

Trans pupillary Sub-liminal yellow laser in variable retinal disorders

By

Mohammed Shikhoun Ahmed (MD)

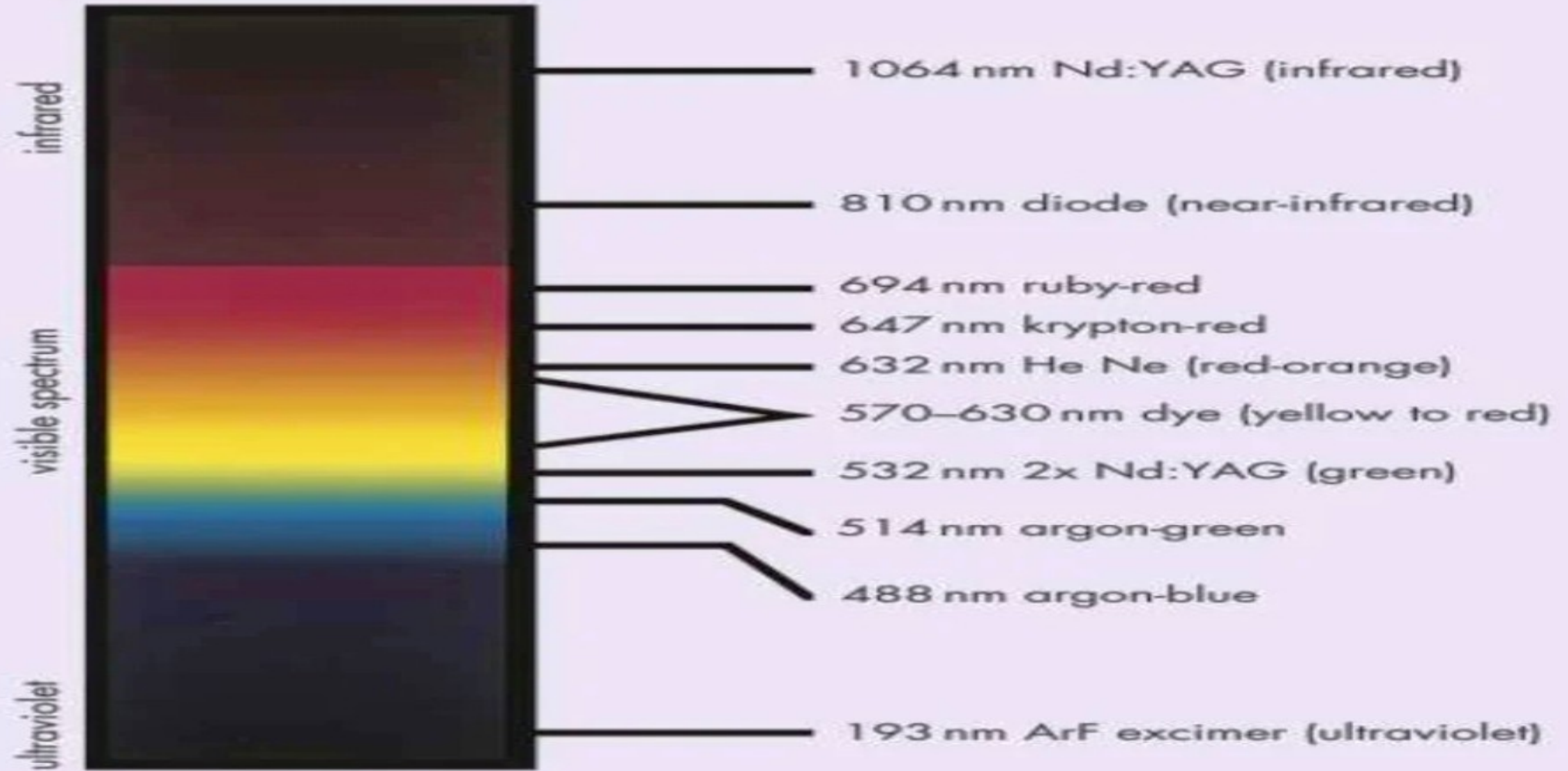
Assist. Professor of ophthalmology at (GOTHI)

Head of Ophthalmology department at STH

Vitreo-retinal consultant



WAVELENGTHS OF LIGHT



Ocular pigments

❑ Haemoglobin/ Oxy haemoglobin

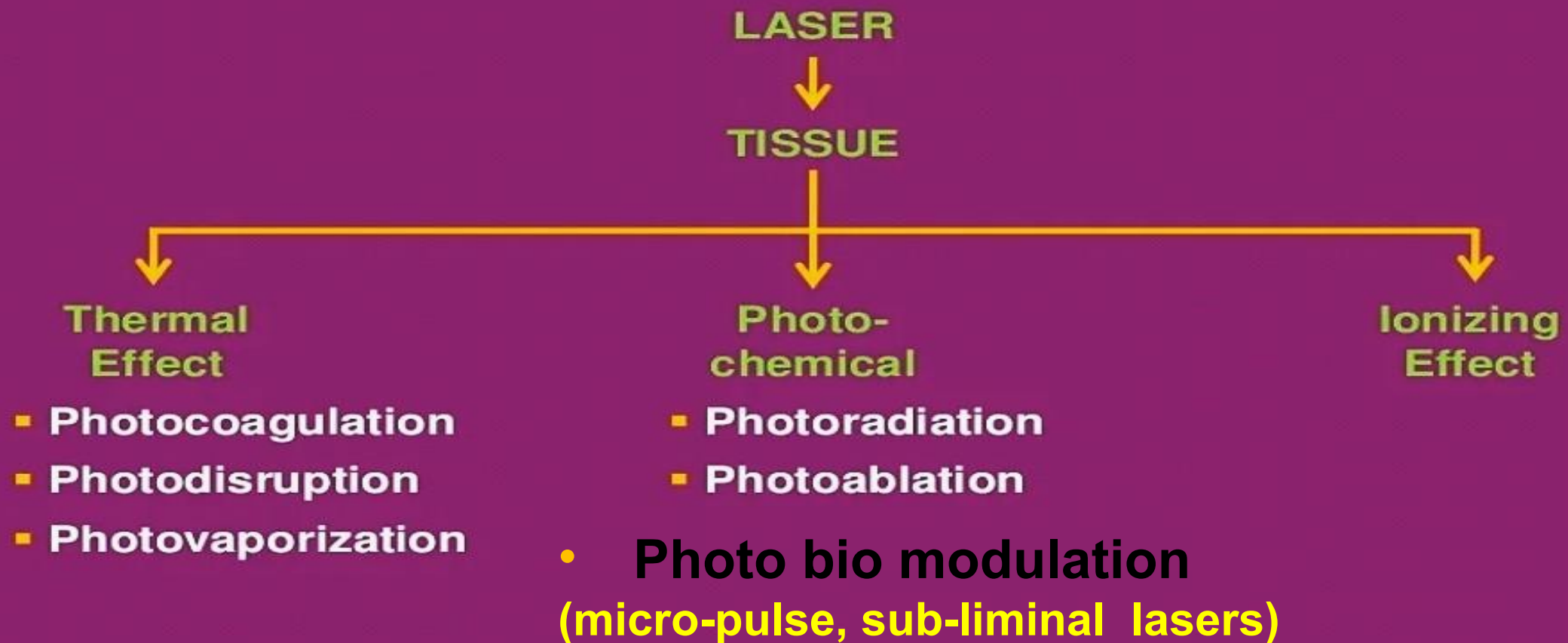
- ✓ BVs, superficial and deep capillary plexuses.
- ✓ Maximum absorption of wavelength laser (green) is preferable for BV coagulation.
- ✓ Absorbed laser before retina interferes with good retinal application

❑ Xanthophyll

- ✓ Present at inner and outer plexiform layers of macula.
- ✓ Maximum absorption of wavelength laser (green/blue) so it is not recommended in macular ttt.

