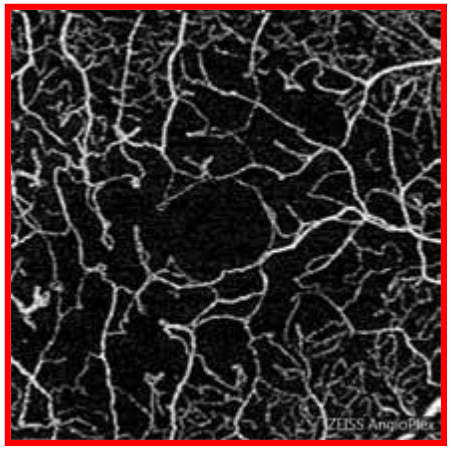
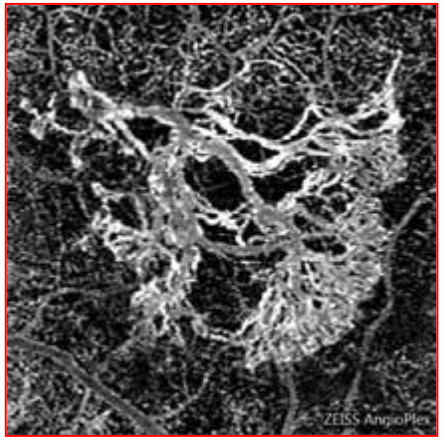
Zeiss Accademy

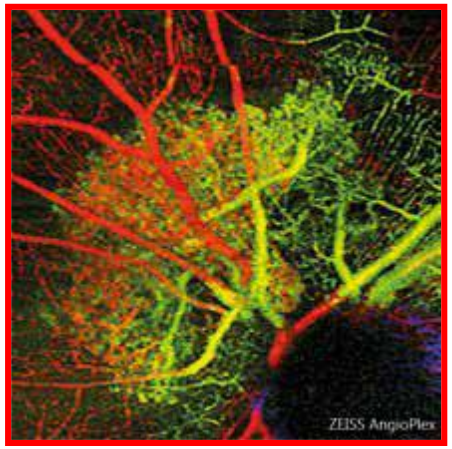
Angio-OCT

We make it visible

Dawn of a New Era in Imaging

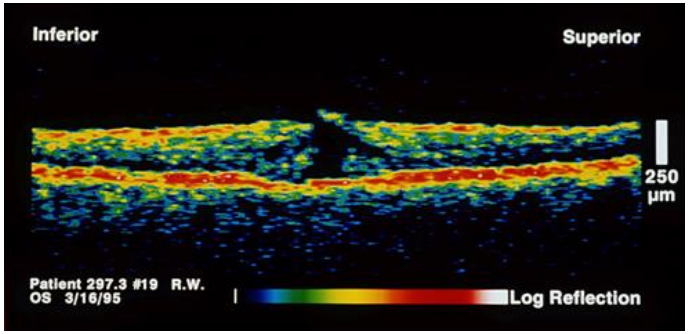
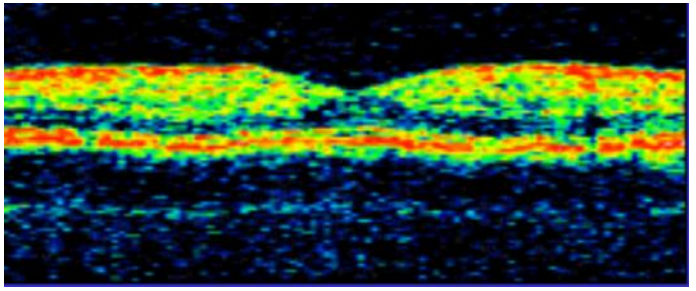
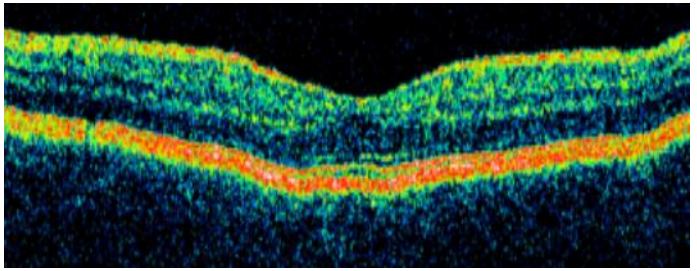
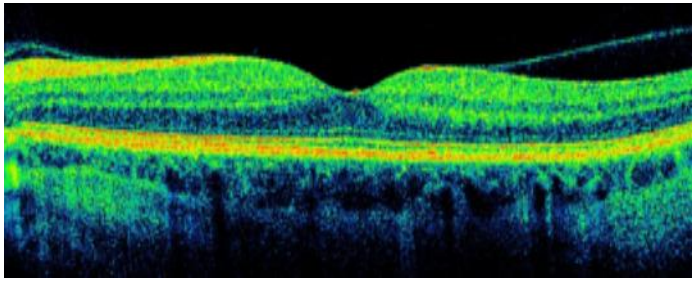






Studio Oculistico
In Oculis Salus
dott. A. Lucente

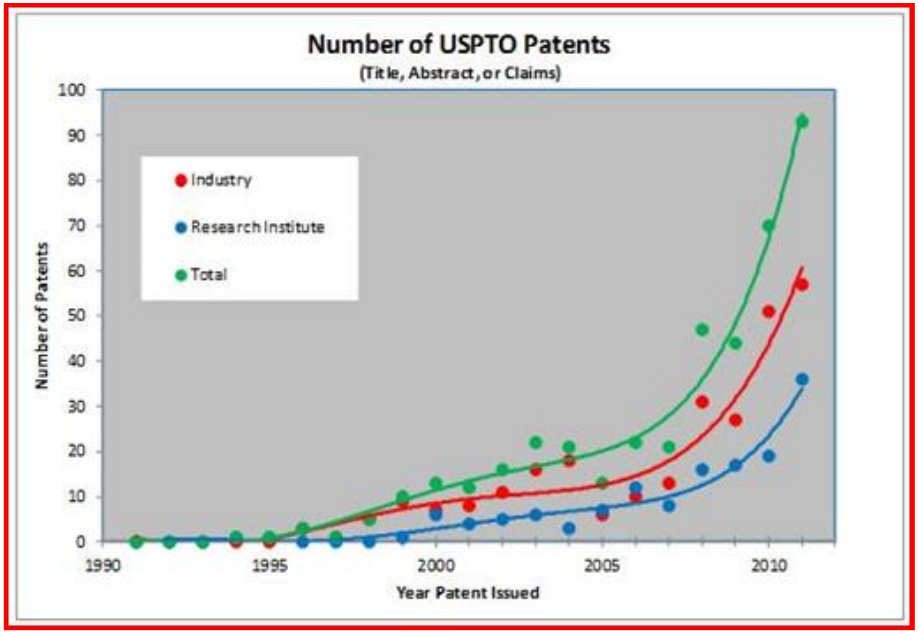
www.amedeolucente.it

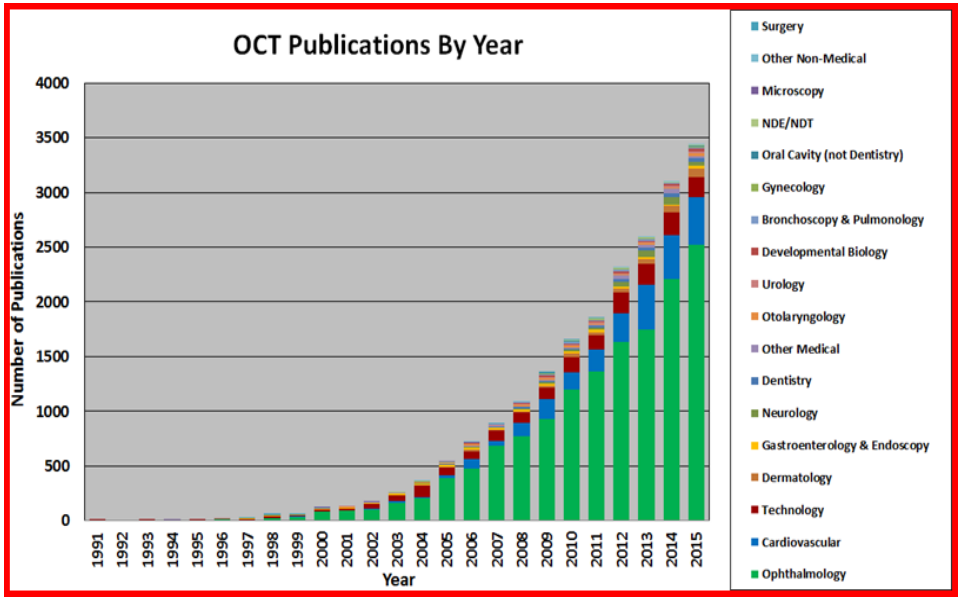
Model Image	Year	Single line Scan	Scans Sec	Resolution (microns)	B Scan
	OCT 1995	100 A-scans x 500 points	100	20	
	OCT2 2000	100 A-scans x 500 points	100	20	
	OCT3 Stratus 2002	512 A-scans x1024 points	500	10	
	Cirrus HD-OCT 2007	4096 A-scans x 1024 points	27,000	5	

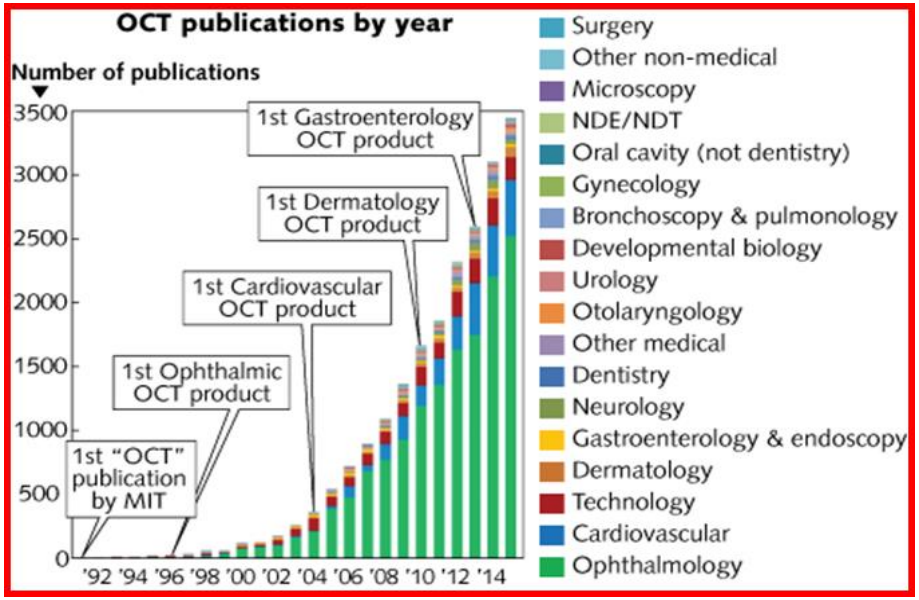
Foreword: 25 Years of Optical Coherence Tomography

by:James Fujimoto and David Huang

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







Optical Coherence Tomography Angiography – A General View

Burak Turgut

Department of Ophthalmology, Faculty of Medicine, Firat University, Elazig, Turkey

DOI: http://doi.org/10.17925/EOR.2016.10.01.39

Table 1: The comparison of the specifications of main OCTA systems

AngioPlex*	AngioVue[a]	Spectralis OCTA[β]	SS OCT Angio[γ]	AngioScan[δ]	Angio eXpert[ε]
• Commercially avaliable • OMAG algoritm • Used a light source of 840 nm and a bandwidth of 90 nm • OCTA mean scan time: 3.8 seconds • Real-time FastTrackeye tracking system • Allowing visualisation of both the retinal flow and structure 3×3 mm and 6×6 mm OCT angiograms (in 2016 planning 8×8 mm and 12×12 mm) • Segmentation algoritms including the maps of the superficial retina, the deep retina, avascular retina choriocapillaris and choroid • 68,000 A-scans/sec • OCTA requires 1 scan • Motion correction software to remove artifacts • En-face microvascular flow images en-face map of the retinal and choroidal blood flow	• Commercially avaliable • SSADA algoritm • Used a light source of 840 nm and a bandwidth of 45 nm • OCTA mean scan time: 3 seconds • Allowing visualisation of both the retinal flow and structure • 3x3 mm 4.5x4.5 mm, 6x6 mm and 8x8 mm OCT angiograms • Segmentation algoritms including plexus of the superficial retinal capillary plexus, the deep retinal capillary plexus, the choriocapillaris • 70,000 A-scans/sec • OCTA requires 2 separate scans • No eye tracking system • Motion Correction Technology software to remove artifacts • Angio quantification with AngioAnalytics quantification • En-face map of the retinal and choroidal blood flow	• Not available in all countries • Amplitude decorrelation algorithm • Used a light source of 870 nm with bandwidth of 50 nm • An automated, realtime mode and an Active Eye Tracking System • Expect a long acquisition time (1-2 minutes per eye) • 85,000 A-scans/sec with upgrading to new OCT2 module • Expect a good image quality • Basic software interface, not yet refined • No detailed information on segmentation capability • No detailed data on device specifications and software	• Not available in all countries • Swept Source OCT • OCTARA algorytm • Used a light source of 1,050 nm • 100,000 A scan/sec • Scan size (mm) 3.0x3.0 mm, 4.5x4.5 mm, 6.0x6.0 mm • SMARTTrack tracking software • Multi-modal SS- • OCT/fundus camera with OCT Angiography • Expect a wide field, deep penetration • Segmentation algorithms including superficial, deep, outer retina and choriocapillaris • No active motion correction software	• Not available in all countries • Modified OMAG algorithm (motion detection and decorrelation analysis) • Used a light source of 880 nm • 3x3 mm, 6x6 mm, 9x9 mm scans plus 12x9 mm montage (12 3x3 mm scans) widest field of view • 53,000 A-scans/sec • Long scan time (40 sec+) • Real-time SLO based tracking system • Multiple scan patterns • Montage ability for panoramic image • Segmentation algorithms including superficial, deep, outer retina and choriocapillaris • The visualisation of the retinal and choroidal blood flow	• Not available in all countries • No data in web about the used OCTA algorithm • Used a light source of 855 nm ± 5 nm • Segmentation algorithms including superficial, deep, outer retina and choriocapillaris • 3x3 to 8x8 mm OCT angiograms • OCTA mean scan time: appr. 3.0 seconds • Maximum 70,000 A-scans/sec • The superficial and deeper blood vessels a designated layer • SLO tracking follow-up • Auto fundus tracking by SLO • No information on the visualisation of the retinal and choroidal blood flow • No detailed data on device specifications and softwares

*Data on all OCTA devices and systems have been provided from the catalogues, manuals and web pages. * Zeiss, [a]Ocuvue, [β]Heidelberg, [γ]Topcon, [δ]Nidek, [ε]Canon. OCT = optical coherence tomography; OCTA = optical coherence tomography angiography; OCTARA = OCT angiography Ratio Analysis; OMAG = optical microangiography; SLO = scanning laser ophthalmoscope; SS = swept-source; SSADA = split-spectrum amplitude decorrelation angiography.*

=

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

Benchmarking OCT. The Ophthalmologist, February 2016

- **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)

The algorithms used in OCTA

- Optical microangiography (OMAG),
- Split-spectrum amplitude decorrelation angiography (SSADA)
- OCT angiography ratio analysis (OCTARA)
- Speckle variance
- Phase variance
- Correlation mapping.

Zhang A, Zhang Q, Chen CL, Wang RK
Methods and algorithms for optical coherence tomography-based angiography: a review and comparison. J Biomed Opt. 2015 Oct;20(10):100901. doi: 10.1117/1.JBO.20.10.100901.

In a recent study, when algorithms including OMAG, speckle variance, phase variance, SSADA and correlation mapping were compared, ***it was found that OMAG****, as the method utilising complex OCT signals to contrast retinal blood flow* ***provided the best visual result for the of retinal microvascular networks concerning image contrast and vessel connectivity****.*

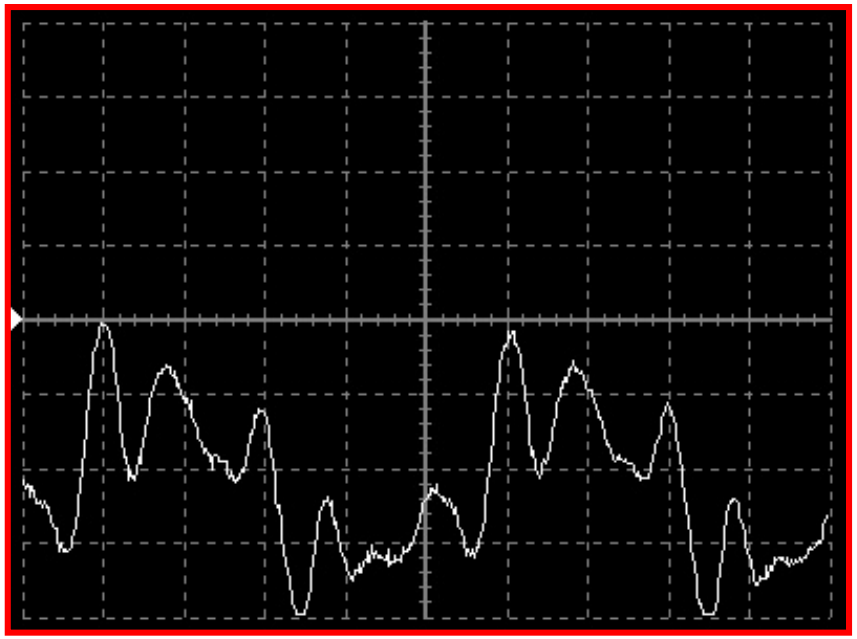
Dawn of a New Era in Imaging

x(t) vs X(f)

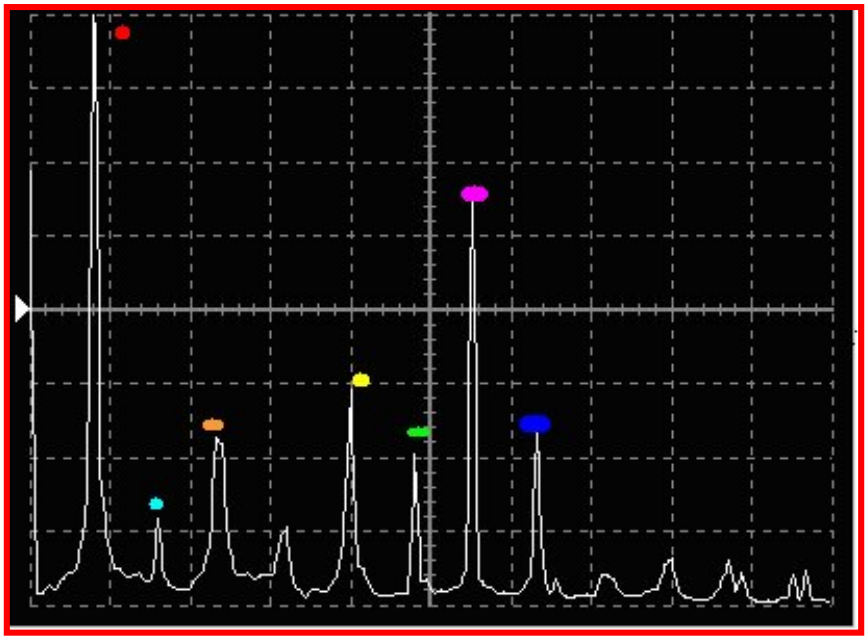
$$X(f) = \int_{-\infty}^{+\infty} x(t) \cdot e^{-j\,2\pi\,f\,t}\,dt$$

