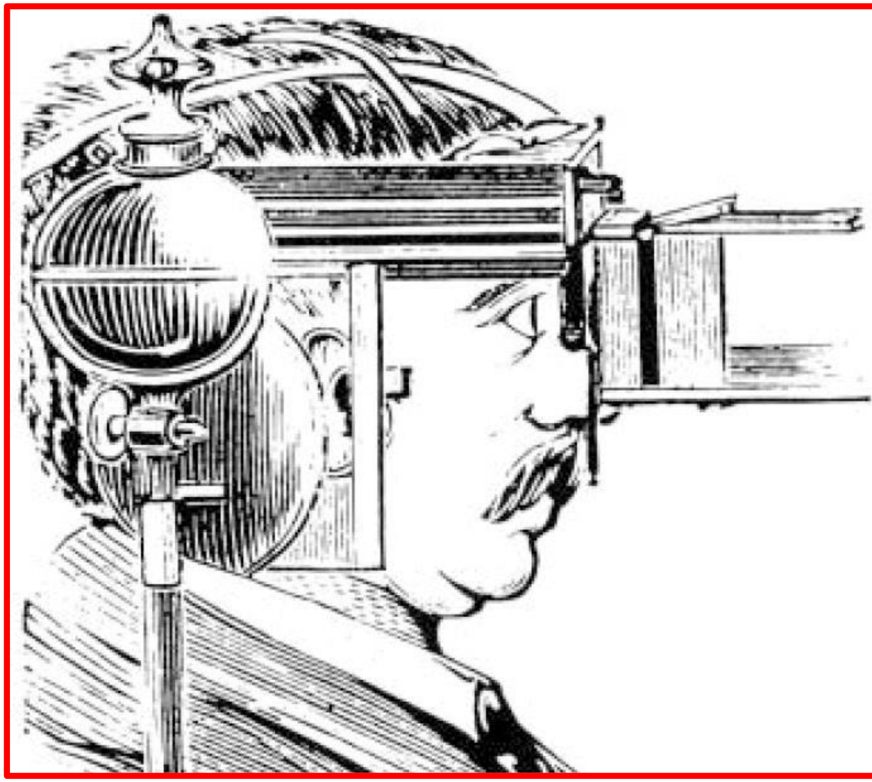
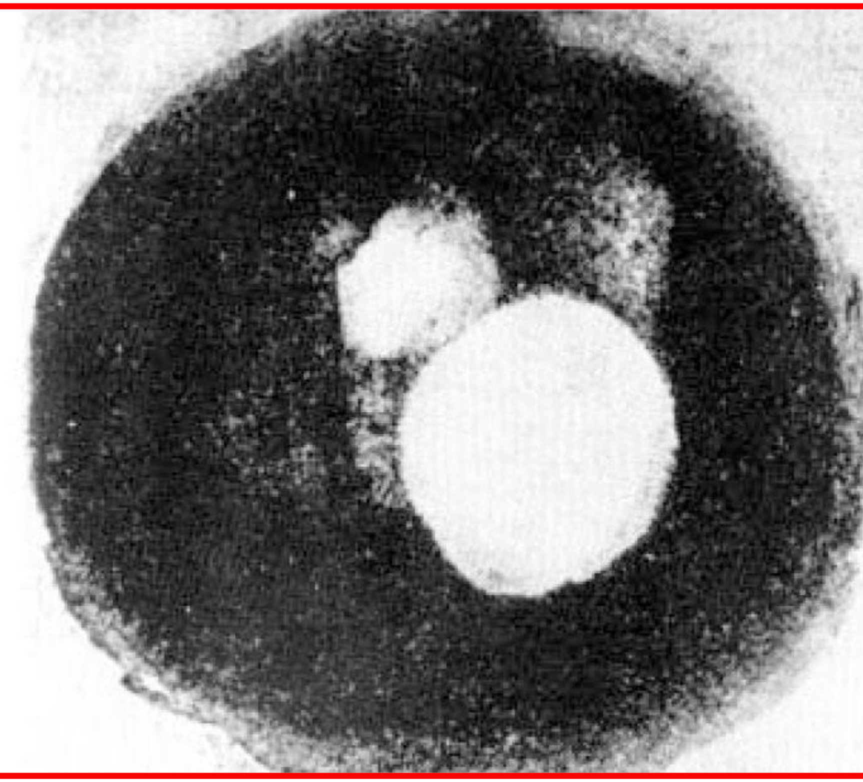
# Widefield and Ultra-Widefield in Ophthalmology


*Dawn of a New Era in Imaging*
*We make it visible*

Studio Oculistico
dott. A. Lucente
In Oculis Salus

**www.amedeolucente.it**





Prima fotografia del fondo oculare e della rudimentale Fundus Camera attribuita dalla maggior parte della letteratura a W.T. Jackman e J.D. Webster, nel 1886 pubblicata sul "Philadephya Photografer"

Lucien Hove 1848/1928, US
Hermann von Helmholtz 1821/1894, Cancelliere della Fisica, Germany

oftalmologia **domani**

Amedeo Lucente: Evoluzione della fotografia retinica e Imaging Widefield, Oftalmologia Domani Anno IX - 2018

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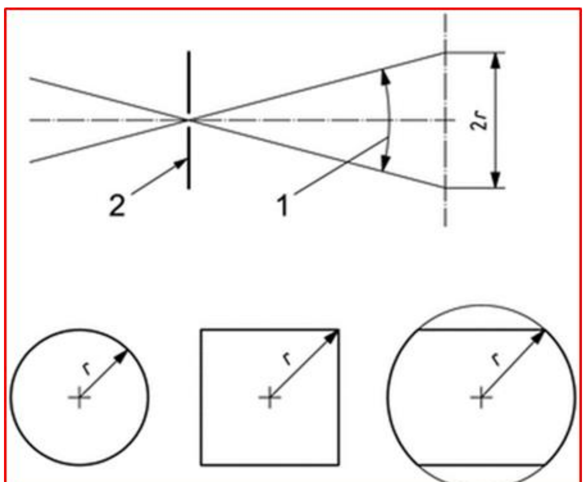
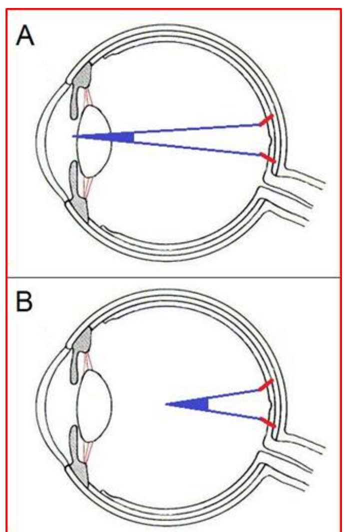
Reflex free Retinal Camera Zeiss after Nordenson, Price $ 768 f.o.b. N.Y.



FF Retinal Camera Zeiss
after Nordenson Year 1930
**Price $ 768 f.o.b. N.Y.**
(free on board, New York)

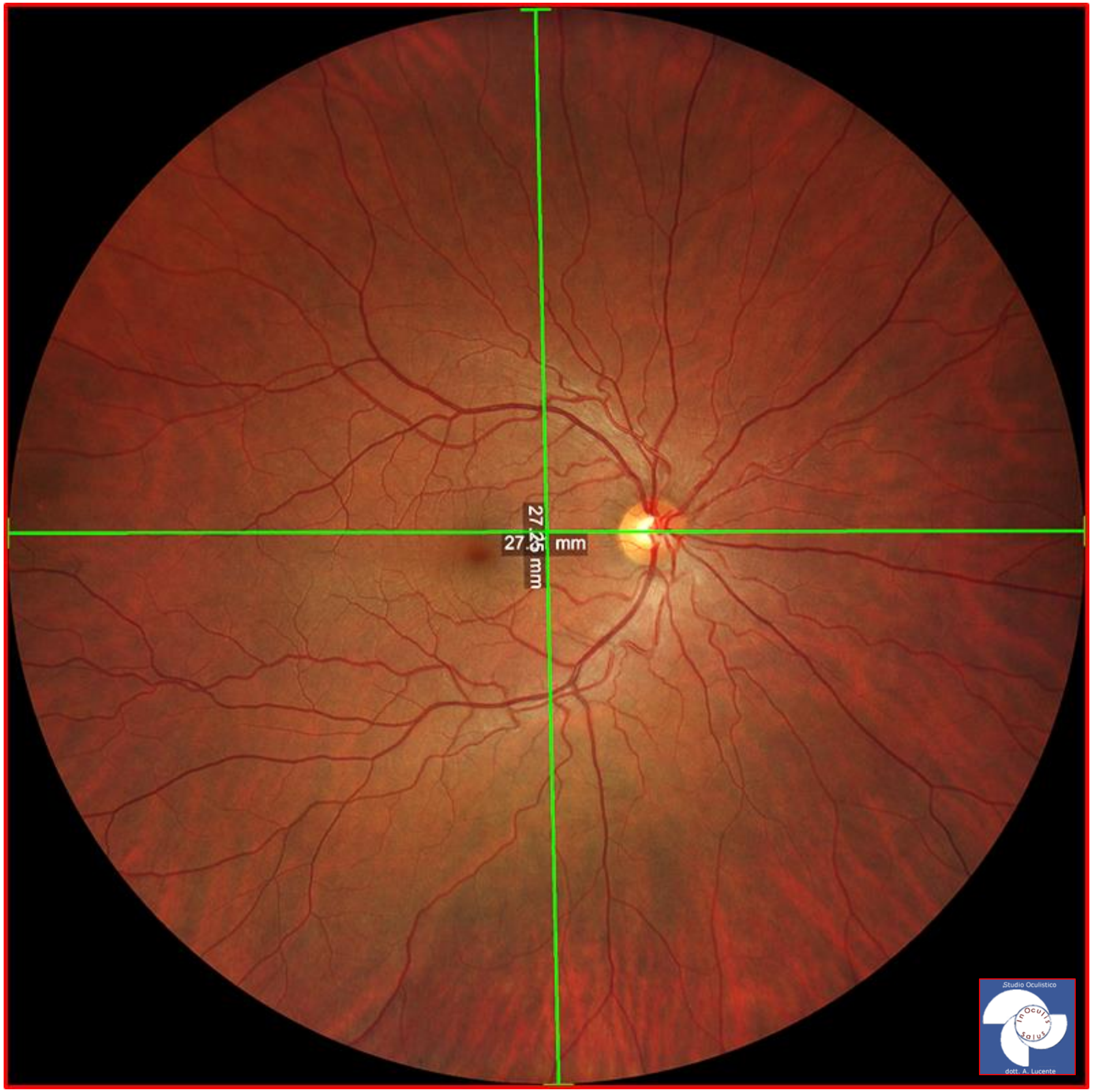
**1 $ 1930 = 76,5 $**
**768 $ x 76,5 $ ~ 58.752 $**



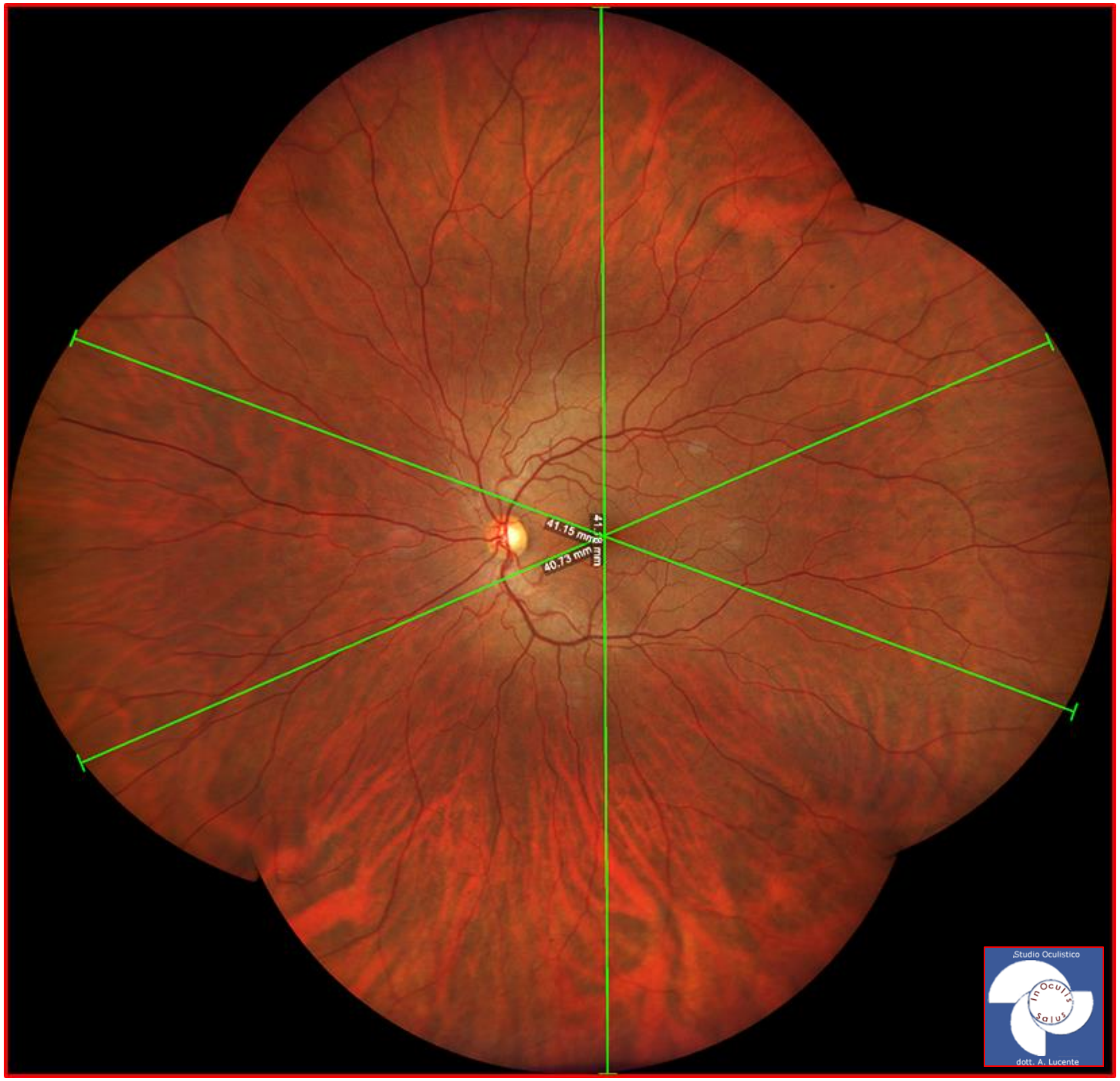




**FoV ≥ 50°** Widefield Imaging
**FoV ≥ 100°** Ultra-Widefield Imaging

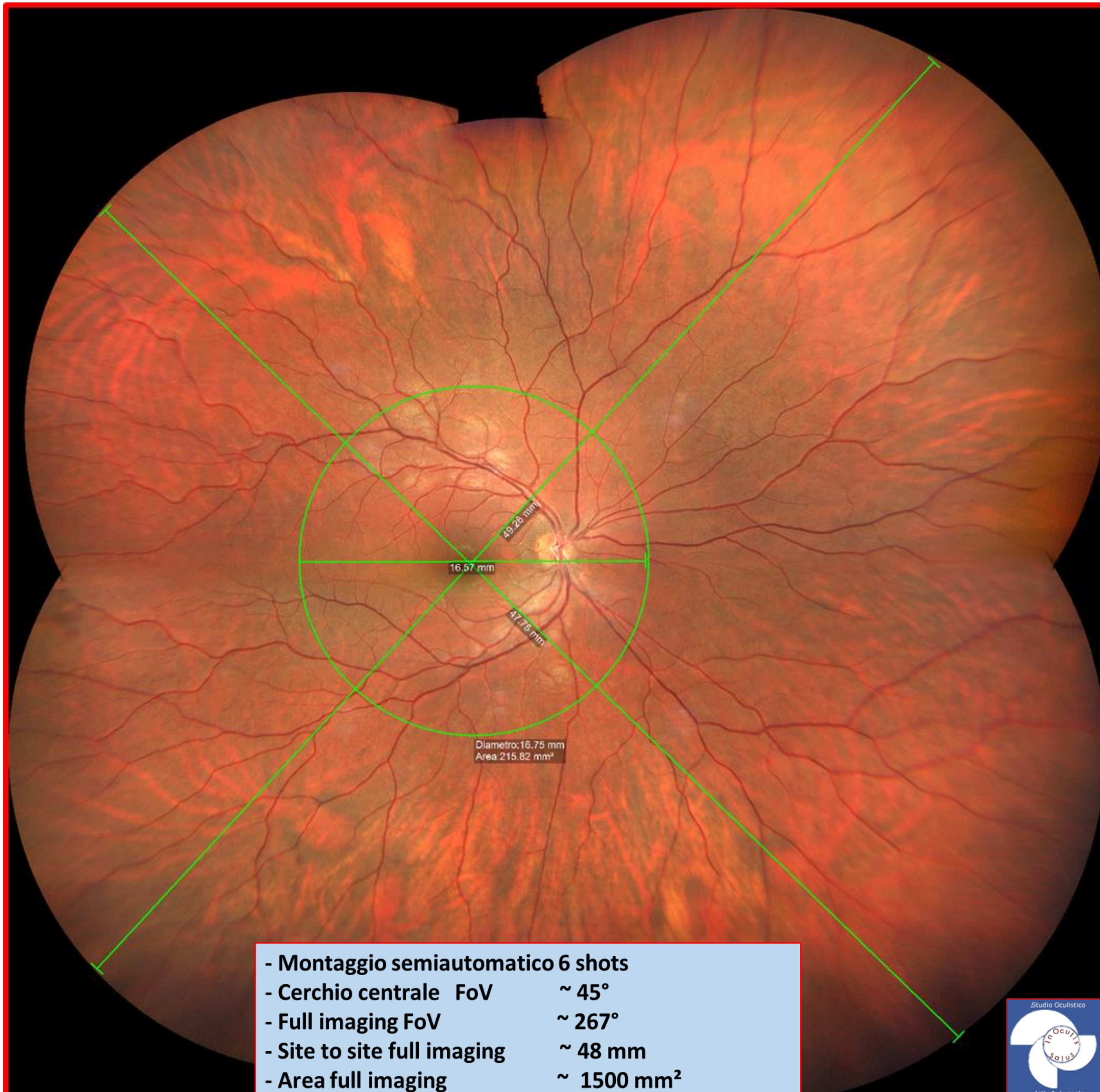
**ISO 10940 International Organization for Standardization**




**FoV 133° x 133° (out of ISO)** occhio emmetrope.
**One shot**; lunghezza misurabile estremo/estremo SI/NT **~ 27 mm**




**FoV 200° wide by 200° tall** **(out of ISO)** occhio emmetrope.
**Four shots** montaggio automatico; lunghezza misurabile estremo/estremo **~ 41 mm**




- Montaggio semiautomatico 6 shots
- Cerchio centrale FoV ~ 45°
- Full imaging FoV ~ 267°
- Site to site full imaging ~ 48 mm
- Area full imaging ~ 1500 mm²

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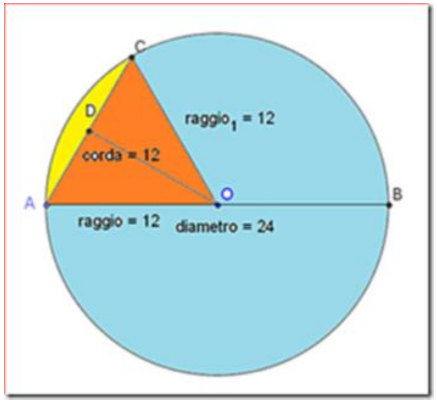
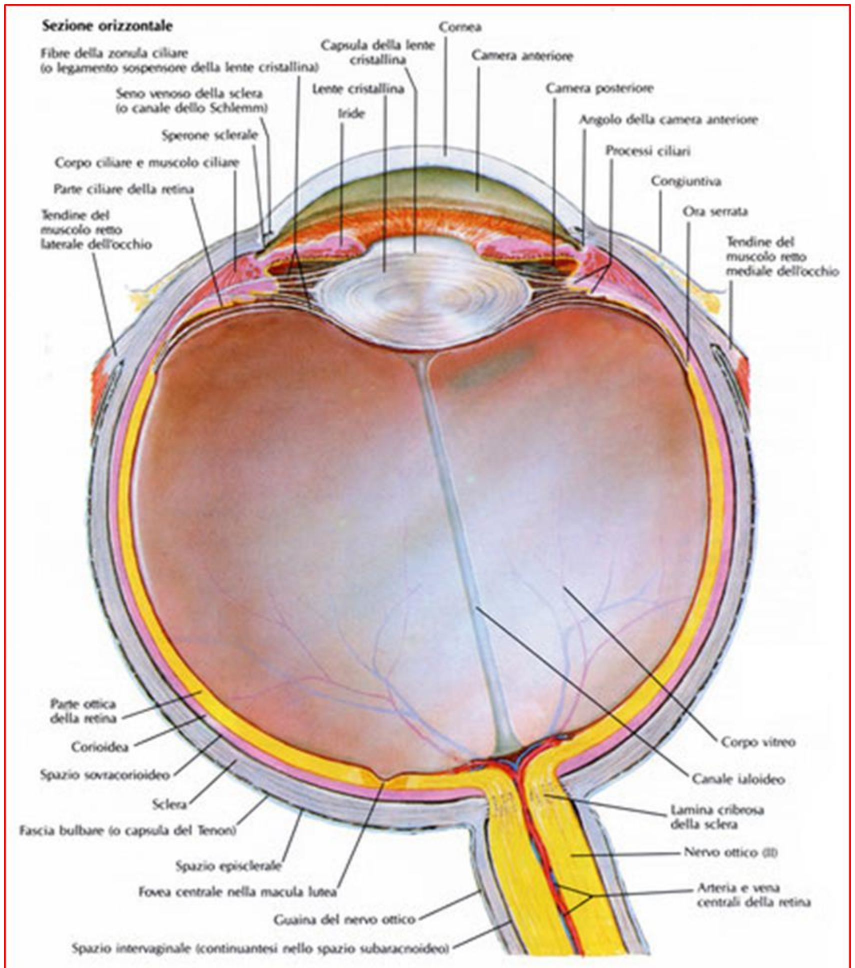


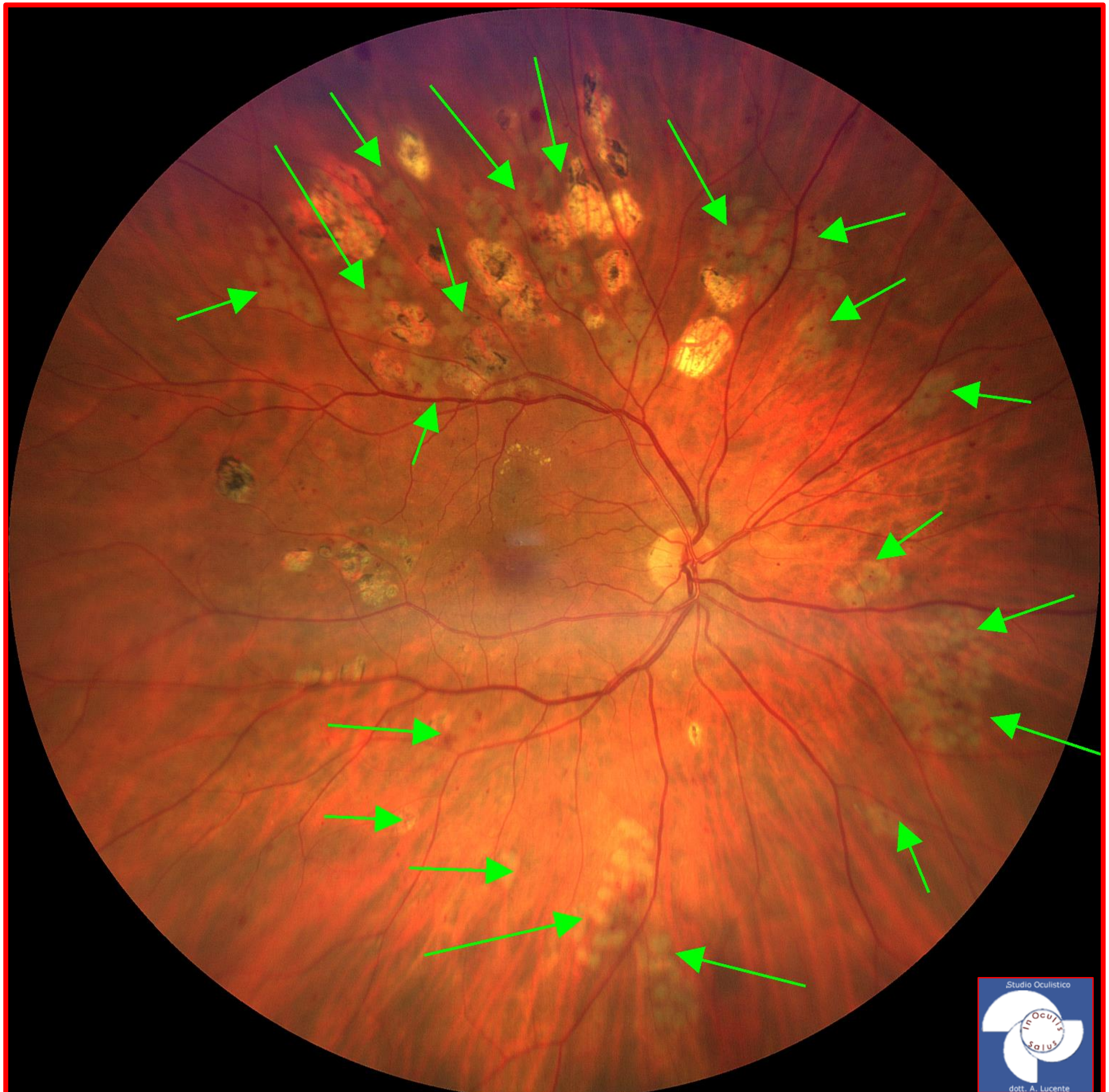

| | |
|---|---|
| **Diametro antero-posteriore** | **~ 24 mm** |
| **Circonferenza ~ 2 π r = 2 x 3,14 x 12** | **~ 75,36 mm** |
| **Corpo Ciliare** | **~ 6 mm** |
| **Bianco /bianco** | **~ 12 mm** |
| **Arco corneale sotteso a 12 mm ~ 1/6 circonferenza (75,36: 6= 12,56)** | **~ 12,56 mm** |
| **Ora serrata/ora serrata ~ 12,56 + (6x2)** | **~ 24,56 mm** |
| **Ora serrata/ora serrata internamente 75,36–[12,56 + (6 + 6)]** | **~ 50,8 mm** |
| **Angolo goniometrico settore circolare ~24,56 mm** (75,36 : 360 = 24,56 : x; x ~ 117,32) | **~ 117,32°** |
| **Fotografia con FoV di 180° copre un'emicirconferenza (75,36/2)** | **~ 37,68 mm** |
| **Area retinica sfera con raggio 12 mm = 4 π r² = 4 x 3,14 x 12²** | **~ 1808 mm²** |
| **Area dell'emisfera = ½ di 1808 mm²** | **~ 904 mm²** |




