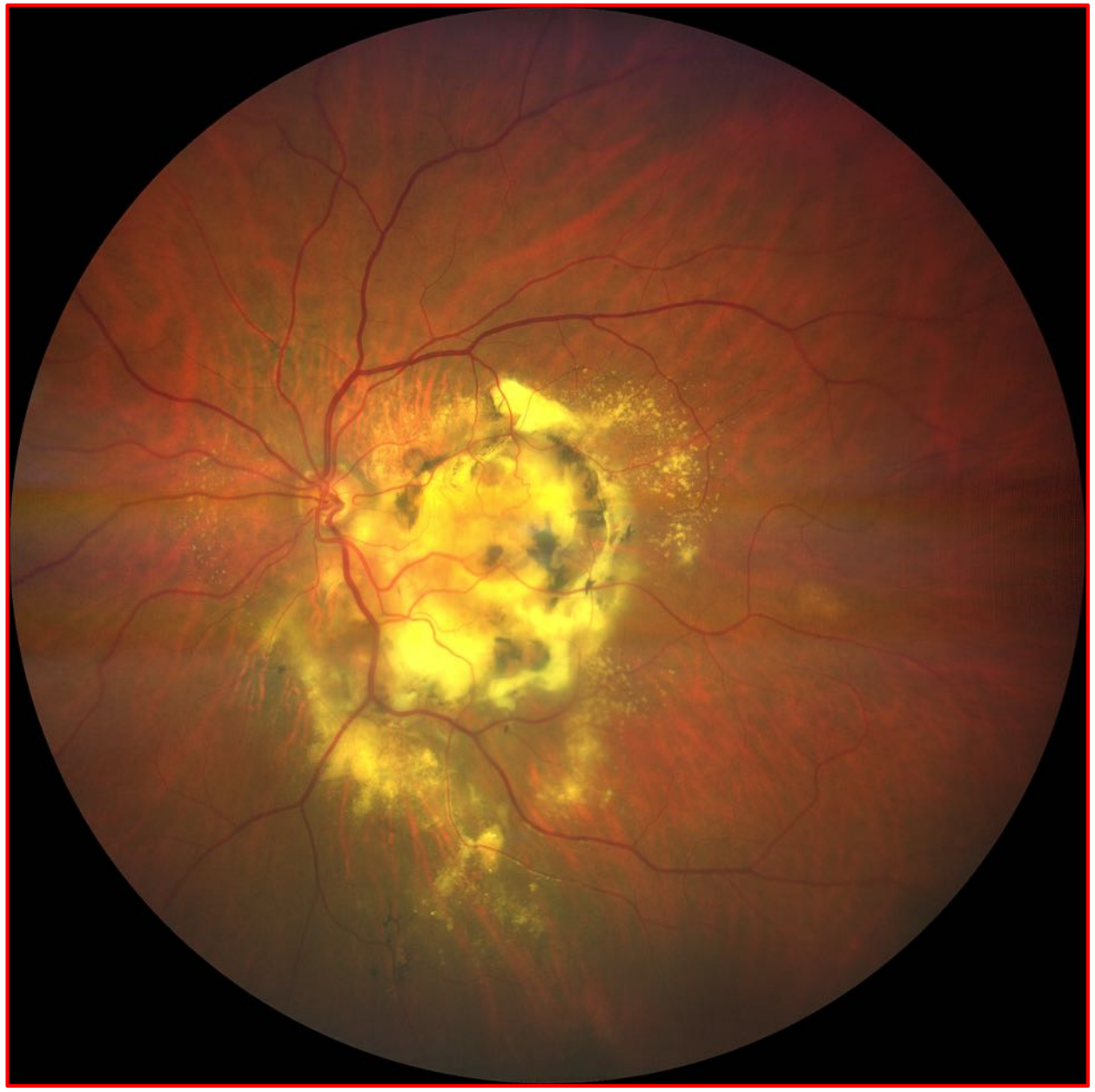
Retinopatia
Pigmentosa



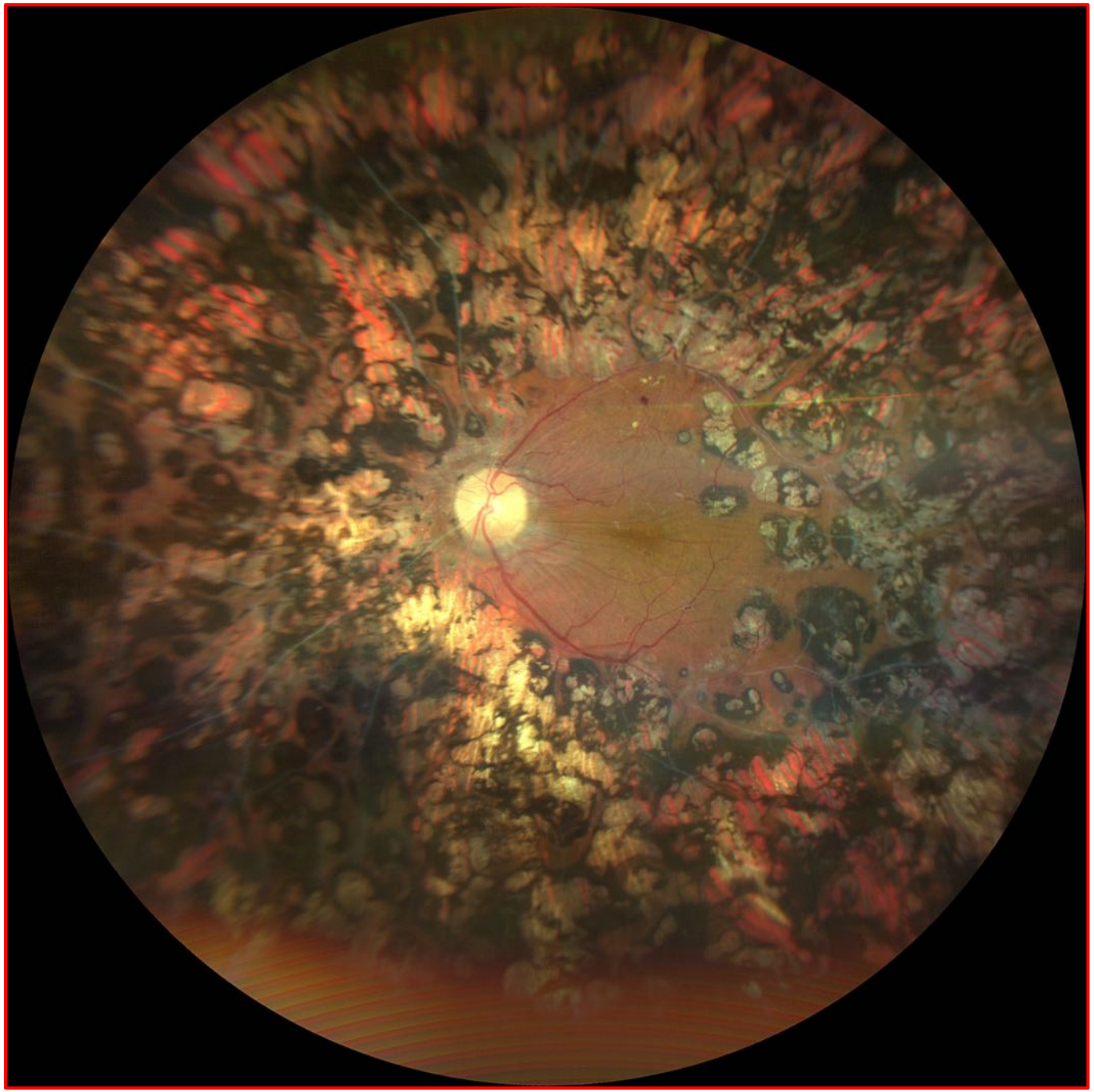
Advanced CNV



evolving CNV

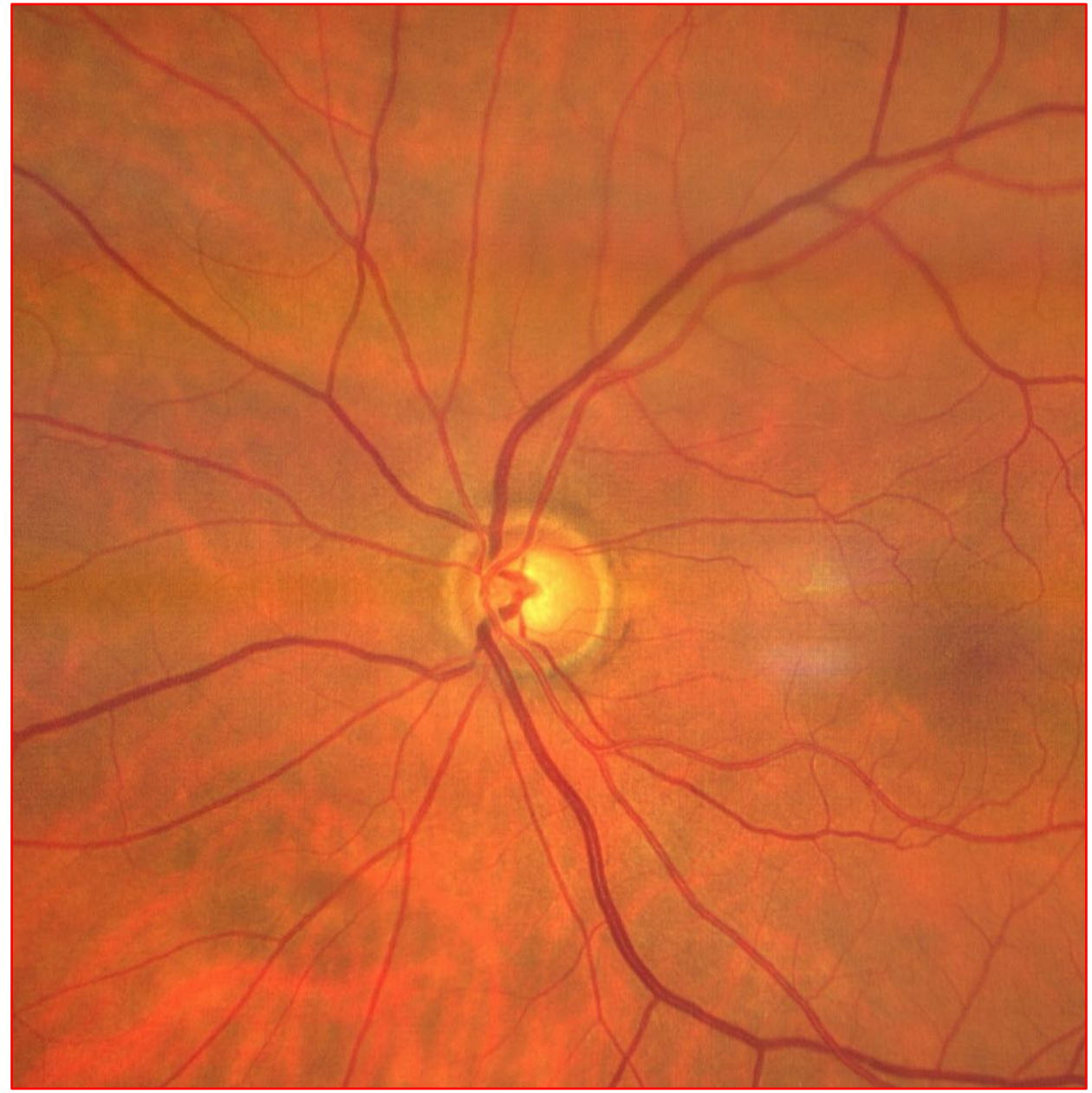


advanced CNV

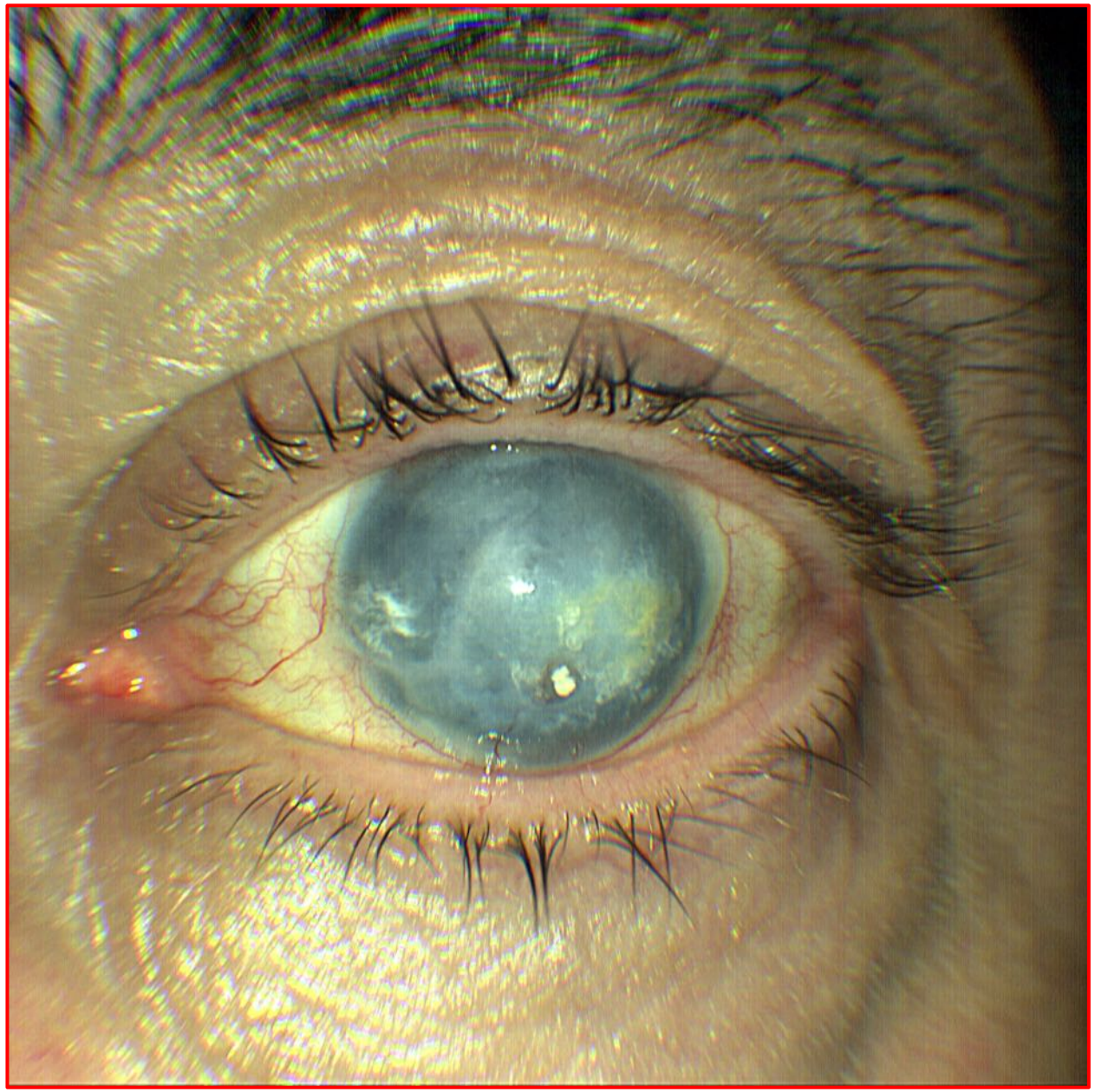