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

Trasformata e Antitrasformata di Fourier

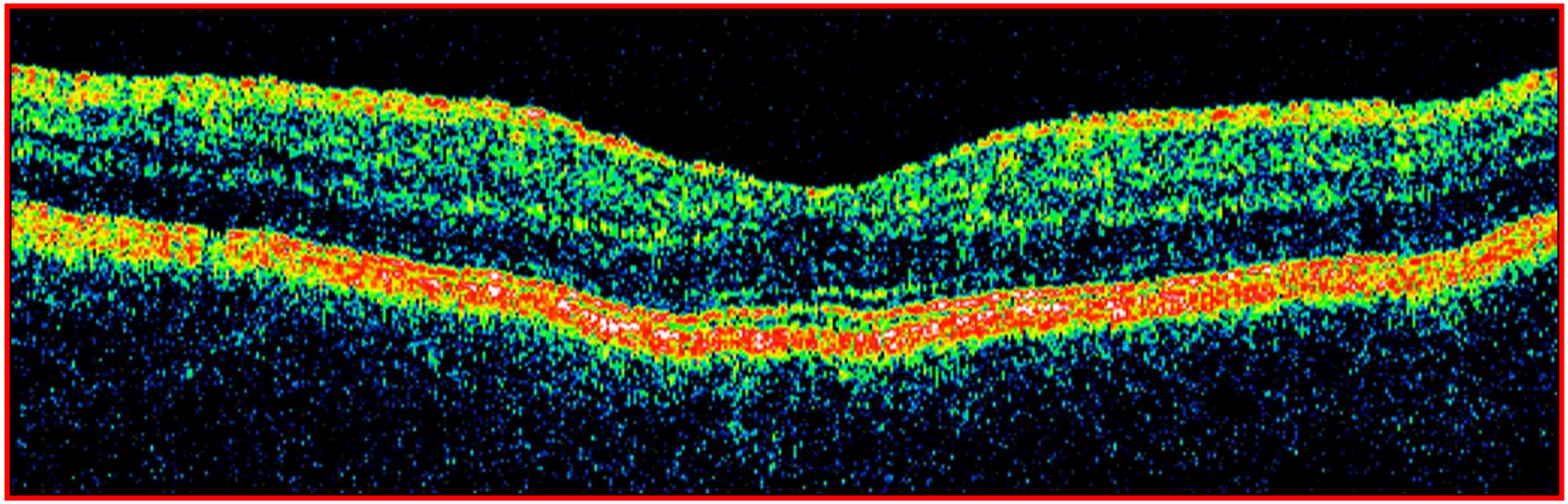


Nota musicale «la» di un clarinetto registrata tramite oscilloscopio nel dominio del tempo *x(t)*

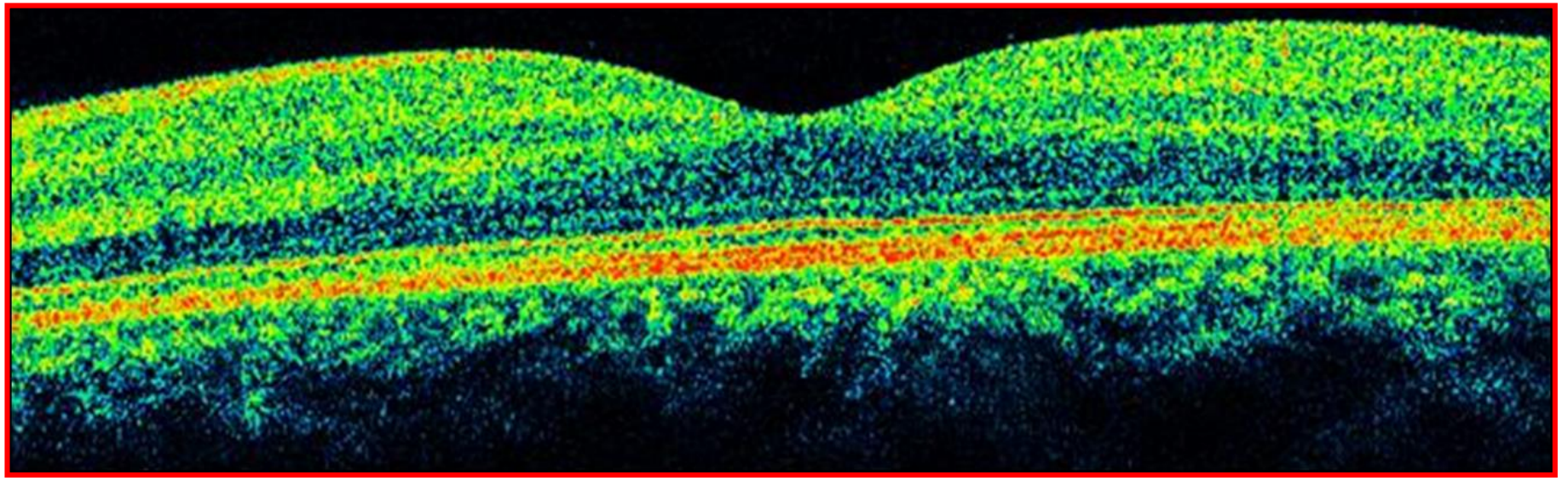


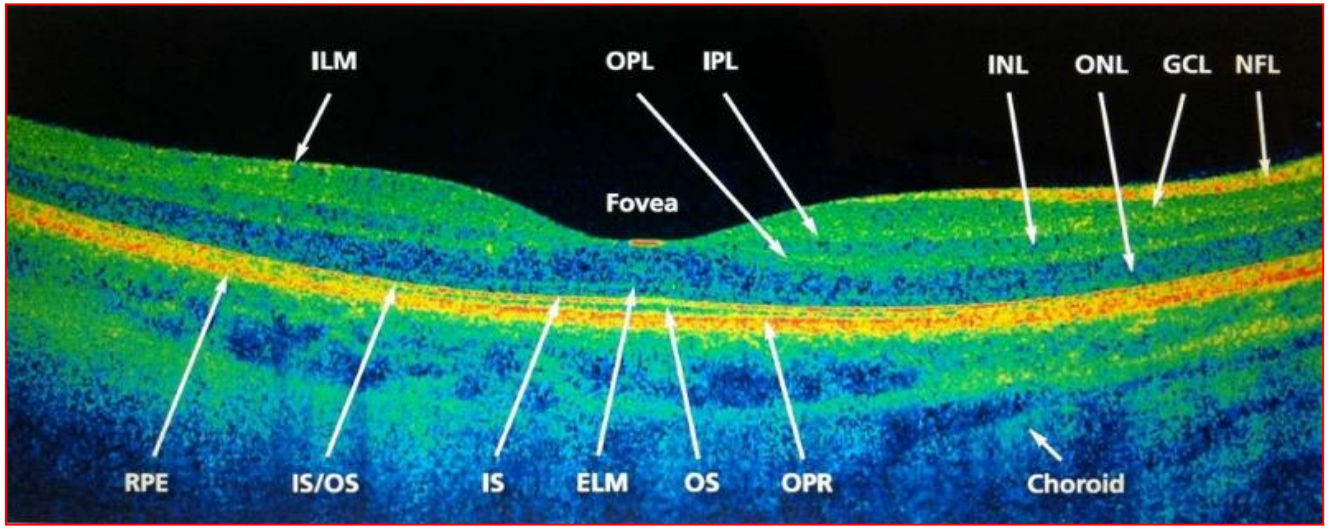
Nota musicale «la» di un clarinetto scomposta in sotto-onde nel dominio delle frequenze *X(f)*

$x(t)$

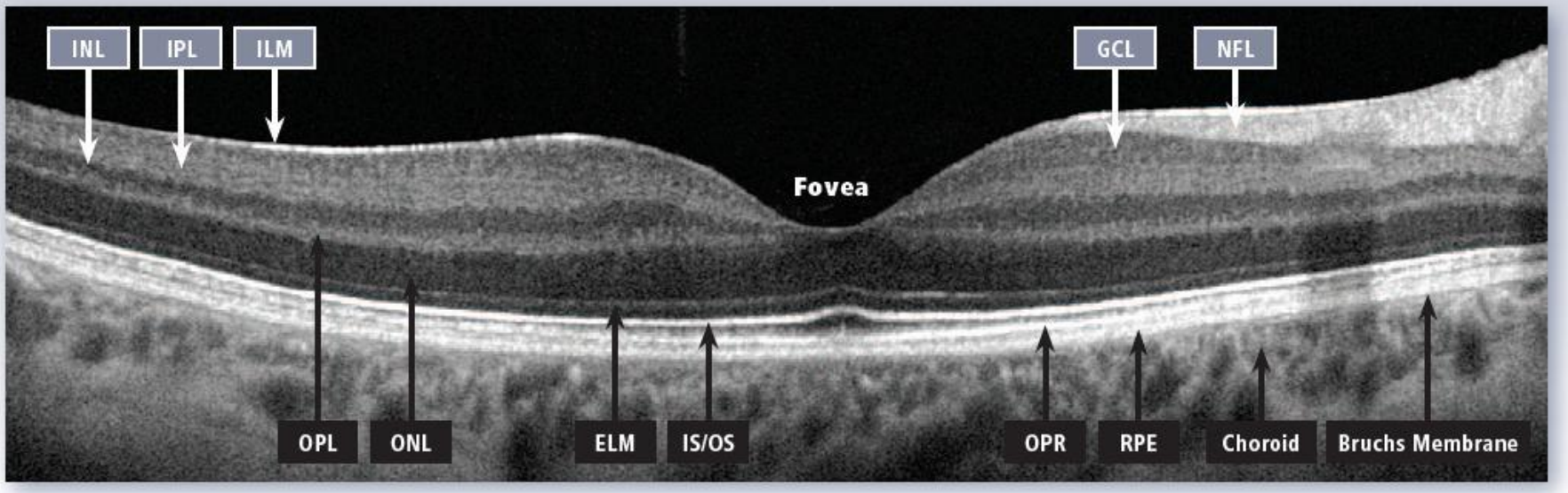


$X(f)$





Cirrus™ HD-OCT: interpretation of retinal layers

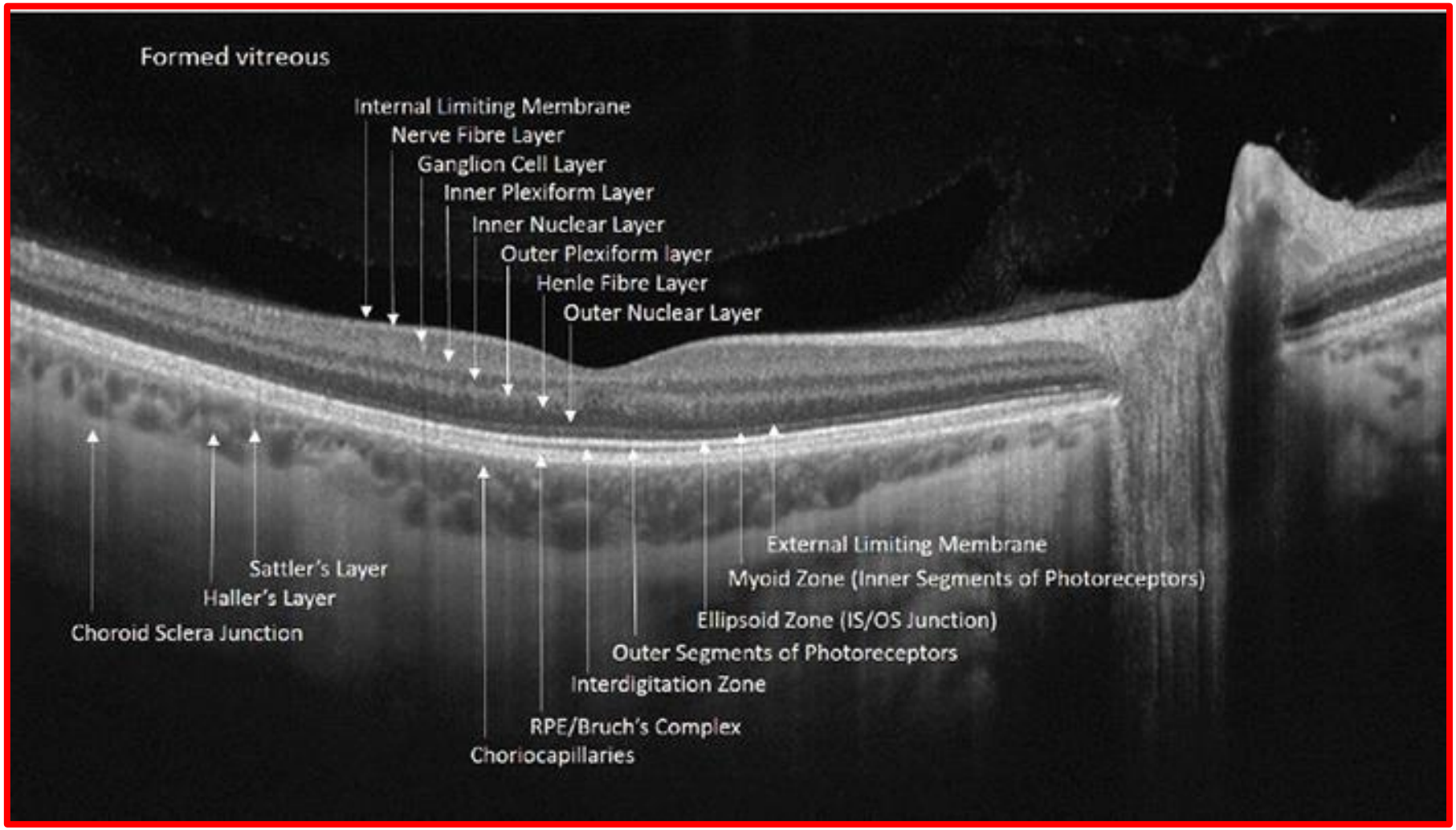


ILM: *Inner limiting membrane*
IPL: *Inner plexiform layer*
INL: *Inner nuclear layer*
OPL: *Outer plexiform layer*
ONL: *Outer nuclear layer*

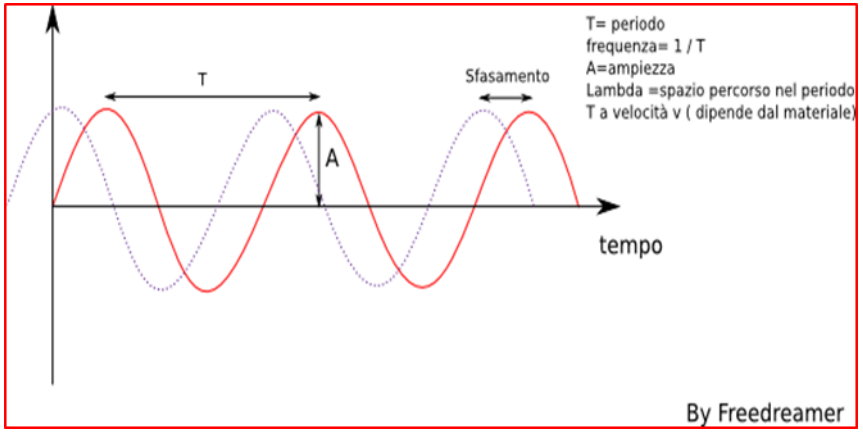
ELM: *External limiting membrane*
IS/OS: *Junction of inner and outer photoreceptor segments*
OPR: *Outer segment PR/RPE complex*

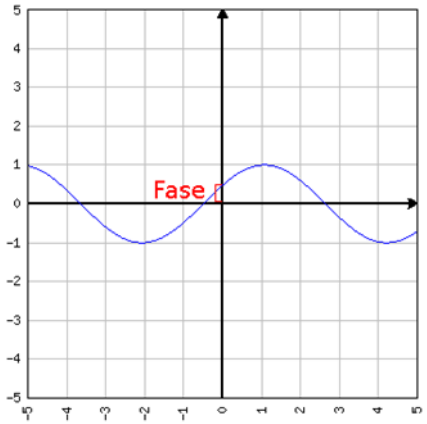
NFL: *Nerve fiber layer*
GCL: *Ganglion cell layer*
RPE: *Retinal pigment epithelium + Bruch´s Membrane*

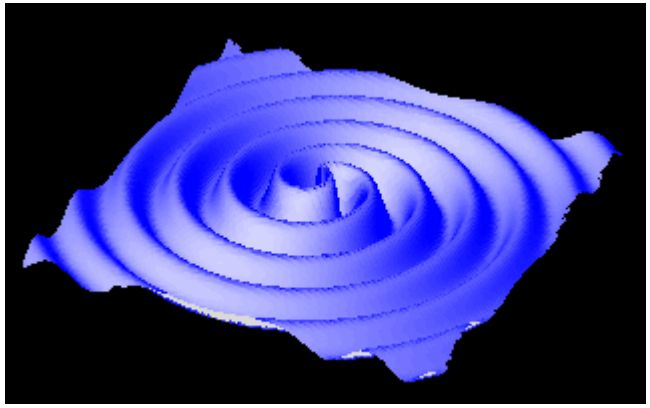
International Nomenclature OCT (INOCT)