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


# >>>Clinical Cases……

## ……*Enter the New Era of Retinal Care by Zeiss*



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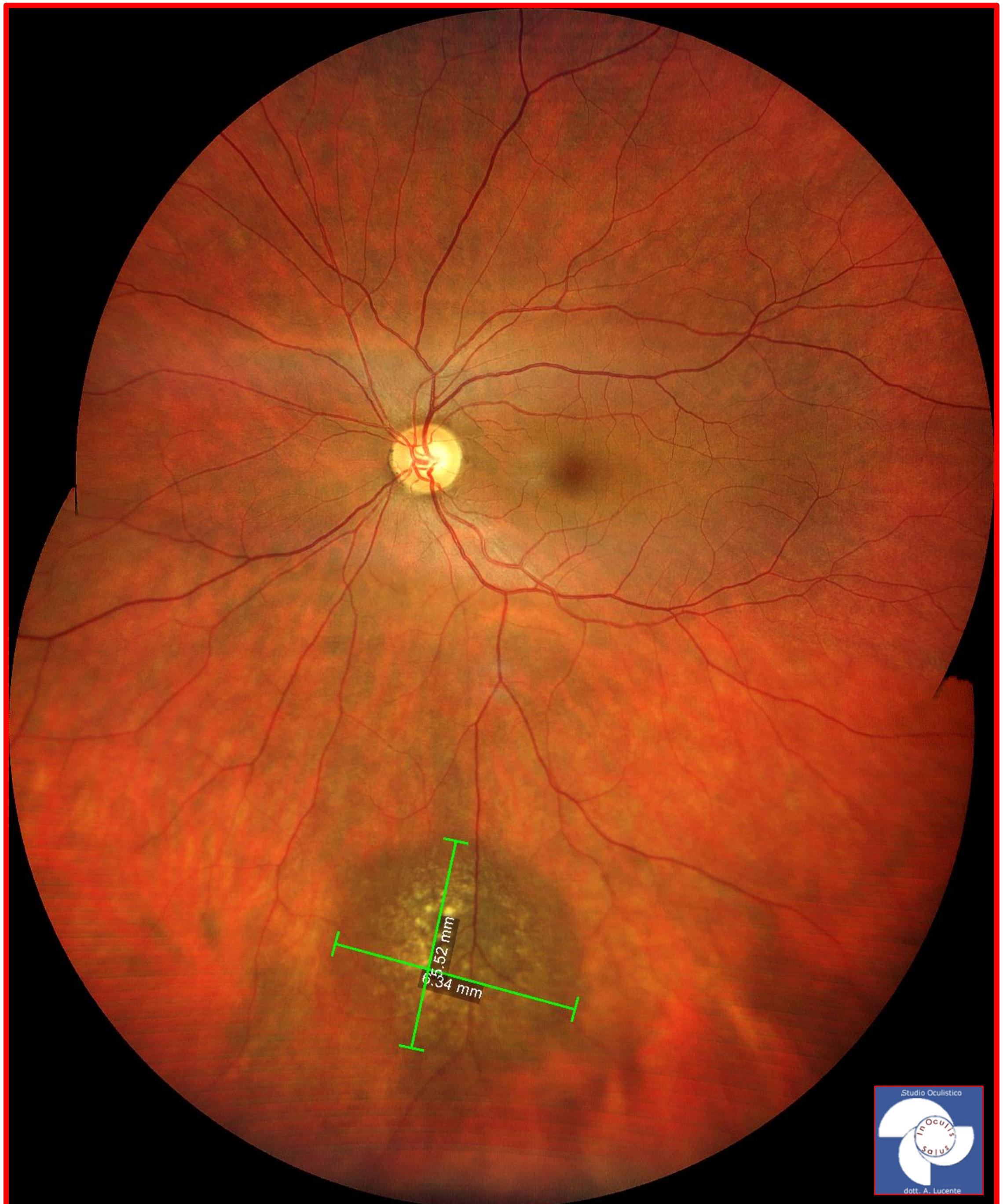
5.52 mm
6.34 mm
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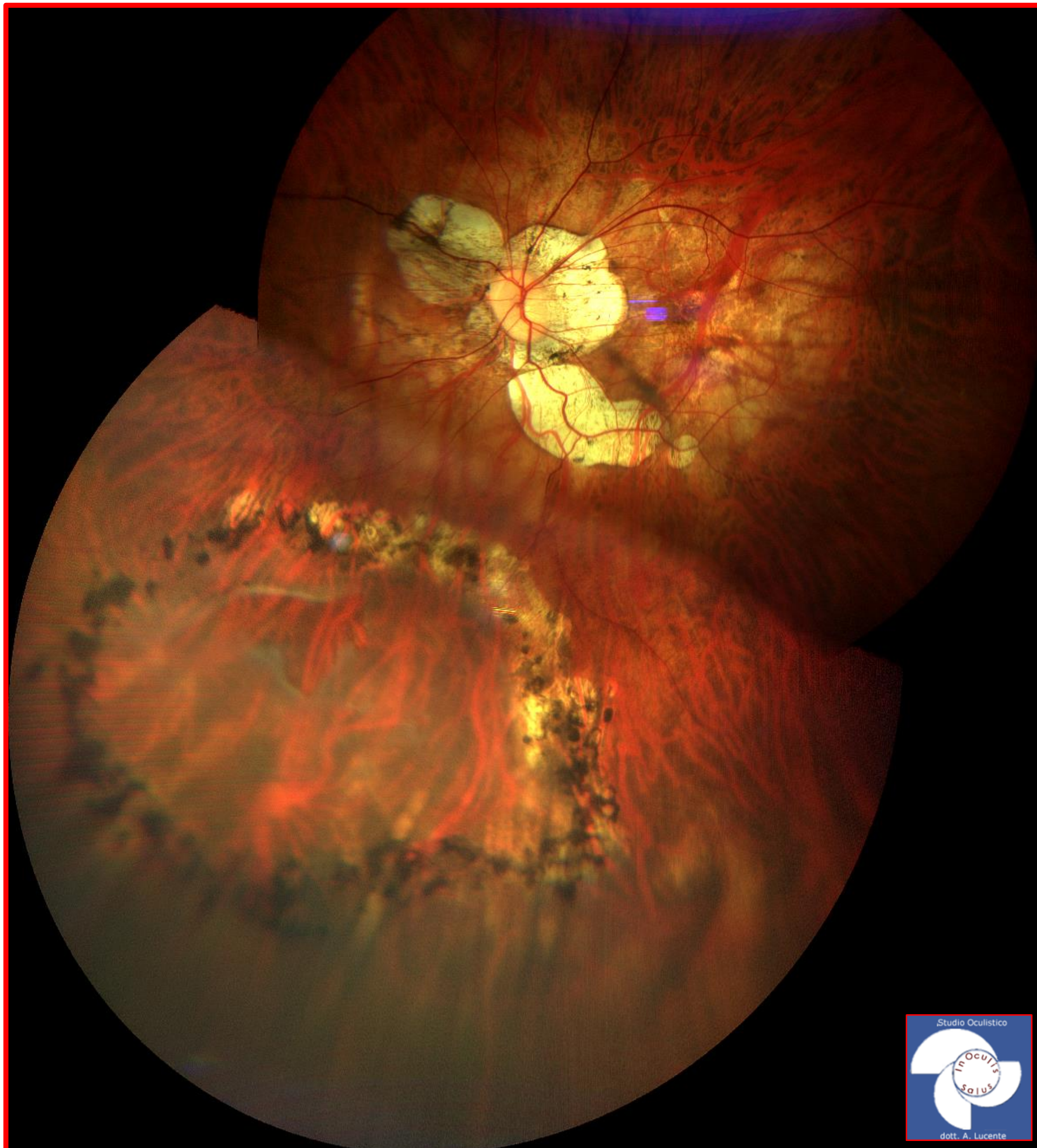
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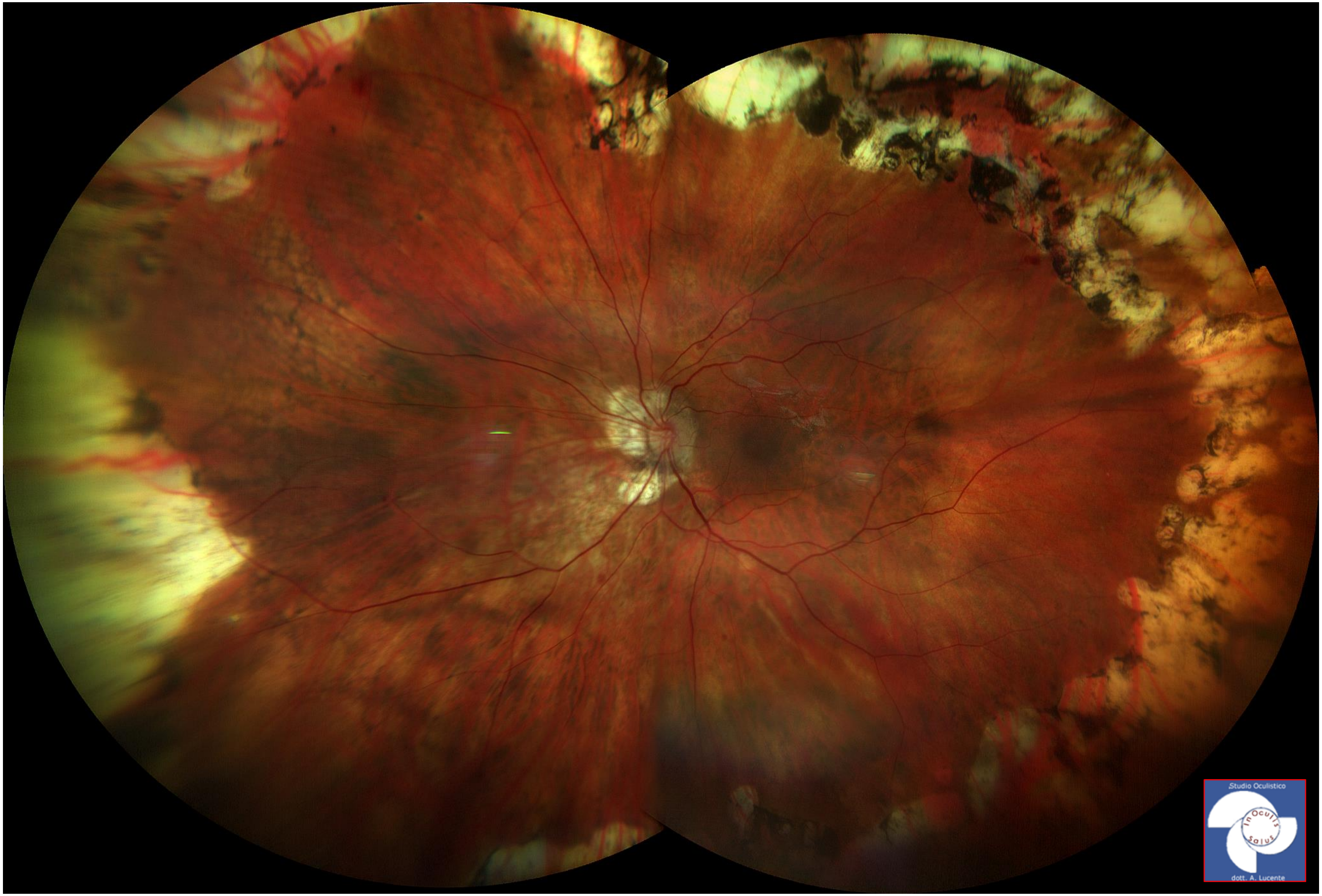
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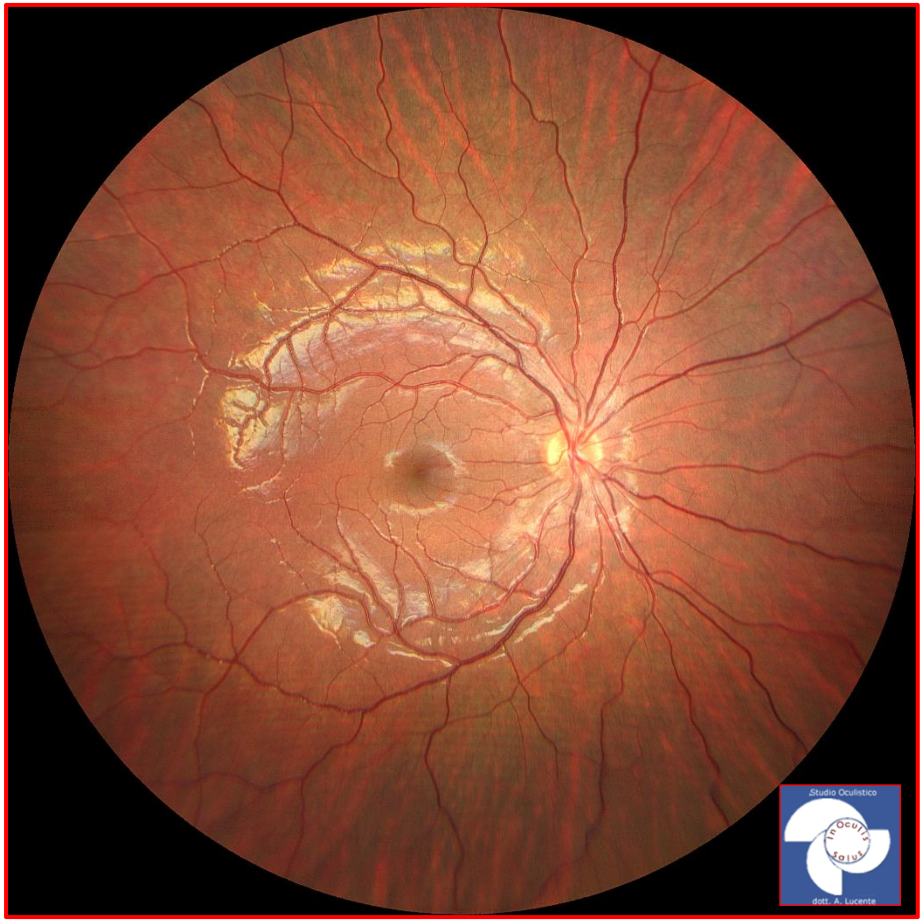
Calabria Scoprire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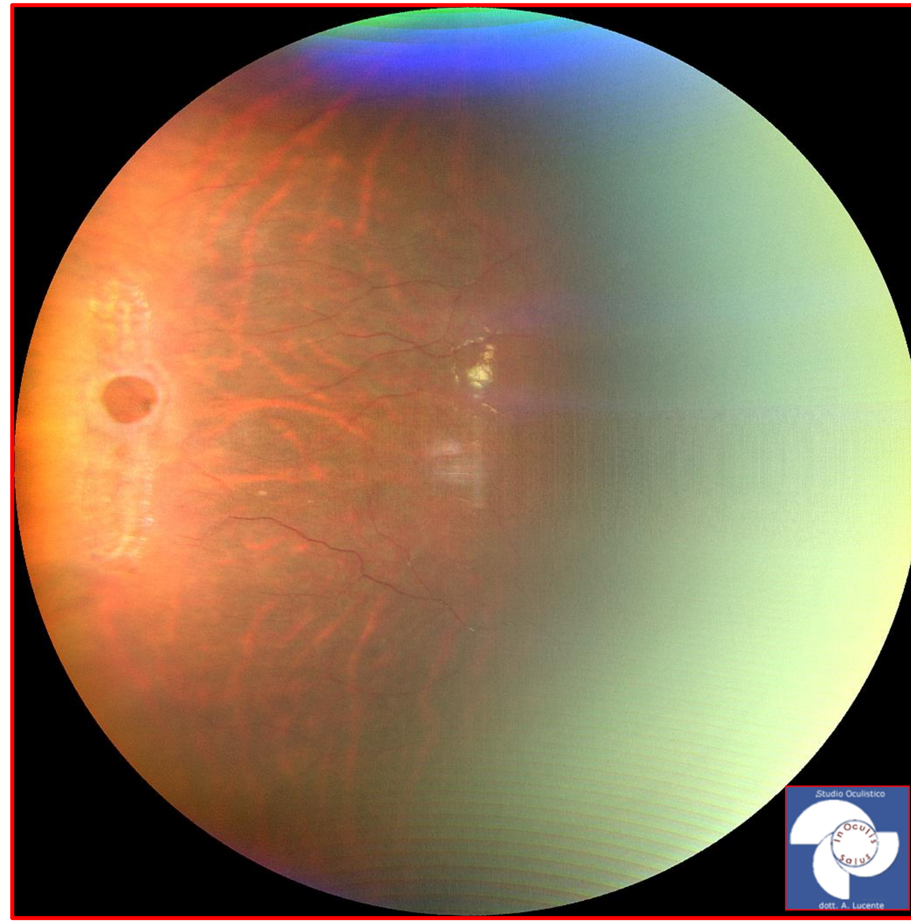
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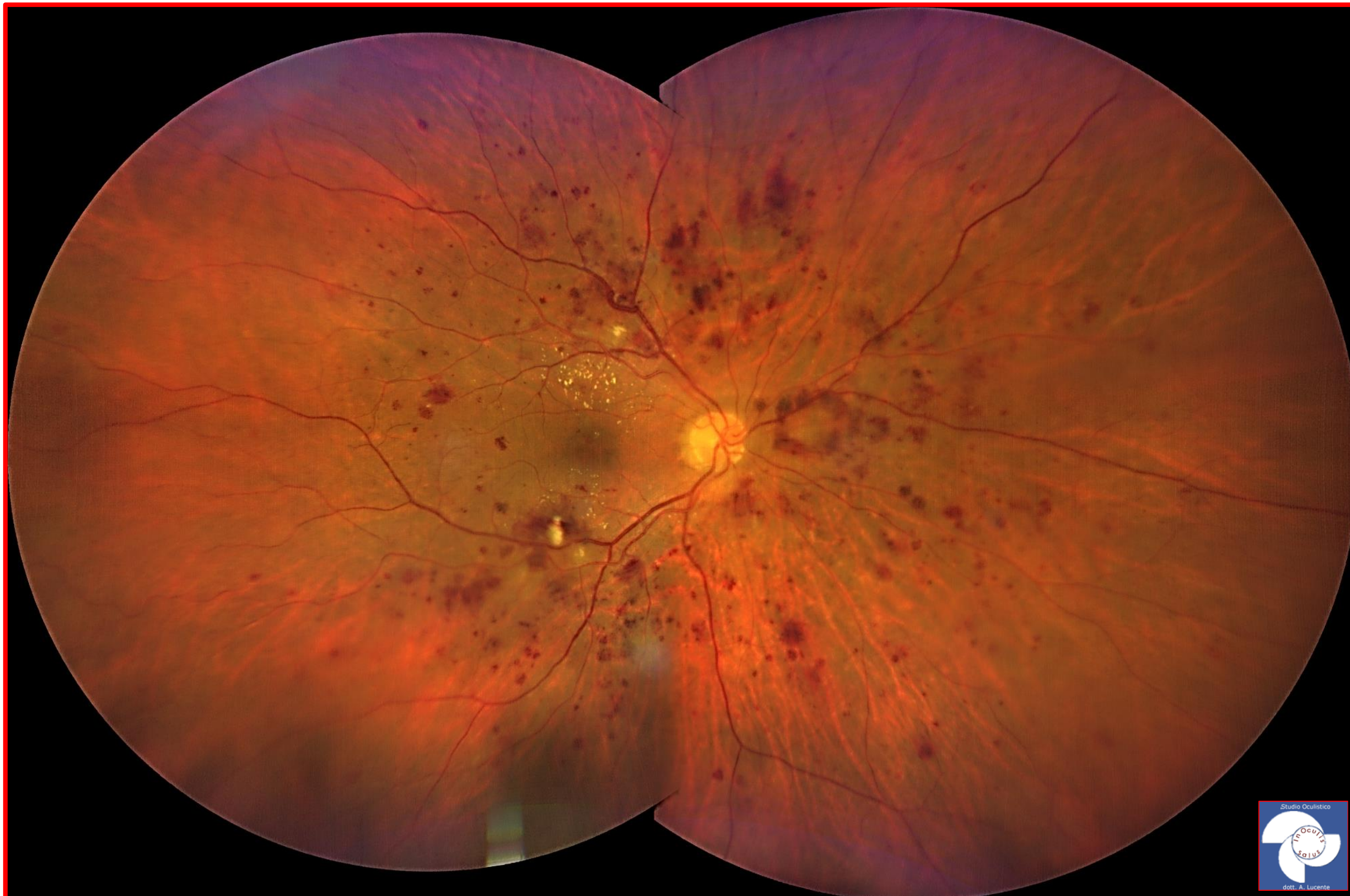
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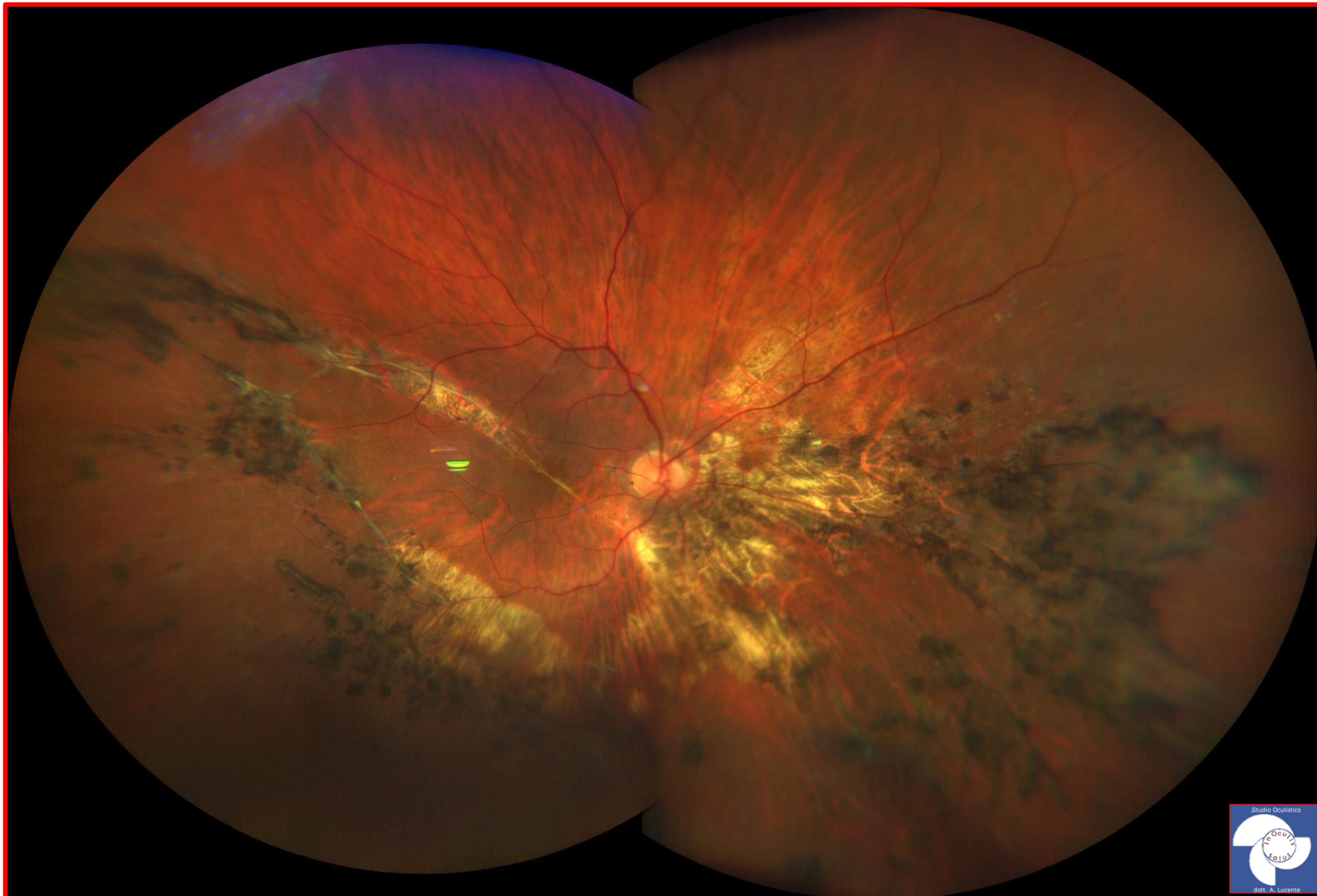
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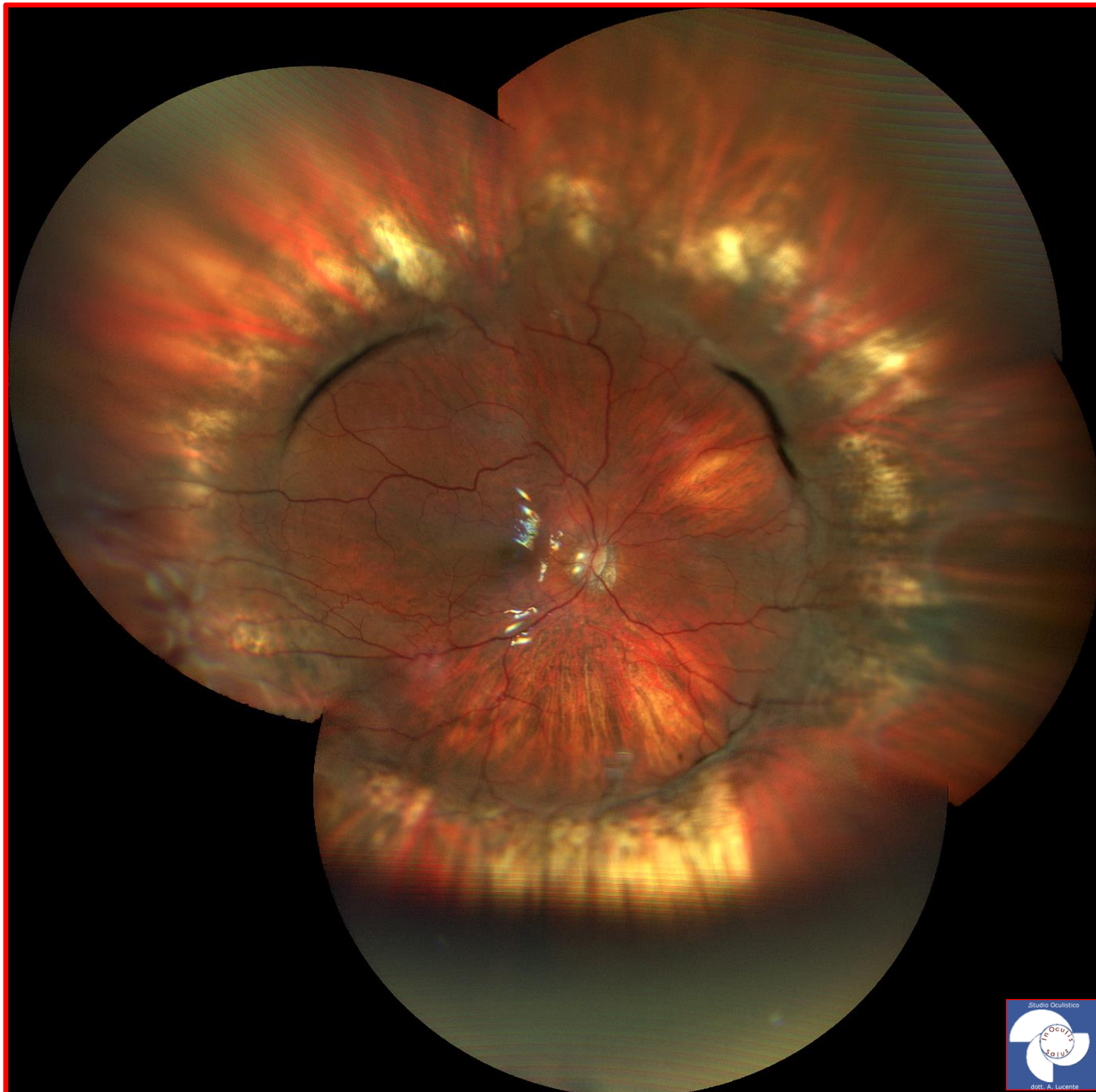
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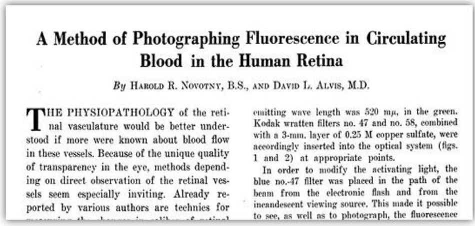