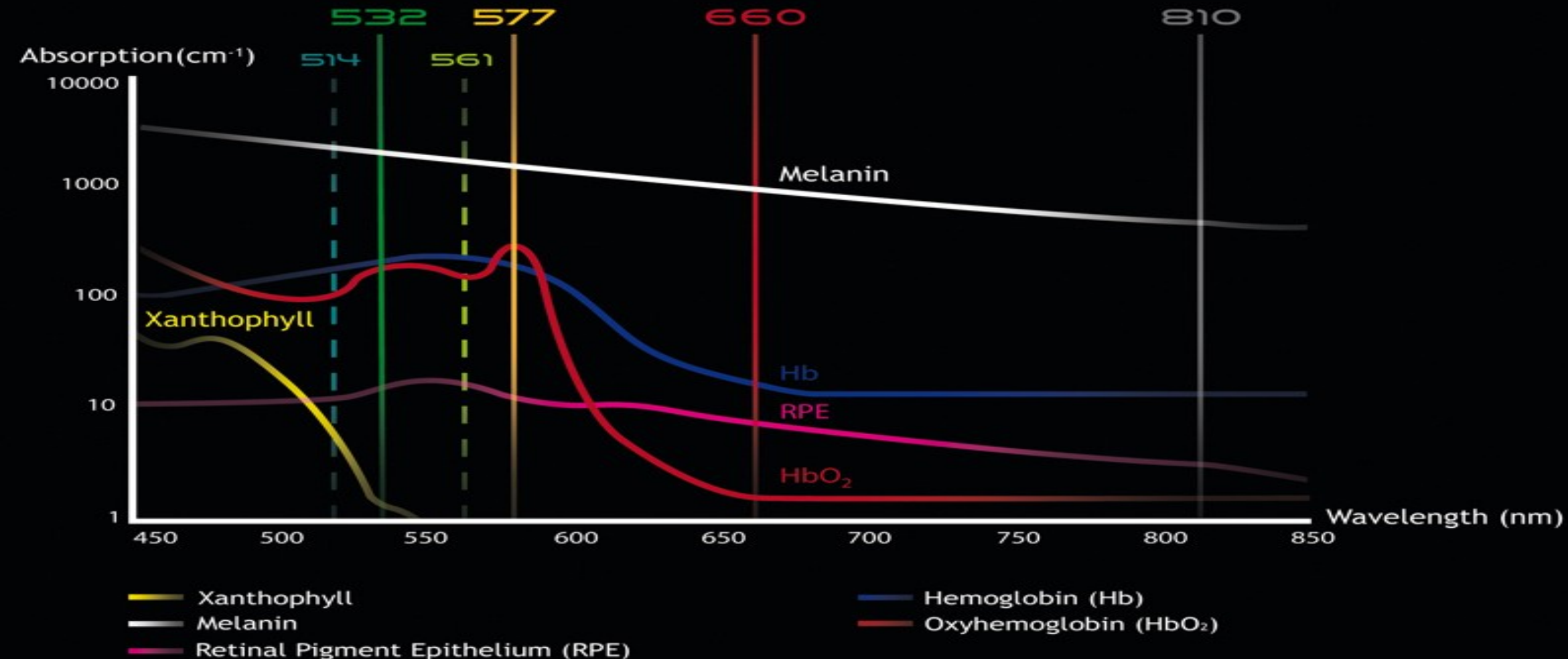
❑ Melanin

LASER TISSUE INTERACTION

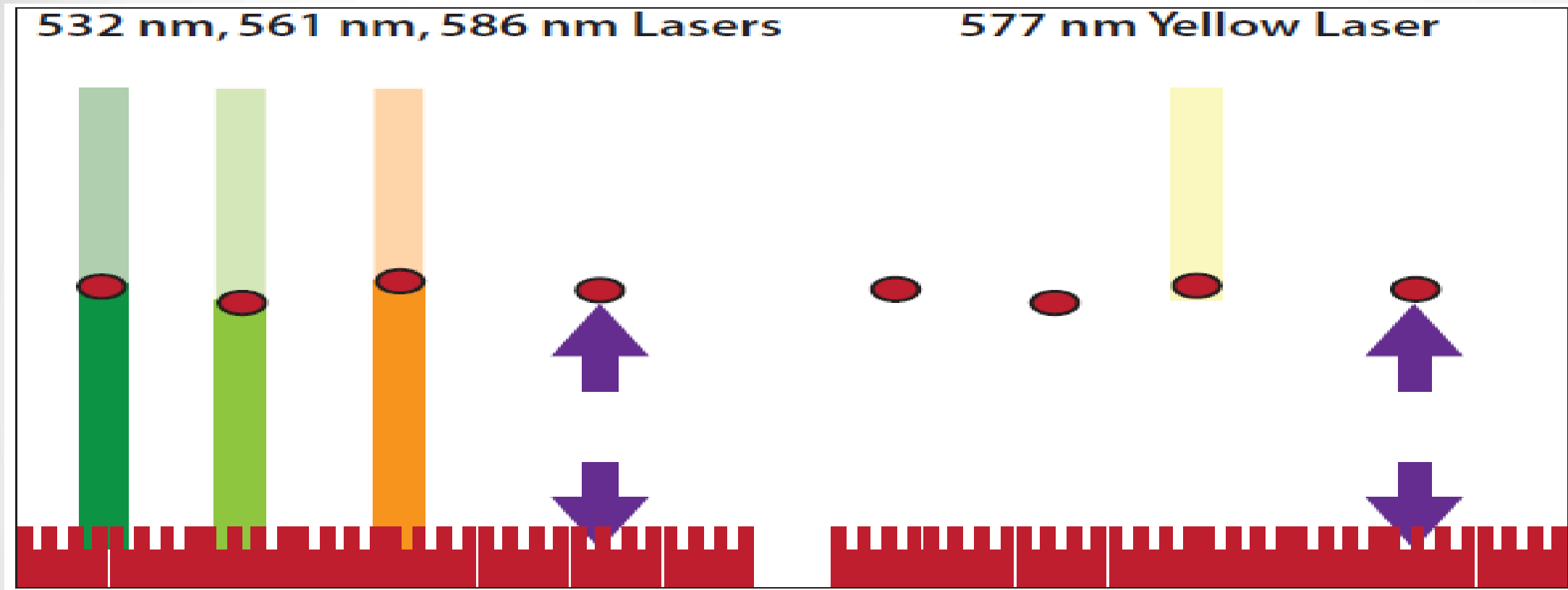


Lasers/tissues interactions

The choice of a laser (wave length) depends on which chromophore (or combination of chromophores) we are aiming at and which others we want to avoid.