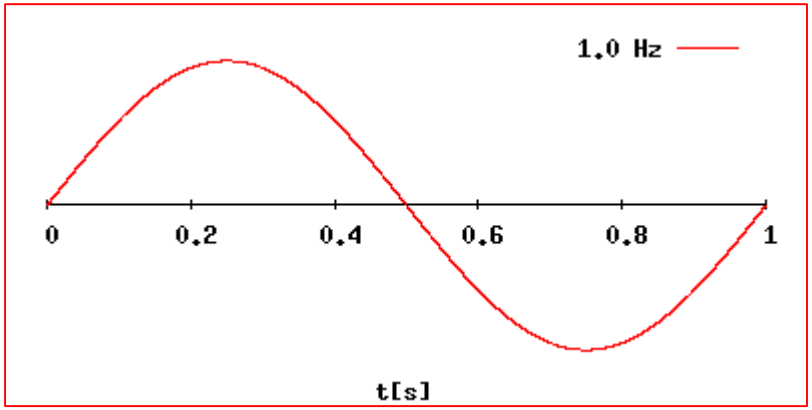


What is a wave? «energy propagated through matter» A. Einstein







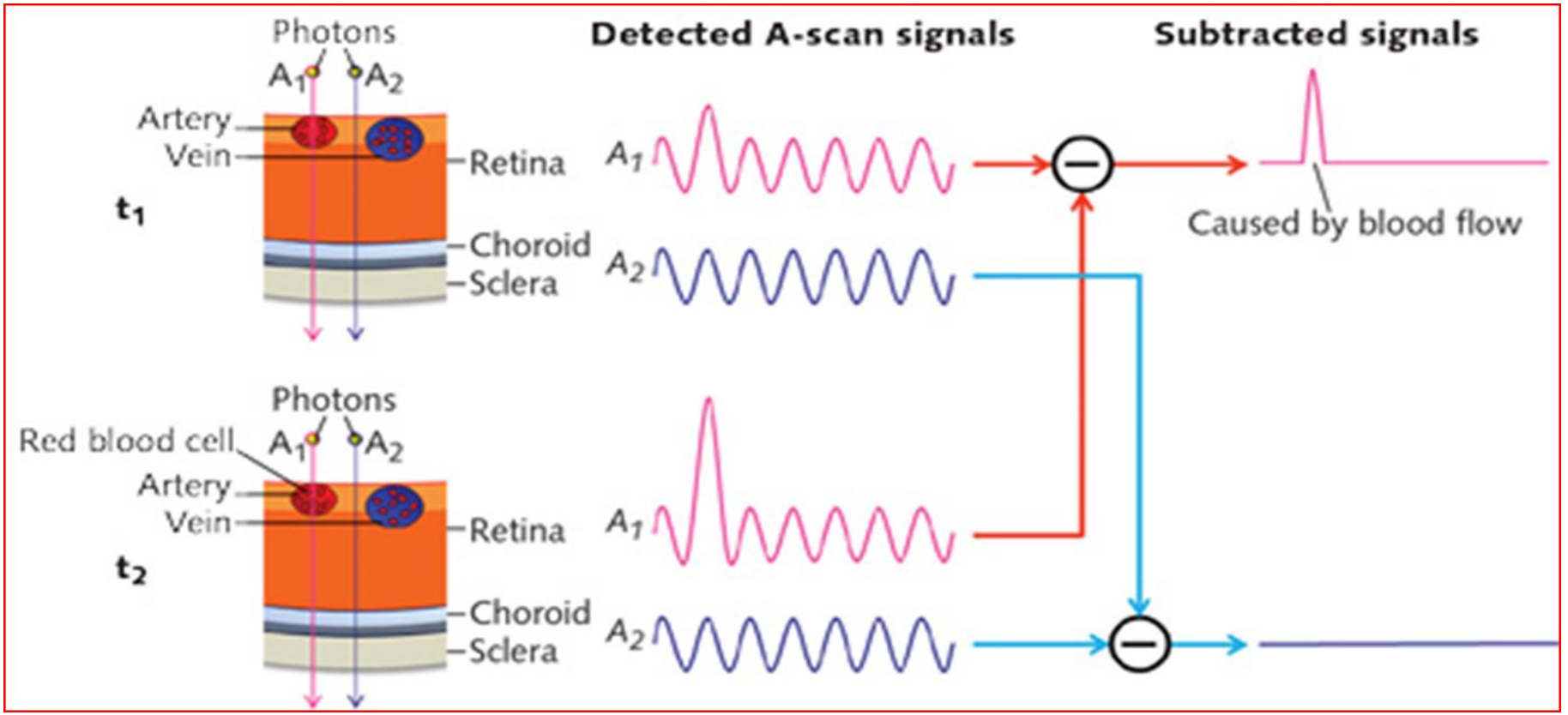


a)Angiografia dyeless basata sull'ampiezza del segnale OCT

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



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

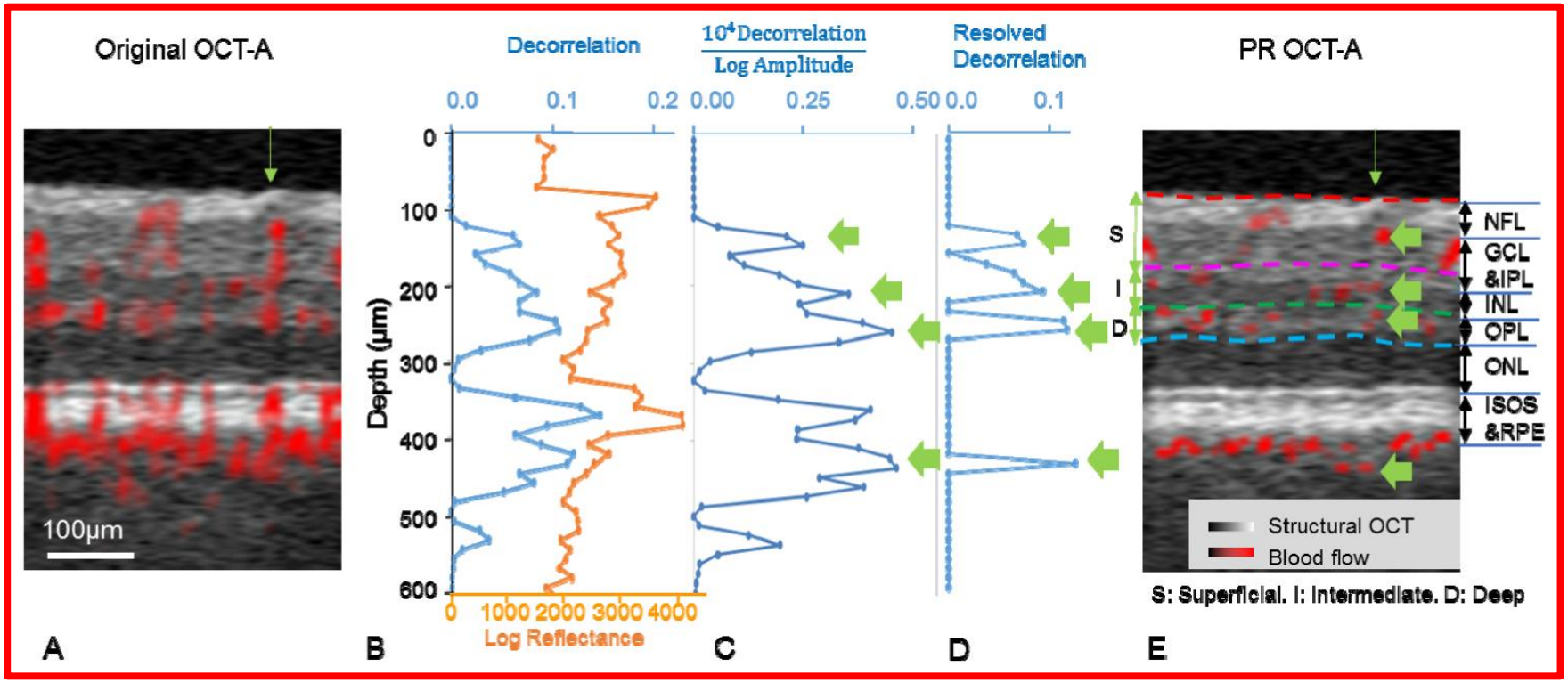


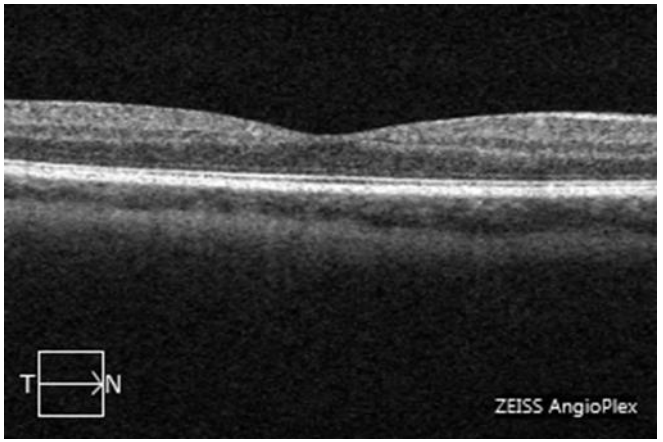
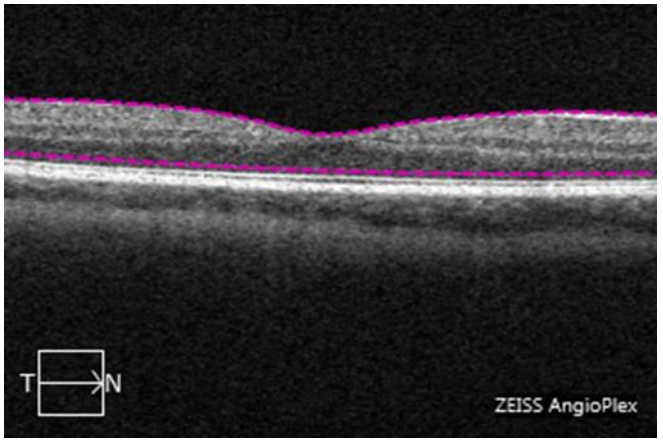
Illustration of **projection-resolved (PR) OCT-A algorithm.**
(A) Composite crosssectional OCT-A before projection suppression. This 0.23 mm wide example is taken from the parafoveal region. **(B)** Original decorrelation and log amplitude values of the A-line pointed to by the green arrow in A.
(C) Decorrelation normalized by log amplitude according to **Eq F= D/S, F = Flow, D = Decorrelation, S = log amplitude OCT signal.** Four successively higher peaks (green arrows) on this plot represent in situ flow in real vessels.
(D) Decorrelations plot after clean up by the PR algorithm – decorrelation values outside the successive peaks represented projection artifacts and were set to zero (Eq. (3).
(E) Composite cross-sectional OCT-A after clean-up of projection artifacts using the PR algorithm. The green arrows in pointed at the same voxels identified as real vessels in C and D. Note that 4 vessels co-existing along the same A-line could be identified on the PR OCT-A, and their axial positions could be pinpointed. The PR OCT-A of the macula shows 3 distinct vascular plexuses in the inner retina - superficial, intermediate, and deep – as has been described in previous histological studies . **by: David Huang and Yali Jia et al**. ; published 9 Feb 2016; BIOMEDICAL OPTICS EXPRESS 816

AngioPlex Analysis Layer

- 8 slab

AngioPlex Analysis Layer Presets: Retina Depth Encoded and Retina

S
D
A

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

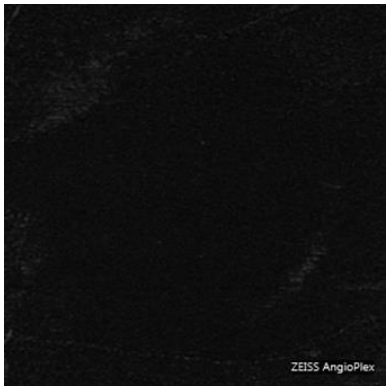
AngioPlex Analysis Layer Presets: VRI and Superficial

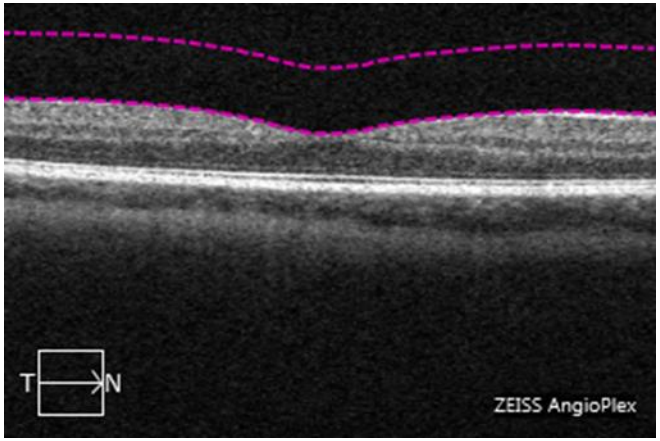
Inner Boundary

- VRI Vitreo-Retinal Interface

– 300µm

Outer Boundary ILM



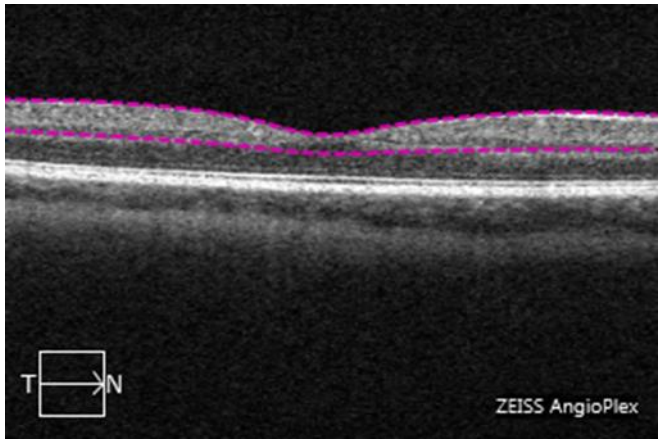


Inner Boundary ILM

IPL=ILM+70%(OPL-ILM)

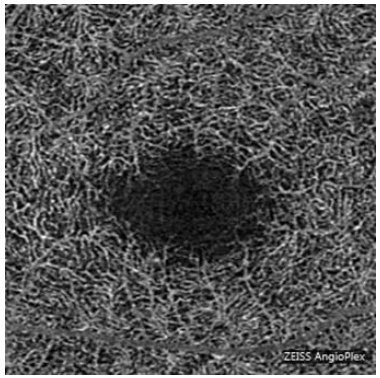
Outer Boundary IPL

- Superficial Superficial Retinal Layer



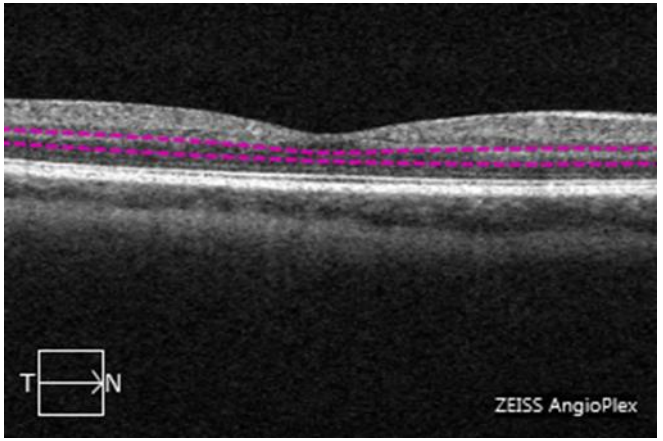
AngioPlex Analysis Layer Presets: Deep and Avascular

- Deep Deep Retinal Layer



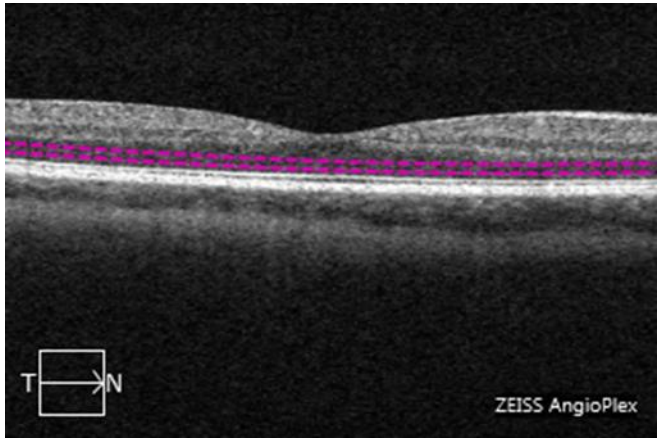
Inner Boundary IPL

Outer Boundary OPL=RPEfit–110µm



Inner Boundary OPL

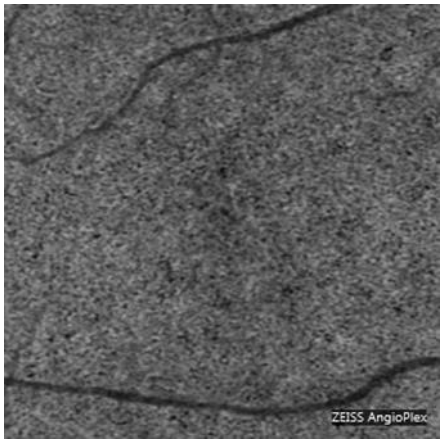
Outer Boundary IS/OS=RPEfit-70µm



- Avascular Avascular Retina

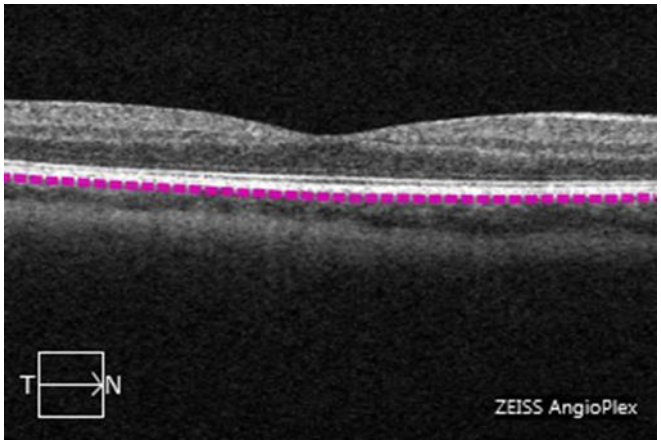
AngioPlex Analysis Layer Presets: Choriocapillaris and Choroid

- Choriocapillaris

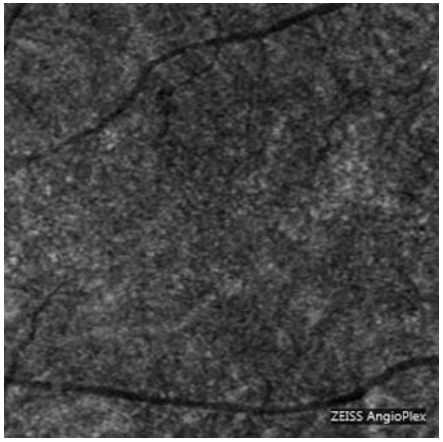


Inner Boundary CCIB=RPE+29µm

Outer Boundary CCOB = RPE+49µm

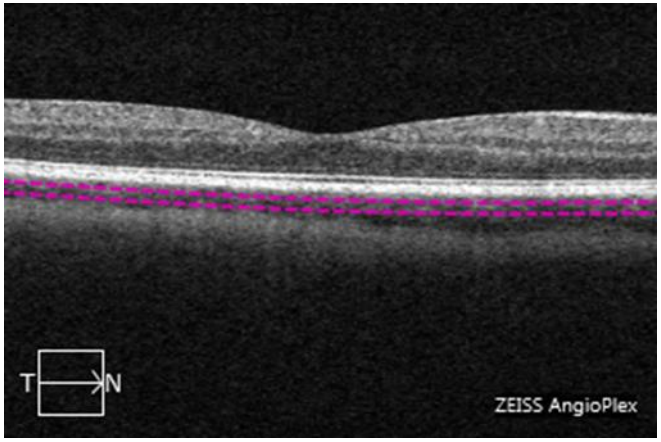


- Choroid

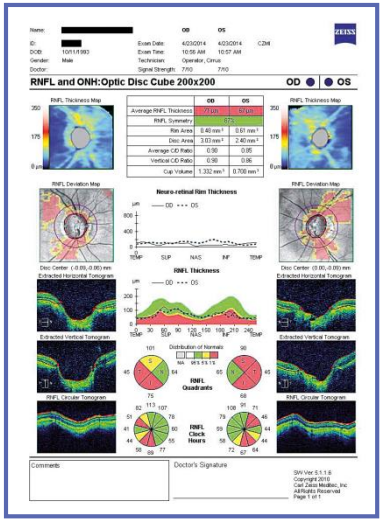


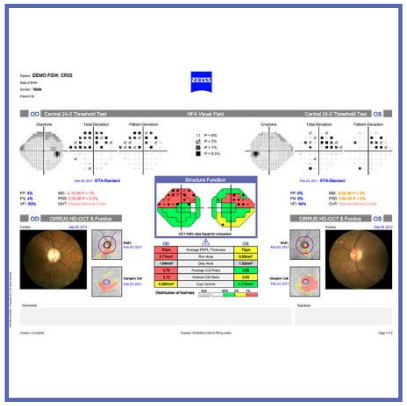
Inner Boundary ChIB = RPEfit + 64µm

Outer Boundary ChOB = RPEfit + 115µm

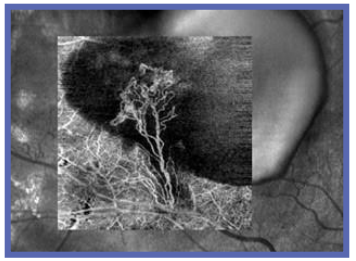


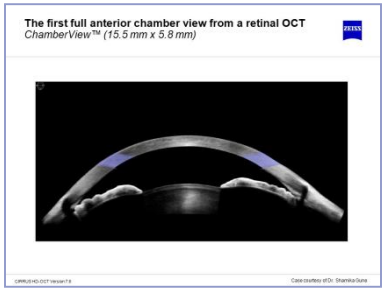
INDEX Angio Plex Cirrus

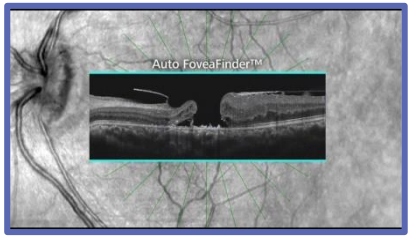


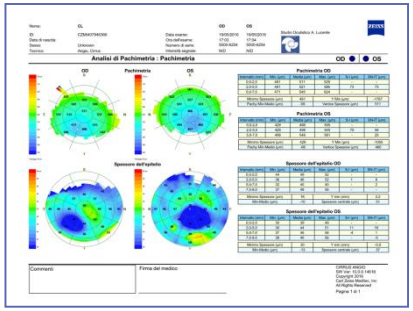


- AngioPlex™ OCT
- Angiography En face
- Analysis Advanced RPE Analysis
- Macular Thickness Analysis
- Macular Change Analysis
- HD 1 line
- HD 21 Line
- RNFL and ONH Analysis
- ONH/RNFL Guided Progression Analysis™ (GPA™)
- Ganglion Cell Analysis
- GCA Guided Progression Analysis (GPA)
- PanoMap™ Analysis
- Anterior ChamberAnalysis
- Wide Angle-to-Angle
- Analysis Pachymetry **(epithelial and stromal thickness maps)**
- Analysis HD Cornea
- HD Angle
- HFA–CIRRUS Structure-Function Report









AngioPlex Metrix™for HD-Cirrus 5000

- **Density measure (ETDRS, central, inner, full)**

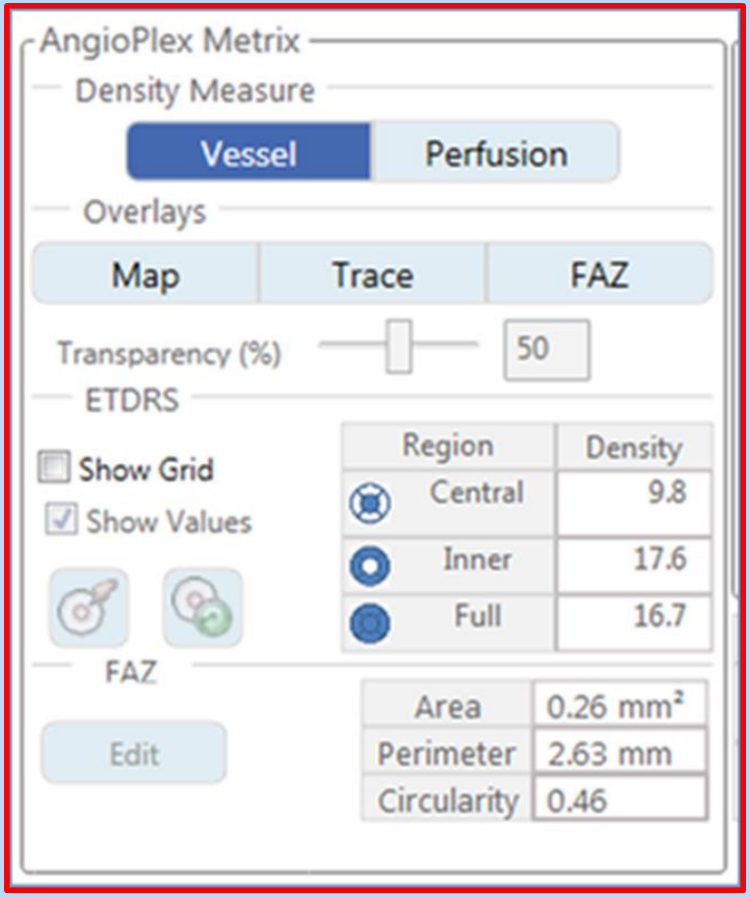
densità dei vasi/Vessel Density
densità di perfusione/Flow Index