# A Method of Photographing Fluorescence in Circulating Blood in the Human Retina

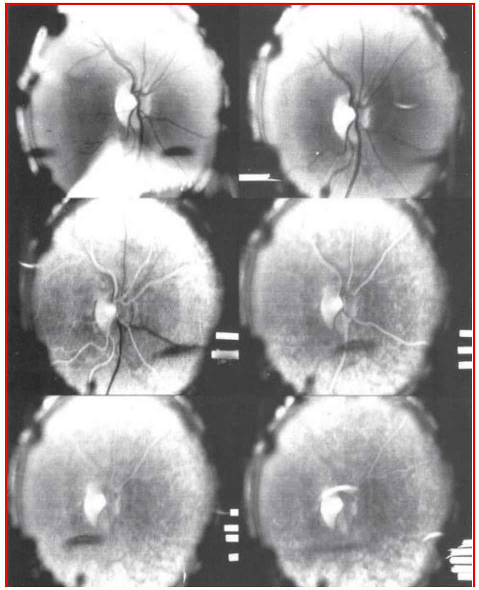
By Harold R. Novotny, B.S., and David L. Alvis, M.D.

The physiopathology of the retinal vasculature would be better understood if more were known about blood flow in these vessels. Because of the unique quality of transparency in the eye, methods depending on direct observation of the retinal vessels seem especially inviting. Already reported by various authors are technics for

emitting wave length was 520 mμ, in the green. Kodak wratten filters no. 47 and no. 58, combined with a 3-mm. layer of 0.25 M copper sulfate, were accordingly inserted into the optical system (figs. 1 and 2) at appropriate points.

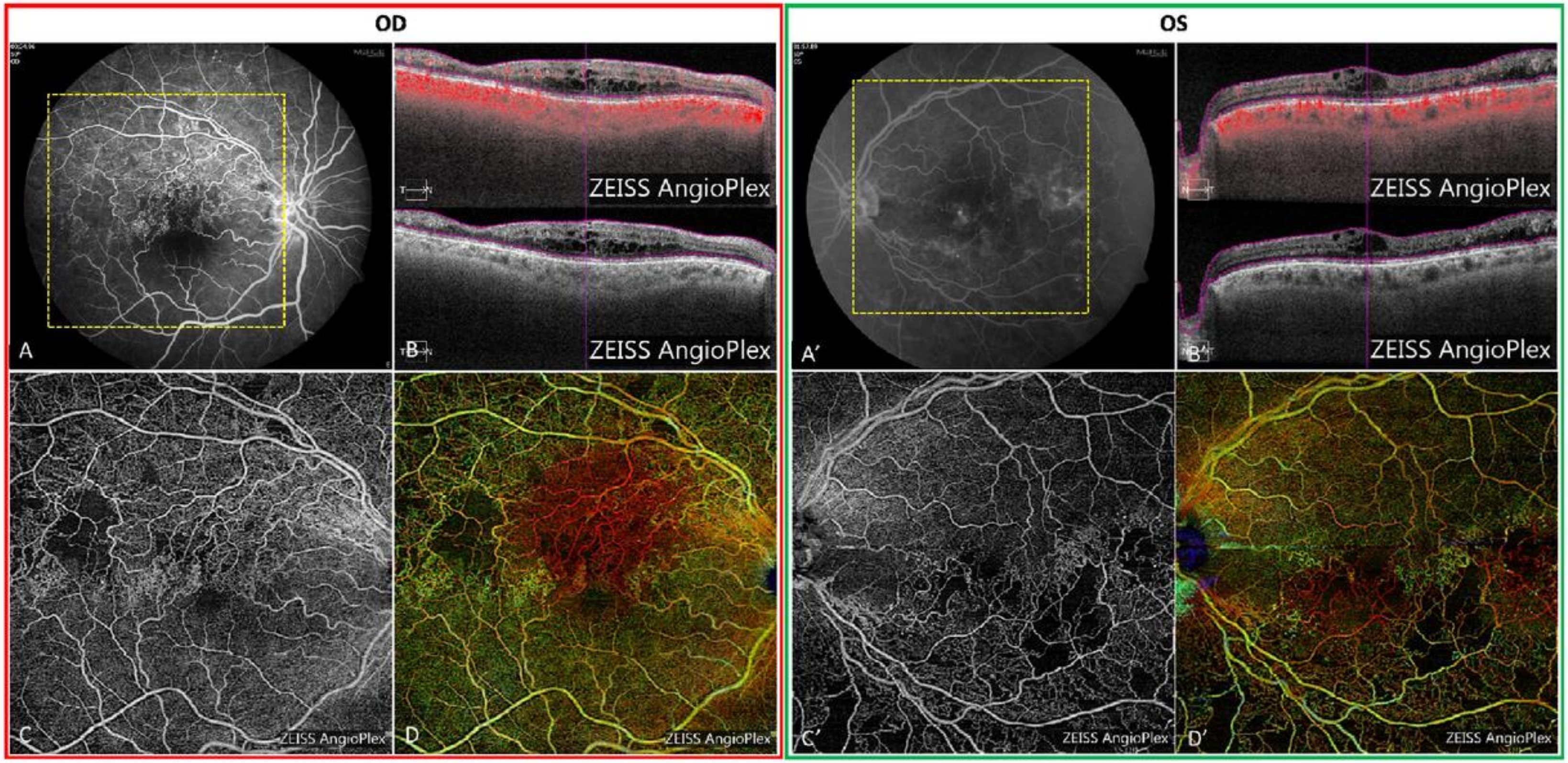
In order to modify the activating light, the blue no.-47 filter was placed in the path of the beam from the electronic flash and from the incandescent viewing source. This made it possible to see, as well as to photograph, the fluorescence

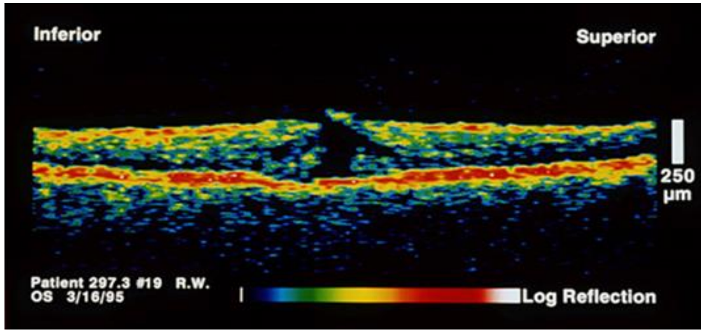
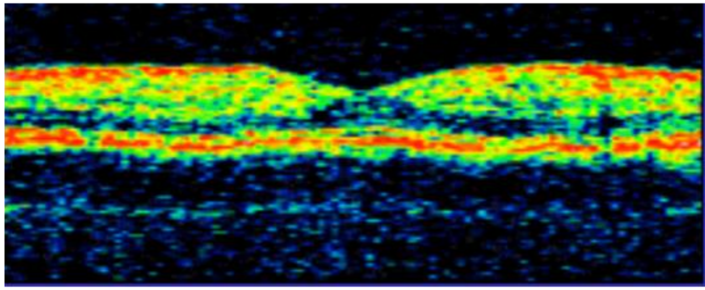
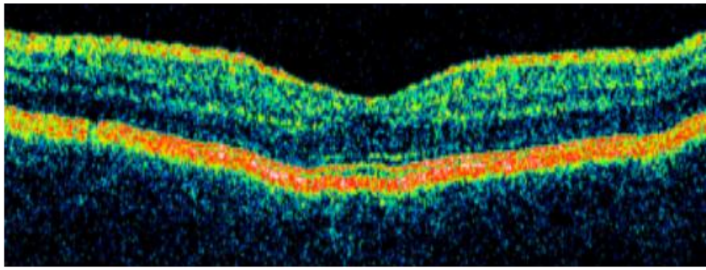
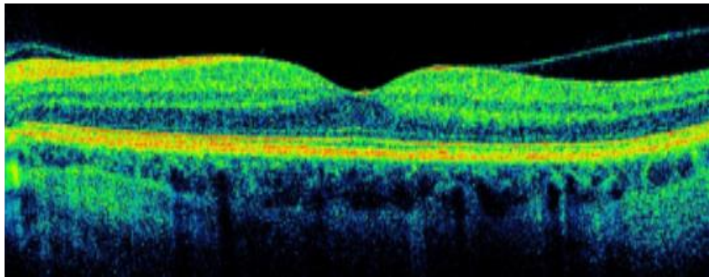
*Image shows at the Fovea:*
2.0 x 2.0 mm (A)
3.0 x 3.0 mm (B)
6.0 x 6.0 mm (C)
8.0 x 8.0 mm (D)
**12 x 12 mm 12 x 16 mm**
*Images at the Optic Nerve*:
3.0 x 3.0 mm (E)
6.0 x 6.0 mm (F)
**8.0 x 8.0 mm**




**H. Novotny and D. Alvis; Circulation 1961**

**The first fluorescein angiogram taken in November 1959, of the right eye of David Alvis with Harold R. Novotny**



| Model Image | Year<br>Units Installed | Single line Scan | Scans Sec | Resolution (microns) | B Scan |
|---|---|---|---|---|---|
|  | OCT 1995<br>200/99 | 100 A-scans x 500 points | 100 | 20 |  |
|  | OCT2 2000<br>400/2002 | 100 A-scans x 500 points | 100 | 20 |  |
|  | OCT3 Stratus 2002<br>6000/2006 | 512 A-scans x1024 points | 500 | 10 |  |
|  | Cirrus HD-OCT 2007<br>10000/2012 | 4096 A-scans x 1024 points | 27,000 | 5 |  |

# Foreword: 25 Years of Optical Coherence Tomography

by:James Fujimoto and David Huang

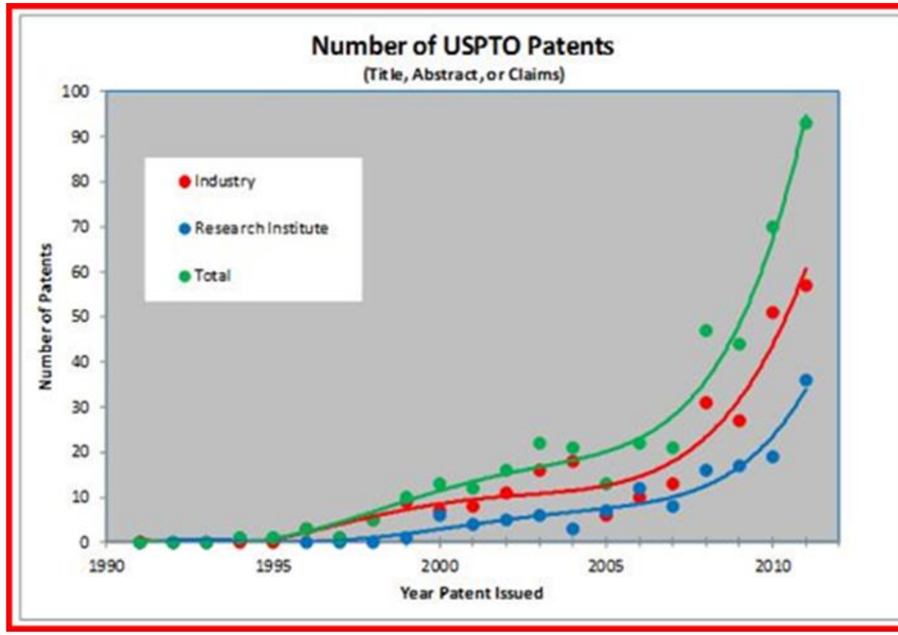
**$1B\$ = 10^{9} \neq 1B€ = 10^{12}$**

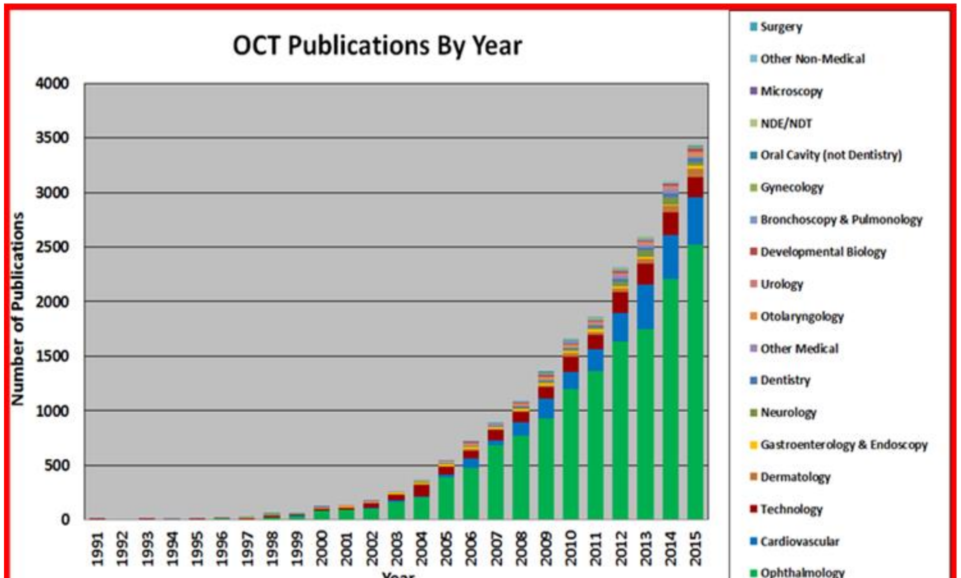
**Scale metriche ≠ dal 1974**

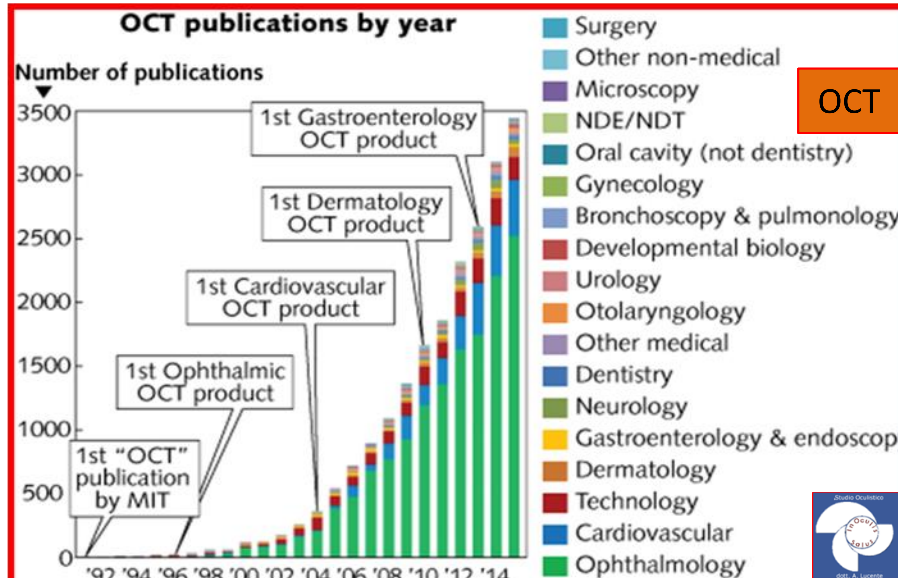
The market is just over $1B in 2012, and it is expected to grow by 18–30% per year for the foreseeable future

±50.000 OCT/AngioOCT

±250.000 Ophthalmologists




OCT

Mark Hillen. Benchmarking OCT. The Ophthalmologist, February 2016, #27

- 55,9% Zeiss **OCT**
- 35,6% Heidelberg By Mark Hillen
- 6,4% Topcon
- 2,1% Nidek

- **Zeiss →AngioPlex Cirrus 5000**
- Optovue→RTvue Avanti AngioVue
- Topcon→DRI OCT Triton
- Heidelberg→Spectralis con modulo OCT2
- Nidek→RS-3000 Advance OCT Angio-Scan
- Canon →OCT-HS100 Angio-eXpertcon modulo AX (Gruppo Haag-Streit)

- **HD-Cirrus Zeiss68.000 A-Scan/Sec →OMAGc (Optical Microangiography complex)**
- RTvue Avanti Optovue70.000A-Scan/Sec →SSADA (Split Spectrum Amplitude Decorrelation Angiography)
- SS OCT DRI OCT Topcon100.000A-Scan/Sec →OCTARA (OCT Angiography Ratio Analysis)
- Spectralis Heidelberg70.000 A-Scan/Sec →Full SADA (Spectrum Amplitude Decorrelation Algorithm)

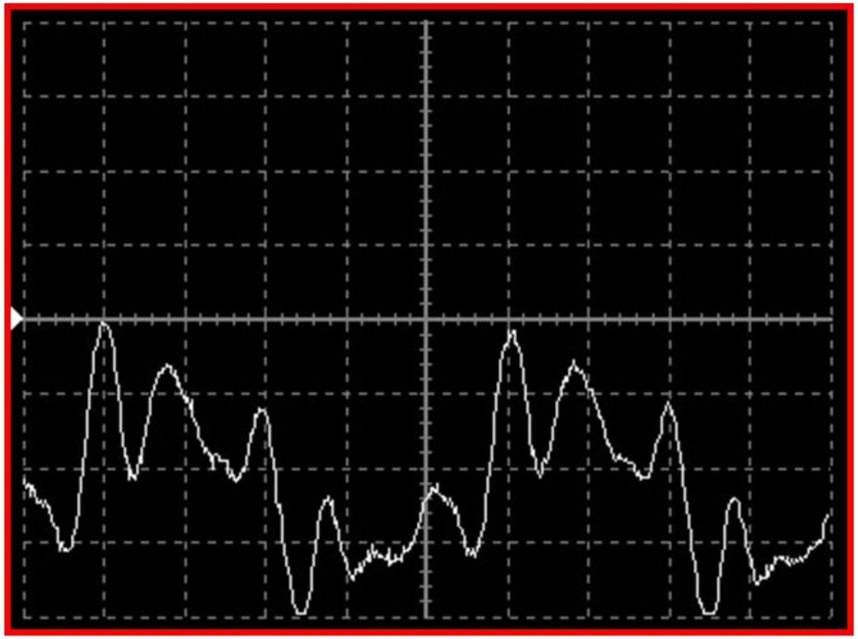
## Dawn of a New Era in Imaging

## x(t) vs X(f)

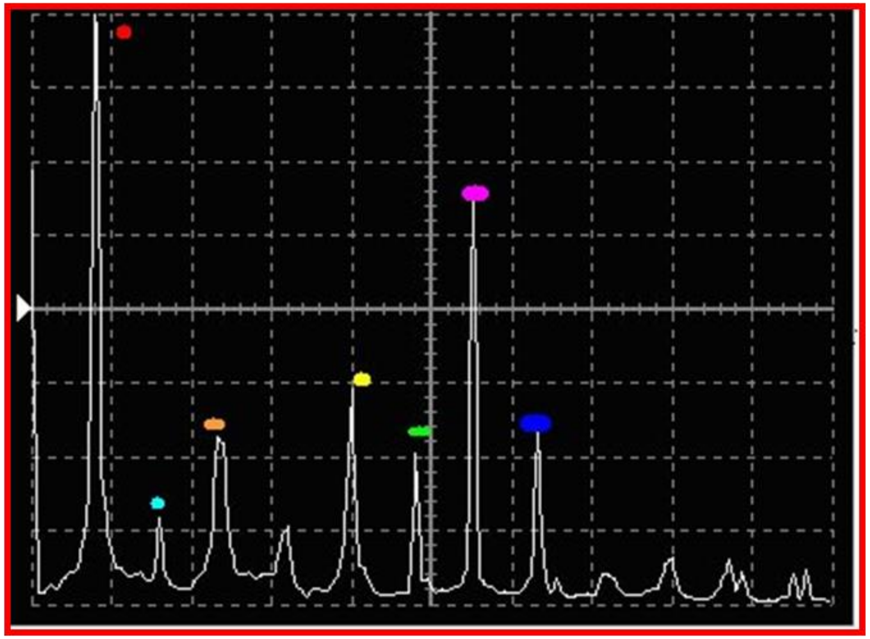
$$X(f) = \int_{-\infty}^{+\infty} x(t) \cdot e^{-j\,2\pi\,f\,t}\,dt$$