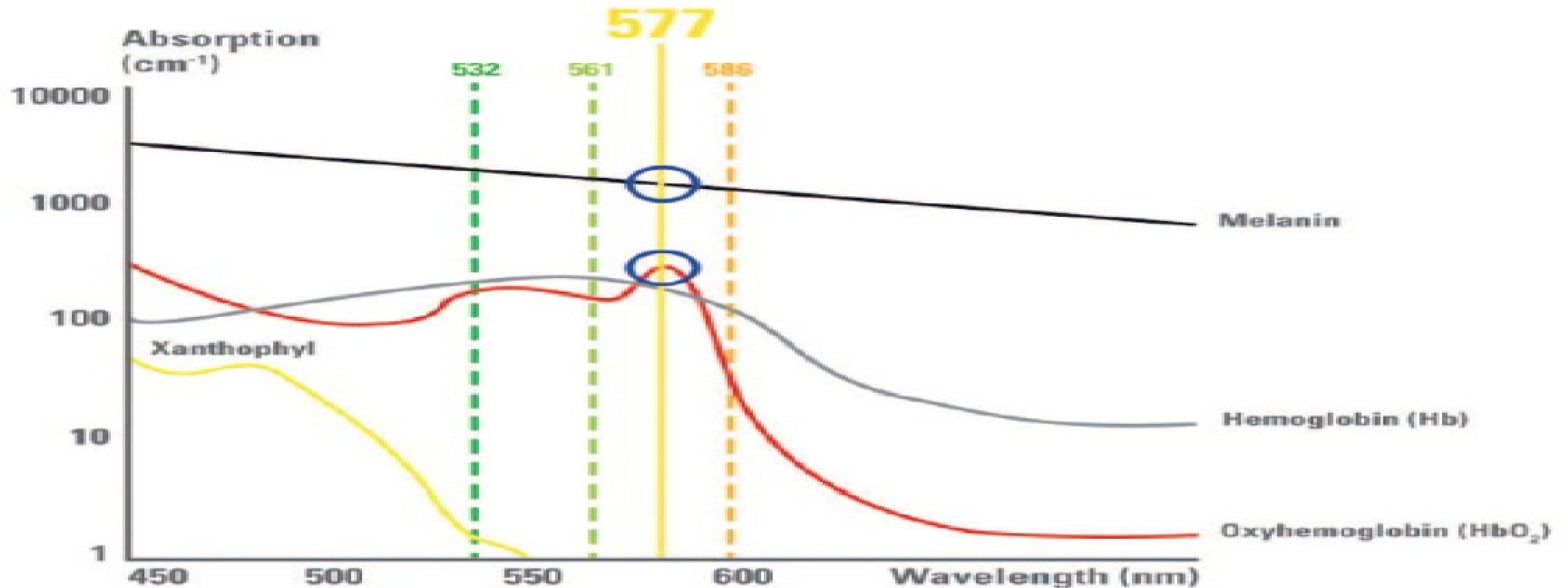


Lasers/tissues interactions



Yellow laser is absorbed by the oxy-hemoglobin
so the laser does not reach the RPE

Yellow Laser (577nm wavelength)



The most preferable wavelength for the following features:

- Excellent combined absorption by both melanin and oxy-hemoglobin.
- Excellent penetration through cataract and hazy media.

Factors affecting Laser tissue interaction

☐ **Laser variables** (setting).

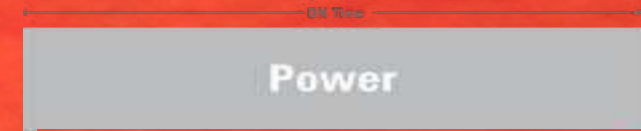
- ✓ Wavelength
- ✓ Power
- ✓ Spot size
- ✓ Duration (duty cycle)

☐ **Tissue variables**

- ✓ Transparency
- ✓ Pigmentation
- ✓ Water content

Subliminal : Principle

Conventional Photocoagulation (Duty cycle 100%)



Micropulse Mode (Duty cycle 9%)

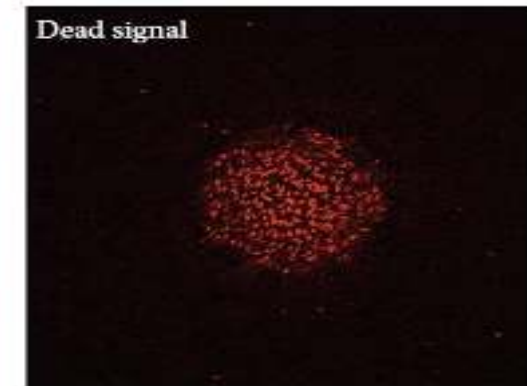
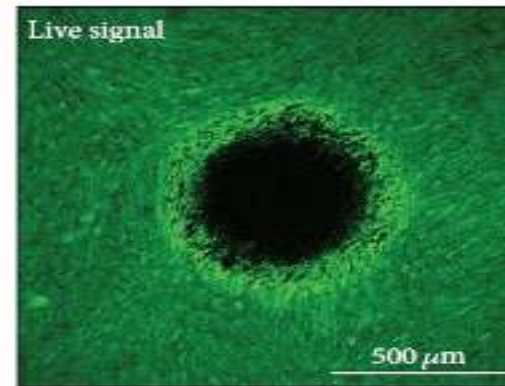
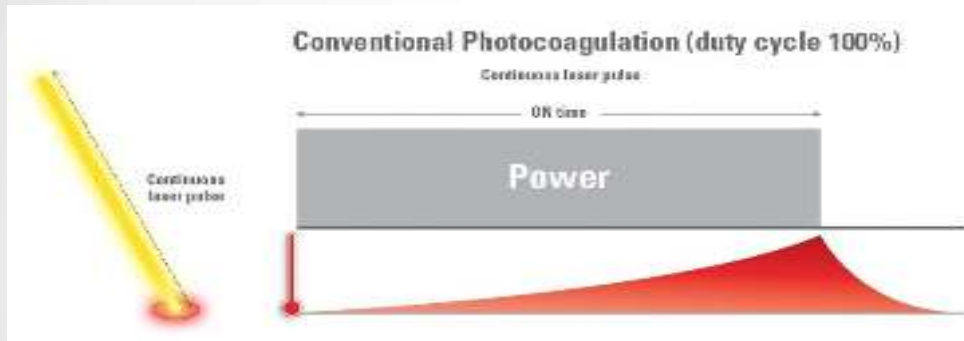
200 ms



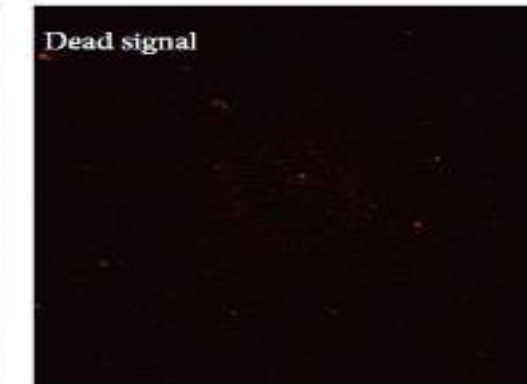
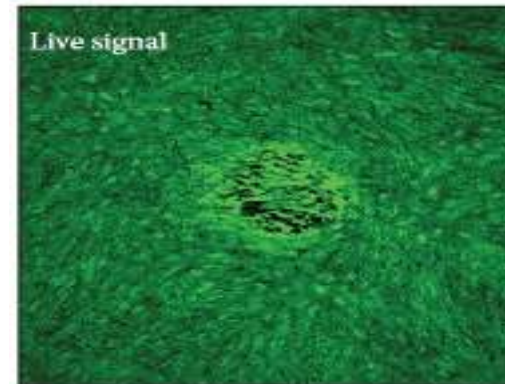
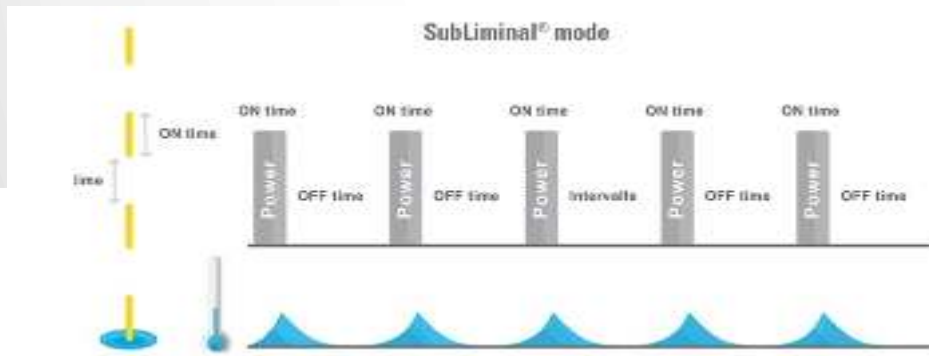
How dose Subliminal therapy Work ?