- **FAZ Parameters**

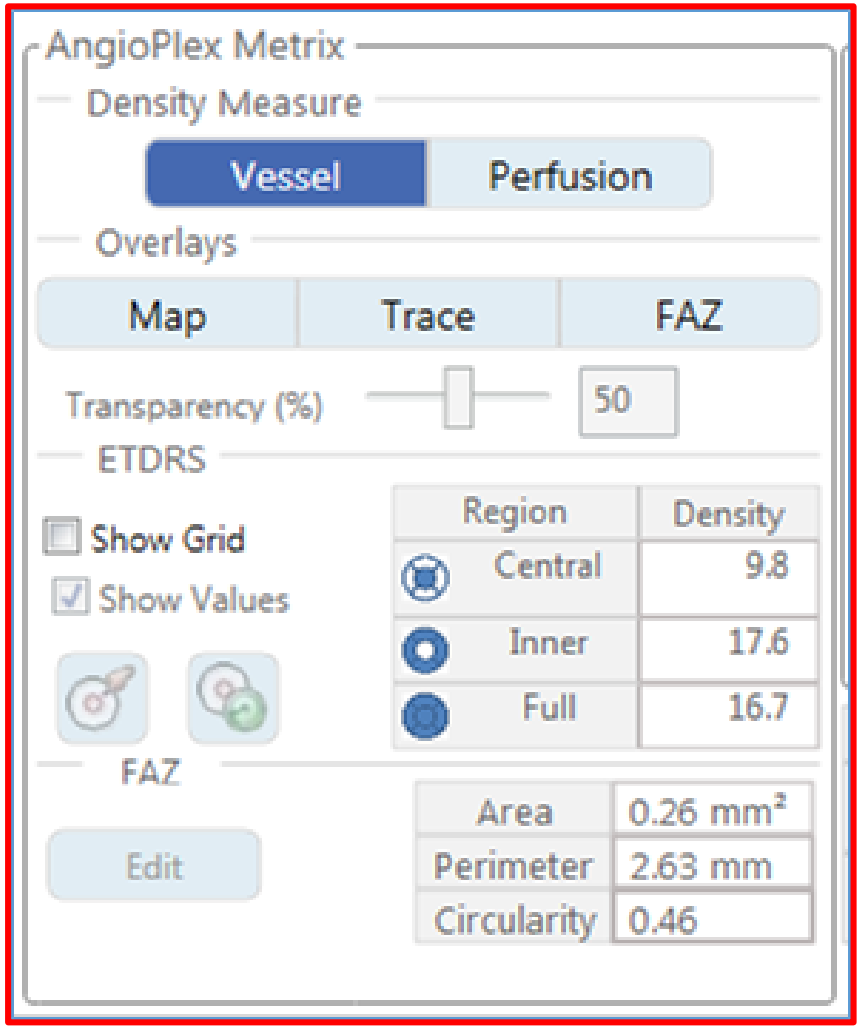
Area mm²
Perimetro (mm)
Circolarità della FAZ

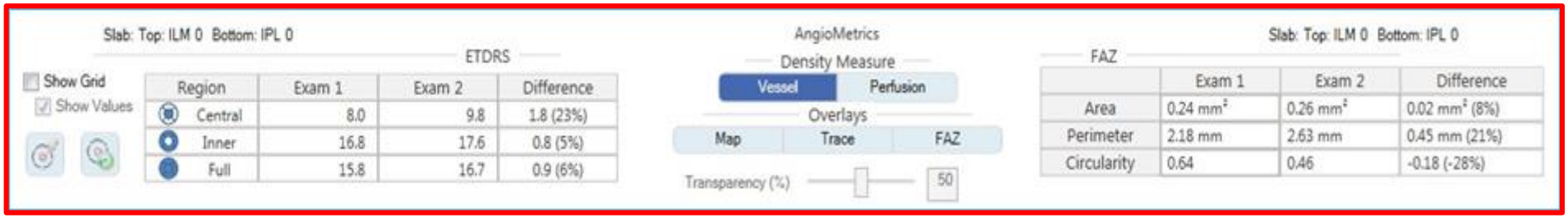
- **Angiography Change**

Vessel Density
Fow Index
FAZ



AngioPlex Metrix: Angiography Analysis/Change Screen





Perfusion Density/Flow Index 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
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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)

>>>Clinical Cases……

……Enter the New Era of Retinal Care by Zeiss

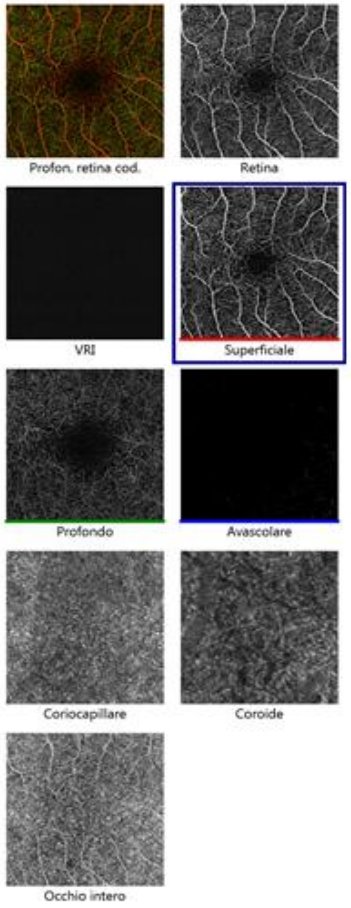
dott. A. Lucente
In Oculis Salus
Studio Oculistico

Nome:	VF		OD
ID:	783893887	Data esame:	20/02/2016
Data di nascita:		Ora dell'esame:	09:20
Sesso:	Donna	Numero di serie:	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	10/10

Studio Oculistico A. Lucente

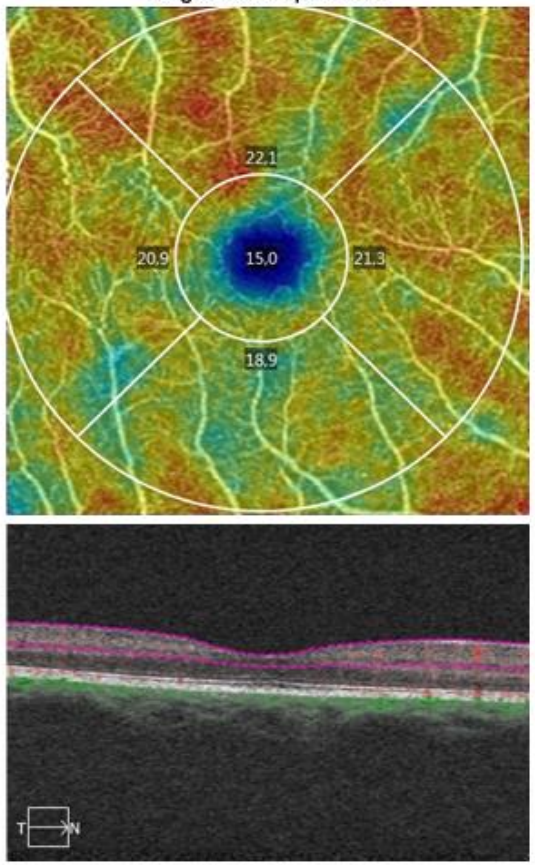
Analisi dell'angiografia : Angiography 3x3 mm

OD ● | ○ OS



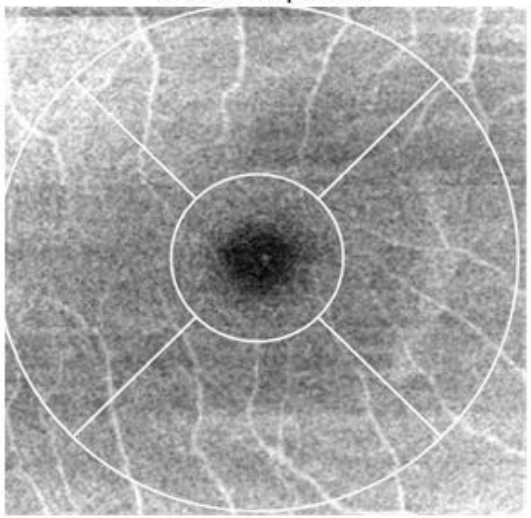
S
D
A

AngioPlex - Superficiale



Segmento: 122 Parte sup.: ILM Parte inf.: IPL

Struttura - Superficiale



Sovrapposizioni
Struttura - Nessuno
AngioPlex - Vaso Mappa

AngioPlex Metrix

ETDRS - Vaso

Regione	Densità
Centrale	15,0 mm⁻¹
Interna	20,8 mm⁻¹
Completo	20,2 mm⁻¹

FAZ

Area	0,16 mm²
Perimetro	1,78 mm
Circolarità	0,64

Monitorato durante la scansione

Commenti

Firma del medico

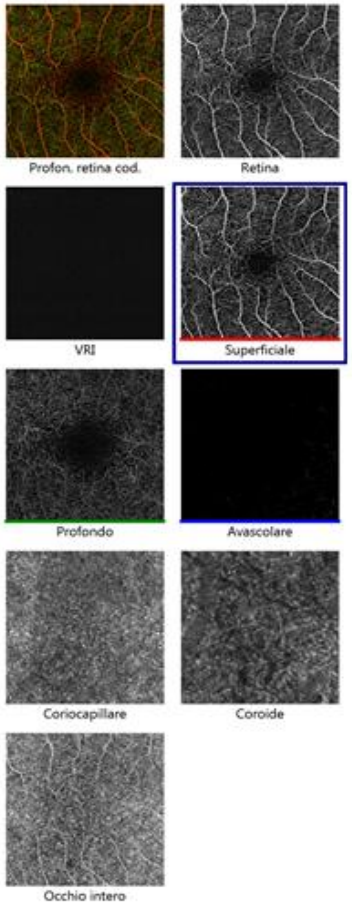
Nome:	**VF due**		**OD**
ID:	783893887	Data esame:	20/02/2016
Data di nascita:		Ora dell'esame:	09:20
Sesso:	Donna	Numero di serie:	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	10/10

Studio Oculistico A. Lucente

ZEISS

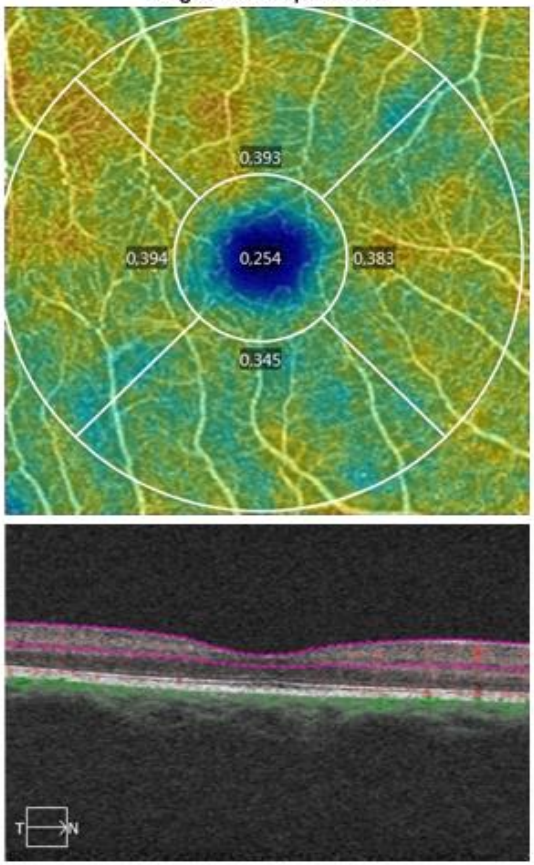
Analisi dell'angiografia : Angiography 3x3 mm

OD ● | ○ OS



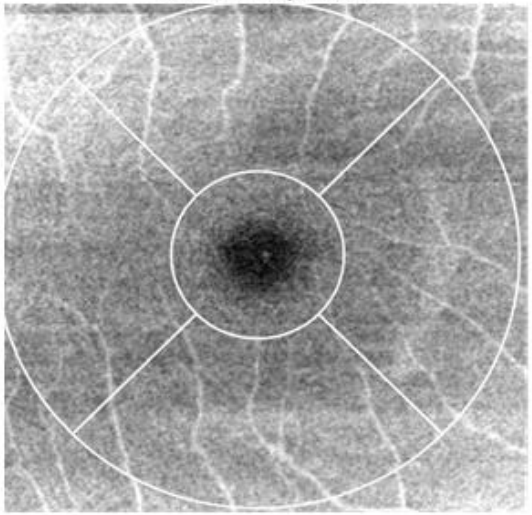
S
D
A

AngioPlex - Superficiale



Segmento: 122 Parte sup.: ILM Parte inf.: IPL

Struttura - Superficiale



Sovrapposizioni
Struttura - Nessuno
AngioPlex - Perfusione Mappa

AngioPlex Metrix

ETDRS - Perfusione

Regione	Densità
Centrale	0,254
Interna	0,379
Completo	0,365

FAZ

Area	0,16 mm²
Perimetro	1,78 mm
Circolarità	0,64

Monitorato durante la scansione

Commenti

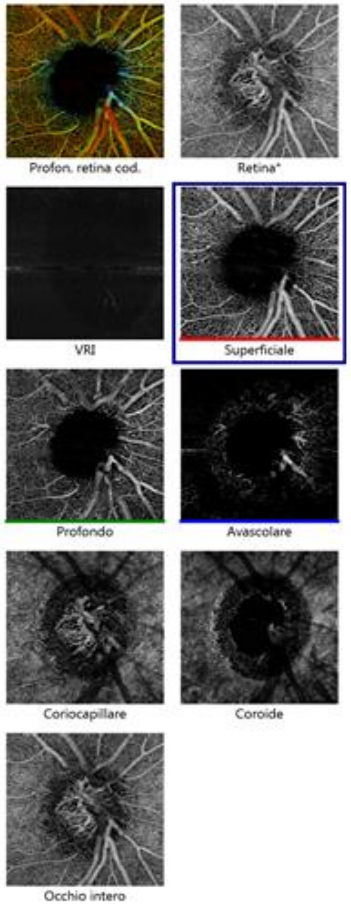
Firma del medico

Nome:	**VF tre**		**OD**
ID:	783893887	Data esame:	20/02/2016
Data di nascita:		Ora dell'esame:	09:44
Sesso:	Donna	Numero di serie:	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	9/10

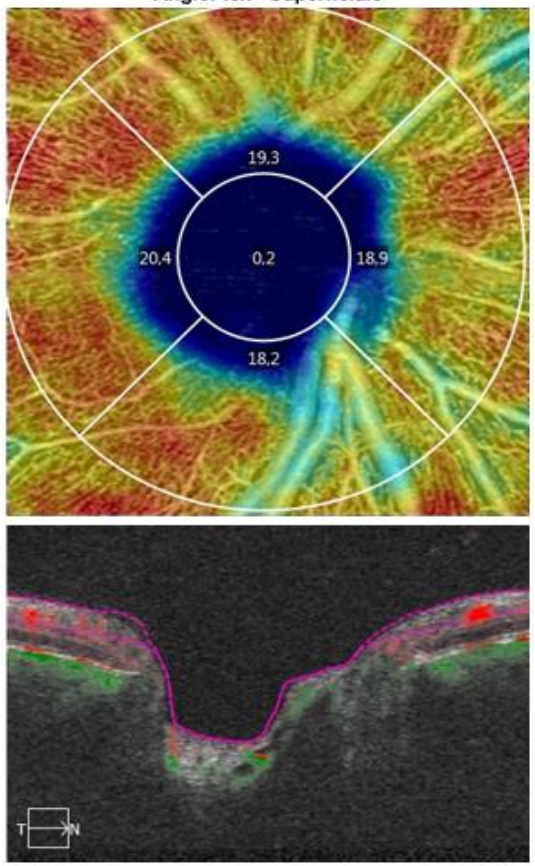
Studio Oculistico A. Lucente

Analisi dell'angiografia : Angiography 3x3 mm

OD ● | ○ OS

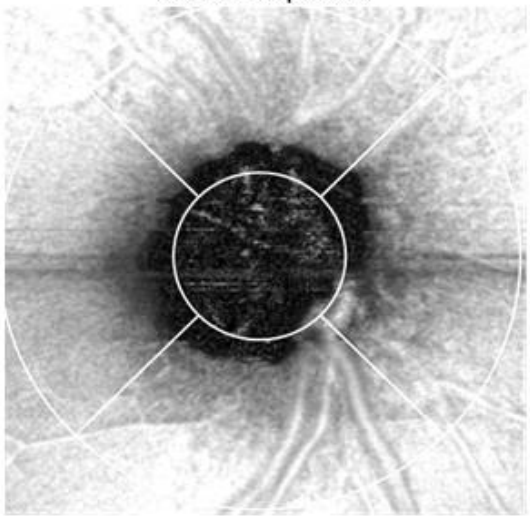


AngioPlex - Superficiale



Segmento: 122 Parte sup.: ILM Parte inf.: IPL

Struttura - Superficiale



Sovrapposizioni
Struttura - Nessuno
AngioPlex - Vaso Mappa

AngioPlex Metrix

ETDRS - Vaso

Regione	Densità
Centrale	0,2 mm^{-1}
Interna	19,2 mm^{-1}
Completo	17,1 mm^{-1}

FAZ

Area	0,00 mm^2
Perimetro	0,14 mm
Circolarità	0,90

Monitorato durante la scansione

Commenti

Analisi modificata: 09/04/2017 11:55

Firma del medico

Optic disc perfusion in glaucoma with optical microangiography OMAG by Chieh-Li Chen et al 2015

Table. Summary of mean flow intensity in different layers and groups.