$$x(t) = \int_{-\infty}^{+\infty} X(f) \cdot e^{+j\,2\pi\,f\,t}\,df$$

**Trasformata e Antitrasformata di Fourier**

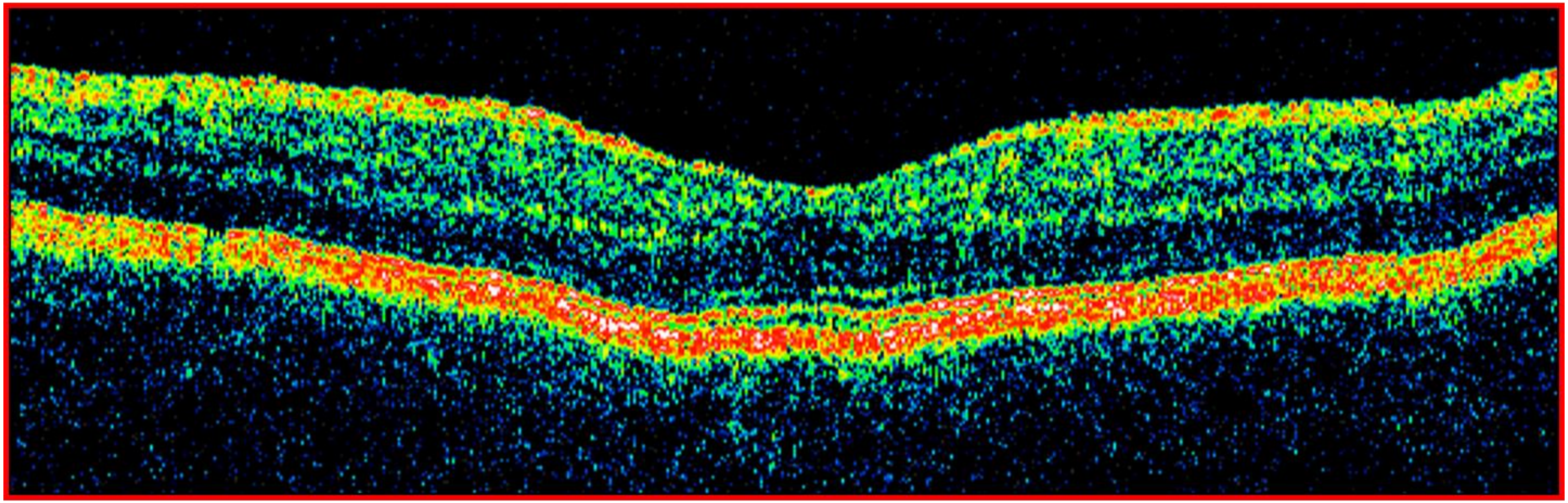


**Nota musicale «la» di un clarinetto registrata tramite oscilloscopio nel dominio del tempo *x(t)***

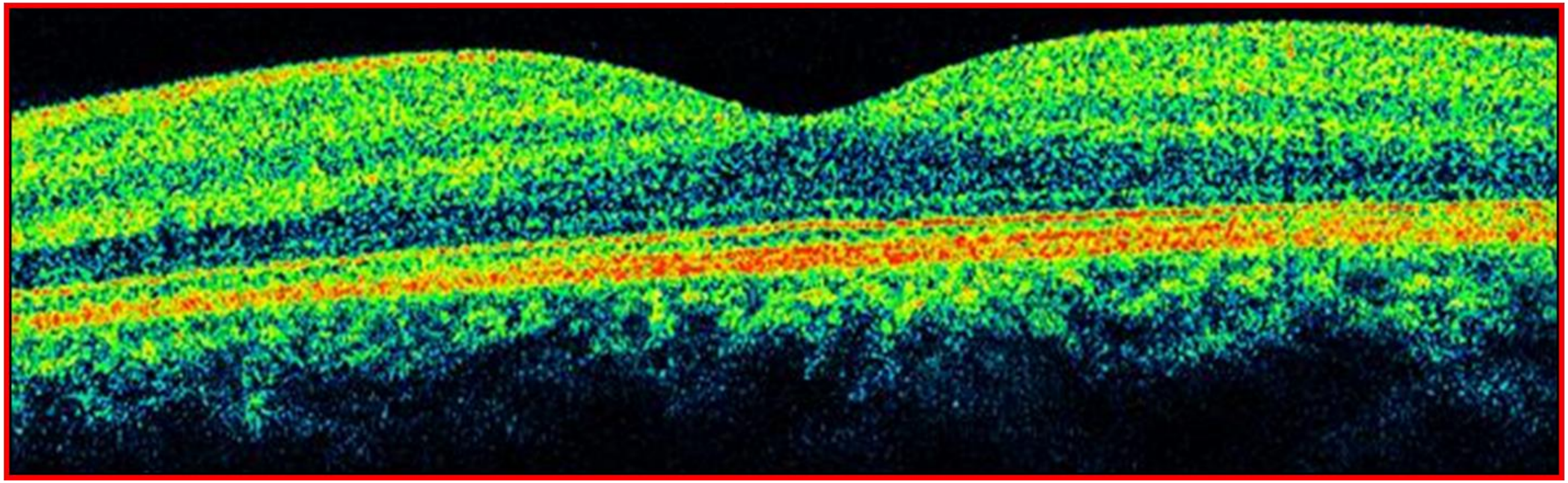


**Nota musicale «la» di un clarinetto scomposta in sotto-onde nel dominio delle frequenze *X(f)***

**$x(t)$**

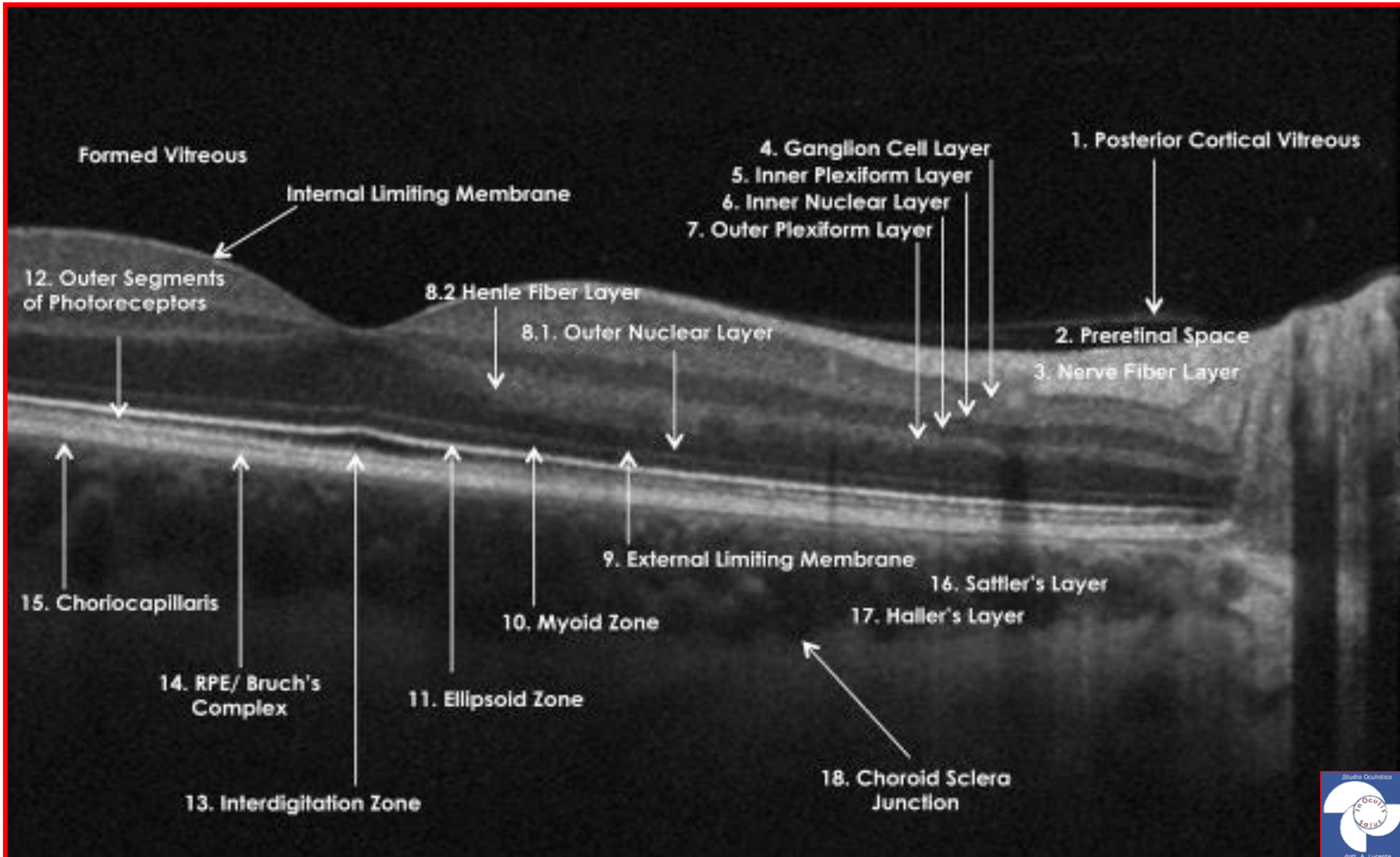


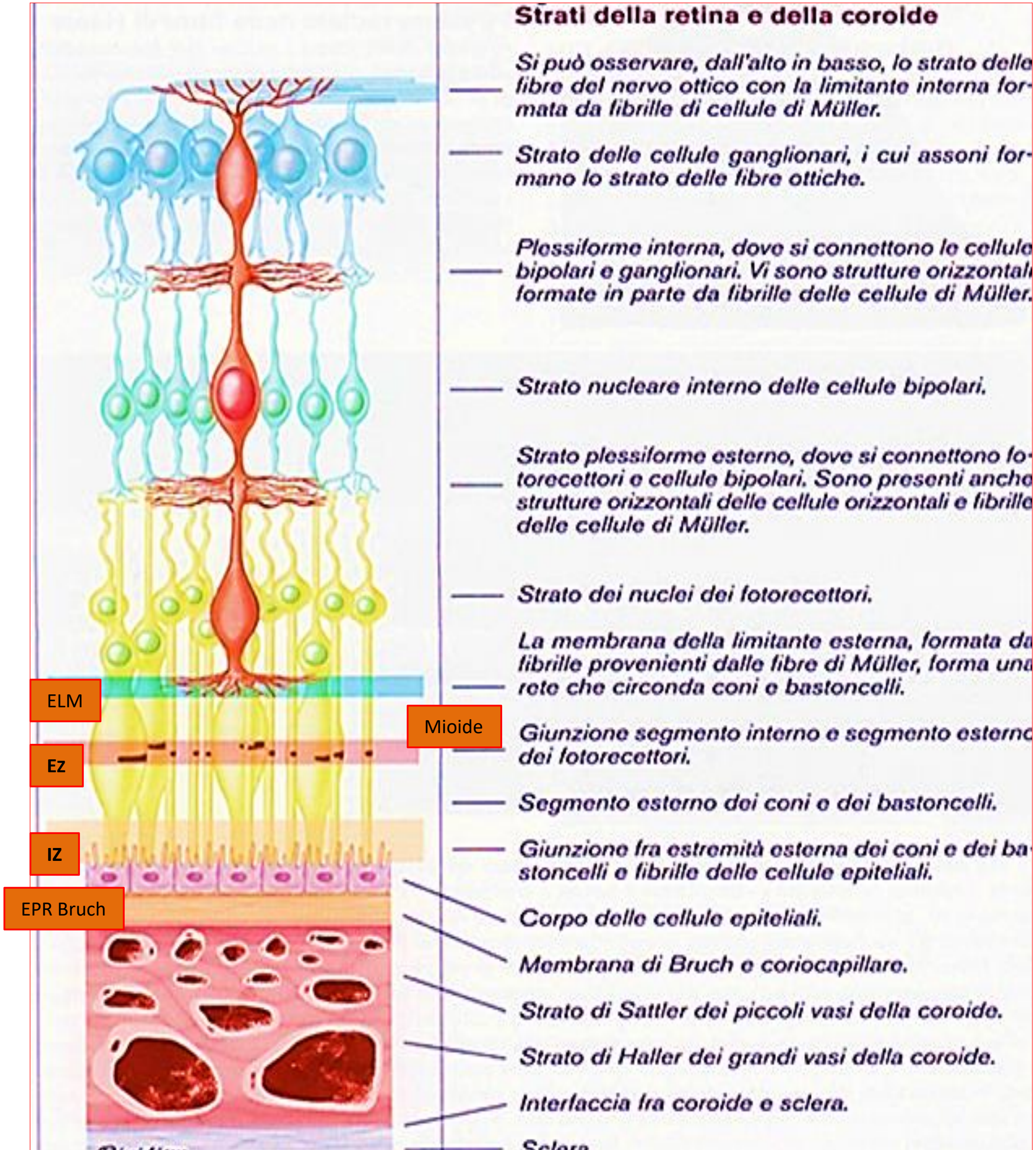
**$X(f)$**



# International Nomenclature OCT (INOCT) 2014

By: Staurenghi G, Sadda S, Chakravarthy U, Spaide RF; International Nomenclature for Optical Coherence Tomography (IN•OCT) Panel.





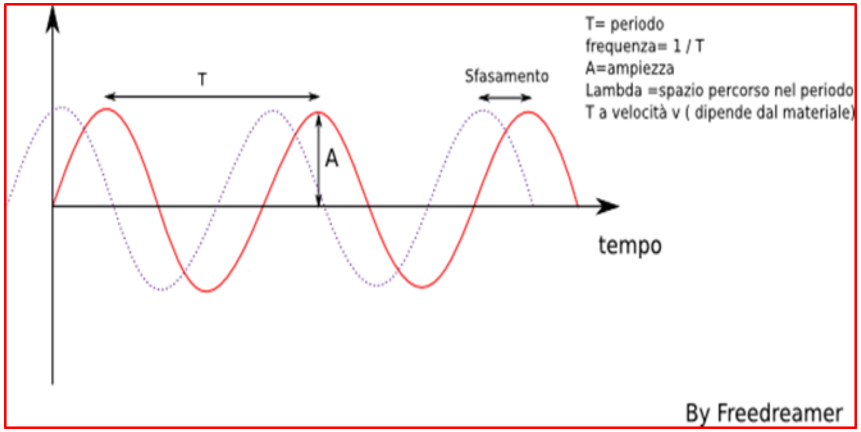

**1) La membrana limitante esterna (ELM)**
si trova al confine tra i corpi cellulari (nuclei) e i segmenti interni dei fotorecettori e comprende gruppi di complessi giunzionali tra le cellule Müller e i fotorecettori.

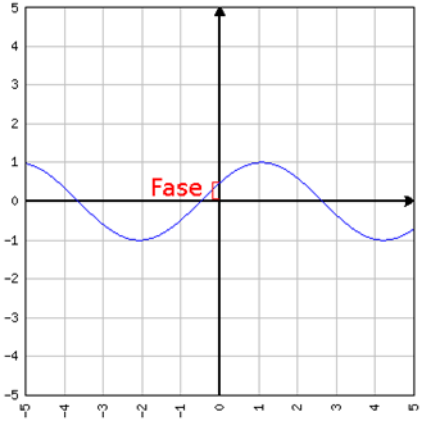
**2) La Zona Ellissoidale (EZ),**
precedentemente indicata come giunzione del segmento interno /segmento esterno del fotorecettore **(IS /OS),** è ora pensata per essere formata principalmente dai mitocondri all'interno dello strato ellissoidale della porzione esterna dei segmenti interni di i fotorecettori. In una fovea normale, la distanza dalla linea EZ all'ELM è inferiore a quella dalla linea EZ all'EPR

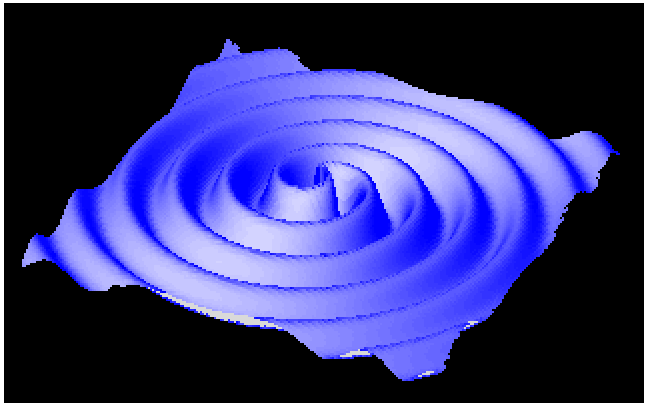
**3) La Zona di Interdigitazione (IZ)**
corrisponde al cilindro di contatto rappresentato dagli apici delle celle EPR che racchiudono parte dei segmenti esterni del cono. Questo strato era precedentemente indicato come punte del segmento esterno del cono **(COST)** o punte del segmento esterno dello stelo **(ROST),** e non è sempre distinguibile dal livello RPE sottostante, anche nei soggetti normali.

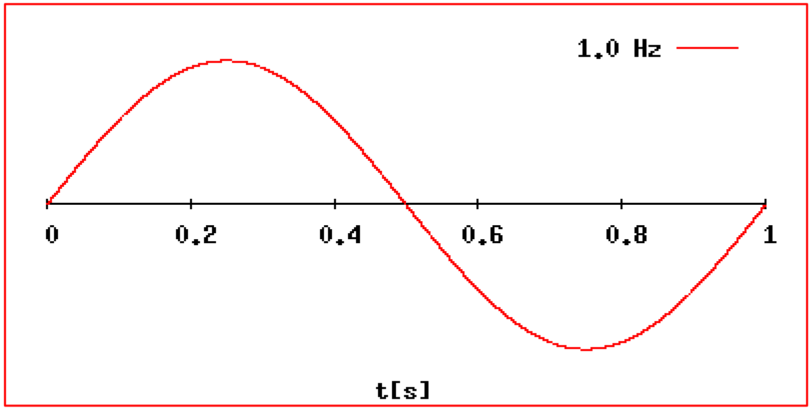
**4) EPR-Bruch**
La banda epiteliale del pigmento retinico è formata dall'EPR e dalla membrana di Bruch (indistinguibili l'una dall'altra in uno stato normale utilizzando gli attuali sistemi SD-OCT). Nella fovea, questa banda è più spessa, il che indica che le strutture coroidali possono anche contribuire all'iper-riflettività della banda EPR in questa posizione

# What is a wave? «energy propagated through matter» A. Einstein



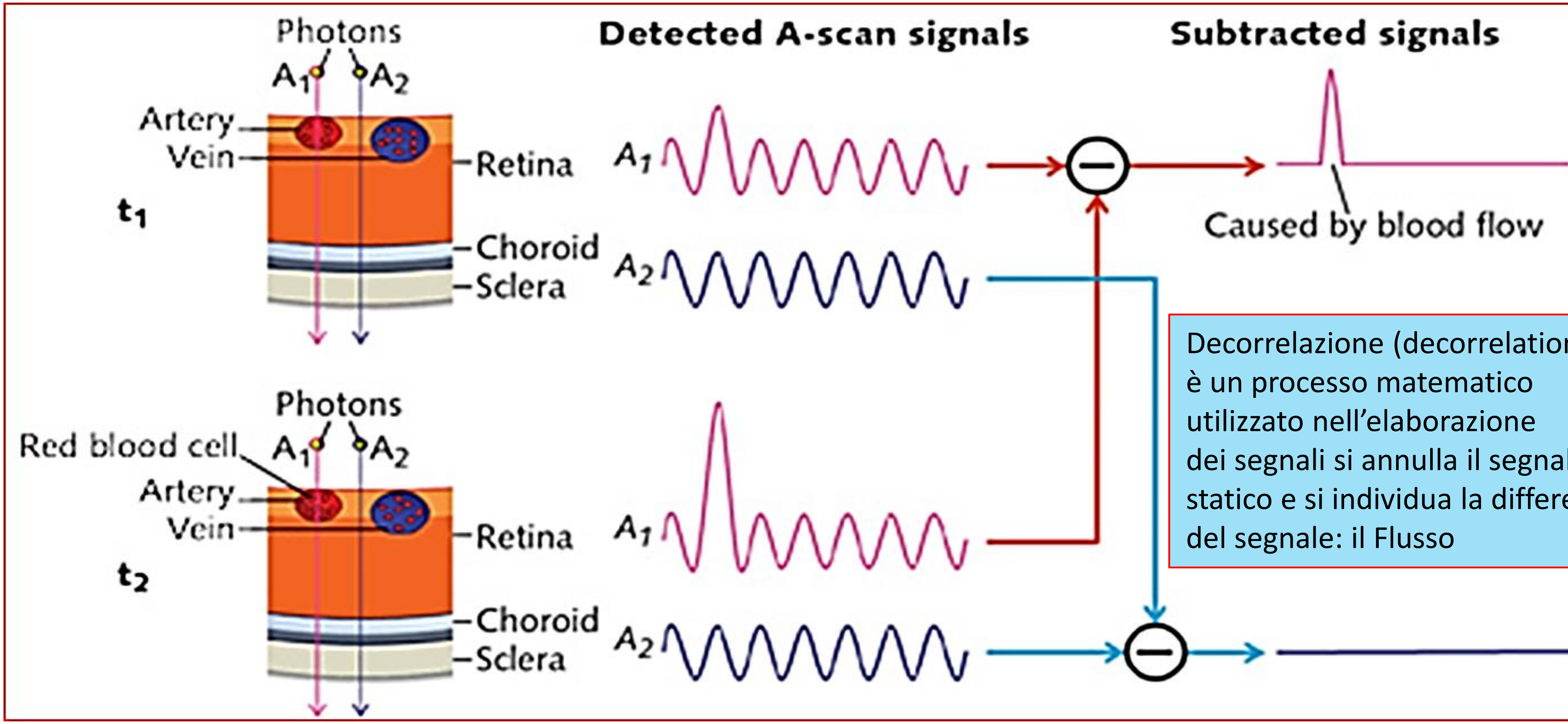



**a)Angiografia dyeless basata sull’ampiezza del segnale OCT**

**b) Angiografia dyeless basata sulla fase del segnale OCT**

**c) Angiografia dyeless basata sull’ampiezza e sulla fase del segnale OCT**
**(complex signal)**

# How OCTA Works → decorrelation




Decorrelazione (decorrelation): è un processo matematico utilizzato nell'elaborazione dei segnali si annulla il segnale statico e si individua la differenza del segnale: il Flusso

As moving blood cells pass through vessels, they generate changes in OCT signals. Based on this concept, a blood flow signal can be extracted by subtracting the OCT signals from the same location but at different time points (red path). The OCT signals will be different at these locations, while OCT signals from surrounding retinal tissues will remain steady (blue path).

**by CHIEH-LI CHEN 11/13/2015 Bio Optics World**

# Perfusion Density and Vessel Density

$$Perfusion\ Density = \frac{Area\ Perfusa\ [mm^2]}{Area\ Totale\ [mm^2]}$$

$$Vessel\ Density\ [mm^{-1}] = \frac{Lunghezza\ Vasi\ [mm]}{Area\ Totale\ [mm^2]}$$

The VD was defined as the percentage of signal-positive pixels/area of interest

The flow index is defined as the average decorrelation values in the segmented area

The Vessel Density is defined as the percentage area occupied by vessels the segmented area

$$\frac{\int_A D \cdot V dA}{\int_A dA}$$

If not

($V$=1, if vessel; $V$=0,

$$\frac{\int_A V dA}{\int_A dA}$$

If not

($V$=1, if vessel; $V$=0,

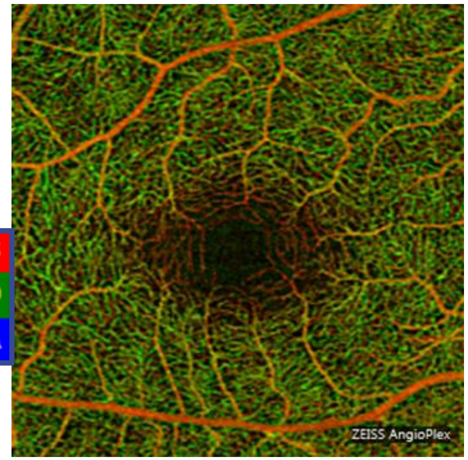
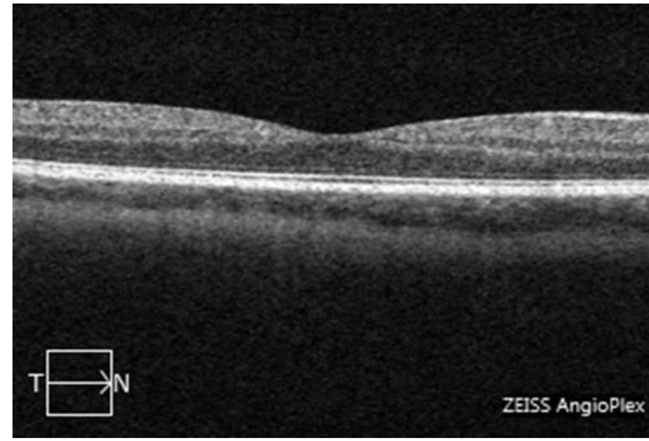
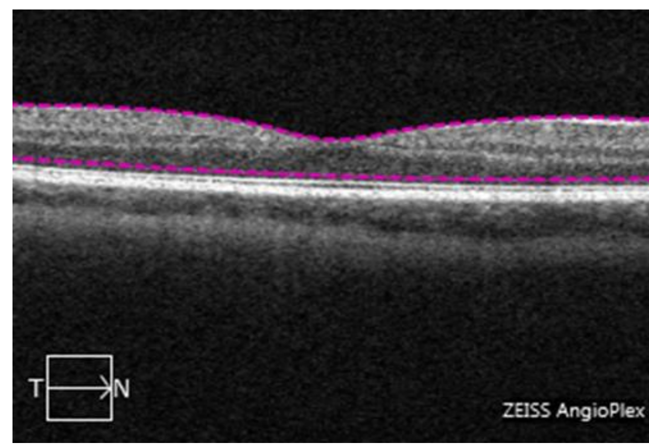
Numero di pubblicazione WO2014040070 A1
Tipo di pubblicazione Richiesta
Numero domanda PCT/US2013/059047
Data di pubblicazione 13 mar 2014
Data di registrazione 10 set 2013
Data di priorità 10 set 2012
Pubblicato anche come CA2883402A1, Altri 5 »
**Inventori David Huang, Yali Jia, Jason Tokayer, Ou Tan**
Candidato Oregon Health & Science University
Esporta citazione BiBTeX, EndNote, RefMan
Citazioni di brevetti (5), Con riferimenti in (1), Classificazioni (15), Eventi legali (4)

# AngioPlex & Analysis Layer

- 10 slab +

**Retina Depth Encoded**
**Retina**
**VRI** **Vitreo-Retinal Interface**
**Superficial Retinal Layer**
**Deep Retinal Layer**
**Avascular**
**Sub RPE**
**Choroid**
**RPE-RPE fit**
**ORCC** **Outer Retina to Choriocapillaris**

# AngioPlex Analysis Layer Presets: Retina Depth Encoded and Retina

| Layer Preset | Layer Boundaries | Example Image (Normal Eye) | B-scan with Layers |
|---|---|---|---|
| **Retina Depth Encoded** | Combination of: Superfical, Deep, and Avascular Layers<br><br>Superficial: Red S<br>Deep: Green D<br>Avascular: Blue A |  |  |
| **Retina** | Inner Boundary: ILM<br><br>Outer Boundary: RPE = RPEfit - 70µm |  |  |

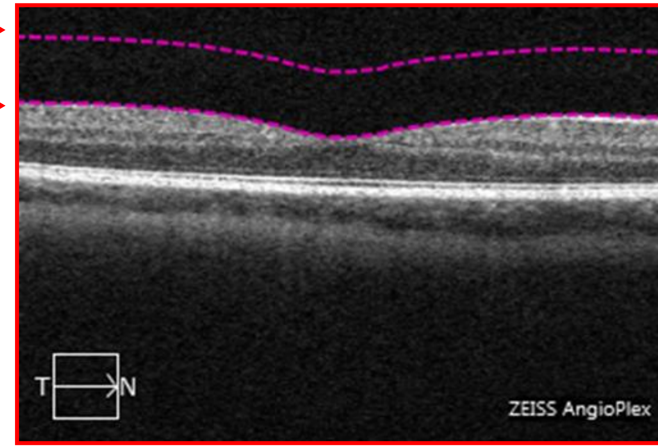
# AngioPlex Analysis Layer Presets: VRI and Superficial