An experimental setup for laser irradiation of cultured cell layers

With conventional continuous wave mode [600mW, 150ms, 90 mJ]



With Subliminal mode [600mW, DC 15%, 1000ms, 90 mJ]



Uses of Sub-liminal 577 (yellow) laser in retinal disorders

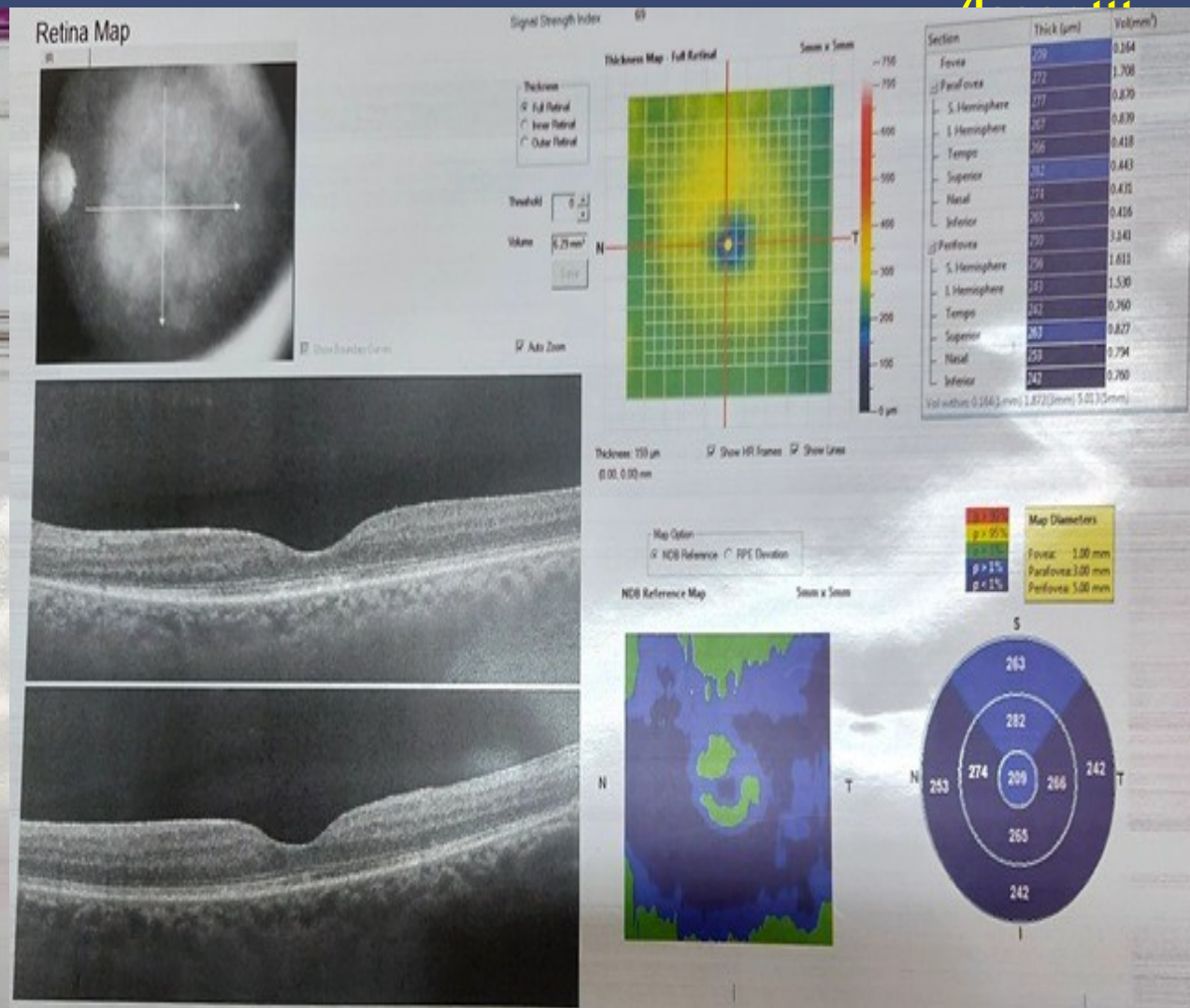
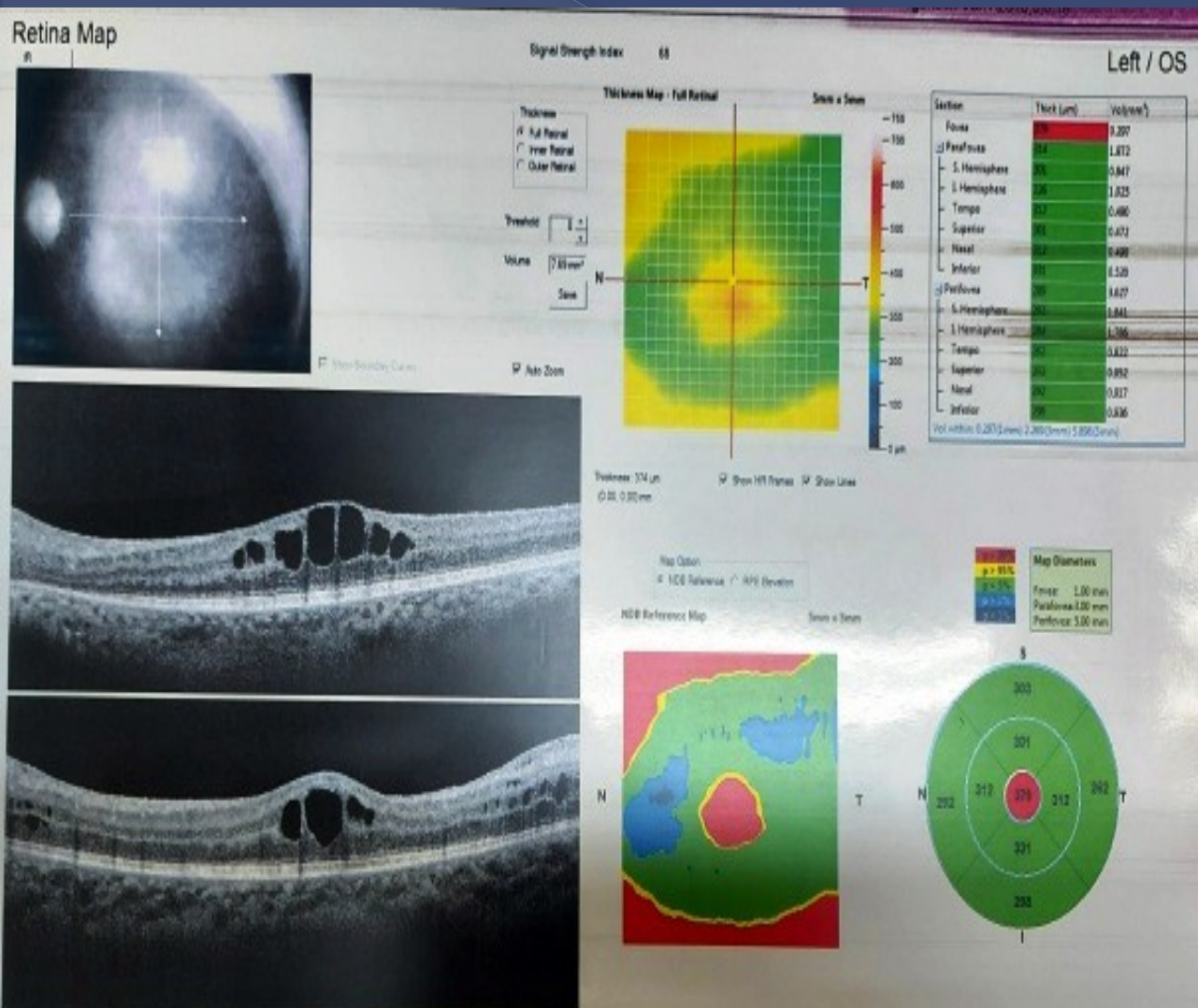
- **Center involved macular edema.**
- **Central serous chorio retinopathy (CSCR)**
- **Dominant hereditary Foveo-schisis**
- **PED, PCV**
- **Macular pucker, pseudo macular hole.**
- **Idiopathic macular hole.**
- **BRVO, CRVO**
- **Ischemic maculopathy**
- **Solar maculopathy, macular scar.**
- **Myopic Foveo-schisis.**
- **ARMD (dry, Wet, atrophic)**
- **Hereditary macular dystrophies, degenerations.**
- **Retinitis Pigmentosa.**