			Mean	STD	P-value
Mean Flow Intensity	Pre-Lamina	Normal (N=15)	0.29	0.03	0.024
		Glaucoma (N=25)	0.26	0.03	
	Lamina Cribrosa	Normal (N=15)	0.17	0.02	0.788
		Glaucoma (N=25)	0.17	0.03	
	Entire ONH	Normal (N=15)	0.30	0.03	0.022
		Glaucoma (N=25)	0.27	0.03	

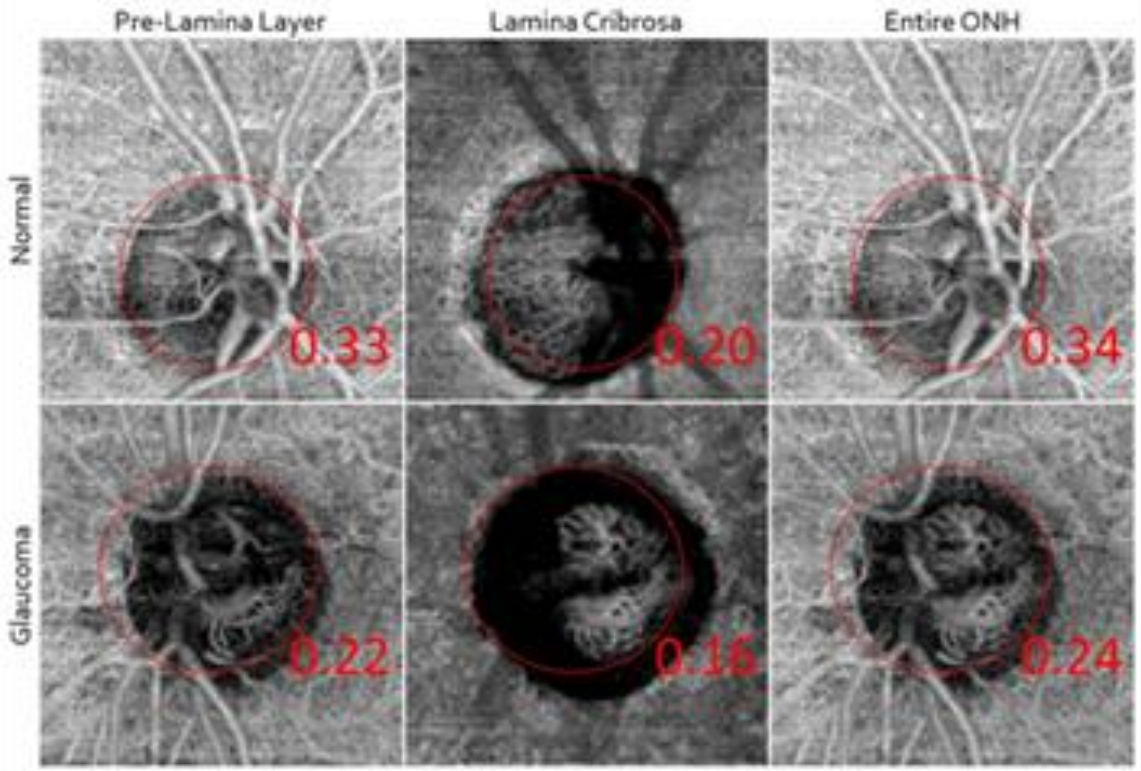
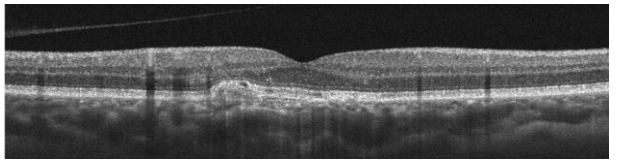
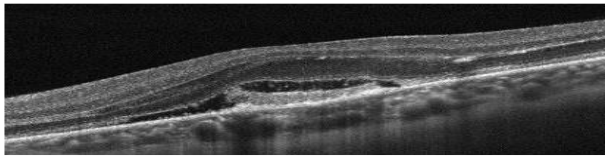


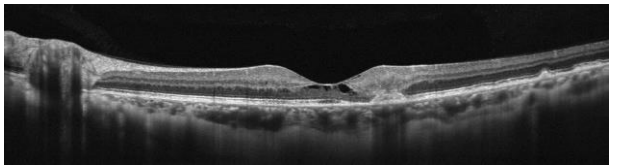
Figure. An example of mean flow intensity measurements between normal and glaucomatous eyes.

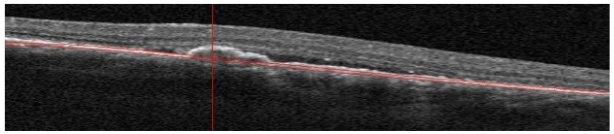
CNV Classification based on location

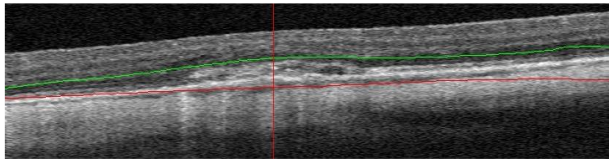
- Type 1: below RPE (Jung and Freund AJO 2014)
- Type 2: above RPE
- Type 3: intraretinal
- Type 4: mixed 1-2
- Filamentous (pachychoroid) NVs
- Myopic CNVs
- Residual flow in fibrosis







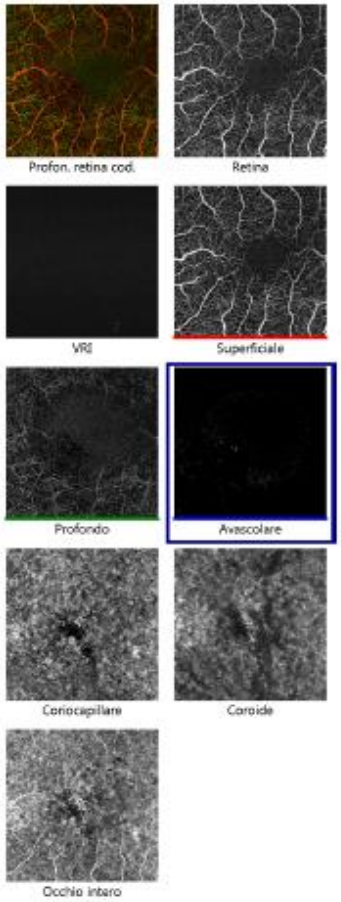




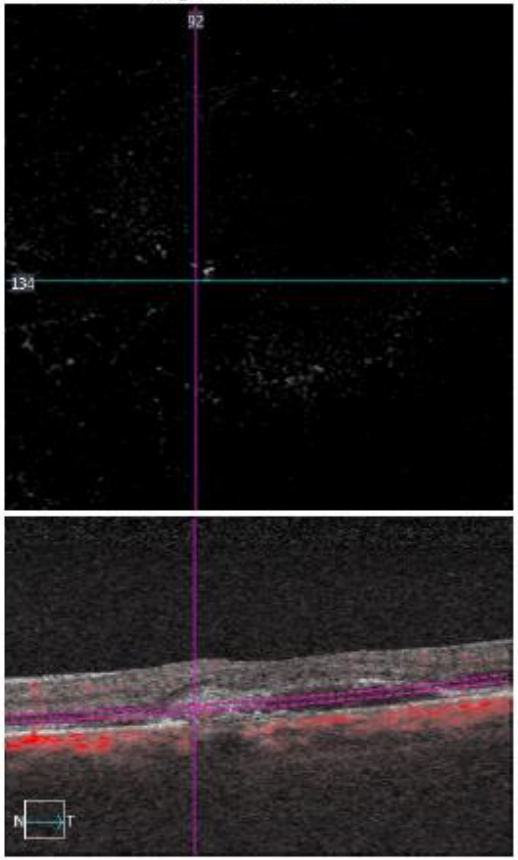
Nome:			OS	
ID:	CZMI1728205762	Data esame:	14/06/2017	Studio Oculistico A. Lucente
Data di nascita:	13/09/1945	Ora dell'esame:	09:20	
Sesso:	Uomo	Numero di serie:	5000-6254	
Tecnico:	Angio, Cirrus	Intensità segnale:	6/10	

Analisi dell'angiografia : Angiography 3x3 mm

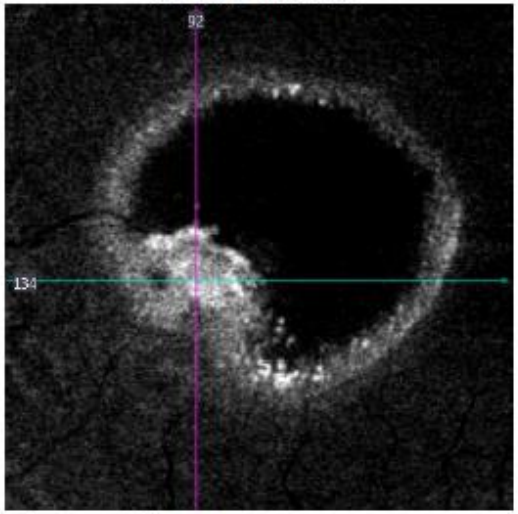
OD ○ | ● OS



AngioPlex - Avascolare



Struttura - Avascolare



Sovrapposizioni
Struttura - Nessuno
AngioPlex - Nessuno

Segmento: 134 Parte sup.: OPL Parte inf.: RPEFit-70µ

Monitorato durante la scansione

Commenti

Analisi modificata: 14/06/2017 09:26

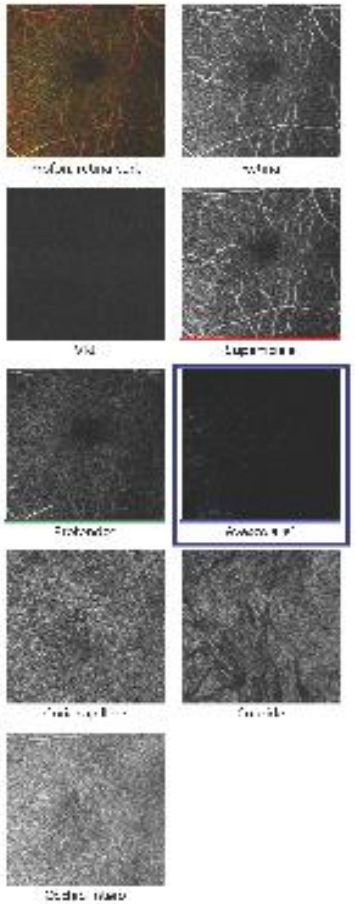
Firma del medico

Nome:	XXXXXXX		OS
ID:	CZMI1726205762	Data esame:	20/11/2017
Data di nascita:	13/09/1945	Ora dell'esame:	10:19
Sesso:	Uomo	Numero di serie:	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	6/10

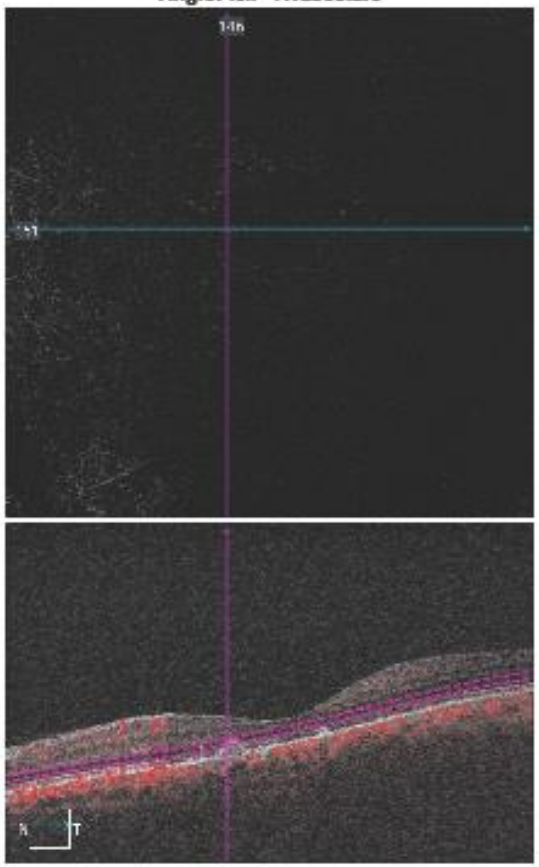
Studio Oculistico A. Lucente

Analisi dell'angiografia : Angiography 6x6 mm

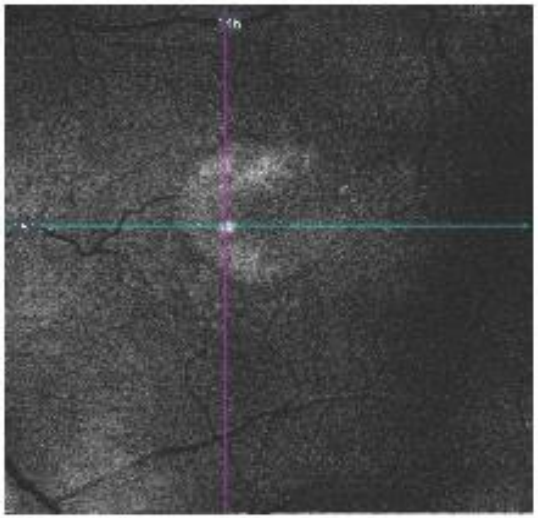
OD ○ | ● OS



AngioPlex - Avascolare



Struttura - Avascolare



Sovrapposizioni

Struttura - Nessuno

AngioPlex - Nessuno

Segmento: 151 Parte sup.: OPL+6µ Parte Inf.: RPEFit-64µ

Monitorato durante la scansione

Commenti

Analisi modificata: 22/11/2017 18:07

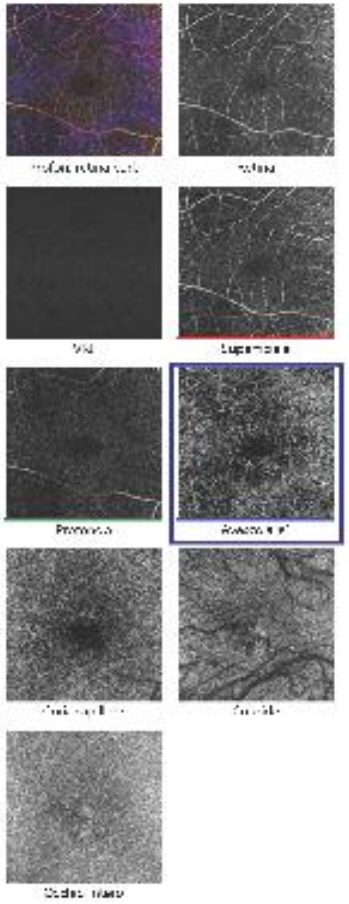
Firma del medico

Nome:	XXXXXXX		OD
ID:	1947.0905.B18A.8419.B950.4	Data esame:	22/11/2017
Data di nascita:	05/09/1947	Ora dell'esame:	08:32
Sesso:	Unknown	Numero di serie:	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	6/10

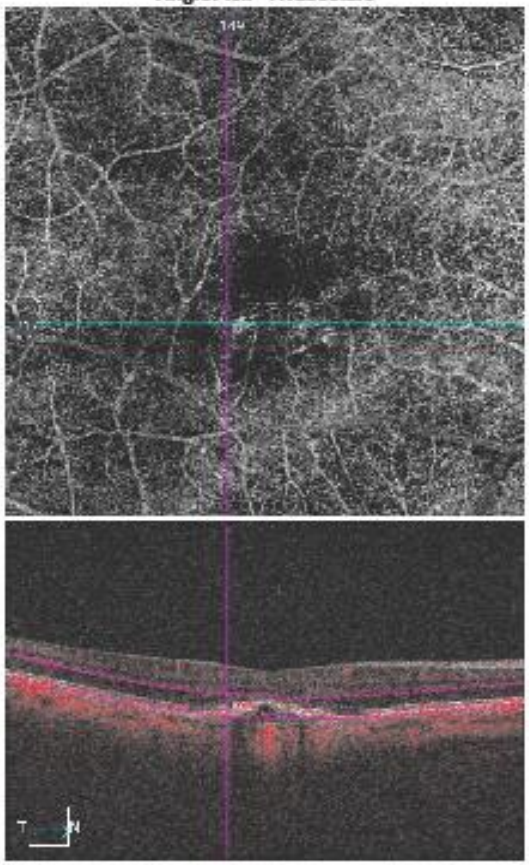
Studio Oculistico A. Lucente

Analisi dell'angiografia : Angiography 6x6 mm

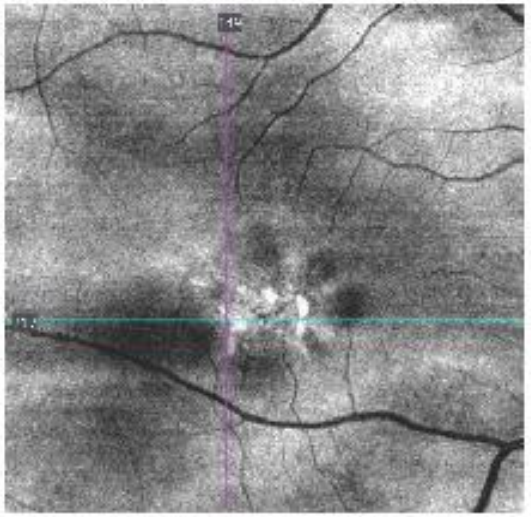
OD ● ○ OS



AngioPlex - Avascolare



Struttura - Avascolare



Sovrapposizioni
Struttura - Nessuno
AngioPlex - Nessuno

Segmento: 217 Parte sup.: OPL Parte Inf.: RPEFit+16µ

Monitorato durante la scansione

Commenti

Analisi modificata: 22/11/2017 08:39

Firma del medico

			Precedente	Corrente
Nome:	**SAtre**			
ID:	275554531	Data esame:	21/04/2016	28/03/2017
Data di nascita:		Ora dell'esame:	11:25	09:20
Sesso:	Uomo	Numero di serie:	5000-6254	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	8/10	7/10

Studio Oculistico A. Lucente

ZEISS

Analisi angiografica della variazione : Angiography 6x6 mm

OD ○ | ● OS

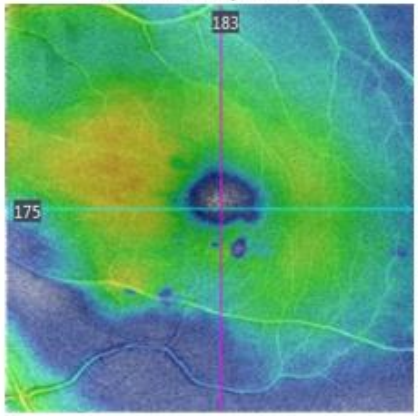
Esame 1 (scansione precedente)
21/04/2016 11:25:03

Segnale (8/10)

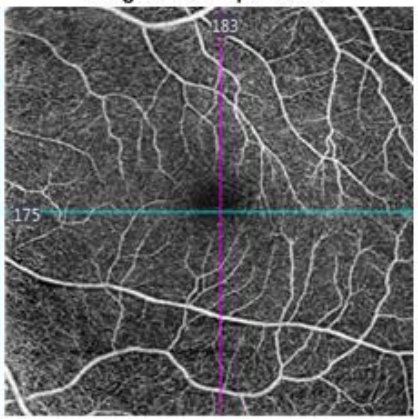
Segnale (7/10)

Esame 2 (scansione selezionata)
28/03/2017 09:20:28

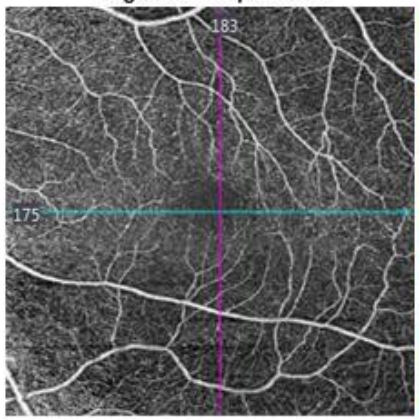
Struttura - Superficiale



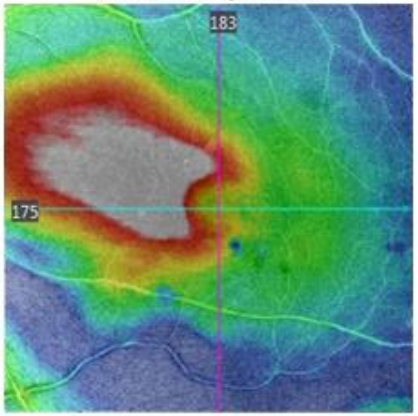
AngioPlex - Superficiale



AngioPlex - Superficiale



Struttura - Superficiale



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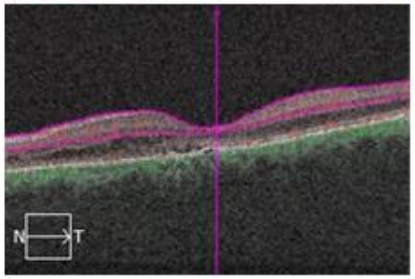


Parte sup.: ILM Parte inf.: IPL
Monitorato durante la scansione

Sovrapposizioni
Struttura - Mappa dello spessore
AngioPlex - Nessuno

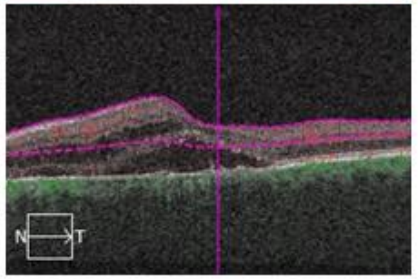
Angiometria

ETDRS - Vaso

Regione	Esame 1	Esame 2	Differenza
Centrale	5,8 mm^{-1}	9,6 mm^{-1}	3,8 mm^{-1} (66%)
Interna	16,7 mm^{-1}	16,6 mm^{-1}	-0,1 mm^{-1} (-1%)
Esterna	16,6 mm^{-1}	15,7 mm^{-1}	-0,9 mm^{-1} (-5%)
Completo	16,3 mm^{-1}	15,7 mm^{-1}	-0,6 mm^{-1} (-4%)

FAZ

	Esame 1	Esame 2	Differenza
Area	0,24 mm^2	0,35 mm^2	0,11 mm^2 (46%)
Perimetro	2,02 mm	2,96 mm	0,94 mm (47%)
Circolarità	0,74	0,50	-0,24 (-32%)



Parte sup.: ILM Parte inf.: IPL
Monitorato durante la scansione
Modificato: 28/03/2017 09:27:48