**- VRI** Vitreo-Retinal Interface


**Inner Boundary**

– 300µm

**Outer Boundary ILM**



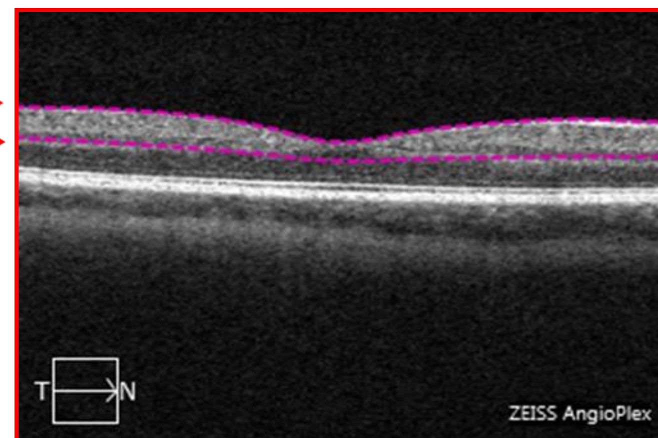


**- Superficial** Superficial Retinal Layer

**Inner Boundary ILM**

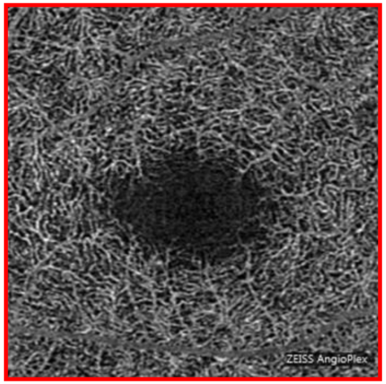
**IPL=ILM+70%(OPL-ILM)**

**Outer Boundary IPL**



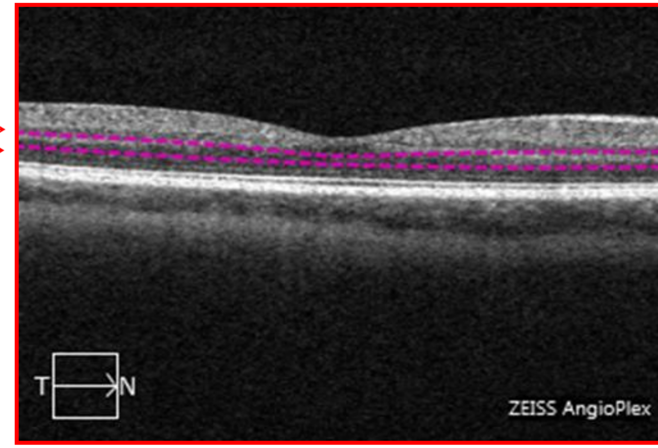
# AngioPlex Analysis Layer Presets: Deep and Avascular

**- Deep** Deep Retinal Layer




Inner Boundary IPL

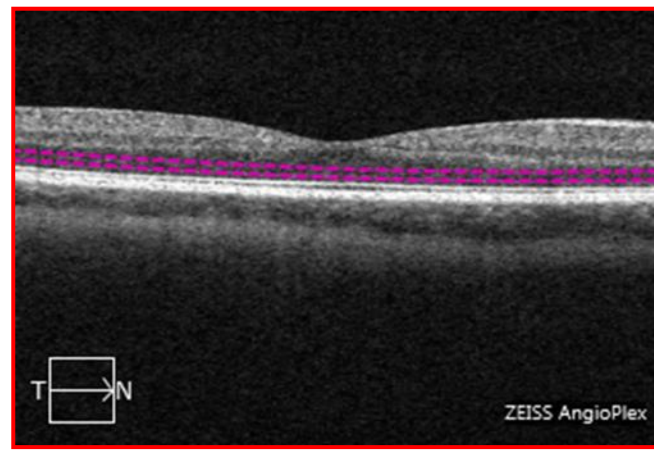
Outer Boundary OPL=RPEfit–110µm



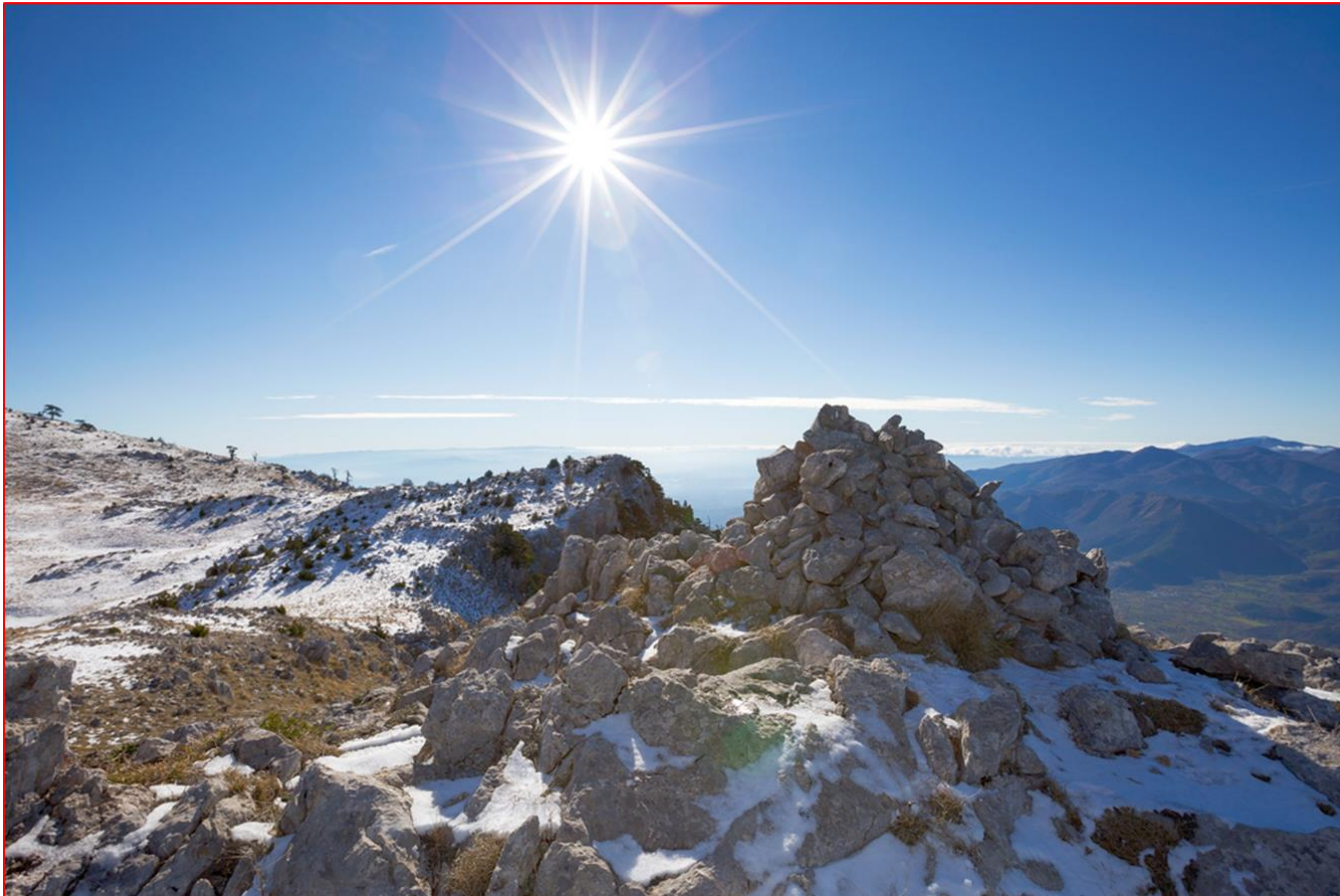


Inner Boundary OPL

Outer Boundary IS/OS=RPEfit-70µm

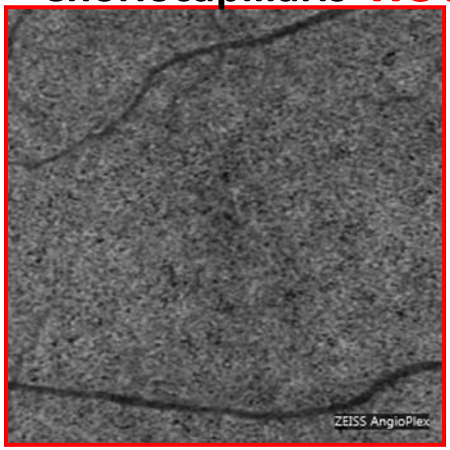



**- Avascular** Avascular Retina



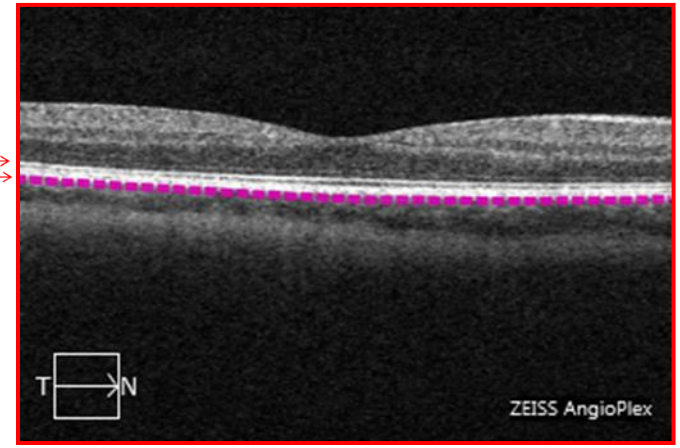
# AngioPlex Analysis Layer Presets: Choriocapillaris and Choroid

## - Choriocapillaris not used

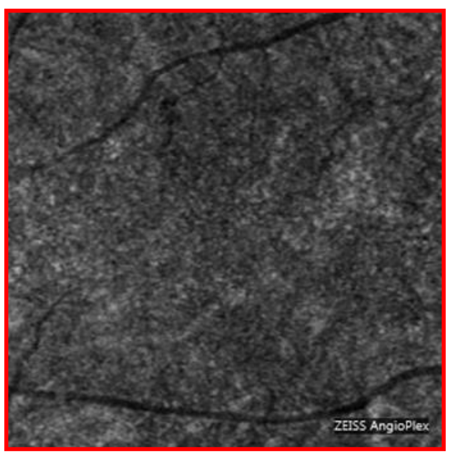



Inner Boundary CCIB=RPE+29µm

Outer Boundary CCOB = RPE+49µm

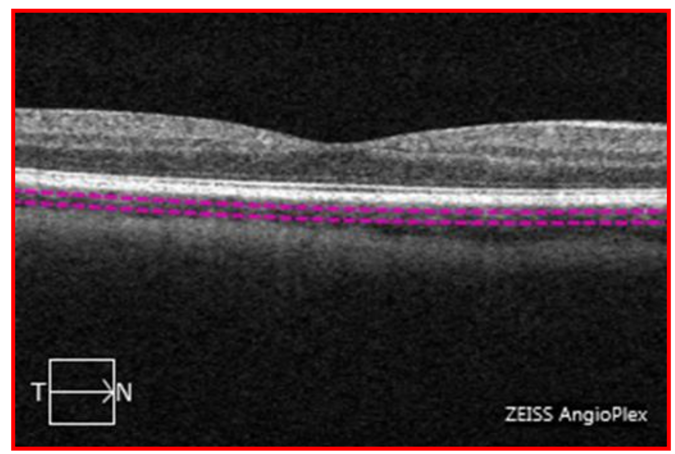



## - Choroid




Inner Boundary ChIB = RPEfit + 64µm

Outer Boundary ChOB = RPEfit + 115µm

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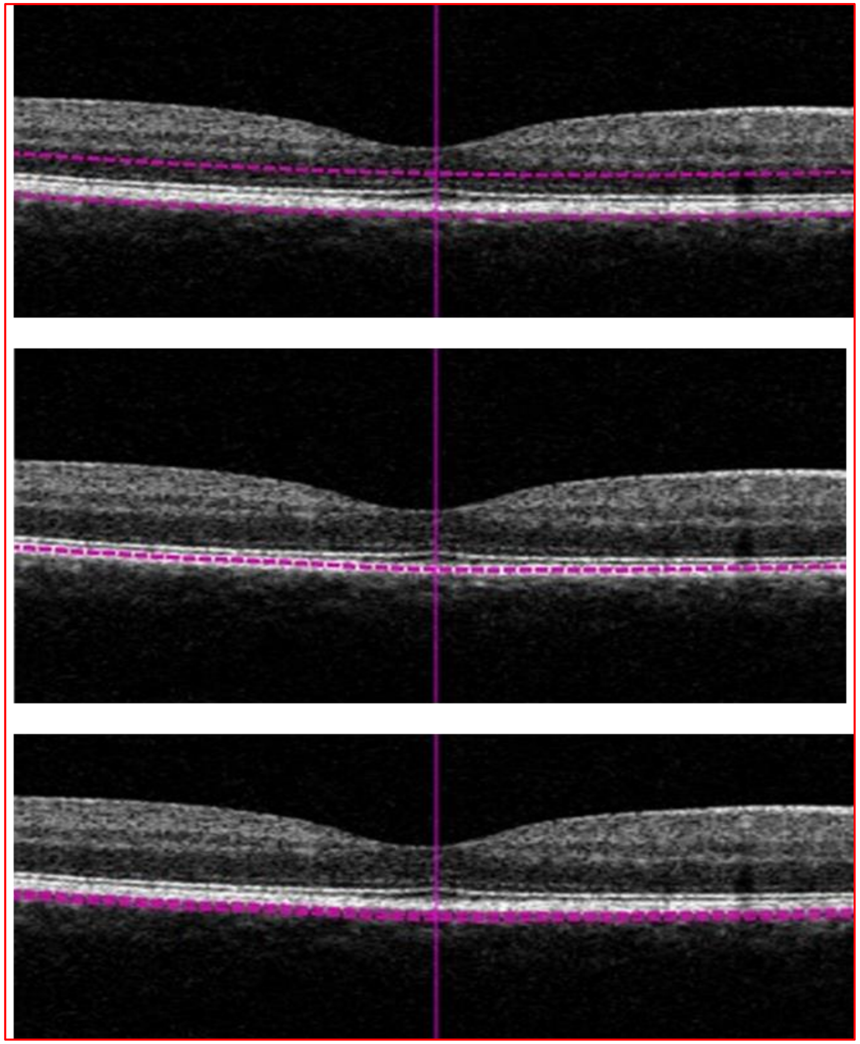
# Useful to visualize CNV & Wet AMD

ORCC: Outer Retina to Choriocapillaris
visualize classic CNV or occult

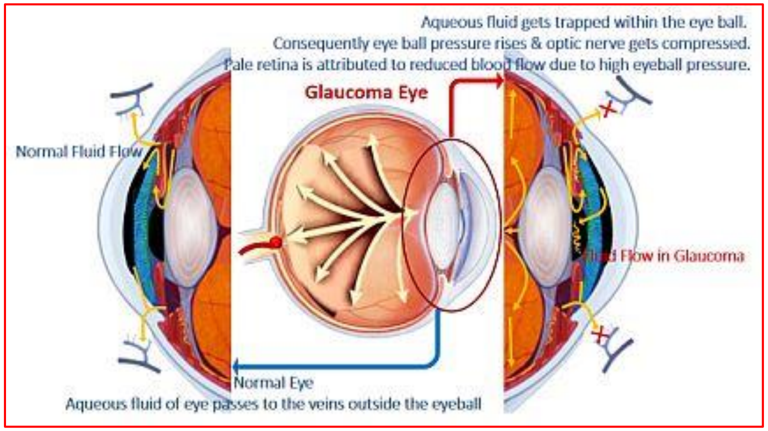
RPE to RPE fit: visualize CNV

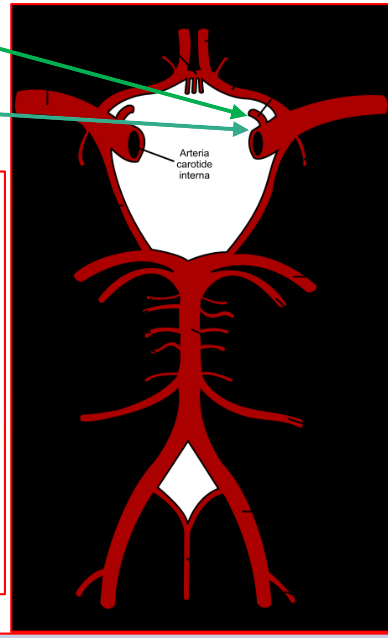
Sub-RPE:   visualize CNV

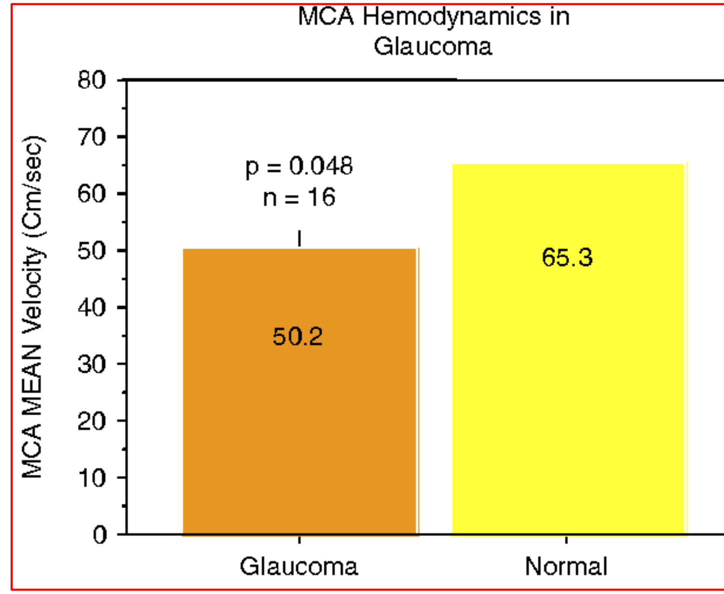


a. oftalmica

a. cerebrale media a. silviana Carotide interna



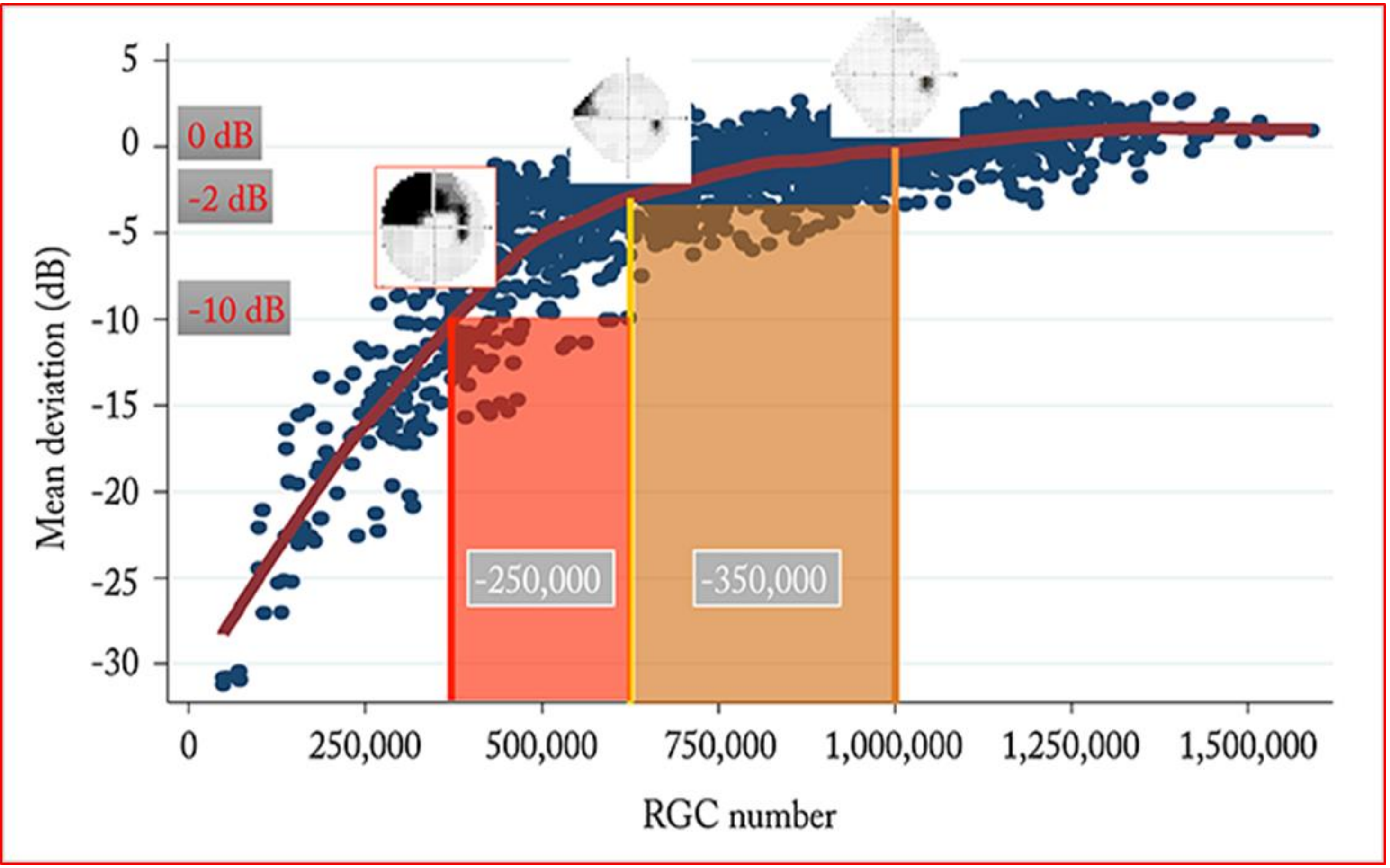

**Mean blood flow velocities in the middle cerebral artery (MCA)**

**Blood flow of the ONH is supplied by two main sources** [1]

- **Central retinal artery (CRA),** which supplies the superficial RNFL layer of the ONH
- **Posterior ciliary artery (PCA)** circulation

**Blood flow to the RNFL** is supplied by the microcirculation coming from the **retinal radial peripapillary capillaries (RPC)**
**OCTA can visualize the RPC network but traditional fluorescein angiography cannot** [2]
**OCTA for GLAUCOMA: It has been reported that optic disc perfusion may be useful in the evaluation of glaucoma and glaucoma progression** [3,4]

1. Hayreh SS. Blood supply of the optic nerve head and its role in optic atrophy, glaucoma, and oedema of the optic disc. Br J Ophthalmol 1969;53:721-748.
2. Spaide RF, Klancnik JM, Cooney MJ. Retinal Vascular Layers Imaged by Fluorescein Angiography and Optical Coherence Tomography Angiography. JAMA Ophthalmol 2015;133:45-50.
3. Chen CL, Bojikian KD, Gupta D, Wen JC, Zhang Q, Xin C, Kono R, Mudumbai RC, Johnstone MA, Chen PP, Wang, RK, “Optic nerve head perfusion in normal eyes and eyes with glaucoma using optical coherence tomography-based microangiography,” Quant Imaging Med Surg, 2016 Apr;6(2):125-133
4. Chen CL, Zhang A, Bojikian KD, Wen, JC, Zhang, Q, Xin, C, Mudumbai, RC, Johnstone, MA, Chen, PP, Wang, RK, “Peripapillary Retinal Nerve Fiber Layer Vascular Microcirculation in Glaucoma using Optical Coherence Tomography–based Microangiography,” Invest Ophthalmol Vis Sci. 2016 Jul;57(9):OCT475–OCT485




**Angio-OCT**
**By Michel Puech**
**Explore Vision Parigi**

**1) Peri-Optic Disc Blood Flow**

**2) Optic Disc Blood Flow**

**3) Lamina Cribrosa**

Relationship between **visual field loss** and **RGC numbers.** A normal visual field in a healthy individual has approximately **1 million RGCs**. At a **mean deviation of -2 dB,** which equates to an **early field defect**, **RGC number** has decreased by around **350,000 cells**. At **-10 dB,** a field defect that can result **in functional impairment** and **quality of life decline**, **RGC number** has **decreased** by **a further 250,000 cells from the RGC number at -2 dB**

**by Felipe Medeiros The Ophthalmologist; May 2017**

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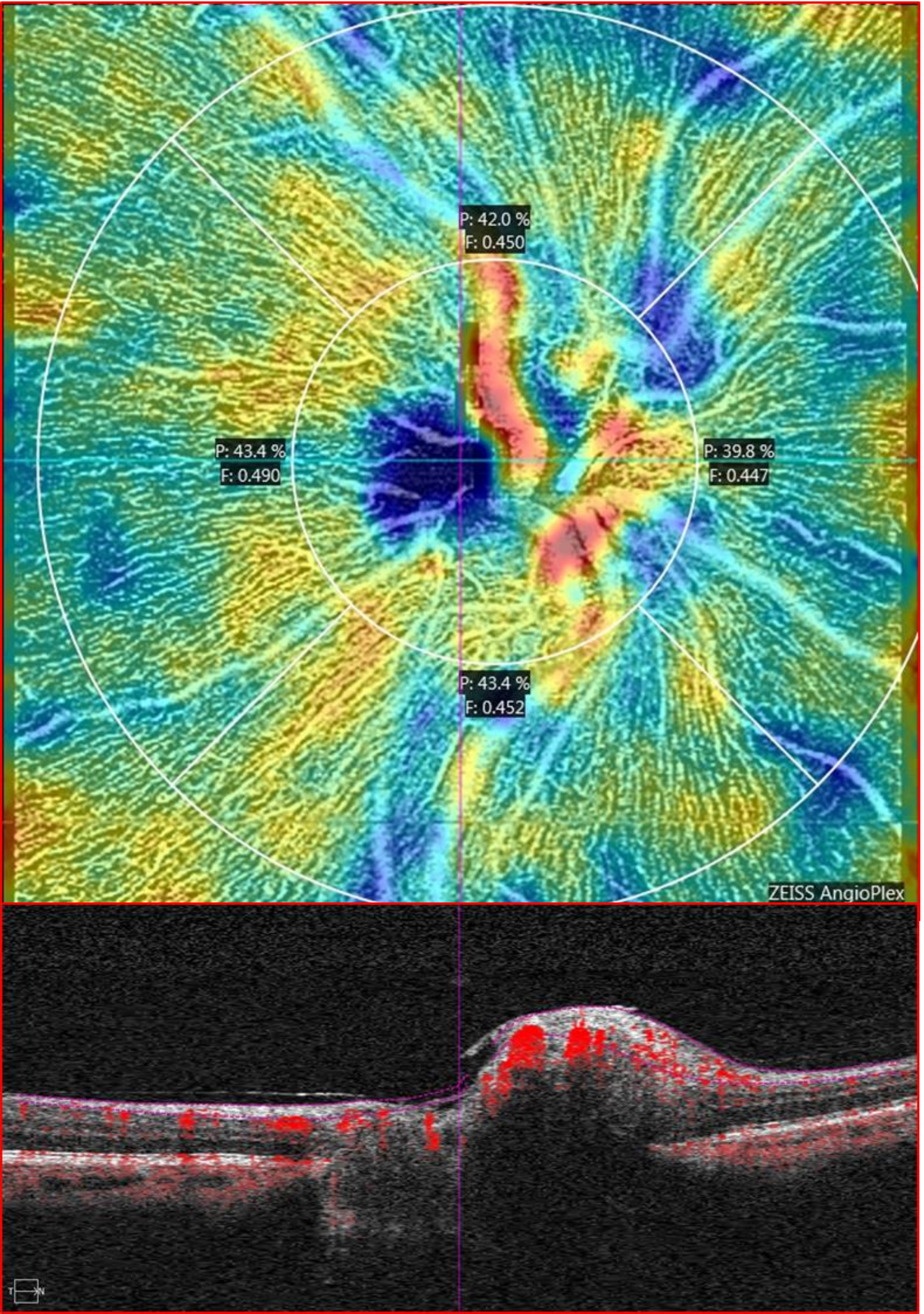
dott. A. Lucente