Center involved macular edema

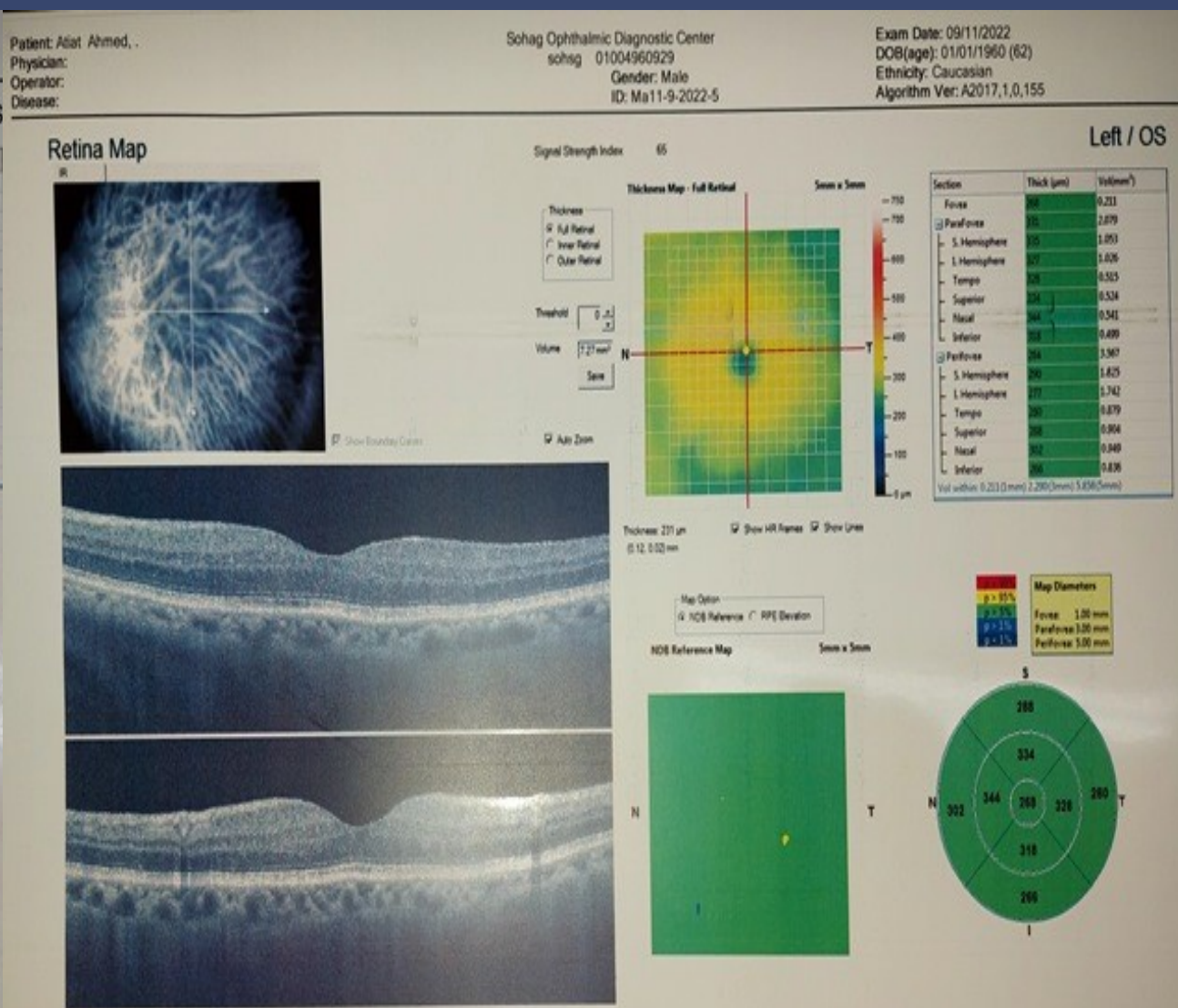
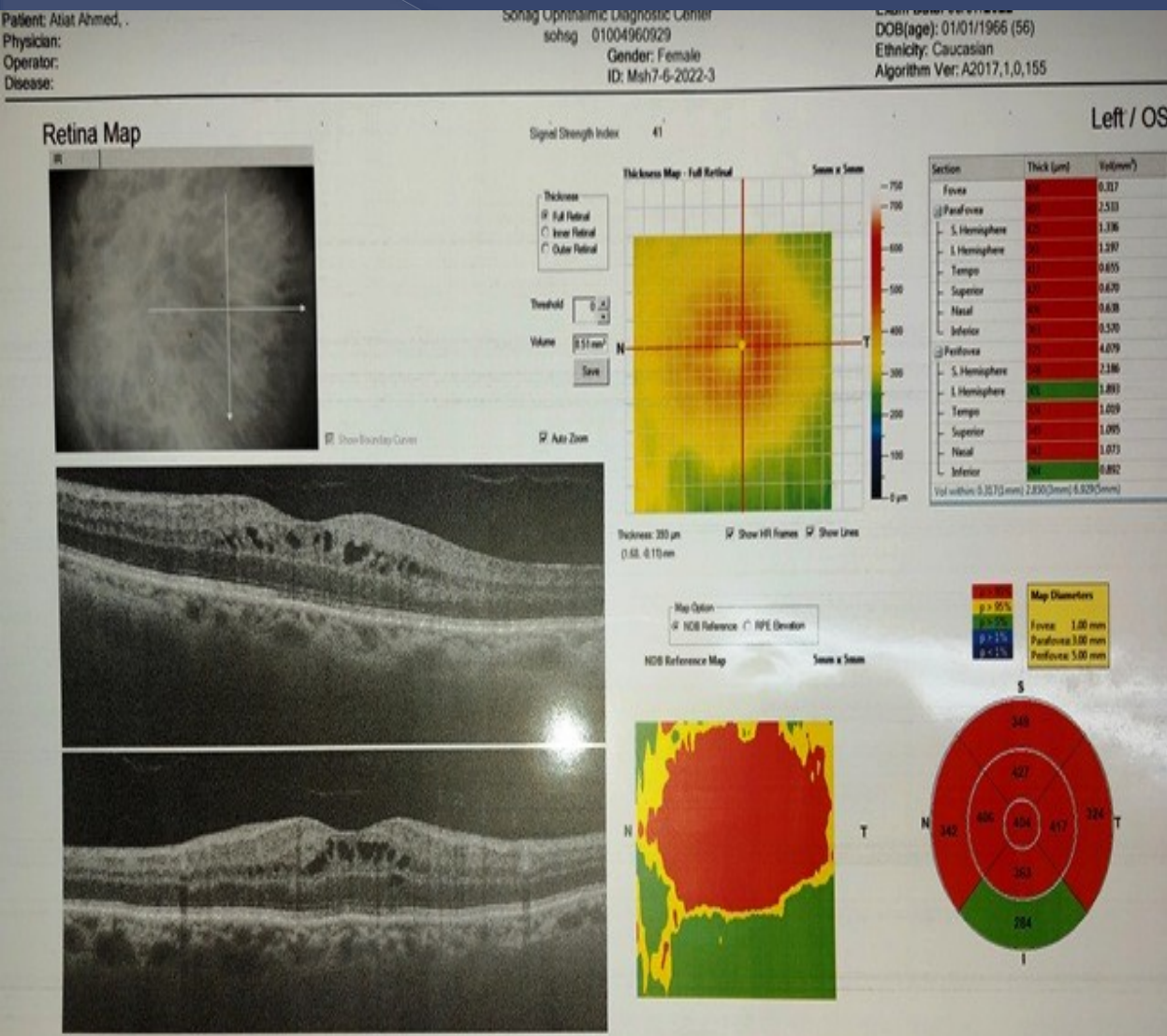
- **Case1** : 47 female patient with diminution of vision of Lt Eye (post phaco emulsification) resulted form mild CME (Ervin Gass CME)