Commenti

Analisi modificata: 28/03/2017 09:27

Firma del medico

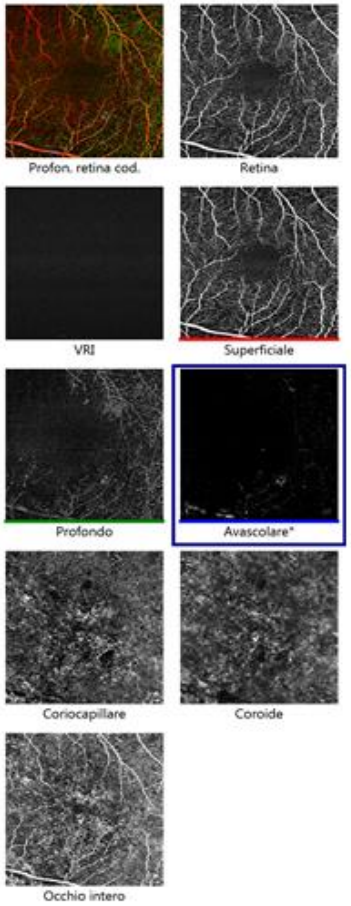
Nome:	SA		OS
ID:	275554531	Data esame:	28/03/2017
Data di nascita:		Ora dell'esame:	09:19
Sesso:	Uomo	Numero di serie:	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	6/10

Studio Oculistico A. Lucente

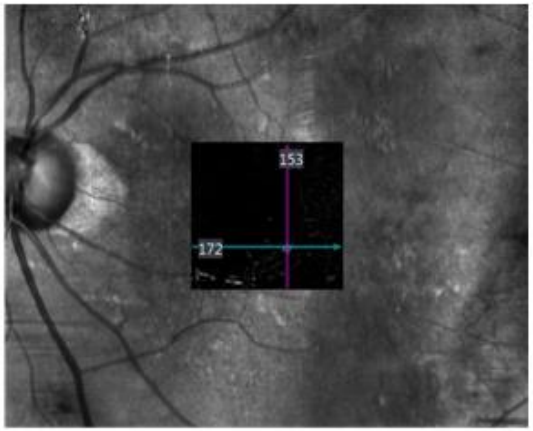
ZEISS

Analisi dell'angiografia : Angiography 3x3 mm

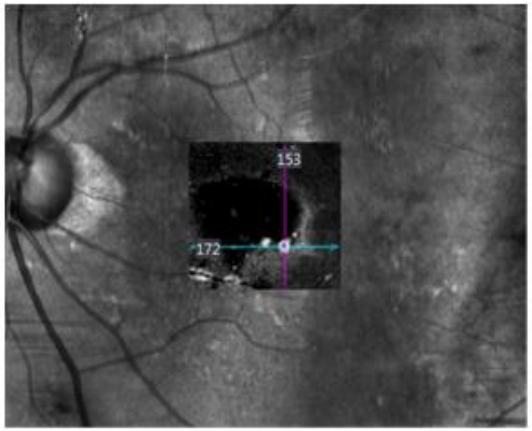
OD ○ | ● OS

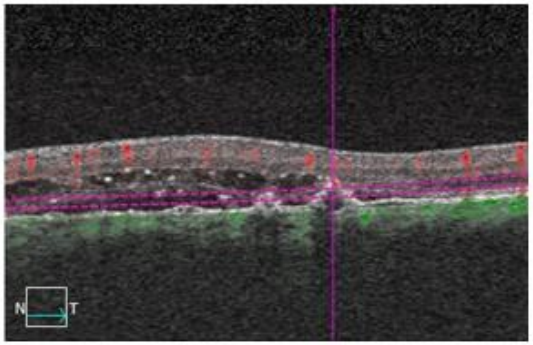


AngioPlex - Avascolare



Struttura - Avascolare





Segmento: 172 Parte sup.: OPL Parte inf.: RPEFit-56µ

Sovrapposizioni
Struttura - Nessuno
AngioPlex - Nessuno

Monitorato durante la scansione

Commenti

Analisi modificata: 28/03/2017 09:26

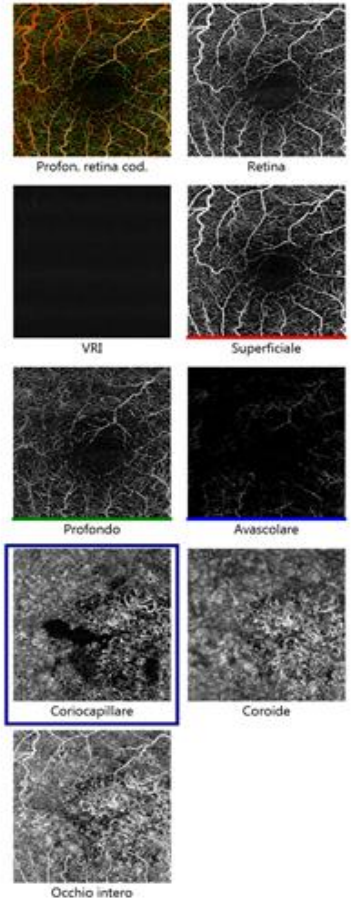
Firma del medico

Nome:	**MBdue**		**OD**
ID:	634456147	Data esame:	16/01/2017
Data di nascita:		Ora dell'esame:	12:01
Sesso:	Uomo	Numero di serie:	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	9/10

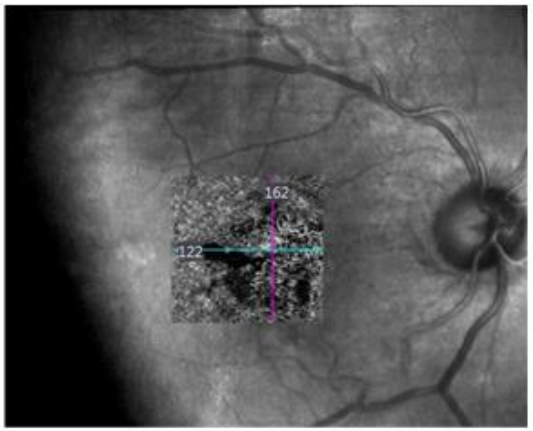
Studio Oculistico A. Lucente

Analisi dell'angiografia : Angiography 3x3 mm

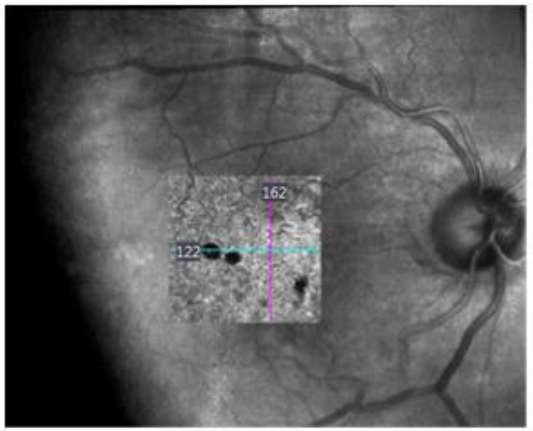
OD ● | ○ OS

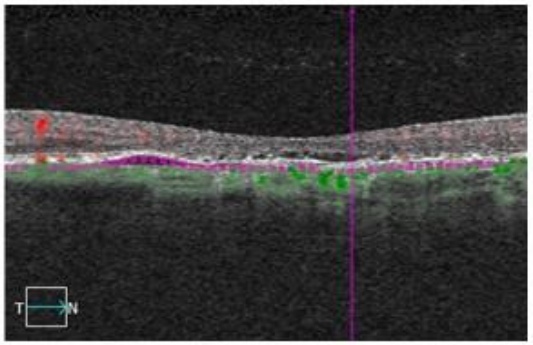


AngioPlex - Coriocapillare



Struttura - Coriocapillare





Sovrapposizioni
Struttura - Nessuno
AngioPlex - Nessuno

Segmento: 122 Parte sup.: RPE+29µ Parte inf.: RPE+49µ

Monitorato durante la scansione

Commenti

Firma del medico

			Precedente	Corrente
Nome:	**MB**			
ID:	634456147	Data esame:	16/03/2017	20/04/2017
Data di nascita:		Ora dell'esame:	09:57	16:32
Sesso:	Uomo	Numero di serie:	5000-6254	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	6/10	7/10

Studio Oculistico A. Lucente

ZEISS

Analisi angiografica della variazione : Angiography 3x3 mm

OD ○ | ● OS

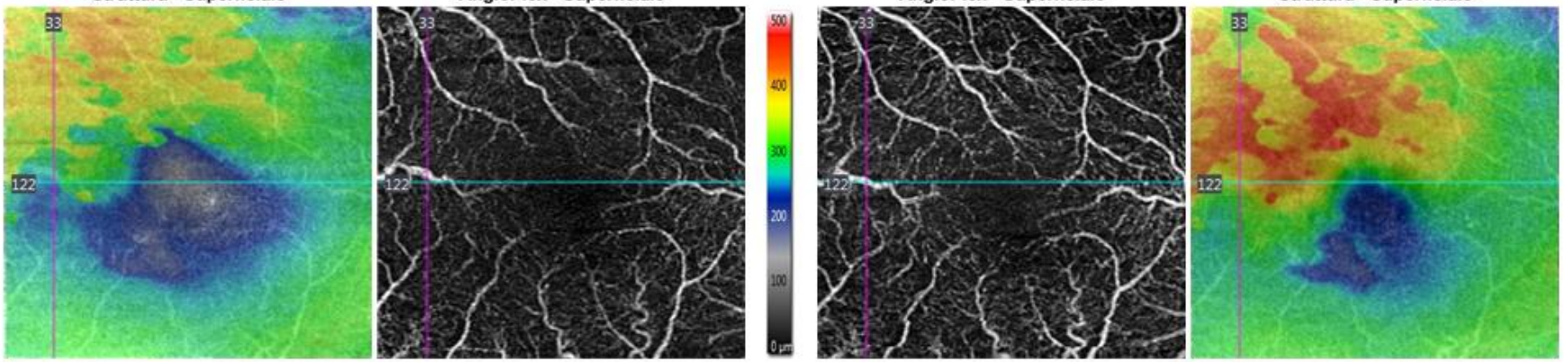
Esame 1 (scansione precedente)
16/03/2017 09:57:55

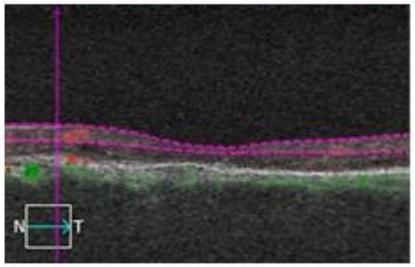
Segnale (6/10)

Segnale (7/10)

Esame 2 (scansione selezionata)
20/04/2017 16:32:24

Struttura - Superficiale | **AngioPlex - Superficiale** | **AngioPlex - Superficiale** | **Struttura - Superficiale**





Parte sup.: ILM Parte inf.: IPL
Monitorato durante la scansione

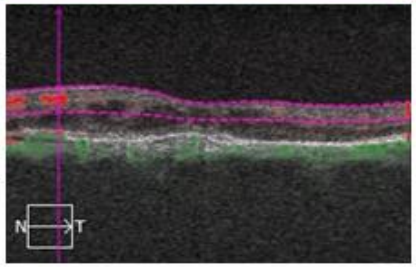
Sovrapposizioni
Struttura - Mappa dello spessore
AngioPlex - Nessuno

Angiometria
ETDRS - Vaso

Regione	Esame 1	Esame 2	Differenza
Centrale	2,4 mm^{-1}	5,1 mm^{-1}	2,7 mm^{-1} (113%)
Interna	10,8 mm^{-1}	13,1 mm^{-1}	2,3 mm^{-1} (21%)
Completo	9,9 mm^{-1}	12,2 mm^{-1}	2,3 mm^{-1} (23%)

FAZ

	Esame 1	Esame 2	Differenza
Area	-	0,05 mm^2	-
Perimetro	-	1,01 mm	-
Circolarità	-	0,59	-



Parte sup.: ILM Parte inf.: IPL
Monitorato durante la scansione

Commenti

Firma del medico

			Precedente	Corrente
Nome:	FA			
ID:	CZMI1545286560	Data esame:	08/06/2016	26/04/2017
Data di nascita:		Ora dell'esame:	09:22	16:06
Sesso:	Unknown	Numero di serie:	5000-6254	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	8/10	8/10

Studio Oculistico A. Lucente

ZEISS

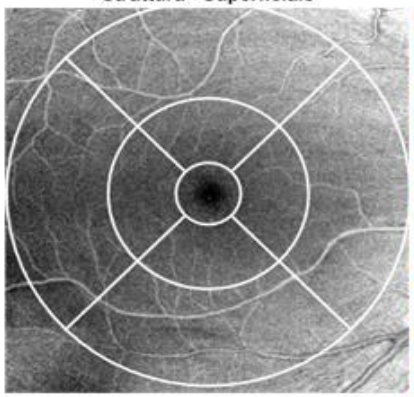
Analisi angiografica della variazione : Angiography 6x6 mm

OD ● | ○ OS

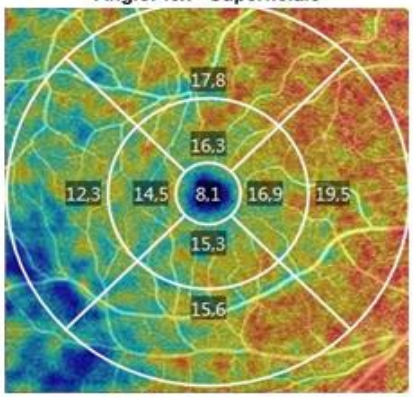
S D A

Esame 1 (scansione precedente)	Segnale (8/10)	Segnale (8/10)	Esame 2 (scansione selezionata)
08/06/2016 09:22:45			26/04/2017 16:06:15

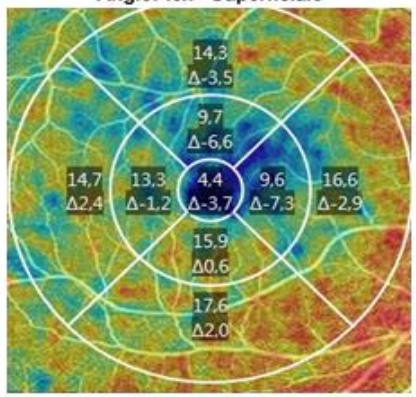
Struttura - Superficiale



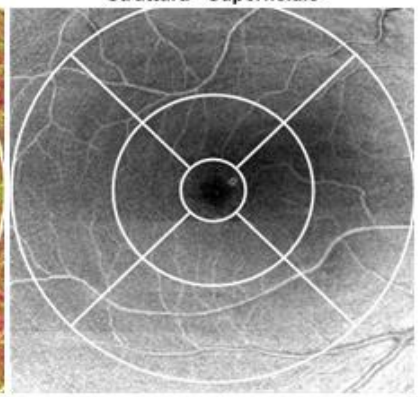
AngioPlex - Superficiale

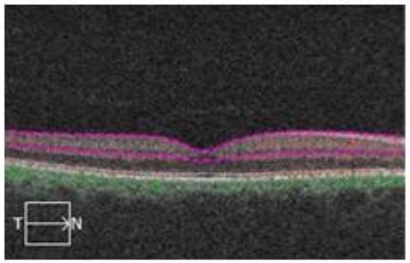


AngioPlex - Superficiale



Struttura - Superficiale





Parte sup.: ILM Parte inf.: IPL
Monitorato durante la scansione

Sovrapposizioni
Struttura - Nessuno
AngioPlex - Vaso Mappa

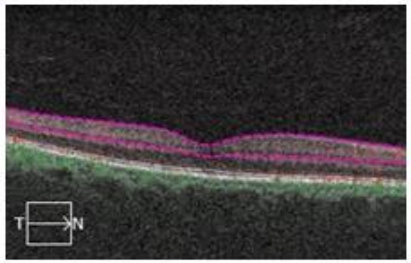
Angiometria

ETDRS - Vaso

Regione	Esame 1	Esame 2	Differenza
Centrale	8,1 mm^{-1}	4,4 mm^{-1}	-3,7 mm^{-1} (-46%)
Interna	15,8 mm^{-1}	12,1 mm^{-1}	-3,7 mm^{-1} (-23%)
Esterna	16,3 mm^{-1}	15,8 mm^{-1}	-0,5 mm^{-1} (-3%)
Completo	16,0 mm^{-1}	14,7 mm^{-1}	-1,3 mm^{-1} (-8%)

FAZ

	Esame 1	Esame 2	Differenza
Area	0,21 mm^2	0,40 mm^2	0,19 mm^2 (90%)
Perimetro	2,02 mm	3,60 mm	1,58 mm (78%)
Circolarità	0,66	0,39	-0,27 (-41%)

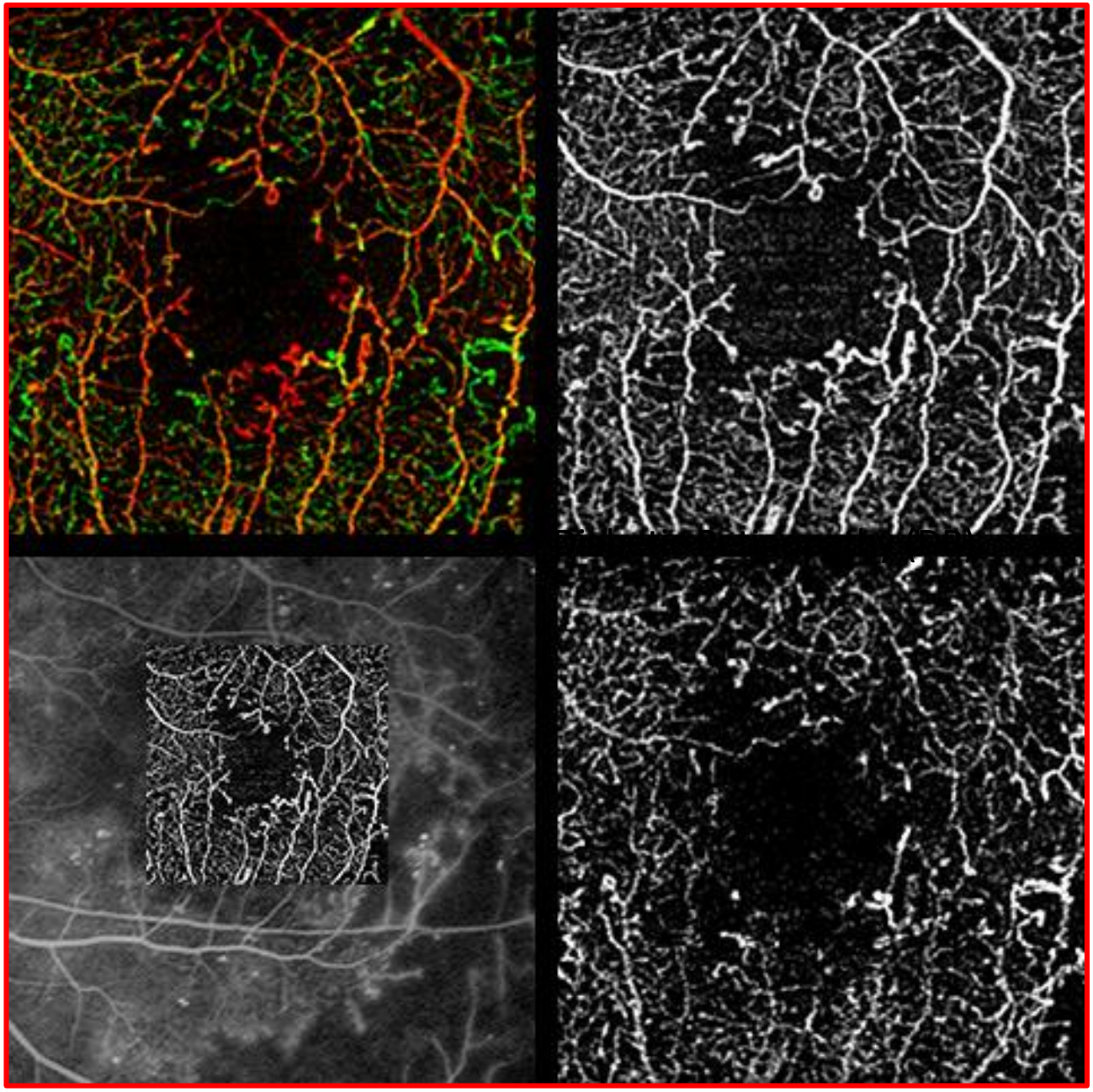


Parte sup.: ILM Parte inf.: IPL
Monitorato durante la scansione

Commenti

Firma del medico

Diabetic Retinopathy (DR)