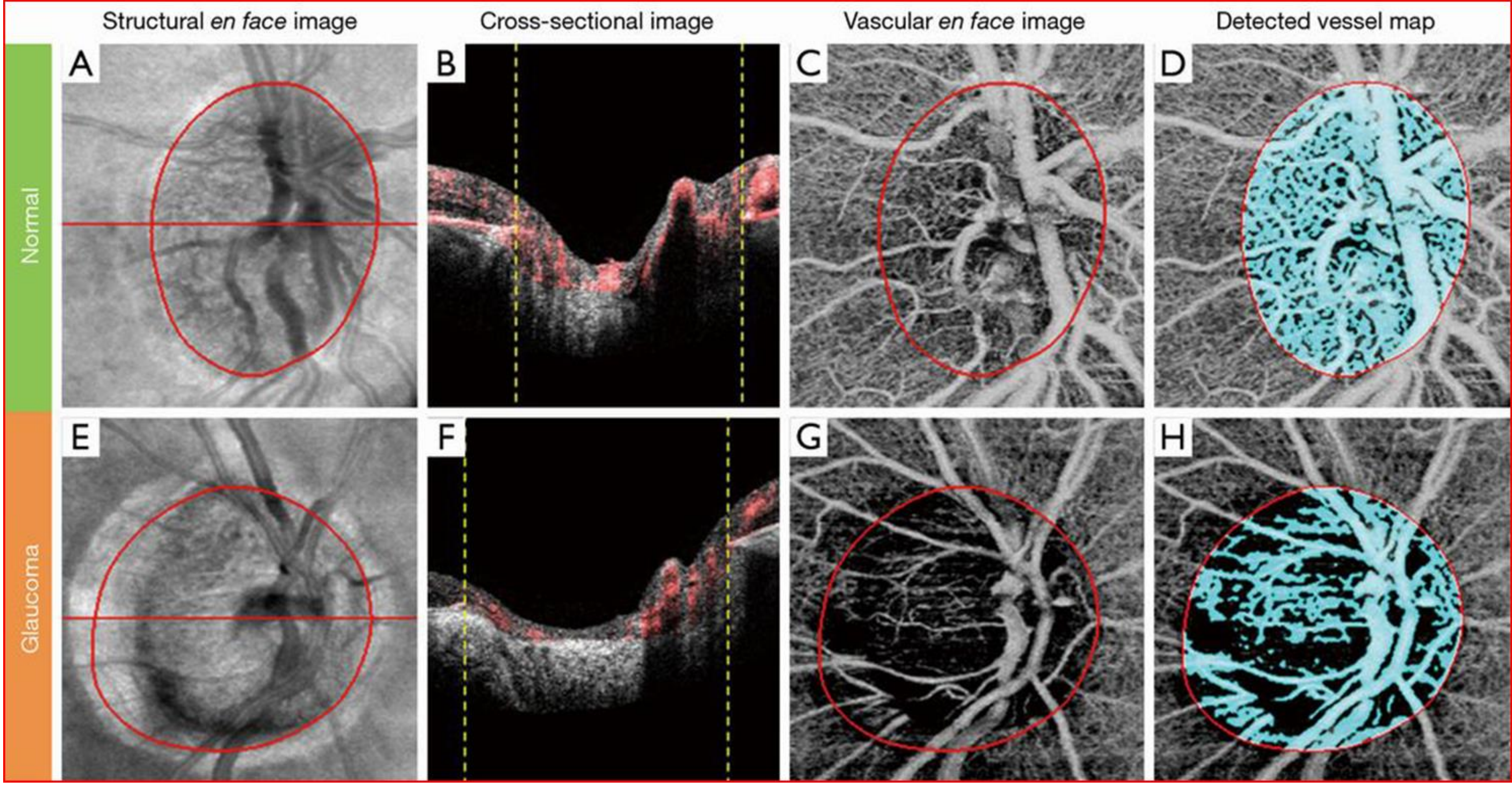

**ONH Angiography Analysis:**
**ONH Angiography**
**4.5 mm x 4.5 mm**

**P = Perfusion = Area perfusa/area totale**
**F = Fux Index = Lunghezza vasi/area totale**

**Reference: Top ILM**
**Botton RNFL**


# >>>Clinical Cases……

*……Enter the New Era of Retinal Care by Zeiss*

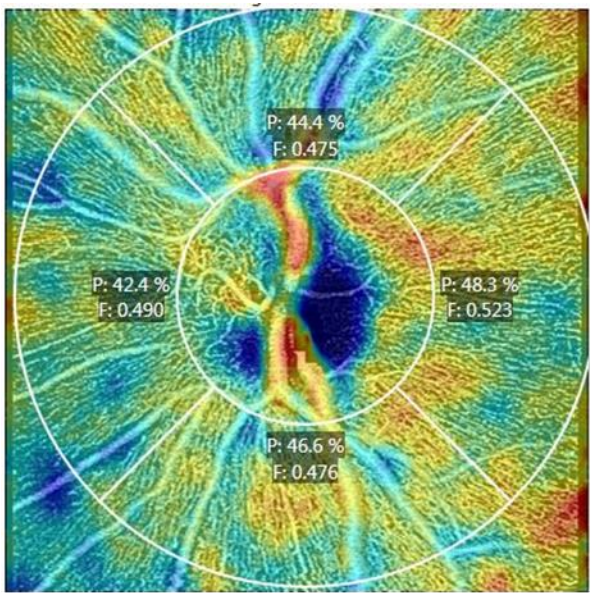


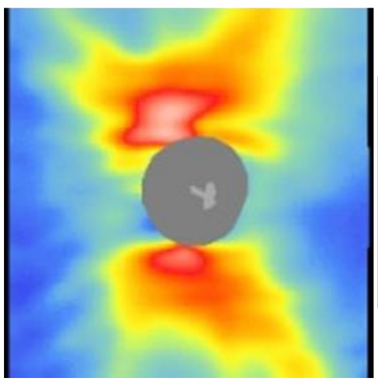

Example of retinal layer segmentation. Two retinal boundaries were segmented: inner limiting membrane (ILM) (the yellow line), retinal pigment epithelium (RPE) (the red line outside the optic disc) and anterior surface of lamina cribrosa (LC) (the same red line within the optic disc). (A,B) Structural and blood flow cross-sectional image superimposed with segmented retinal boundaries. by: Chieh-Li Chen et al.

Zeiss AngioPlex

# AngioPlex Metrix for ONH

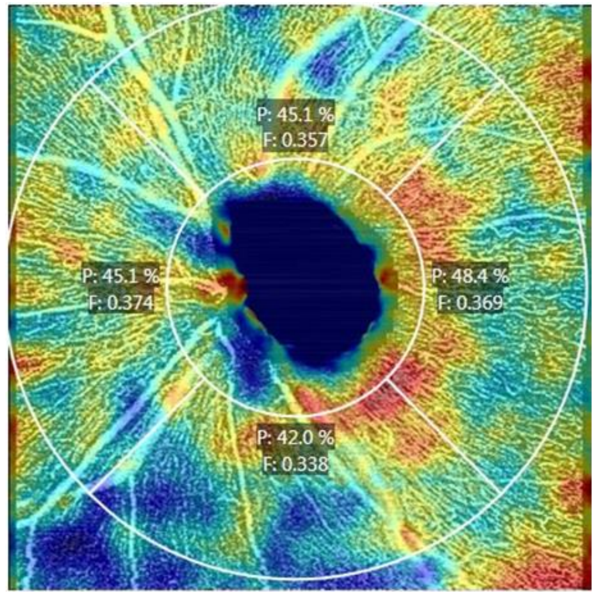
## Normal

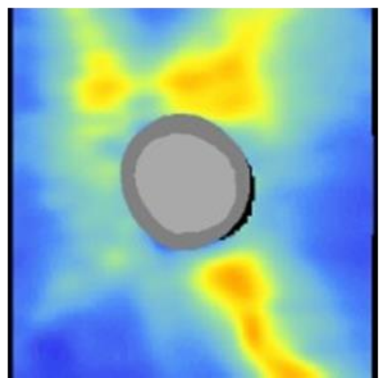


Inferior
P: 46.6%
F: 0.476

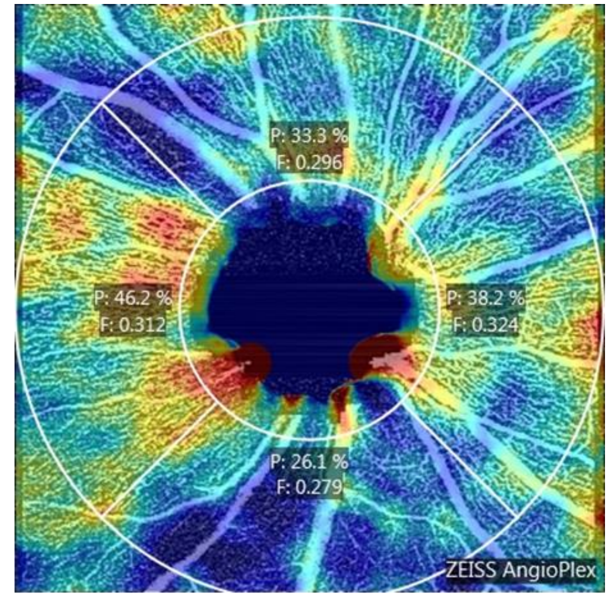
## Glaucoma

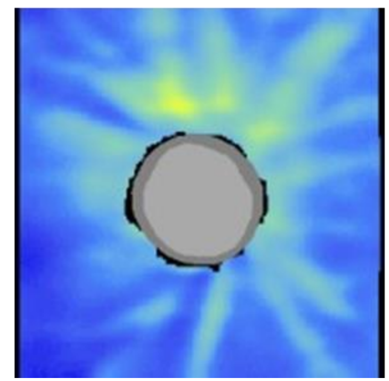


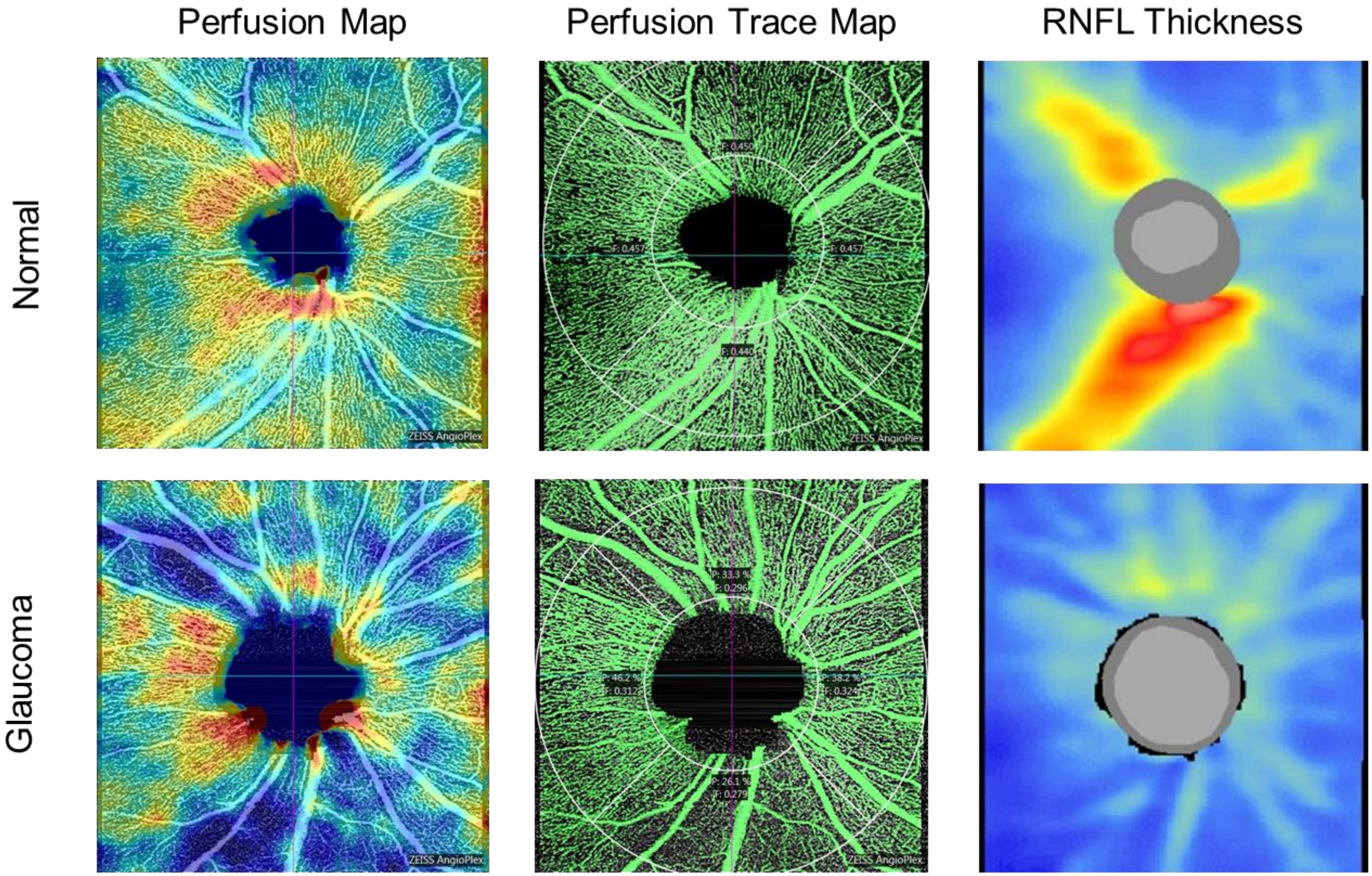
Inferior
P: 42.0%
F: 0.338

## Advanced Glaucoma



Inferior
P: 26.1%
F: 0.279

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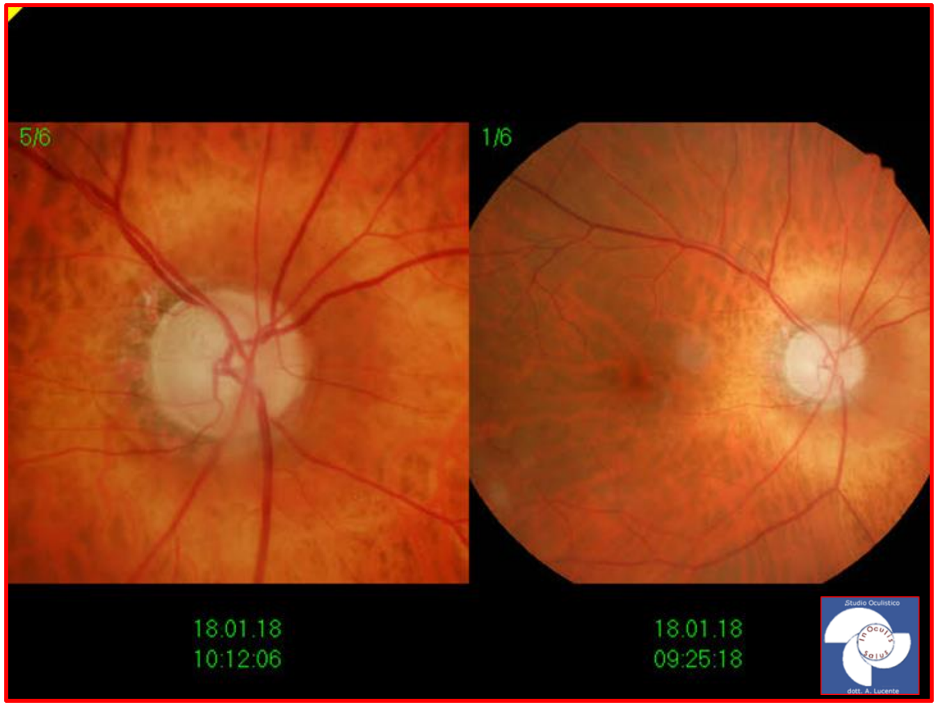
1. Hayreh SS. Blood supply of the optic nerve head and its role in optic atrophy, glaucoma, and oedema of the optic disc. Br J Ophthalmol 1969;53:721-748.
2. Spaide RF, Klancnik JM, Cooney MJ. Retinal Vascular Layers Imaged by Fluorescein Angiography and Optical Coherence Tomography Angiography. JAMA Ophthalmol 2015;133:45-50.
3. Chen CL, Bojikian KD, Gupta D, Wen JC, Zhang Q, Xin C, Kono R, Mudumbai RC, Johnstone MA, Chen PP, Wang, RK, "Optic nerve head perfusion in normal eyes and eyes with glaucoma using optical coherence tomography-based microangiography," Quant Imaging Med Surg, 2016 Apr;6(2):125-133
4. Chen CL, Zhang A, Bojikian KD, Wen, JC, Zhang, Q, Xin, C, Mudumbai, RC, Johnstone, MA, Chen, PP, Wang, RK, "Peripapillary Retinal Nerve Fiber Layer Vascular Microcirculation in Glaucoma using Optical Coherence Tomography–based Microangiography," Invest Ophthalmol Vis Sci. 2016 Jul;57(9):OCT475–OCT485

Stress /Strain and IOP and finite elements

Biomeccanica e Glaucoma

SL♂ 78 aa Glaucoma peripapillare

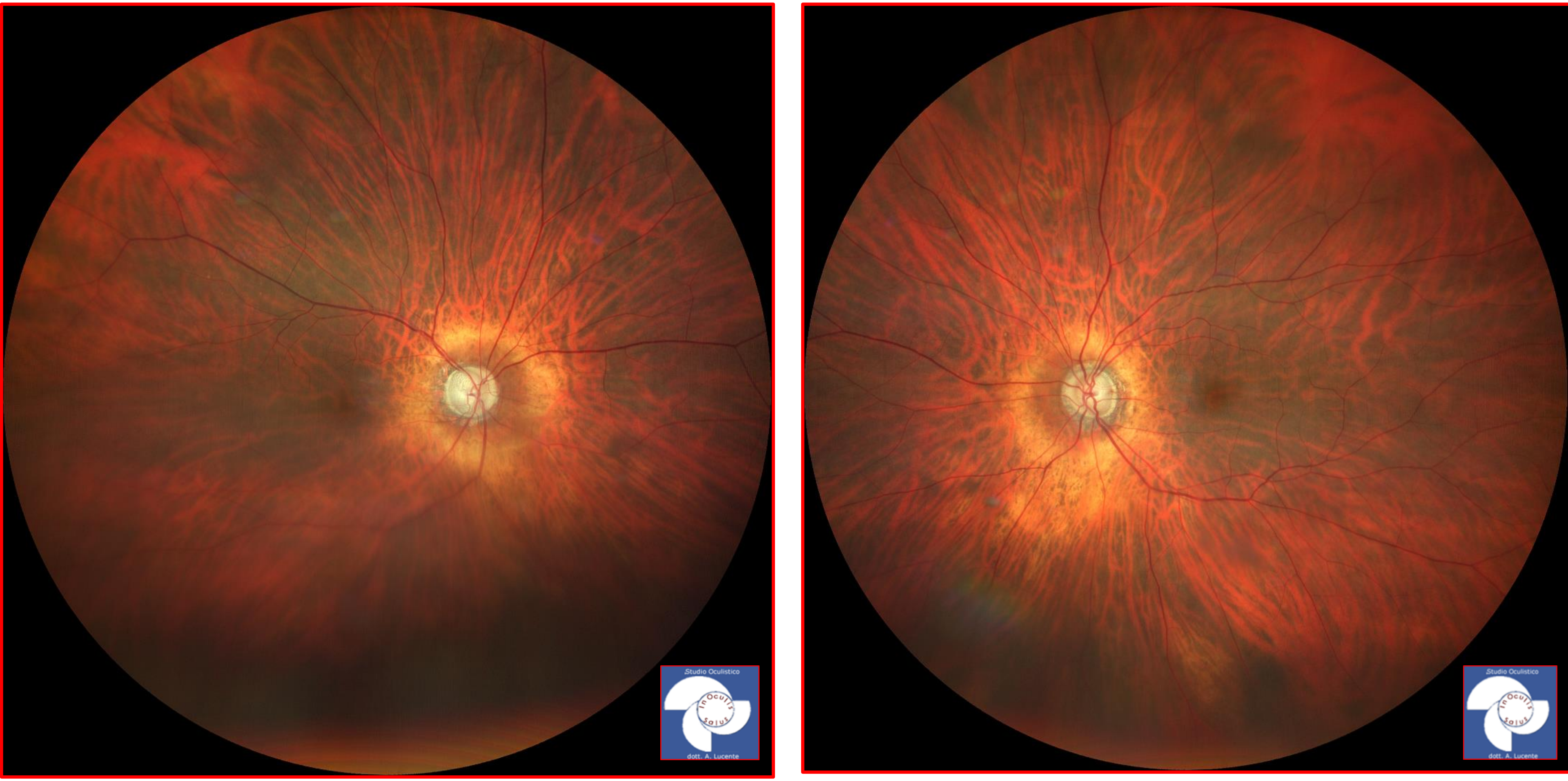


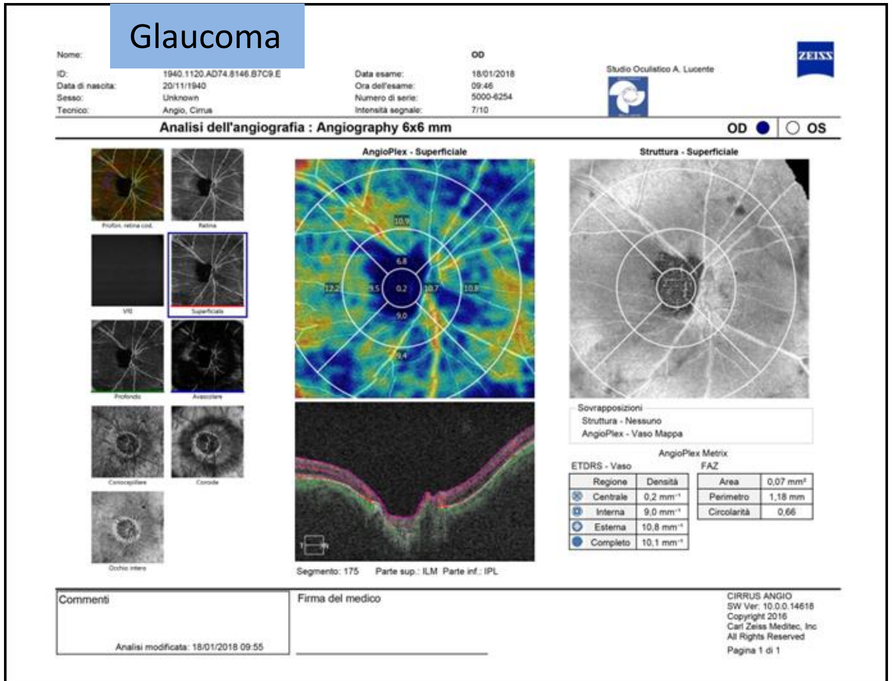


Uno studio biomeccanico del danno strutturale e sulla deformabilità sclerale (Strain) è condotto da anni da Claude Burgoyne (Portland Oregon, USA). Da oltre un decennio Burgoyne studia gli effetti della IOP sulla sclera e, in particolar modo, sulla regione peripapillare

Bruno L., Fazio M. A., Poggialini A., Lucente A. Identificazione dei Meccanismi di Danneggiamento dei Tessuti dell'Occhio Mediante Analisi Numeriche e Sperimentali. Atti del convegno "9° Congresso Internaz. SOI 2011.

Massimo A. Fazio, Rafael Grytz, L. Bruno, Michael J. A. Girard, Stuart Gardiner, Christopher A. Girkin, J. Crawford Downs. Regional Variations in Mechanical Strain in the Posterior Human Sclera. Investigative Ophthalmology & Visual Science, August 2012, Vol. 53, No. 9.