BCVA of Lt Eye 6/12 3 months post)

(BCVA of Lt Eye 6/60 pre laser)



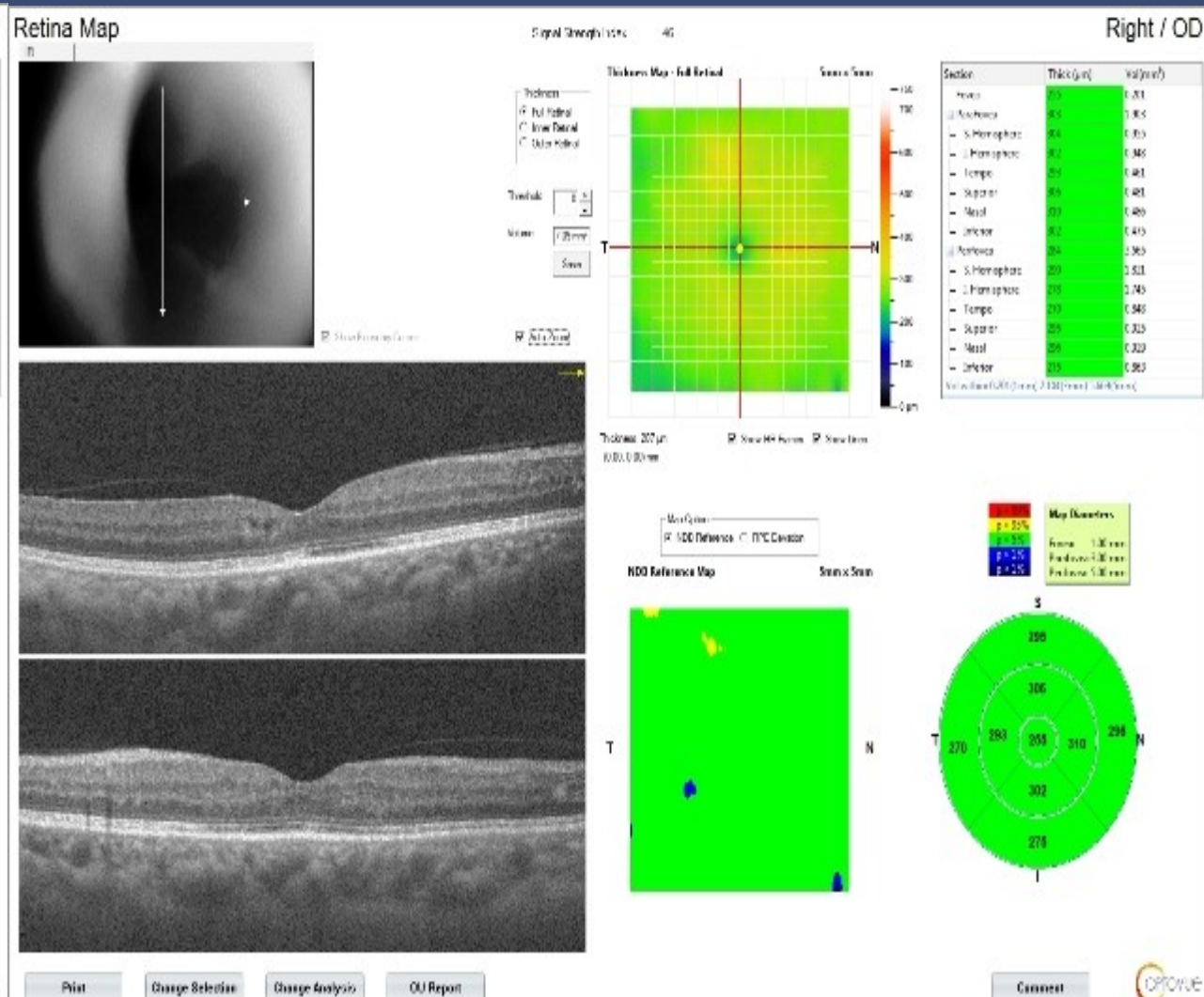
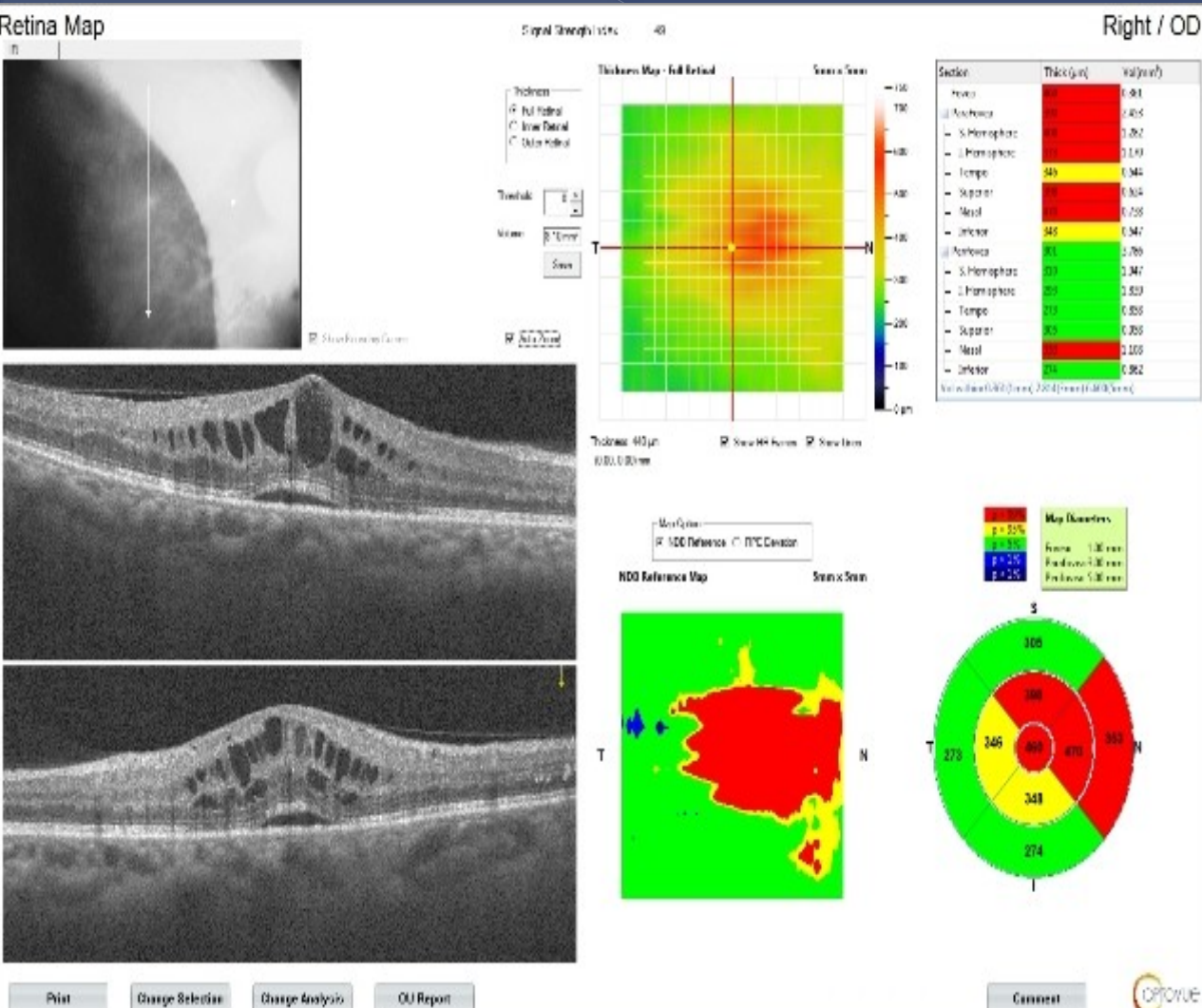
Case2 : 64 female, D patient with diminution of vision of Lt Eye (Mild CME, myopia)