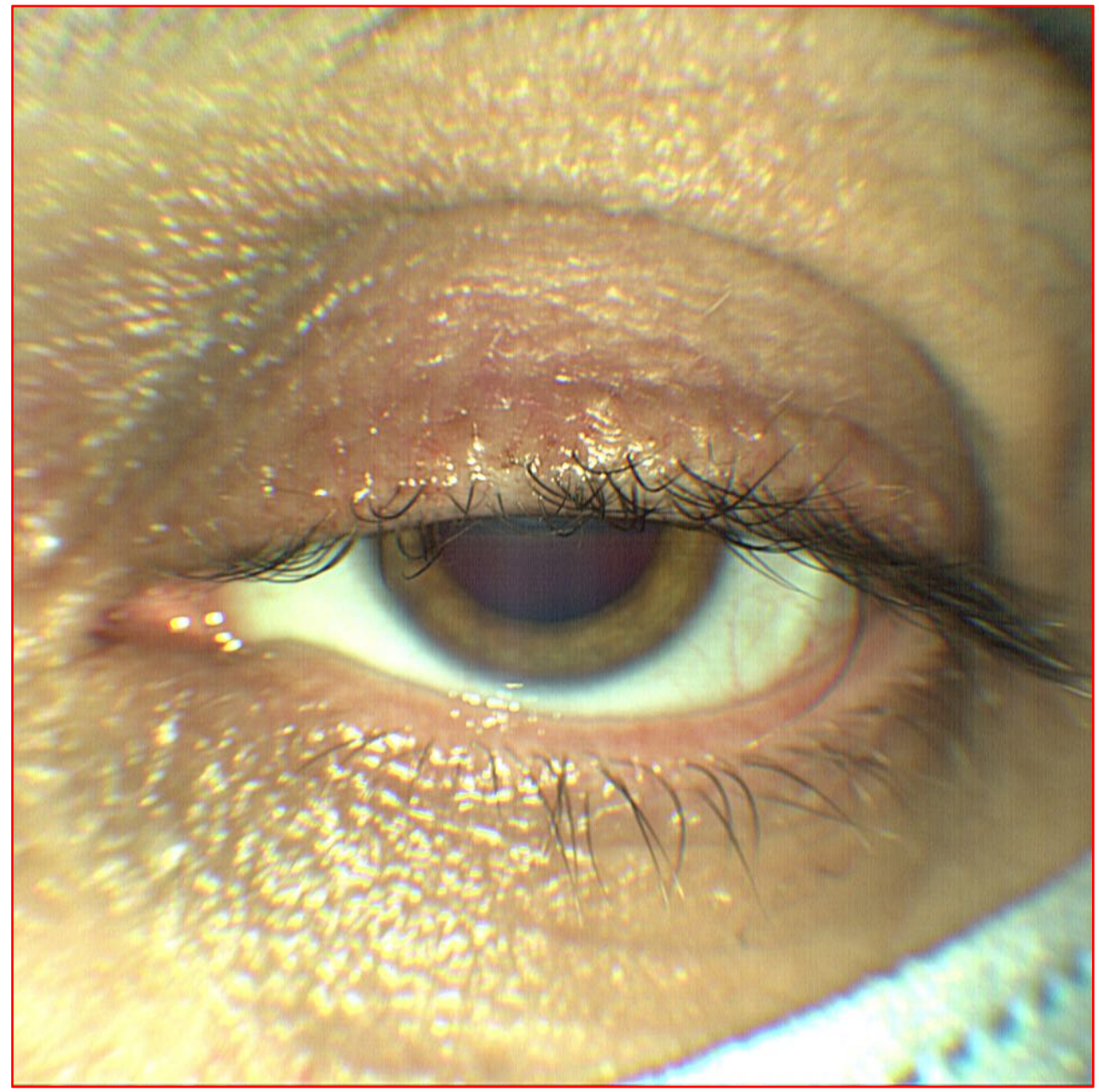
RD argon laser

Albinism with nystagmus aa 9



Bimbo di 8 anni paki 570 tono 16 mmHg



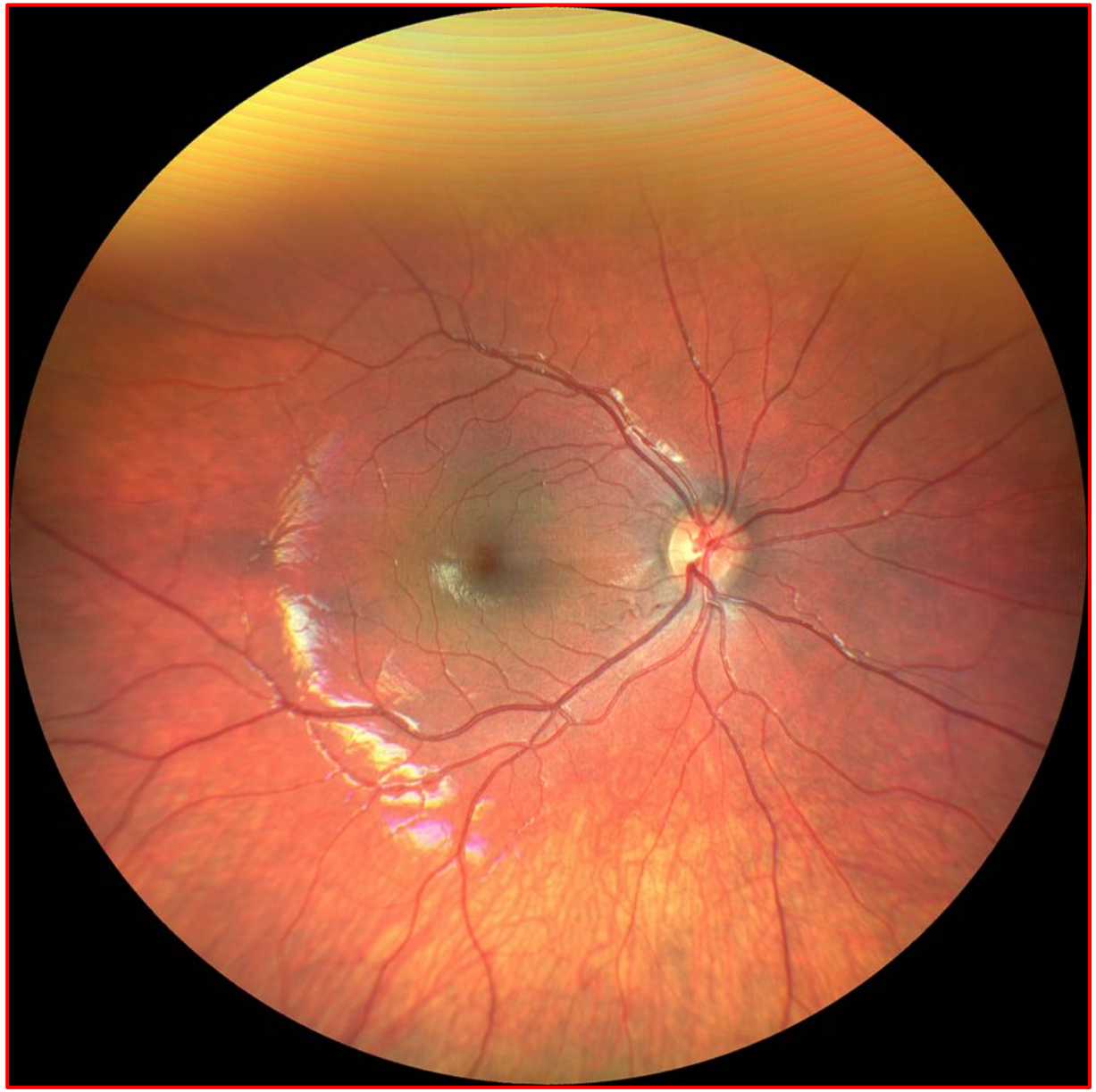


Widefield imaging a child of just 12 months

1 ammiccamento
0,3-0,4 sec

Automatic Operations:
- **Autofocus automontage**
- **Auto-exposure auto-laterality**

Aquisition Speed:
- **Live IR Preview 10 frames/second**
- **Image Capture 0.15 seconds**



Basic References

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- Prasad et al. riferiscono che il UWF è essenziale per una migliore diagnosi, gestione e trattamento delle **patologie vascolari**. Ophthalmology 2010;117:780-4

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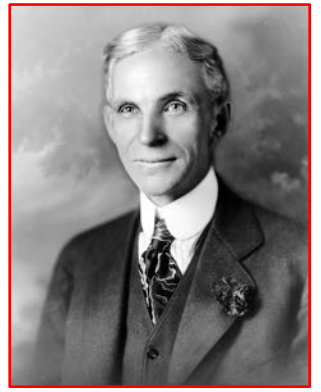
- Le performances dell'UWF hanno trovato positiva applicazione inoltre nella **malattia di Coats** (Kang KB et al.), di **Von Hippel-Lindau** (Haddad NM et al.) e nel **distacco di retina**.

- A. Lucente. Evoluzione della fotografia retinica e Imaging Widefield. Oftalmologia domani Anno IX - 2018

“C'è vero progresso solo quando i vantaggi di una nuova tecnologia diventano per tutti”
Henry Ford (1863 – 1947)



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Thank you for your kind attention!

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