Studio Oculistico
In Oculis Salus
dott. A. Lucente
Studio Oculistico
In Oculis Salus
dott. A. Lucente


Glaucoma
OD
Studio Oculistico A. Lucente
ZEISS
Analisi dell'angiografia : Angiography 6x6 mm
OD OS
AngioPlex - Superficiale
Struttura - Superficiale
Sovrapposizioni
Struttura - Nessuno
AngioPlex - Vaso Mappa
AngioPlex Metrix
ETDRS - Vaso
FAZ
Regione Densità
Centrale 0,2 mm⁻¹
Interna 9,0 mm⁻¹
Esterna 10,8 mm⁻¹
Completo 10,1 mm⁻¹
Area 0,07 mm²
Perimetro 1,18 mm
Circolarità 0,66
Segmento: 175 Parte sup.: ILM Parte inf.: IPL
Commenti
Analisi modificata: 18/01/2018 09:55
Firma del medico
CIRRUS ANGIO
SW Ver: 10.0.0.14618
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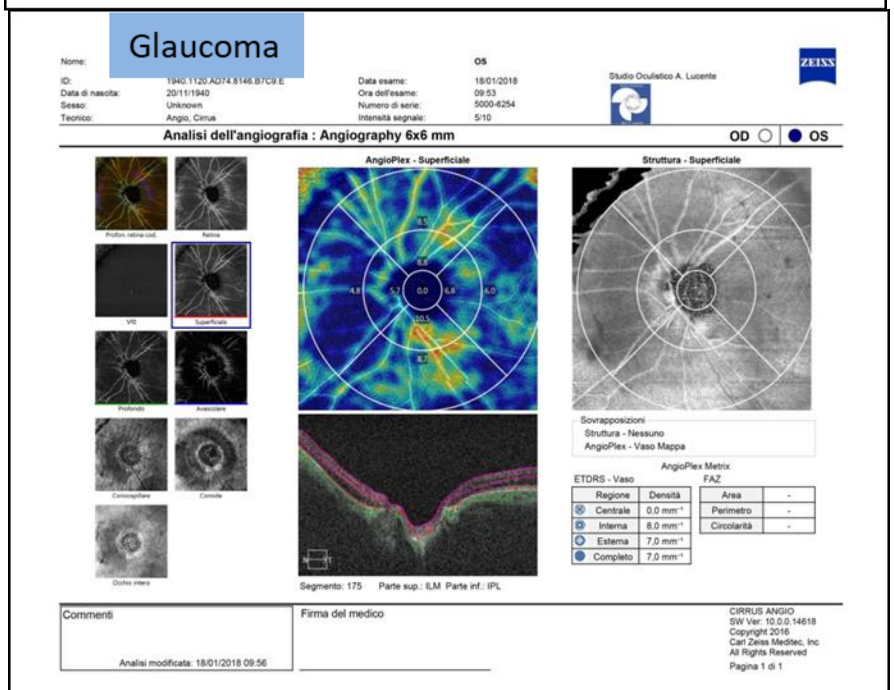
Pagina 1 di 1


Glaucoma
OS
Studio Oculistico A. Lucente
ZEISS
Analisi dell'angiografia : Angiography 6x6 mm
OD OS
AngioPlex - Superficiale
Struttura - Superficiale
Sovrapposizioni
Struttura - Nessuno
AngioPlex - Vaso Mappa
AngioPlex Metrix
ETDRS - Vaso
FAZ
Regione Densità
Centrale 0,0 mm⁻¹
Interna 8,0 mm⁻¹
Esterna 7,0 mm⁻¹
Completo 7,0 mm⁻¹
Area -
Perimetro -
Circolarità -
Segmento: 175 Parte sup.: ILM Parte inf.: IPL
Commenti
Analisi modificata: 18/01/2018 09:56
Firma del medico
CIRRUS ANGIO
SW Ver: 10.0.0.14618
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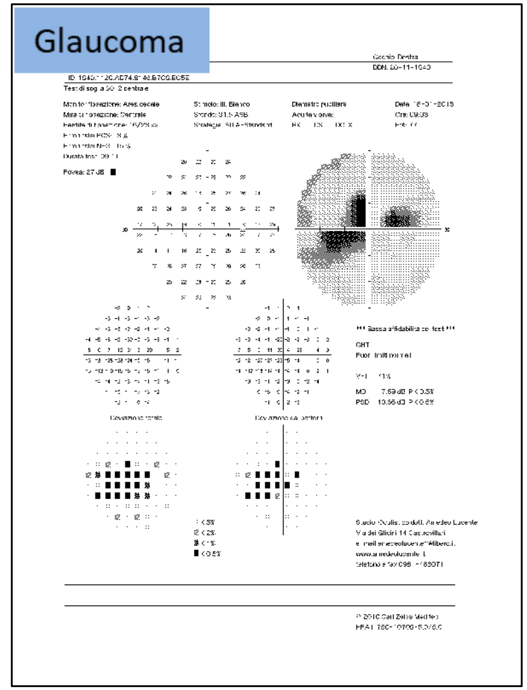
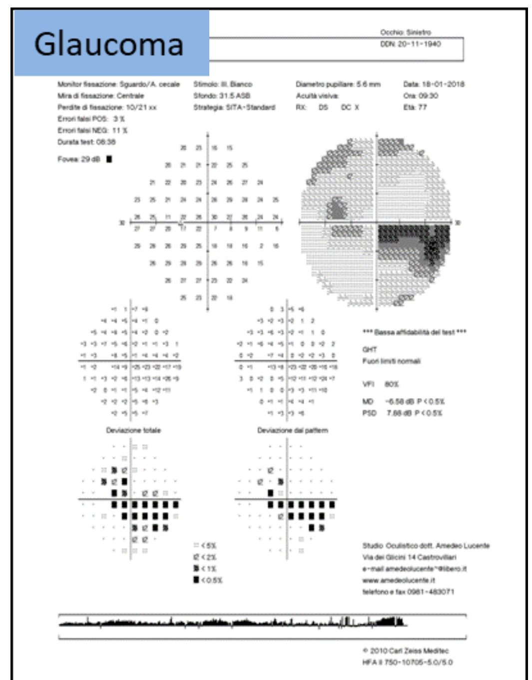
Pagina 1 di 1


Glaucoma
Occhio: Destro


Glaucoma
Occhio: Sinistro
DDN: 20-11-1940
Stimolo: III, Bianco
Sfondo: 31.5 ASB
Strategia: SITA-Standard
Deviazione totale
Deviazione dal pattern
*** Bassa affidabilità del test ***
GHT
Fuori limiti normali
VFI 80%
MD -6.58 dB P < 0.5%
PSD 7.88 dB P < 0.5%
Studio Oculistico dott. Amedeo Lucente
© 2010 Carl Zeiss Meditec


nicola figliolia ©

**FM** RD Angio OD 01/2018

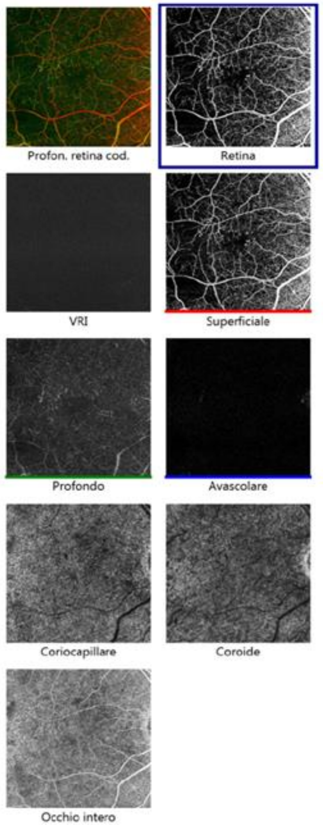
| | | | |
|---|---|---|---|
| Nome: | | | OD |
| ID: | CZMI1844848927 | Data esame: | 17/01/2018 |
| Data di nascita: | 14/09/1988 | Ora dell'esame: | 09:44 |
| Sesso: | Uomo | Numero di serie: | 5000-6254 |
| Tecnico: | Angio, Cirrus | Intensità segnale: | 7/10 |

Studio Oculistico A. Lucente

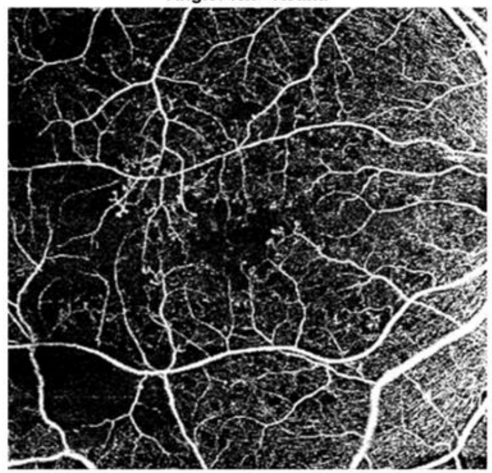
ZEISS

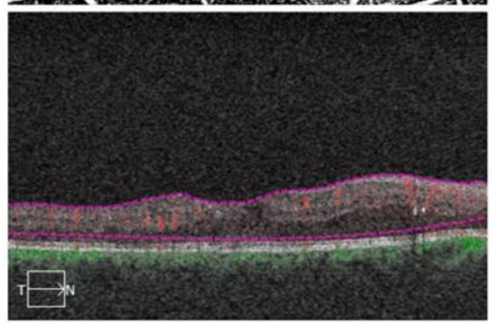
## Analisi dell'angiografia : Angiography 8x8 mm

**OD** ● ○ **OS**



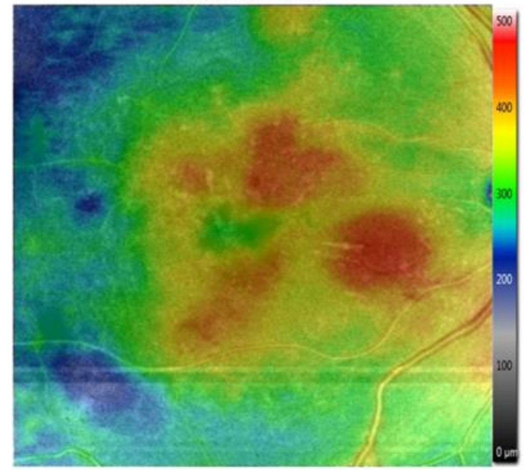

**AngioPlex - Retina**






Segmento: 175 Parte sup.: ILM Parte inf.: RPEFit-70µ

**Struttura - Retina**



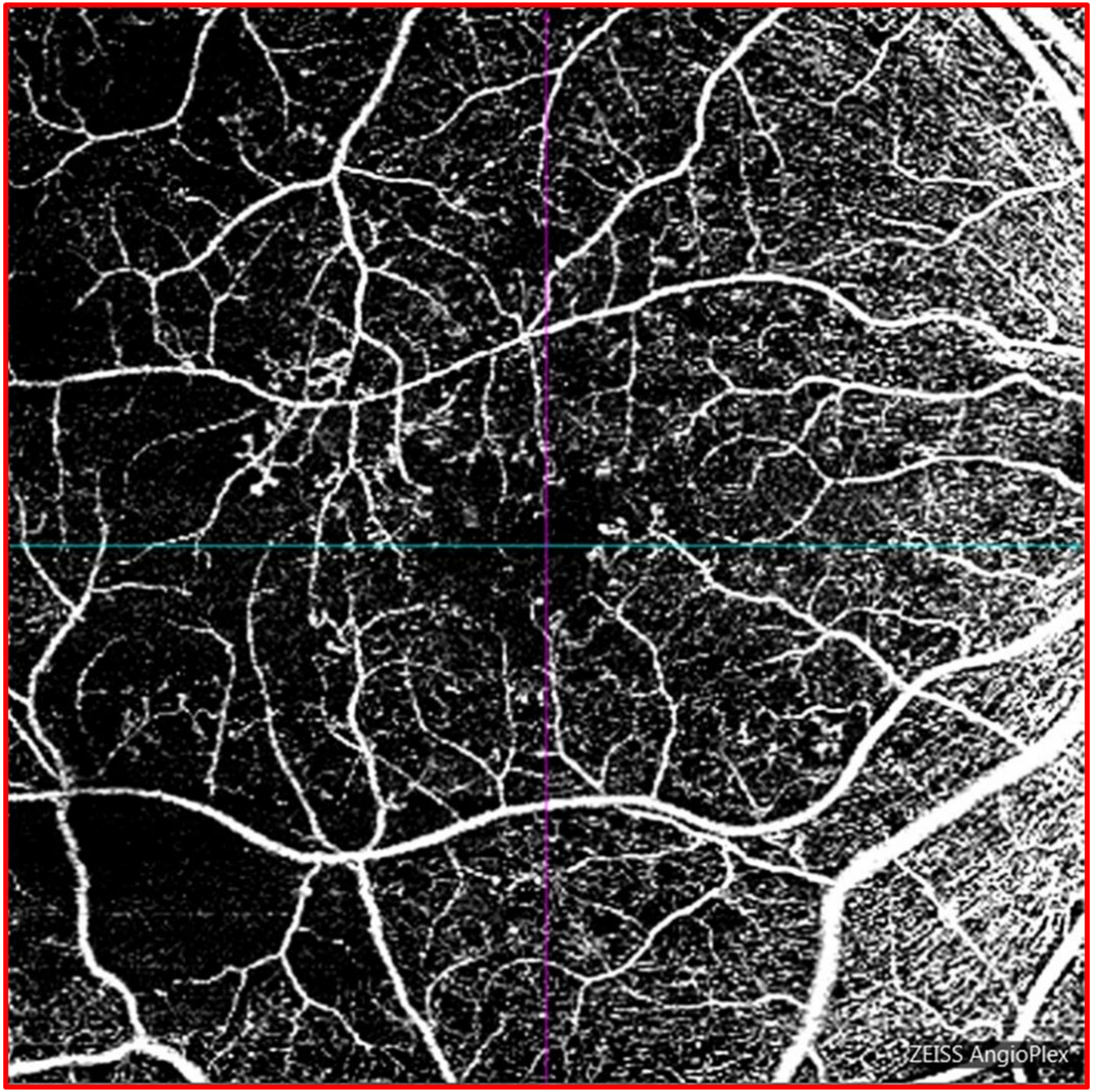

Sovrapposizioni
Struttura - Mappa dello spessore
AngioPlex - Nessuno

Monitorato durante la scansione

Commenti

Analisi modificata: 17/01/2018 11:57

Firma del medico




8 mm x 8 mm

**FM** RD Angio OD 01/2018

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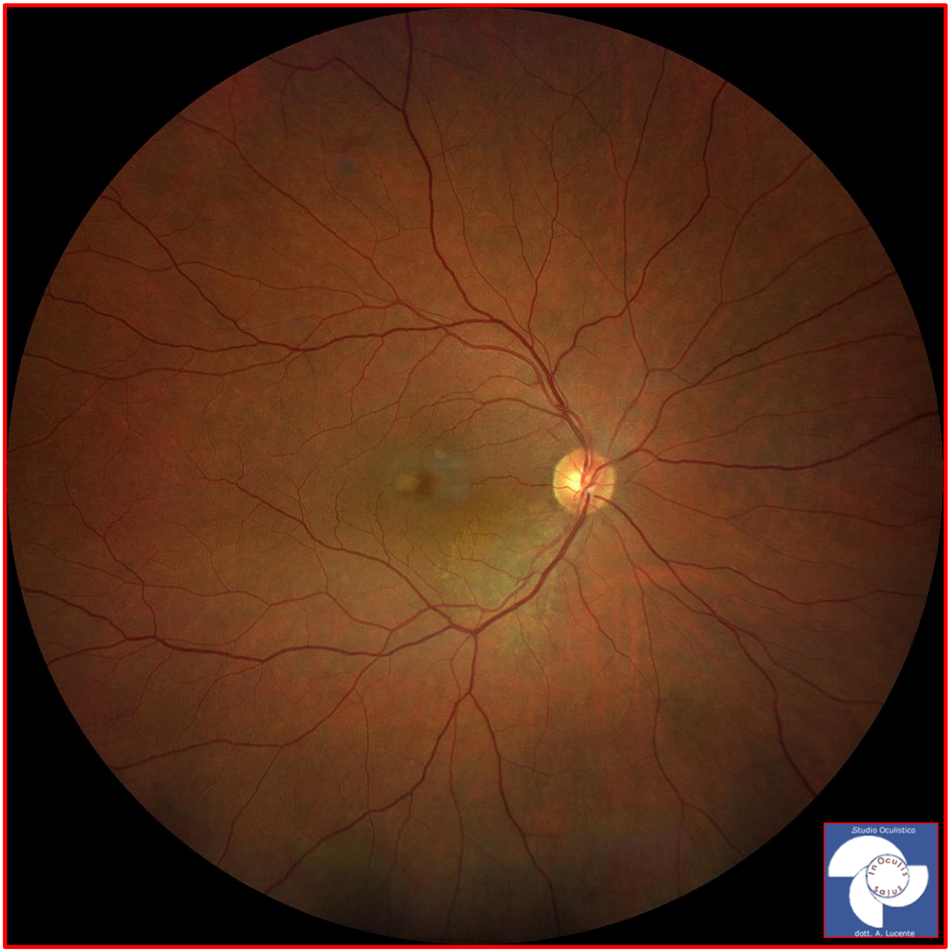
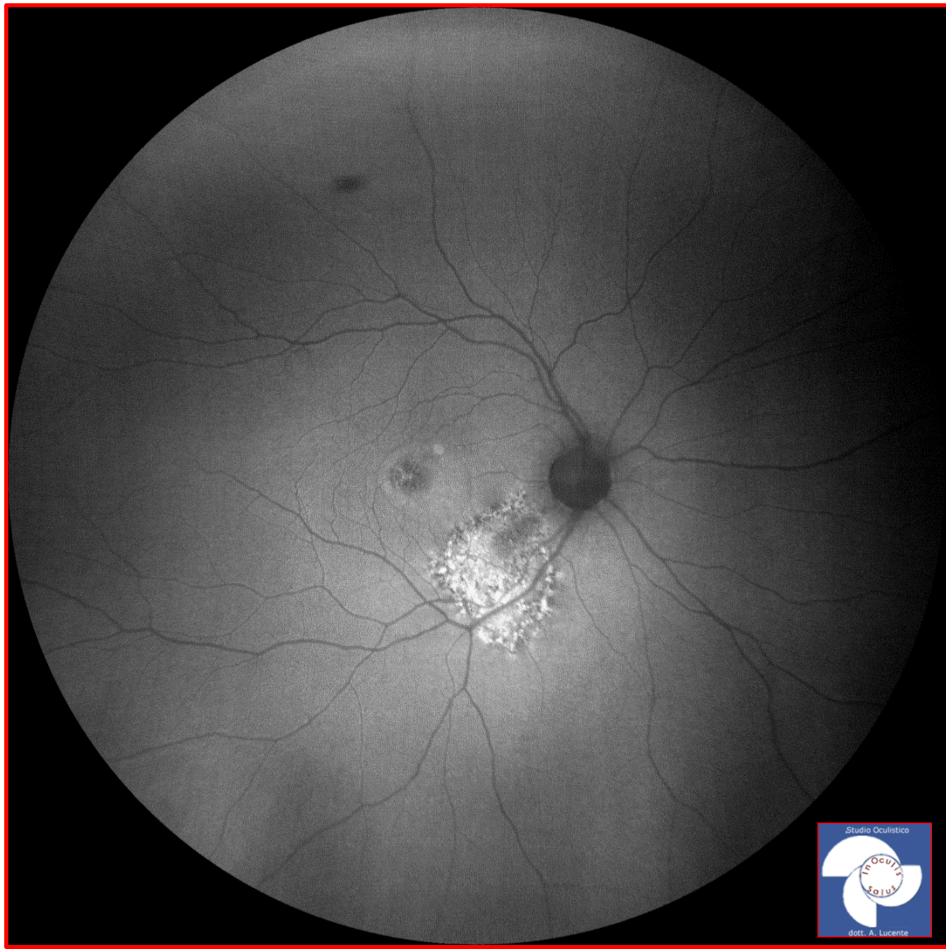

Studio Oculistico
In Oculis Salus
dott. A. Lucente


Studio Oculistico
In Oculis Salus
dott. A. Lucente

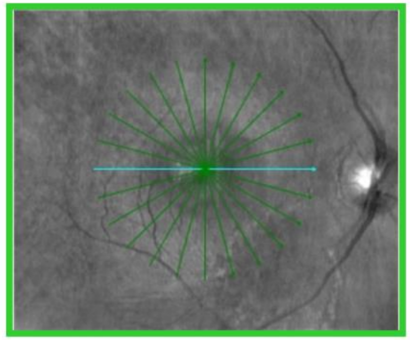
Name: Sierosa

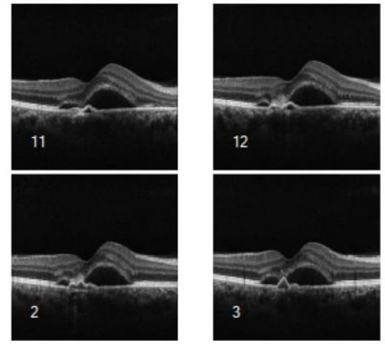
| | | | | |
|---|---|---|---|---|
| ID: | | Exam Date: | 03/10/2018 | CZMI |
| DOB: | 12/11/1965 | Exam Time: | 15:45 | |
| Gender: | Male | Serial Number: | 5000-6254 | |
| Technician: | Operator, Cirrus | Signal Strength: | 7/10 | |

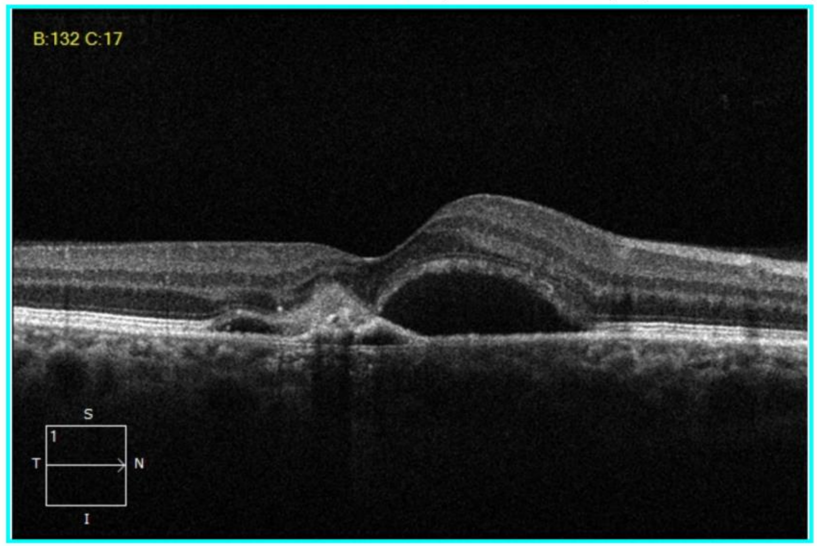
## High Definition Images: HD Radial

OD ● | ○ OS

**Length: 6 mm**






| Comments | Doctor's Signature |
|---|---|
| | |

Name: Sierosa

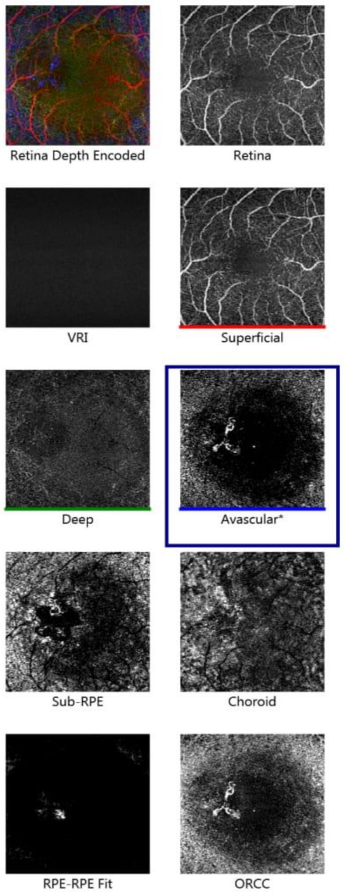
OD

CZMI

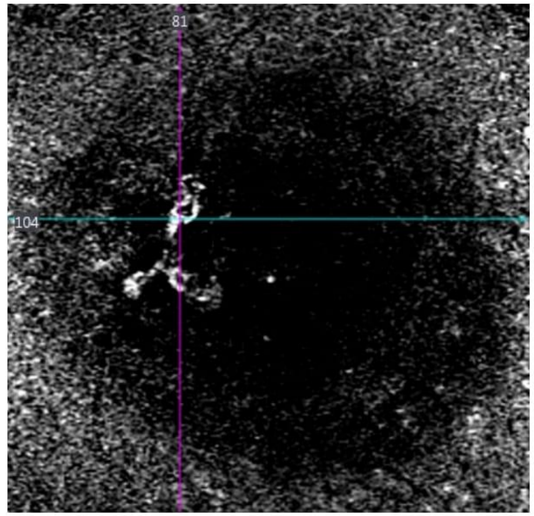
| | | | |
|---|---|---|---|
| ID: | CZMI220218430 | Exam Date: | 03/10/2018 |
| DOB: | 12/11/1965 | Exam Time: | 15:47 |
| Gender: | Male | Serial Number: | 5000-6254 |
| Technician: | Operator, Cirrus | Signal Strength: | 6/10 |

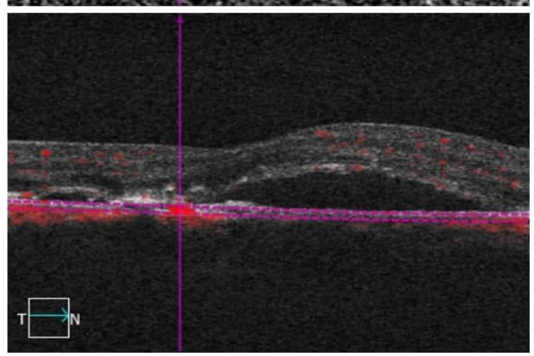
## Angiography Analysis : Angiography 3x3 mm

OD ● ○ OS



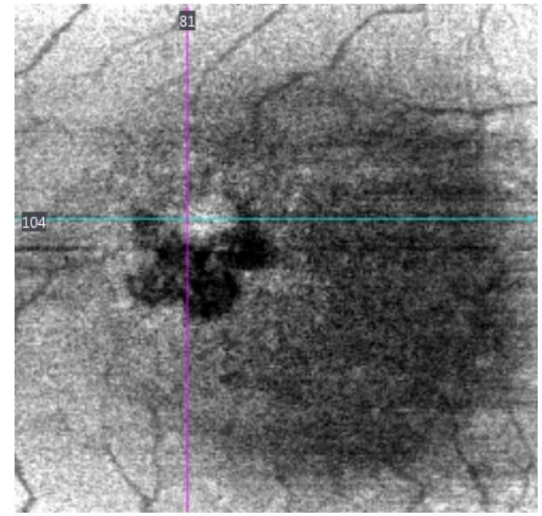

**AngioPlex - Avascular**




Slice: 104 Top: OPL+111µ Bottom: RPEFit+41µ

**Structure - Avascular**




Overlays

Structure - None

AngioPlex - None

Tracked during scan

Comments

Analysis Edited: 03/10/2018 15:55

Doctor's Signature

CIRRUS ANGIO
SW Ver: 11.0.0.29946

# CNV Classification based on location by Gass and Freund

- **Type 1: below EPR or Sub-EPR Occulta** (Jung and Freund AJO 2014)