○ **Case3:** 64 female D patient with diminution of vision of Rt Eye (Moderate CME, PED)

(BCVA of Rt Eye 6/9 , 6 months post laser ttt)

(BCVA of Rt Eye 6/60 pre laser)



☐ ETDRS Change

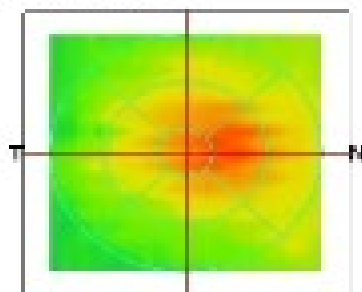
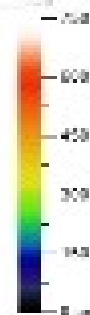
☐ RRC Deviation

Retina Map Change Analysis

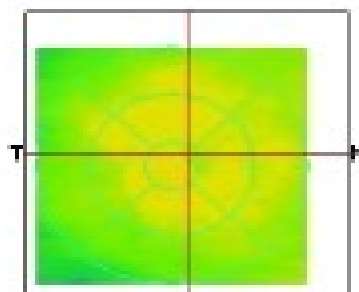
Full Retina Thickness Map

Right / OD

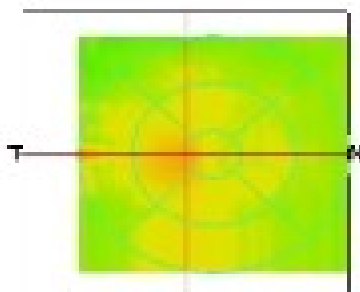
Threshold ☐ ☐



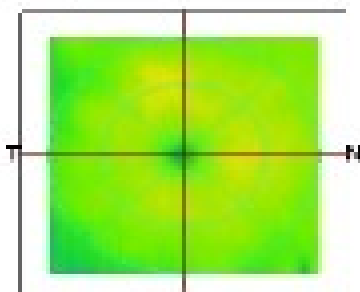
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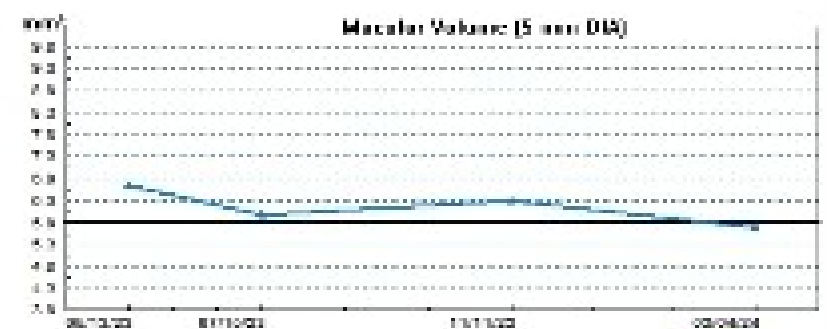
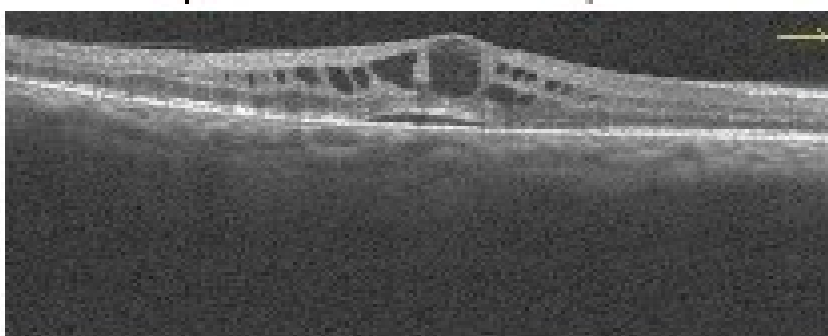
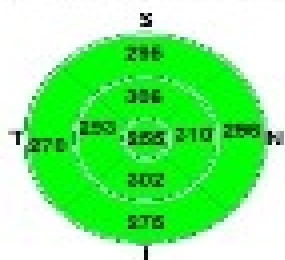
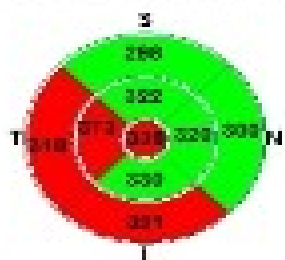
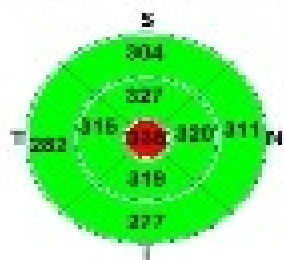
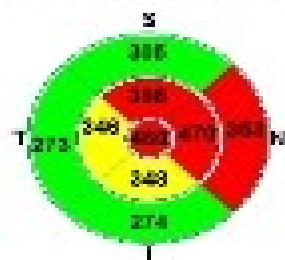
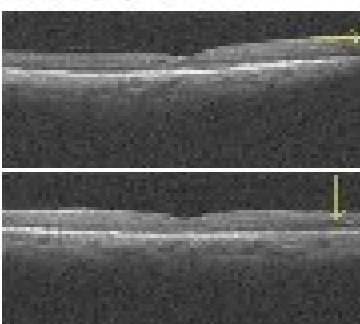
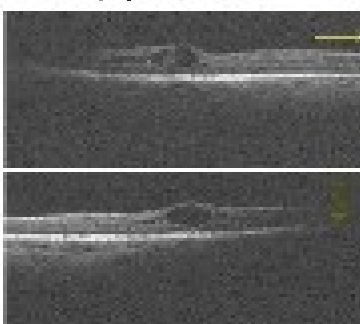
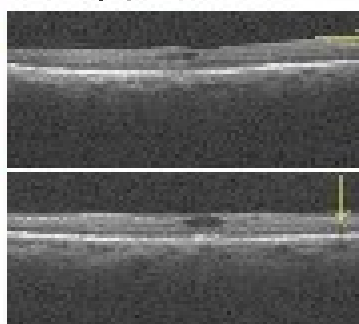
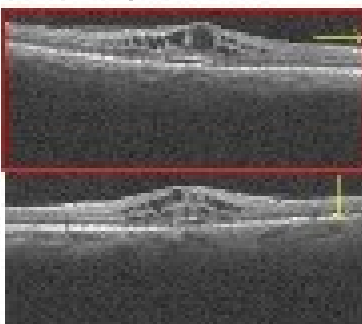
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Date: 11/11/2023 SS = 24.3