Full depth color encoded image

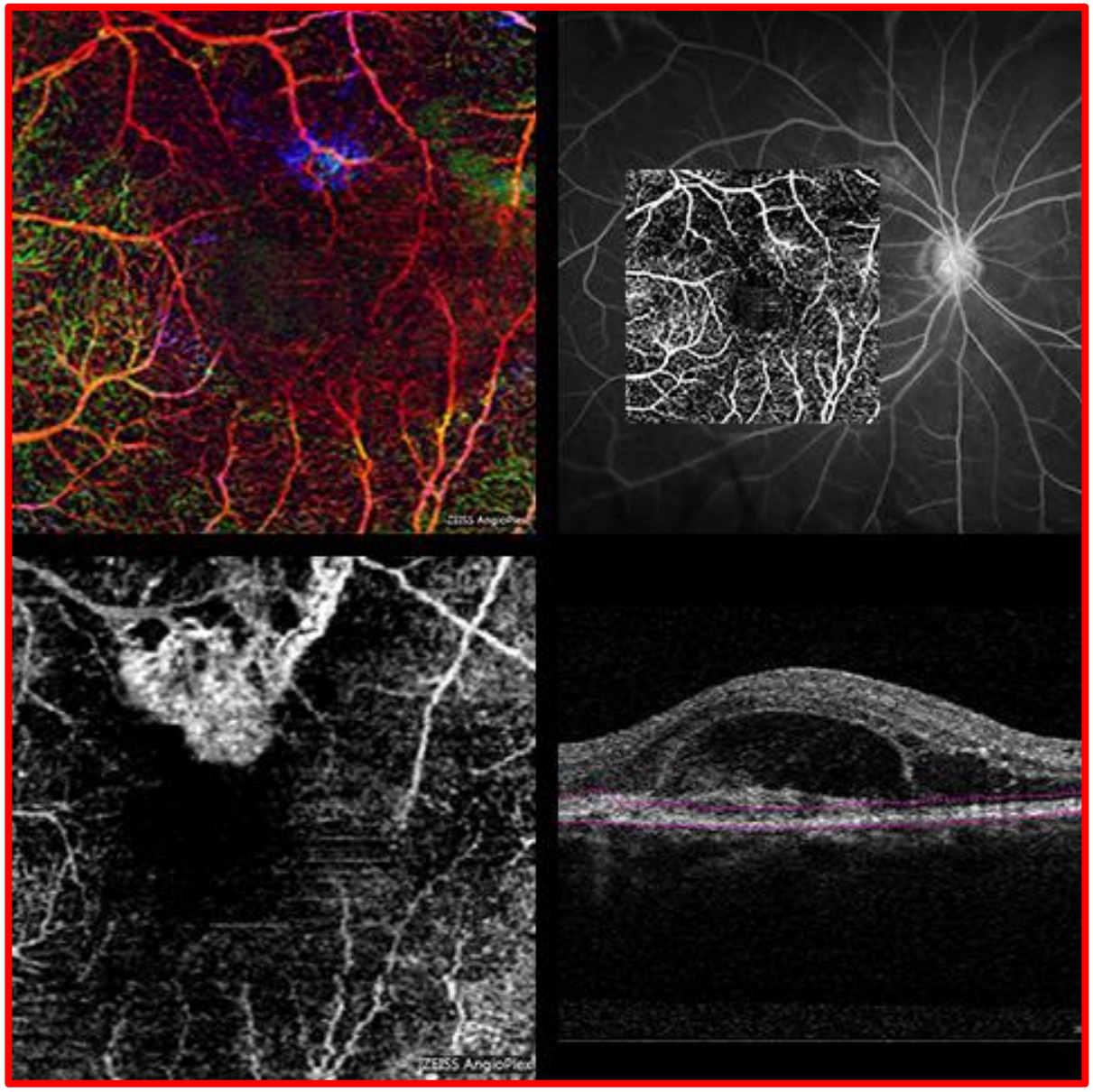
Superficial Retinal Layer

Deep Retinal Layer

Superficial layer overlaid onto FA

Clockwise from top left

Choroidal Neovascularization (CNV)



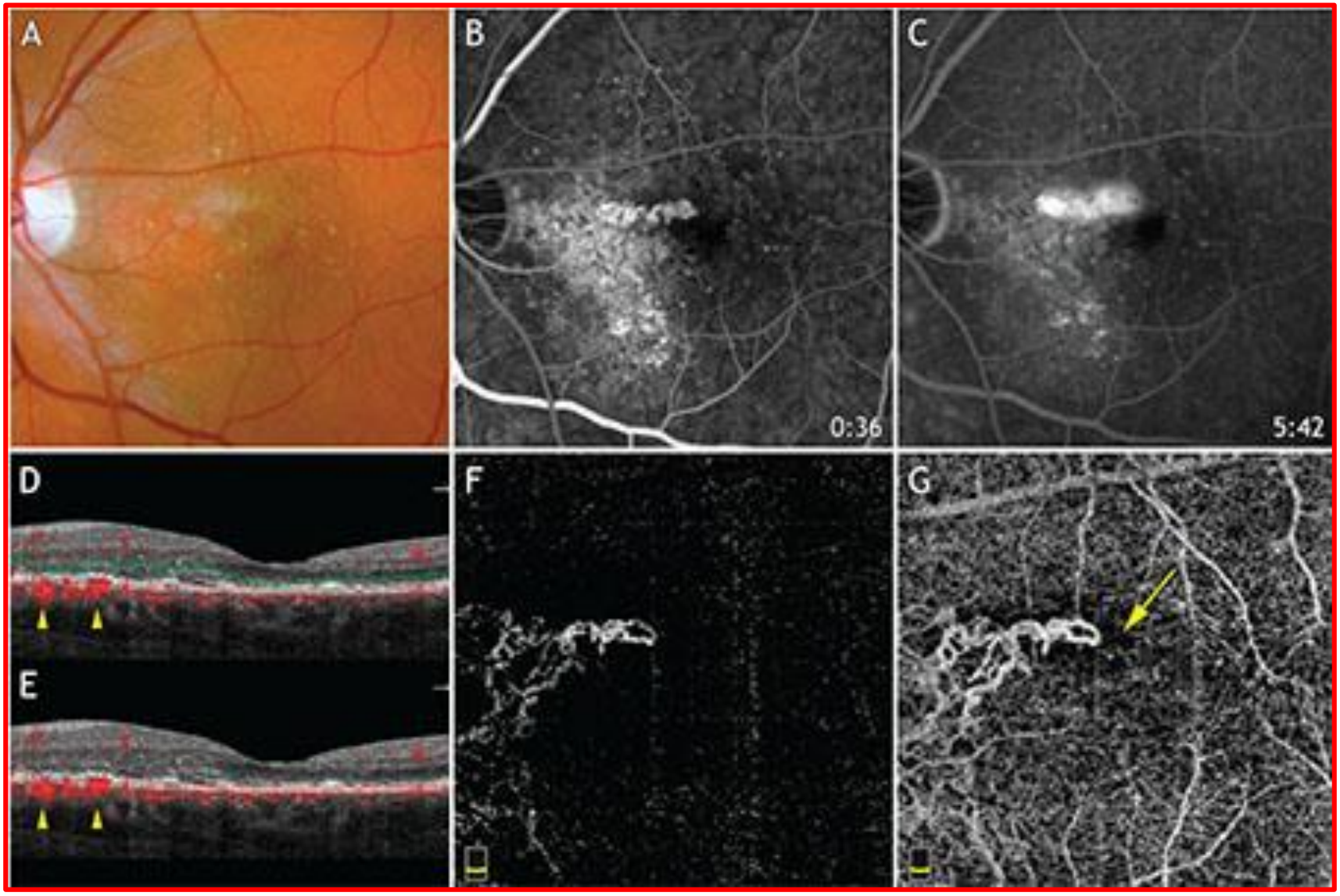
Full depth color encoded image

Superficial Retinal Layer overlaid onto FA

B-Scan

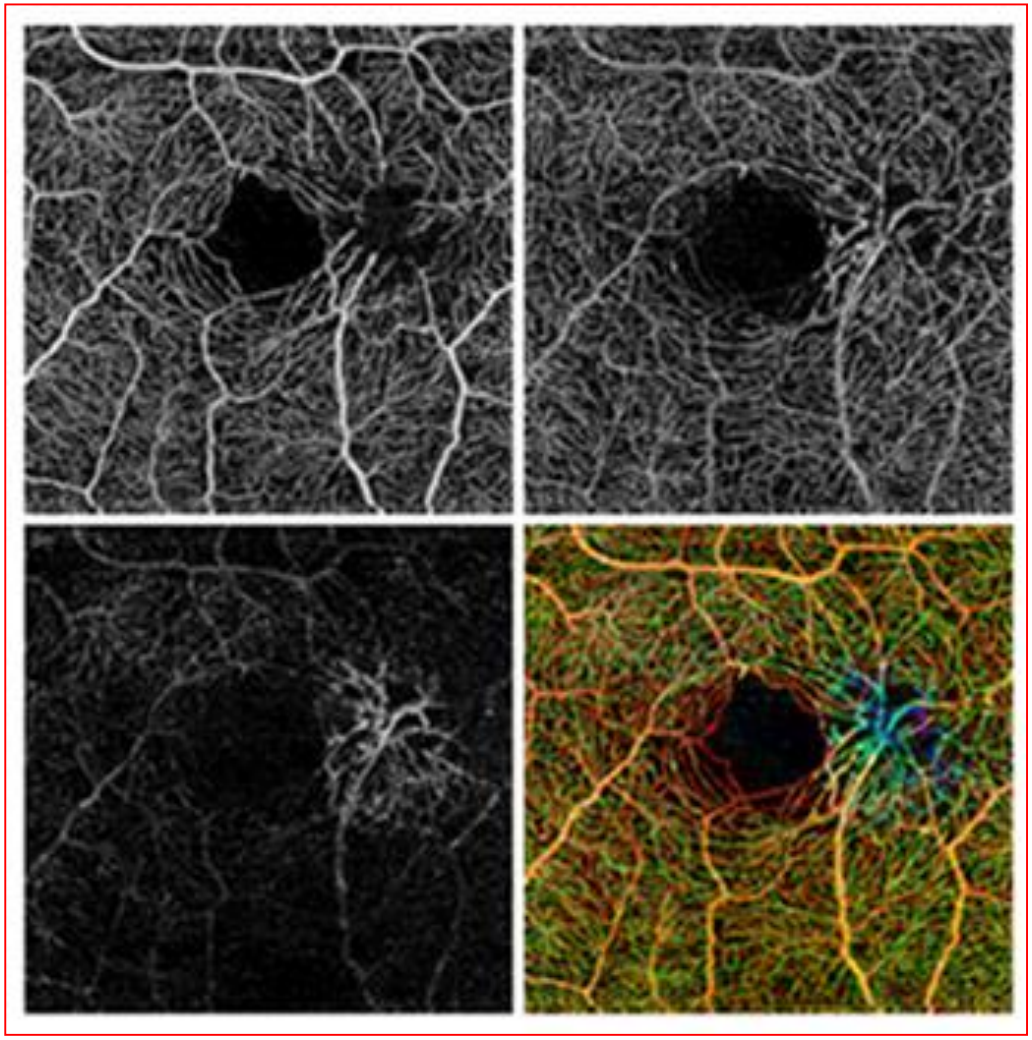
Custom layer revealing CNV below the RPE

Clockwise from top left



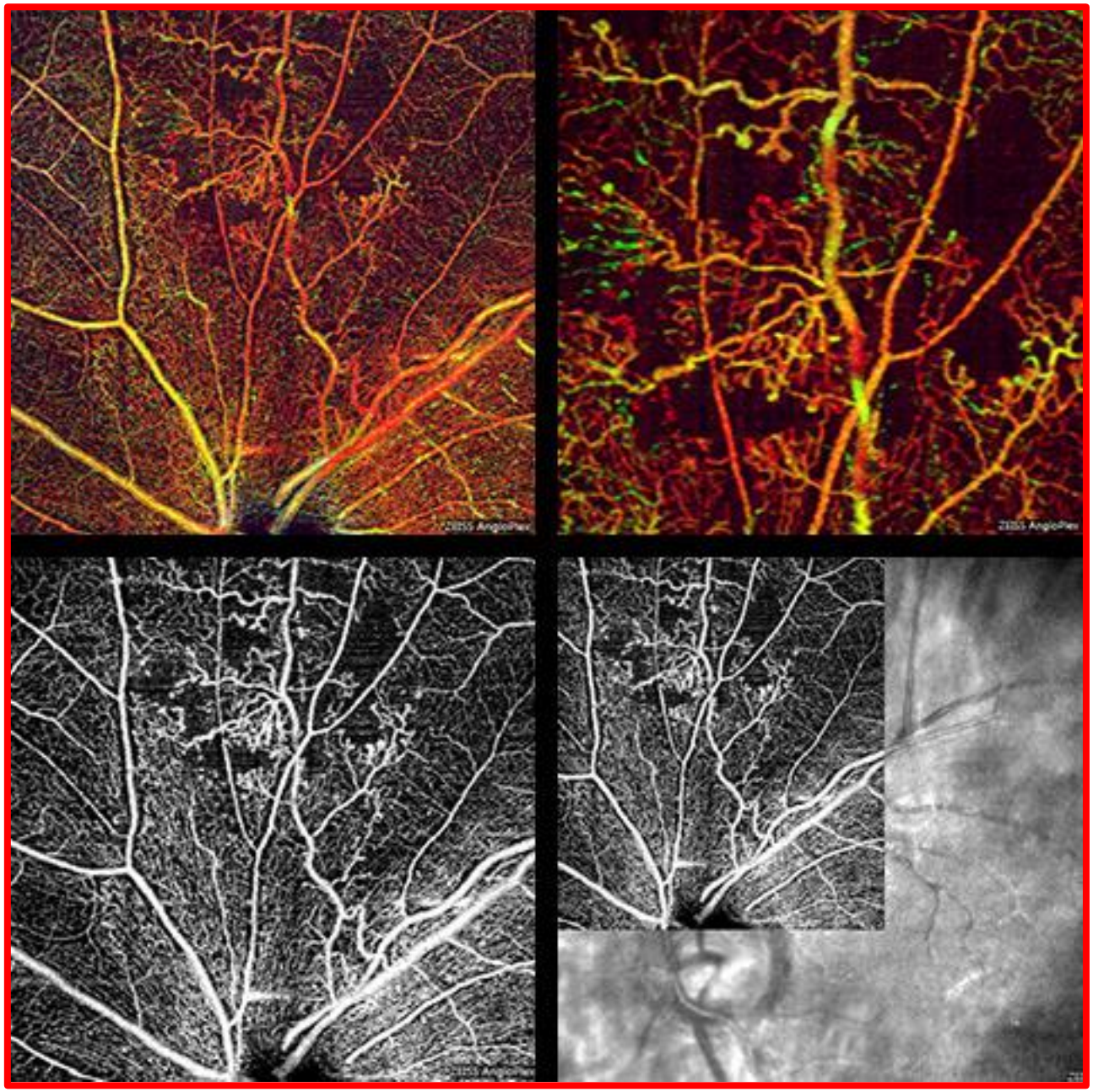
Multimodal imaging of a 63-year-old patient with choroidal neovascularization secondary to central serous chorioretinopathy. (A) Color photograph shows a subretinal hemorrhage at the center of the macula surrounded by retinal pigment epithelium clumps. Early (B) and late-phase (C) fluorescein angiography show leakage from CNV. (D) and (E) represent corresponding OCT B-scan segmentation of the outer retinal and choriocapillaris, respectively. Yellow arrowheads point to the decorrelation signal below the RPE detachment suggestive of CNV. (F) OCT angiogram segmented at the level of the outer retina reveals CNV. (G) OCT angiogram segmented at the level of the choriocapillaris. The yellow arrow highlights the hypo-intense halo surrounding the CNV

Macular Telangiectasia



This OCT angiogram shows the left eye of a 69- year-old patient with **macular telangiectasia.** The patient has classic findings of **microvascular changes** in the **temporal macula** that appear in all three layers of the OCT angiogram (color code: red: inner retina; green: mid retina; blue: outer retina). The top left panel shows the OCTA of the inner retina. Milder changes are noted in the mid-retinal layer (top right panel). In addition, retinal vessels are noted in the outer retina (bottom left panel), where there are usually no vessels.

Branch Retinal Vein Occlusion (BRVO)



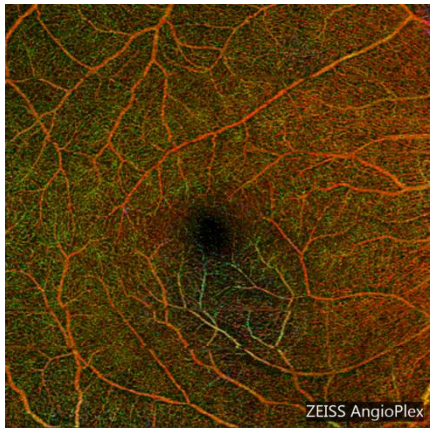
Full depth color encoded image, ***6x6mm image***

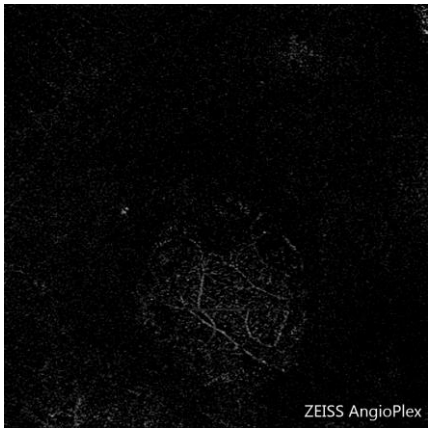
Full depth color encoded image, ***3x3mm image***

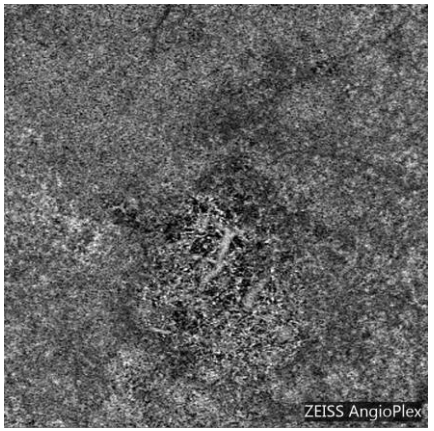
Superficial retina layer overlaid onto
LSO Fundus image