Forma più comune, placca ICG, **anti-vegf +** polipoide, net tra EPR e Bruch, **wider than type 2, avascular zone usually not involved**

- **Type 2: above EPR or Sub-Retinal Classica,** i net penetrano il complesso coroide-Bruch-EPR e proliferano nello spazio sottoretinico al di sopra dell'EPR, + miopia patologica, coroidite multifocale, **anti-vegf - smaller than type 1,** Very heterogeneous shapes **avascular zone always involved.**

- **Type 3: intraretinal RAP** o anastomosi retino-coroideali (RCA) 15% of patients with neovascular age-related macular degeneration, bilateral disease, presence of pigment epithelial detachments, and reticular pseudodrusen, introduced by Freund in 2008 in vivo imaging does not allow us to conclusively rule out **preexisting Type 1** neovascularization or even early RCA; intraretinal anastomosis from the **deep plexus going toward the RPE** .
YANNUZZI PROPOSED THREE VARIANTS

- **Type 4:** mixed 1-2 initially located **below the EPR Type 1,** NV spread out into the outer retina **Type 1** ⇄ **Type 2**

- **Filamentous (pachychoroid)NVs** by Warrow DJ. Retina. 2013; **Type 1** (sub-retinal pigment epithelium) associated with choroidal thickening that includes pachychoroid pigment epitheliopathy, central serous chorioretinopathy, and polypoidal choroidal vasculopathy

- **Myopic CNVs** ± 10% ≥ 6 D, 26 mm axial length start **above the EPR Type 2** and penetrate into avascular zone, usually small size, even if they can get to be much bigger

- **Residual flow in fibrosis**

**OCT-A**
**Sensitivity = 81.8%,**
**Specificity = 100%**

Studio Oculistico
In Oculis Salus
dott. A. Lucente

**LB** 68 aa CNV ♀

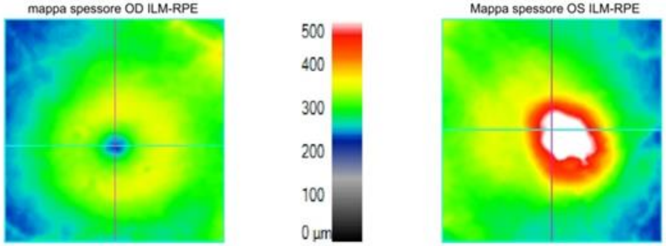
Indacazione →

## LB Macula spessori

| | | | OD | OS | |
|---|---|---|---|---|---|
| ID: | CZMI710188025 | Data esame: | 01/03/2018 | 01/03/2018 | Studio Oculistico A. Lucente |
| Data di nascita: | 12/02/1952 | Ora dell'esame: | 11:32 | 11:35 | |
| Sesso: | Donna | Numero di serie: | 5000-6254 | 5000-6254 | |
| Tecnico: | Angio, Cirrus | Intensità segnale: | 7/10 | 6/10 | |

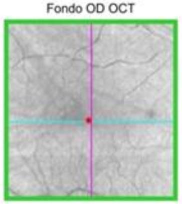
**Spessore maculare OU: Macular Cube 512x128** OD ● ● OS

mappa spessore OD ILM-RPE — Mappa spessore OS ILM-RPE

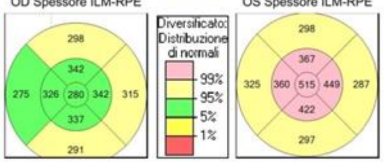



Fovea: 259, 73 — Fovea: Non trovato

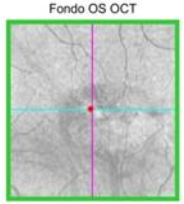
Fondo OD OCT



OD Spessore ILM-RPE — OS Spessore ILM-RPE




Fondo OS OCT



| ILM - RPE | OD | OS |
|---|---|---|
| Spessore Campo secondario cent (µm) | 280 | 515 |
| Volume (mm³) | 10,7 | 11,5 |
| Medio Spessore (µm) | 298 | 319 |

Scansione B orizzontale **BScansione:** 73


Scansione B orizzontale **BScansione:** 64


| Commenti | Firma del medico |
|---|---|
| | |

CIRRUS ANGIO
SW Ver: 10.0.0.14618

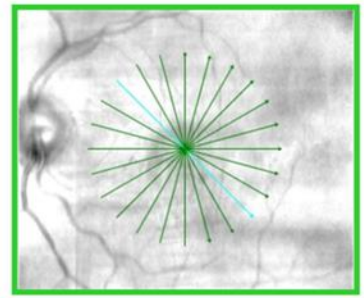


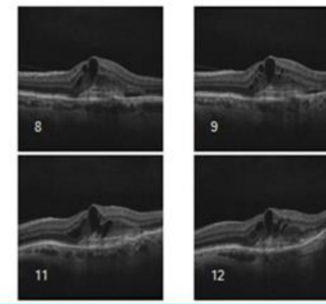
## LB line Type 1 occulta

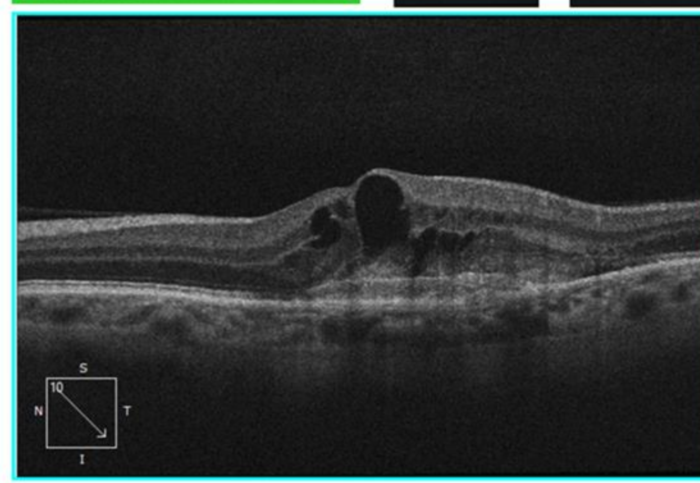
| | | | | |
|---|---|---|---|---|
| ID: | CZMI710188025 | Data esame: | 01/03/2018 | Studio Oculistico A. Lucente |
| Data di nascita: | 12/02/1952 | Ora dell'esame: | 11:36 | |
| Sesso: | Donna | Numero di serie: | 5000-6254 | |
| Tecnico: | Angio, Cirrus | Intensità segnale: | 6/10 | |

**Immagini ad alta definizione: HD Radial** OD ○ ● OS

**Lunghezza: 6 mm**






| Commenti | Firma del medico |
|---|---|
| | |

CIRRUS ANGIO
SW Ver: 10.0.0.14618

LB Angio Avascolare standard net non ben visibile

Indicazione →

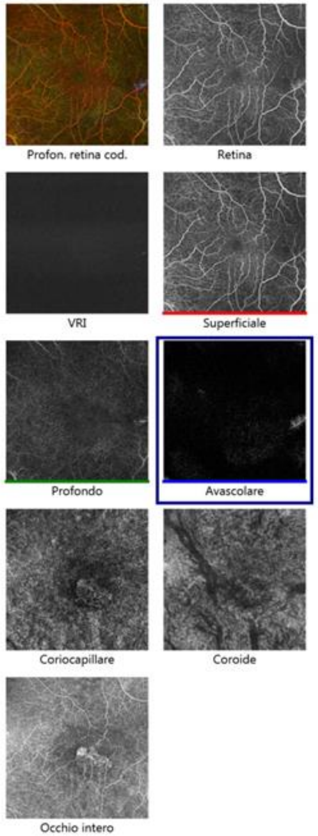
OS

| | | | |
|---|---|---|---|
| ID: | CZMI710188025 | Data esame: | 01/03/2018 |
| Data di nascita: | 12/02/1952 | Ora dell'esame: | 11:37 |
| Sesso: | Donna | Numero di serie: | 5000-6254 |
| Tecnico: | Angio, Cirrus | Intensità segnale: | 6/10 |

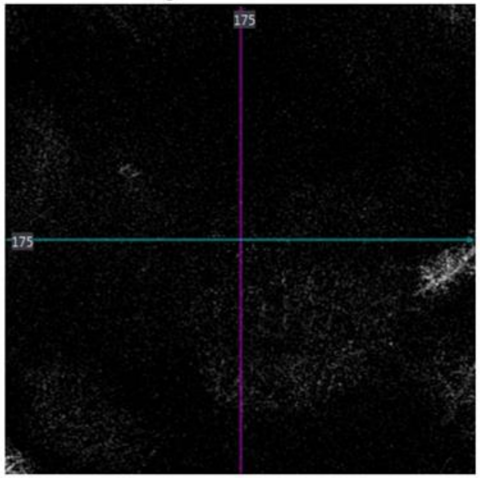
Studio Oculistico A. Lucente

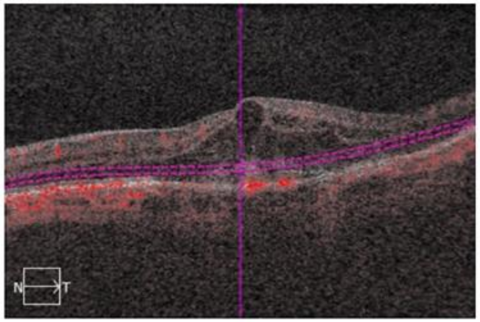
## Analisi dell'angiografia : Angiography 6x6 mm

OD ○ ● OS



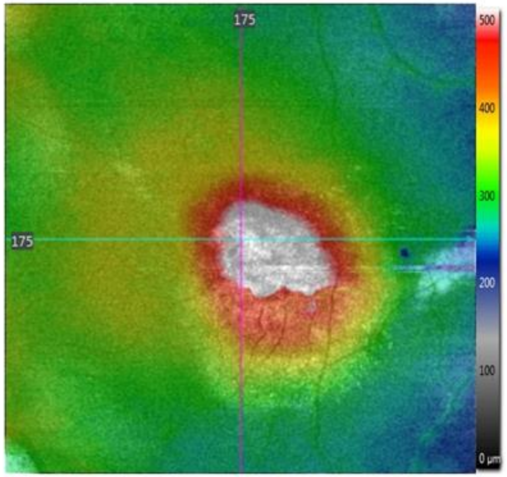

**AngioPlex - Avascolare**




Segmento: 175 Parte sup.: OPL Parte inf.: RPEFit-70µ

**Struttura - Avascolare**




Sovrapposizioni
Struttura - Mappa dello spessore
AngioPlex - Nessuno

Monitorato durante la scansione

Commenti

Analisi modificata: 01/03/2018 11:43

Firma del medico

CIRRUS ANGIO
SW Ver: 10.0.0.14618

LB Angio Modificata CNV visibile

Type 1

OS

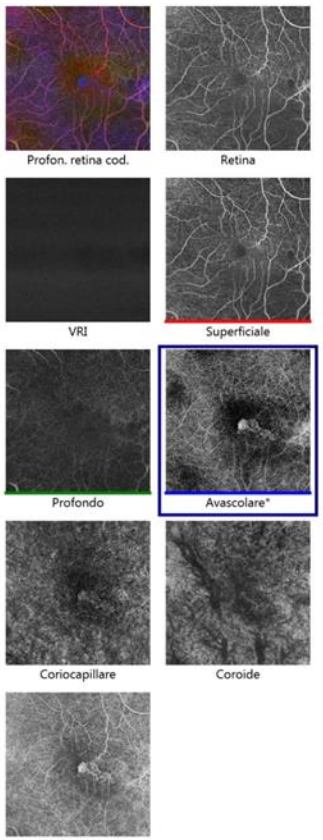
Indicazione

Studio Oculistico A. Lucente

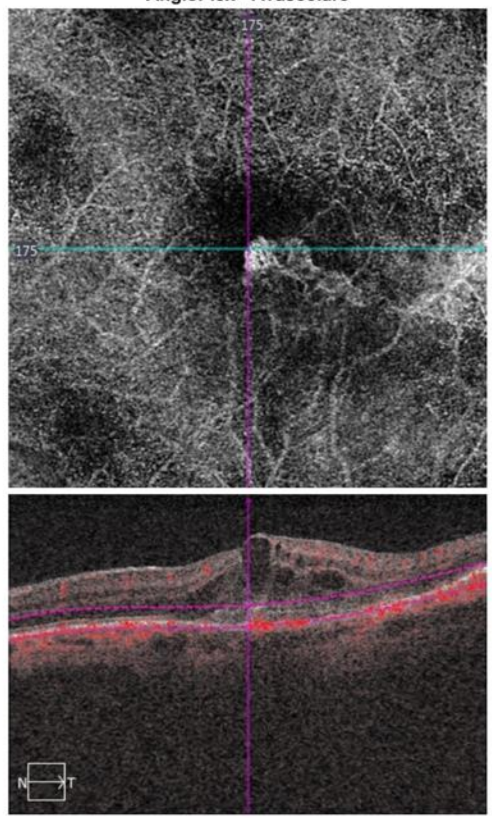
| | | | |
|---|---|---|---|
| ID: | CZMI710188025 | Data esame: | 01/03/2018 |
| Data di nascita: | 12/02/1952 | Ora dell'esame: | 11:38 |
| Sesso: | Donna | Numero di serie: | 5000-6254 |
| Tecnico: | Angio, Cirrus | Intensità segnale: | 5/10 |

## Analisi dell'angiografia : Angiography 6x6 mm

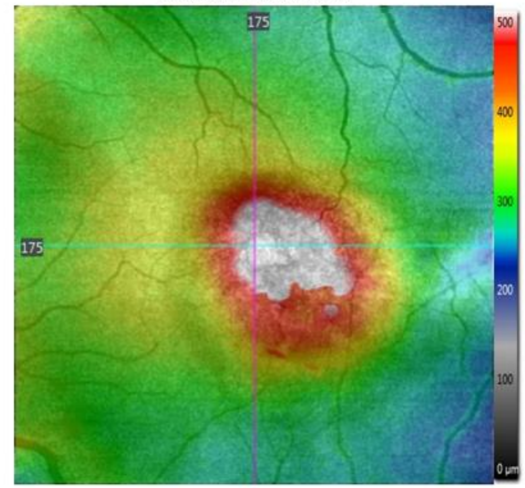
OD ○ | ● OS




AngioPlex - Avascolare




Struttura - Avascolare




Sovrapposizioni
Struttura - Mappa dello spessore
AngioPlex - Nessuno

Segmento: 175 Parte sup.: OPL Parte inf.: RPEFit+22µ

Monitorato durante la scansione

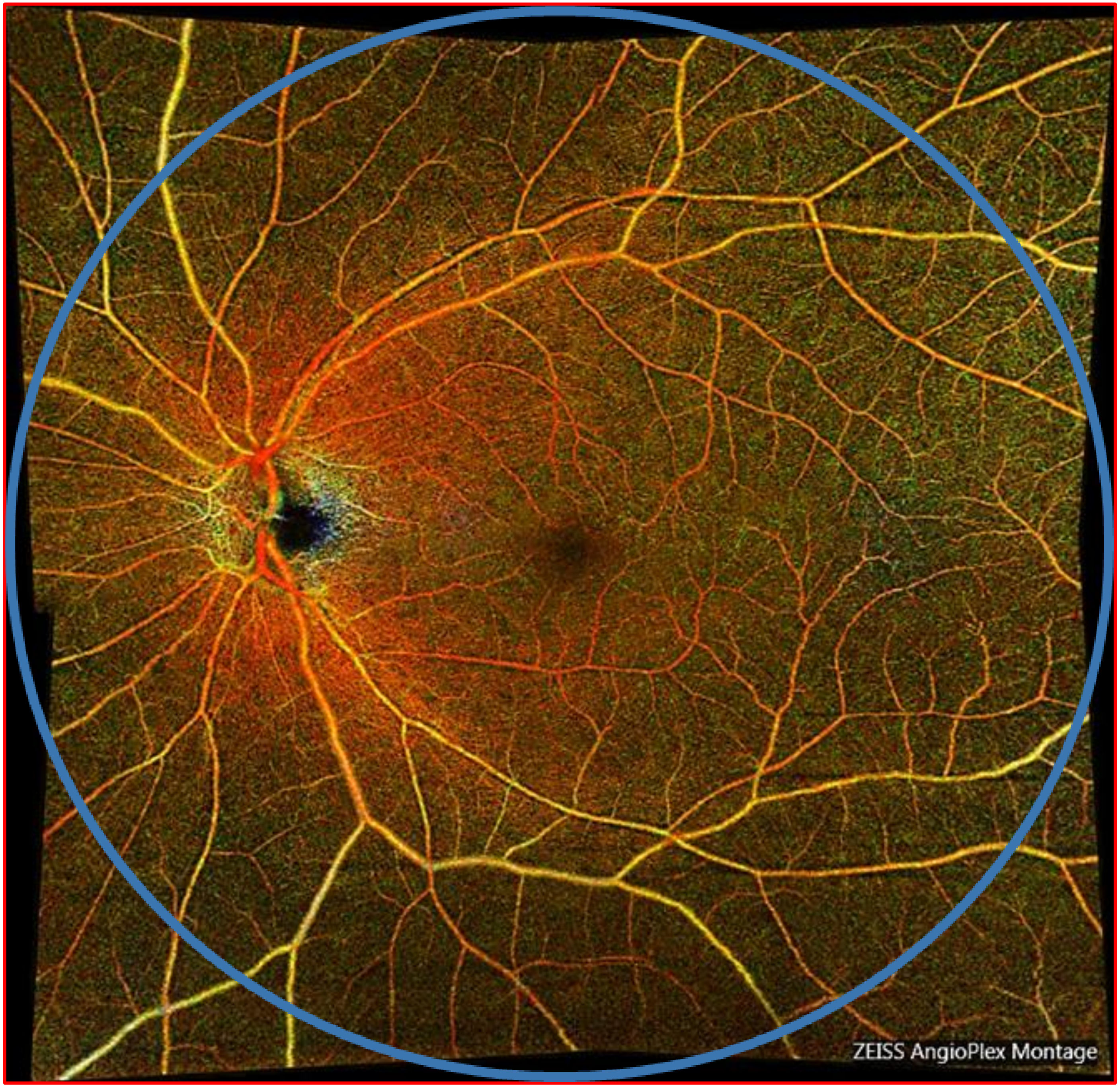
Commenti

Analisi modificata: 01/03/2018 11:45

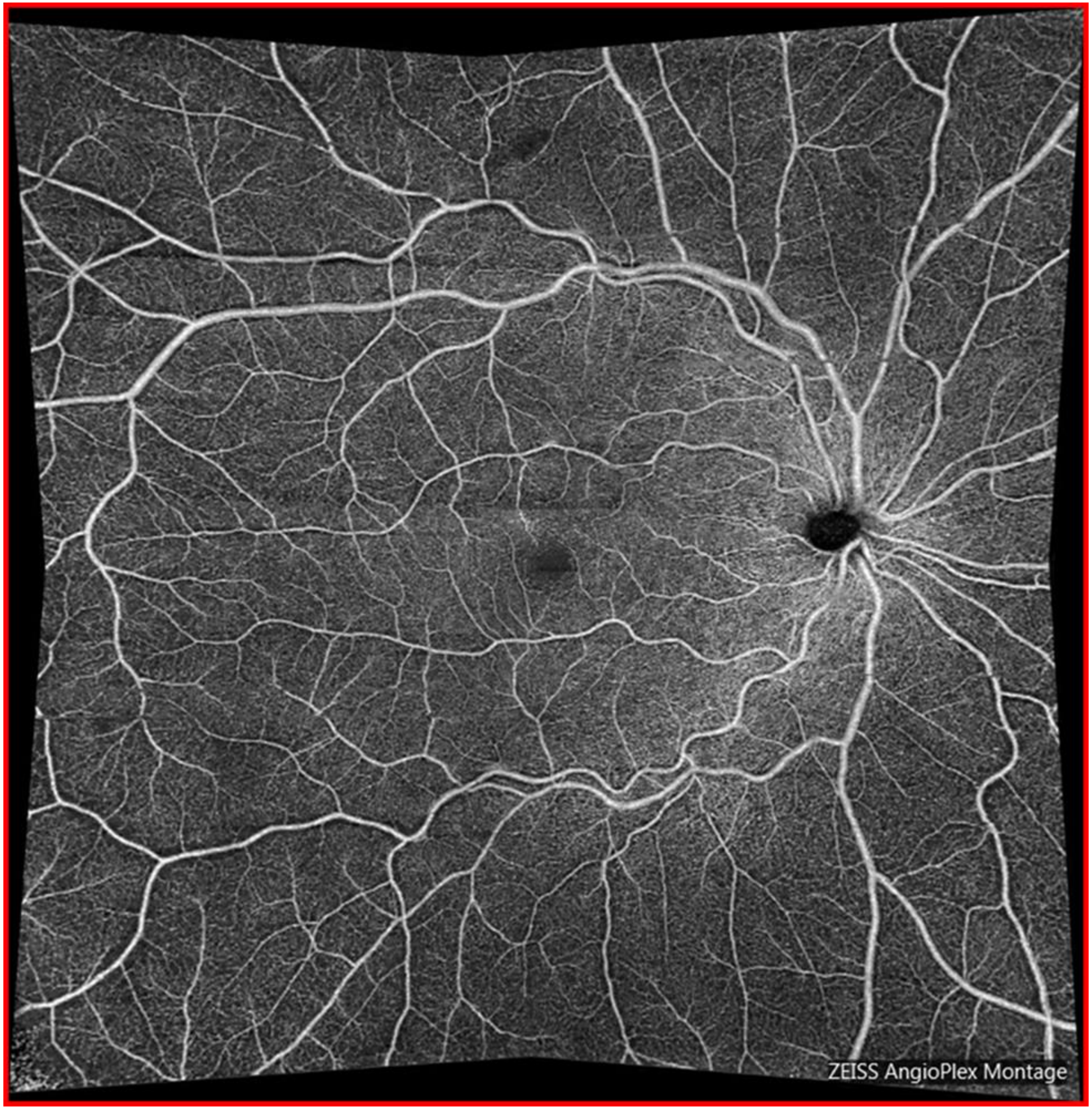
Firma del medico

CIRRUS ANGIO
SW Ver: 10.0.0.14618

Pagina 1 di 1

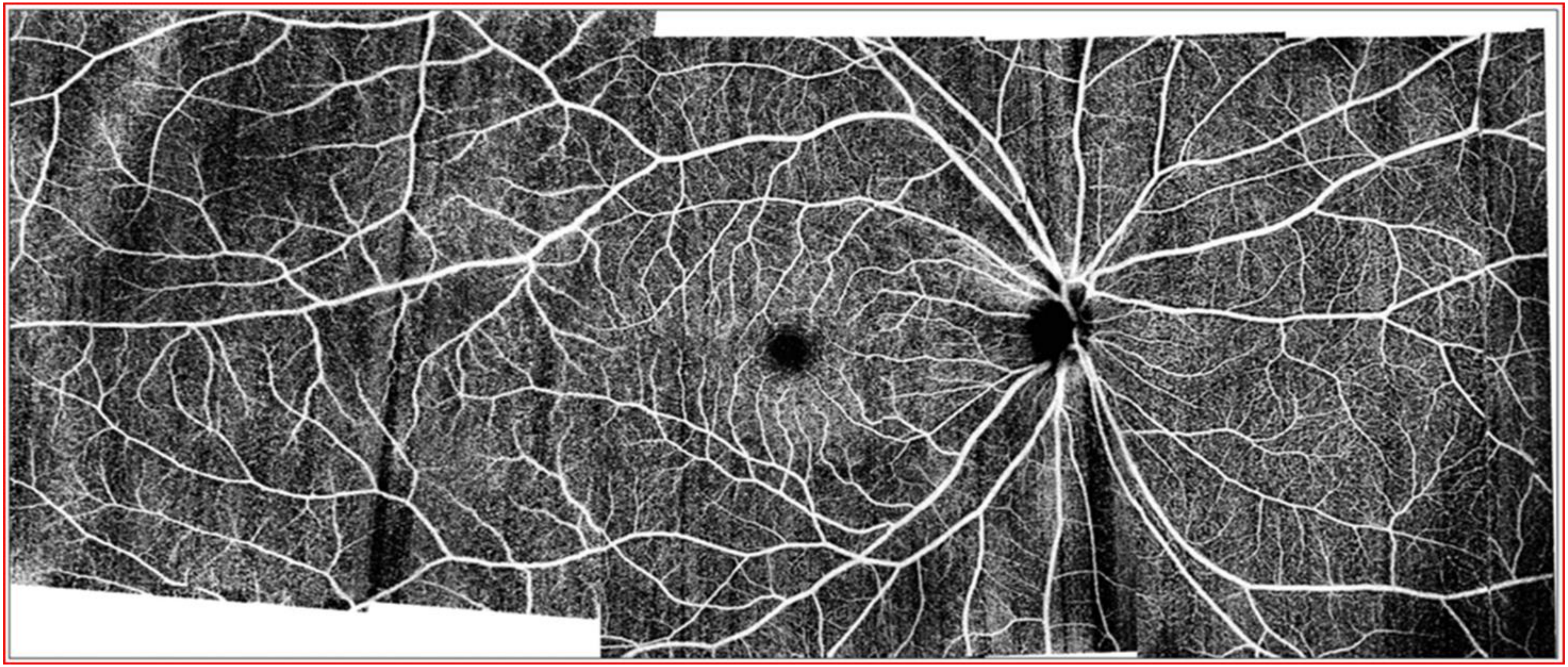

ZEISS AngioPlex Montage

AngioPlex Montage
See more with
wide-field OCT
angiography
(up to 50 degrees)
Comparable
to most traditional
fundus cameras




**Montage 5 images 8x8mmm with AngioPlex Cirrus Zeiss 5000**


**Montage 6 images 6x6mm with AngioPlex Cirrus Zeiss 5000**



**Ultra-widefield OCTA (~20-mm width, 10-mm height,7-mm depth) 200-kHz Swept-Source OCT System.** (by Simon S. Gao et al.)

**"Any sufficiently advanced technology is indistinguishable from magic."**

Arthur C. Clarke (1917/2008) was one of the most important and influential figures in 20th century science fiction.


# Widefield and Ultra-Widefield in Ophthalmology


Thank you for your kind attention!

Studio Oculistico
In Oculis Salus
dott. A. Lucente

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