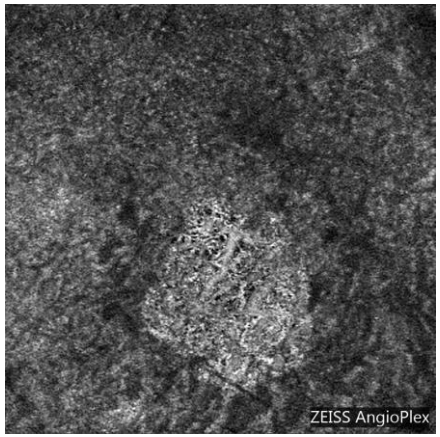
Superficial retina Layer

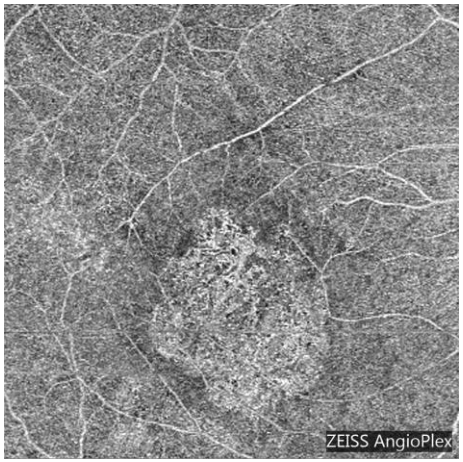
Clockwise from top left

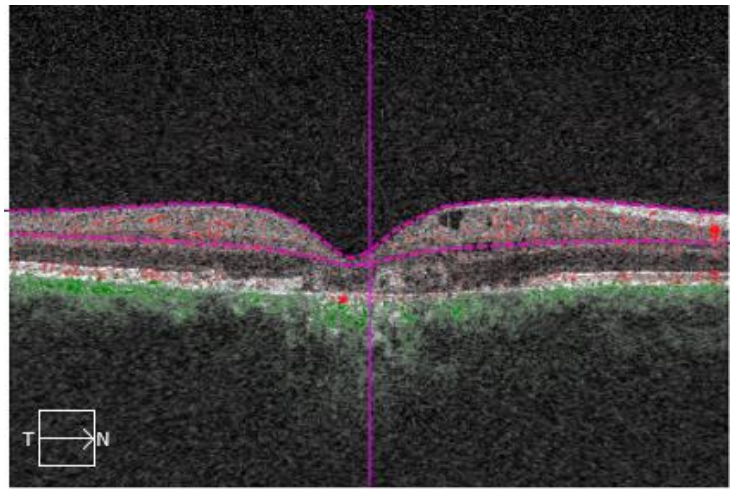

ZEISS AngioPlex

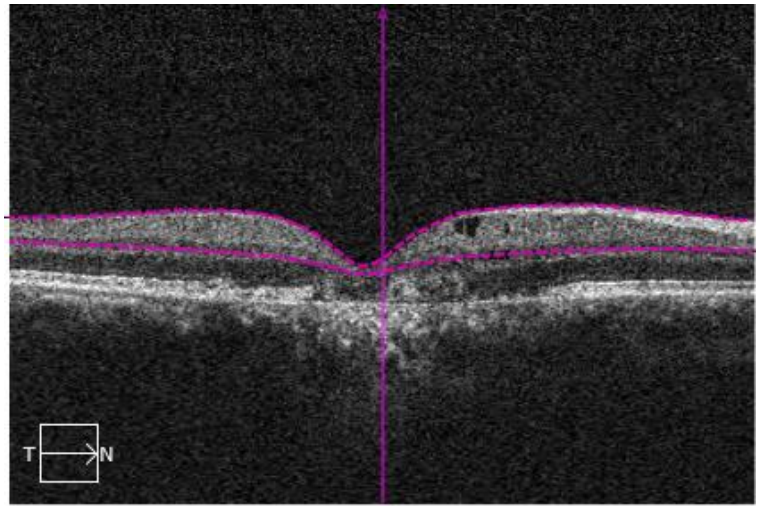

ZEISS AngioPlex


ZEISS AngioPlex


ZEISS AngioPlex


ZEISS AngioPlex


T
N


T
N

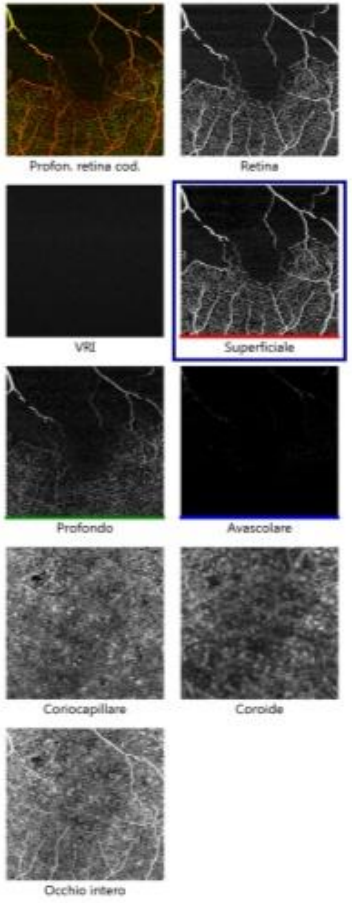
Nome:	[redacted]		OS
ID:	117361906	Data esame:	05/07/2016
Data di nascita:	25/05/1951	Ora dell'esame:	11:07
Sesso:	Donna	Numero di serie:	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	9/10

Studio Oculistico A. Lucente

ZEISS

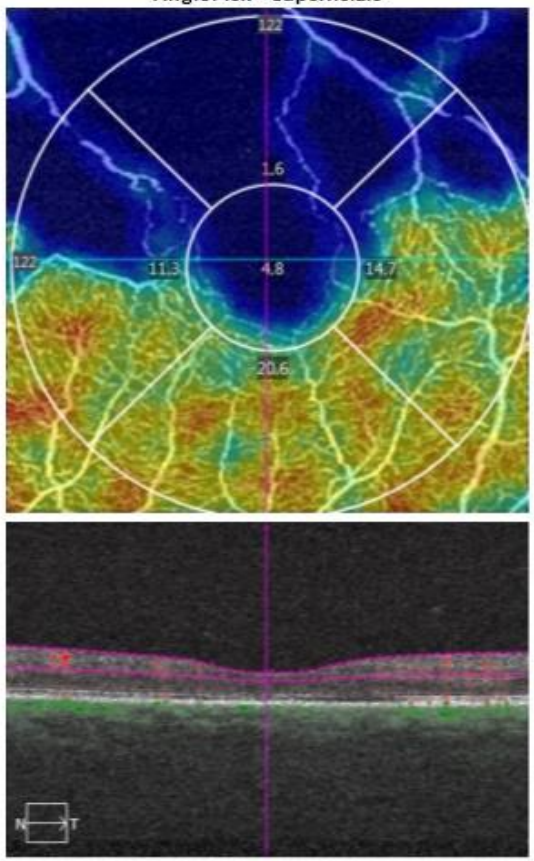
Analisi dell'angiografia : Angiography 3x3 mm

OD ○ | ● OS

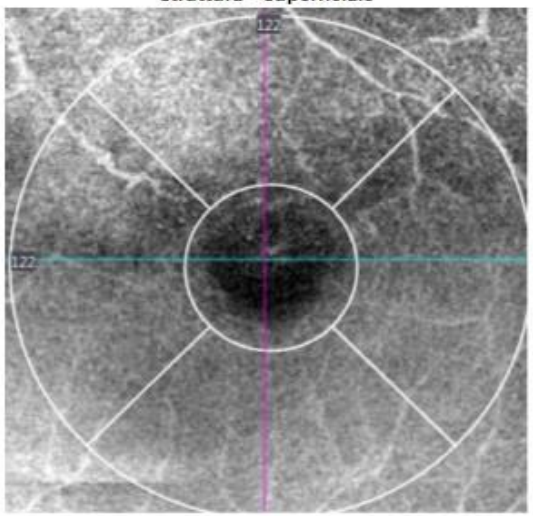


S
D
A

AngioPlex - Superficiale



Struttura - Superficiale



Sovrapposizioni
Struttura - Nessuno
AngioPlex - Vaso Mappa

AngioPlex Metrix

ETDRS - Vaso

Regione	Densità
Centrale	4,8 mm⁻¹
Interna	12,0 mm⁻¹
Completo	11,2 mm⁻¹

FAZ

Area	-
Perimetro	-
Circolarità	-

Segmento: 122 Parte sup.: ILM Parte inf.: IPL

Monitorato durante la scansione

Commenti

Firma del medico

CIRRUS ANGIO
SW Ver: 10.0.0.14618

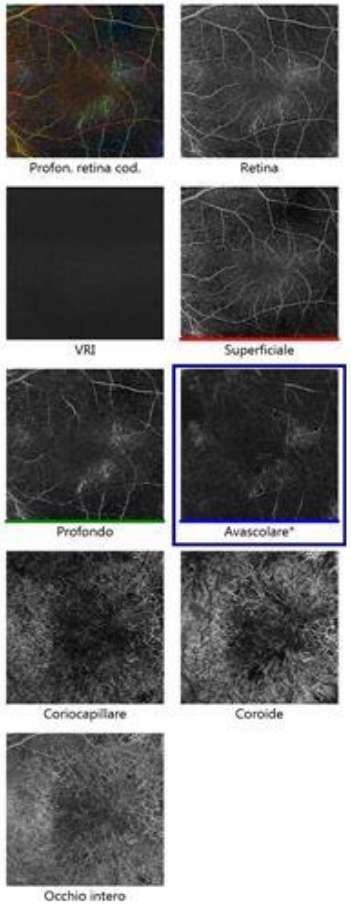
Nome:	CR		OS
ID:	2099419900	Data esame:	19/09/2016
Data di nascita:		Ora dell'esame:	16:22
Sesso:	Donna	Numero di serie:	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	7/10

Studio Oculistico A. Lucente

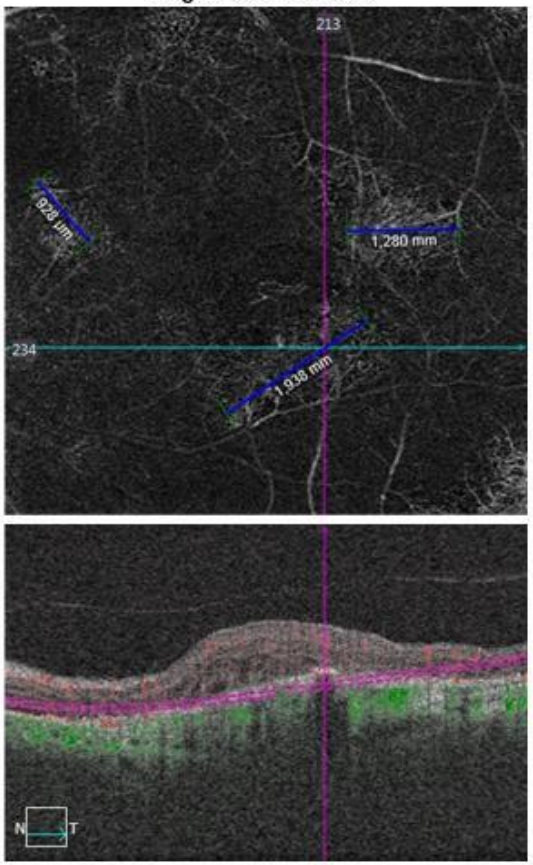
ZEISS

Analisi dell'angiografia : Angiography 6x6 mm

OD ○ | ● OS

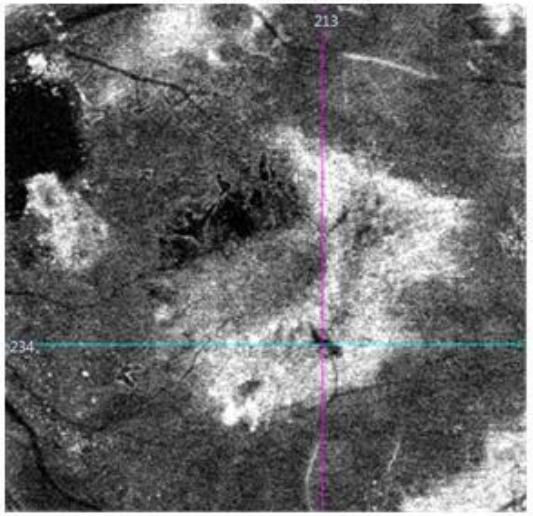


AngioPlex - Avascolare



Segmento: 234 Parte sup.: OPL+8µ Parte inf.: RPEFit-70µ

Struttura - Avascolare



Sovrapposizioni
Struttura - Nessuno
AngioPlex - Nessuno

Monitorato durante la scansione

Commenti

Analisi modificata: 09/05/2017 16:47

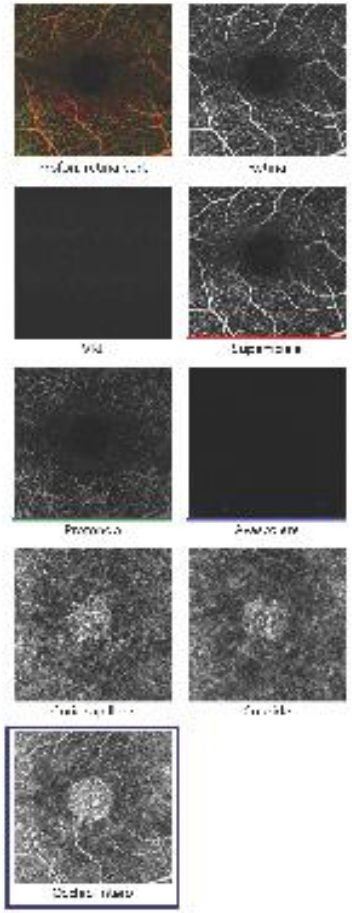
Firma del medico

Nome:	XXXXX		OD
ID:	58164783	Data esame:	15/11/2017
Data di nascita:	23/12/1943	Ora dell'esame:	10:28
Sesso:	Uomo	Numero di serie:	5000-6254
Tecnico:	Angio, Cirrus	Intensità segnale:	6/10

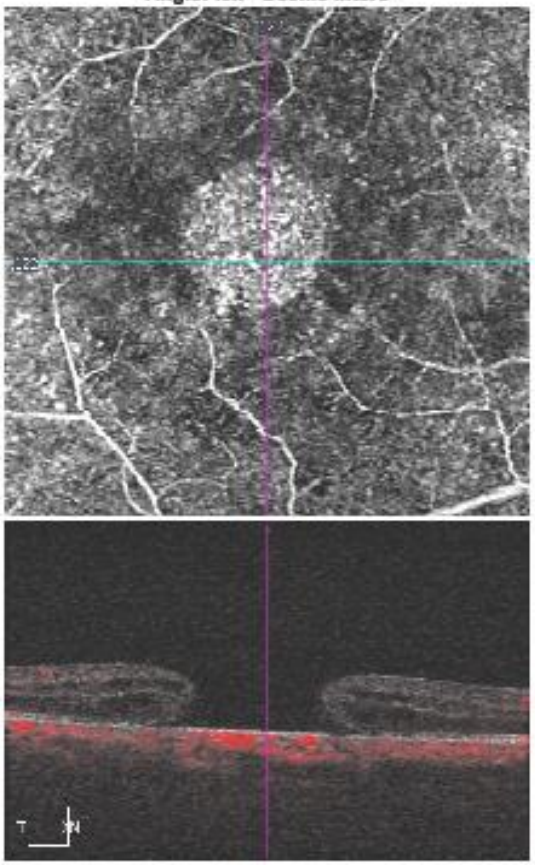
Studio Oculistico A. Lucente

Analisi dell'angiografia : Angiography 3x3 mm

OD ● ○ OS

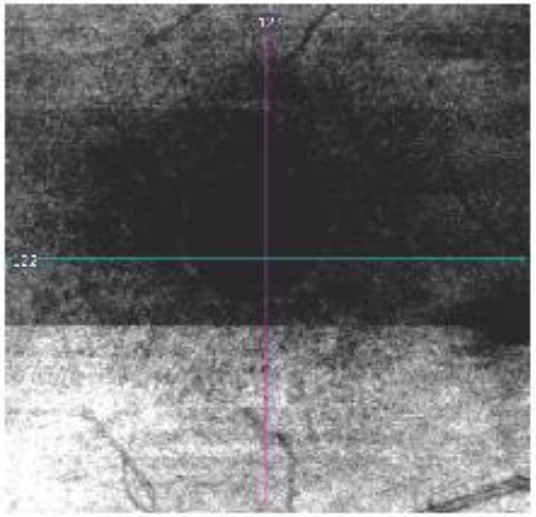


AngioPlex - Occhio Intero



Segmento: 122

Struttura - Occhio Intero



Sovrapposizioni

Struttura - Nessuno

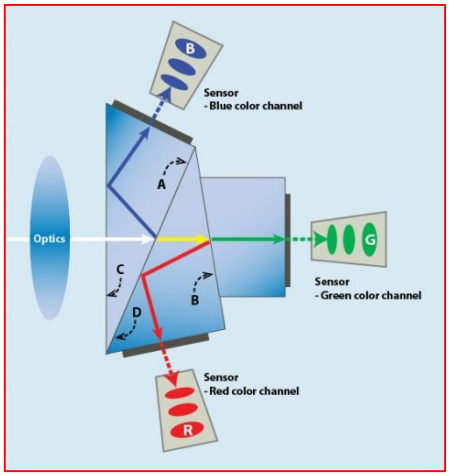
AngioPlex - Nessuno

Monitorato durante la scansione

Commenti

Firma del medico

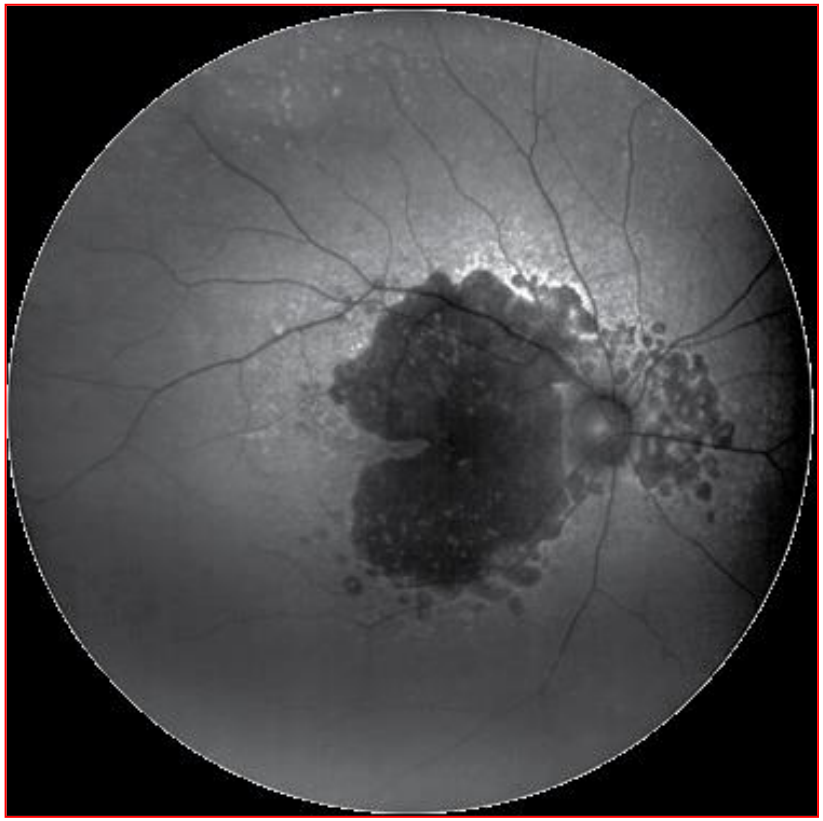
A complete suite of imaging modalities



ZEISS CLARUS 500 Imaging ultra-wide without compromise.

Fundus autofluorescence

FAF-Green image of dry age-related macular degeneration



FAF-Blue image of geographic atrophy

- **Red channel** images reveal the choroid in more detail. This may be helpful in visualizing **choroidal lesions** such as nevi or tumors.
- **Green channel images** provide excellent contrast of the retina, especially of **vasculature and hemorrhages**.
- **Blue channel images** increase visibility of the **anterior retinal layers**, allowing easier visualization of retinal nerve fiber layer (RNFL) defects and epiretinal membranes.
- **Infrared images** have the unique property of **increased penetration** through tissue, providing improved visualization of **choroidal structures**.

Red channel

Green channel

Blue channel

Infrared images

Studio Oculistico
dott. Amedeo Lucente
Via dei Glicini 14 - 87012 CASTROVILLARI Tel e Fax: 0981/483071
e.mail: amedeolucente@libero.it; www.amedeolucente.it

Tomografia Ottica a Radiazione Coerente (HD-OCT AngioPlex Zeiss)

Referto del Signor/ra **(HD-OCT n°)**

Profilo Retinico:

Struttura Retinica:

Volumi Retinici:

Retina Interna:

Retina Esterna:

Complesso EPR/Coriocapillare/Coroide:

ONH:

RNFL Average:

GCL Average:

Angio-OCT Retina:

Angio-OCT ONH:

AS-OCT:

Combo Report:

CONCLUSIONI:

dott. Amedeo Lucente

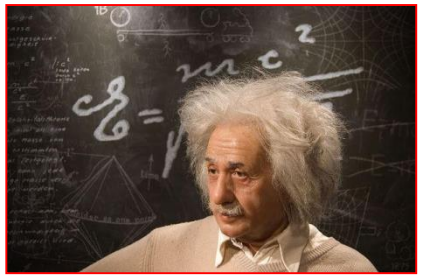
Se ascolto dimentico, se vedo ricordo, se faccio capisco

Confucio 551 a.C. – 479 a.C

Misura ciò che è misurabile, e rendi misurabile ciò che non lo è

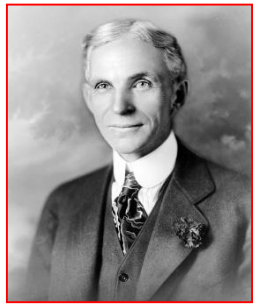
G. Galileo 1564 – 1642

Tutto dovrebbe essere reso il più semplice possibile, ma non più semplicistico



A. Einstein 1879 – 1955

C'è vero progresso solo quando i vantaggi di una nuova tecnologia diventano per tutti



Henry Ford 1863-1947

Thank you for your kind attention!

Angio-Plex Cirrus HD Zeiss Über Alles

www.amedeolucente.it