Date: 02/04/2024 SS = 45.5



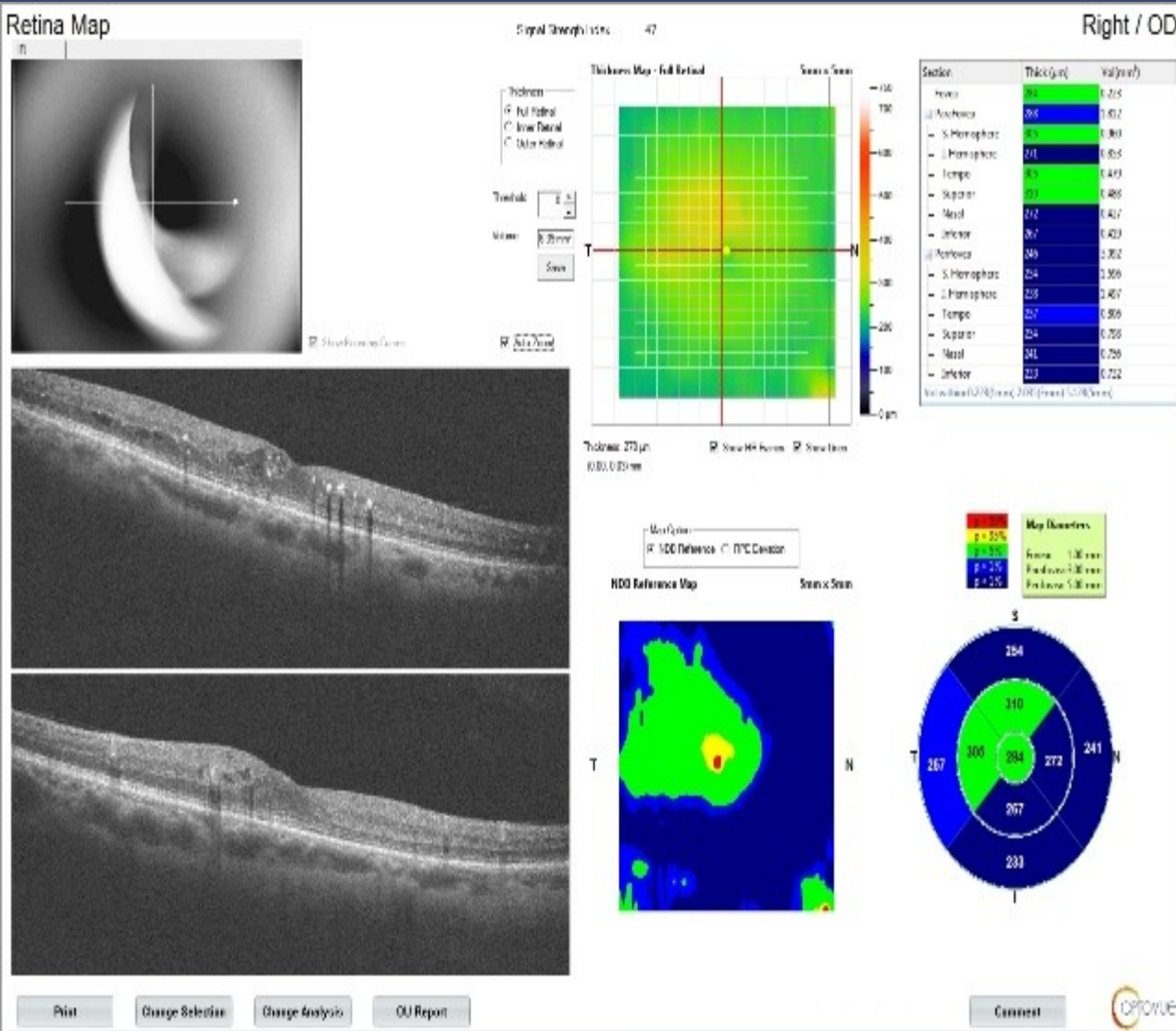
Print

Change Analysis

OU Report

(BCVA of Rt Eye 6/24 pre laser)

(BCVA of Rt Eye 6/12 , 6 months post laser ttt)



☐ ETDRS Change

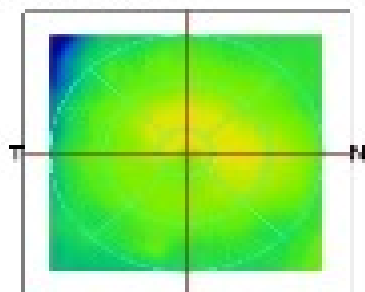
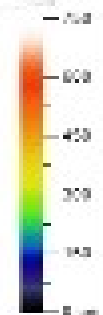
☐ RRC Deviation

Retina Map Change Analysis

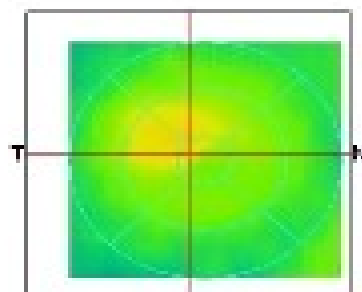
Full Retina Thickness Map

Right / OD

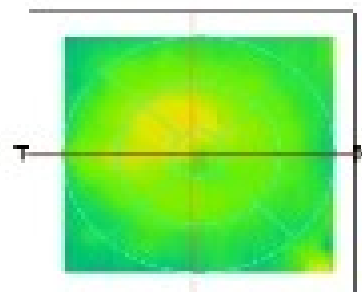
Threshold ☐ ☐



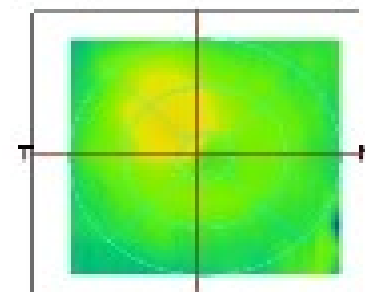
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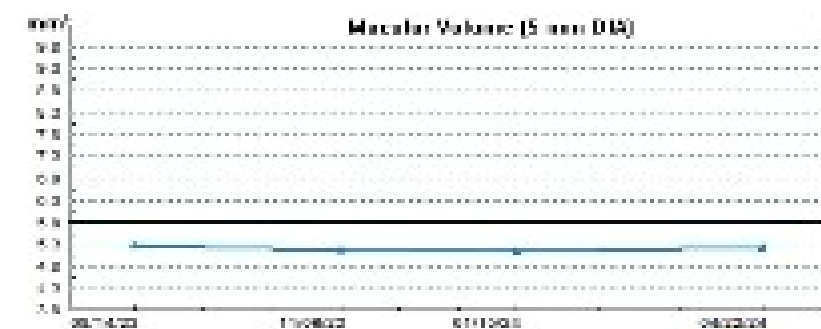
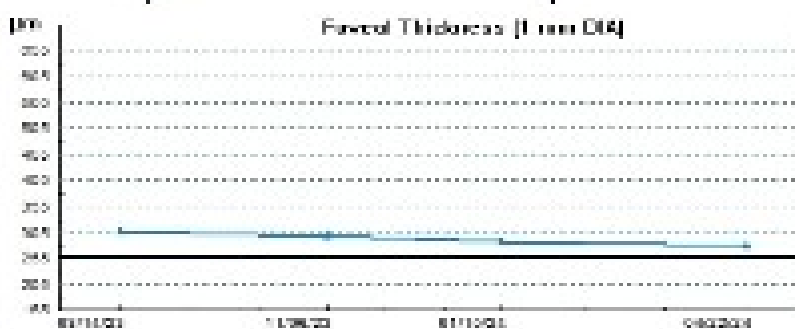
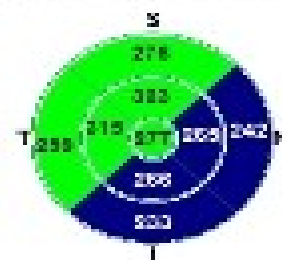
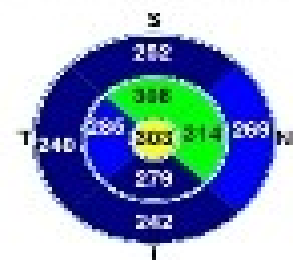
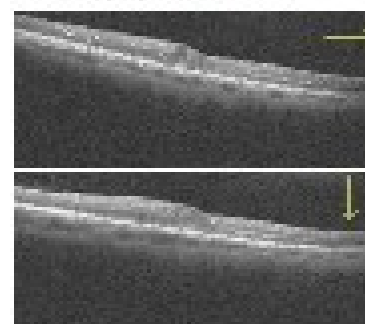
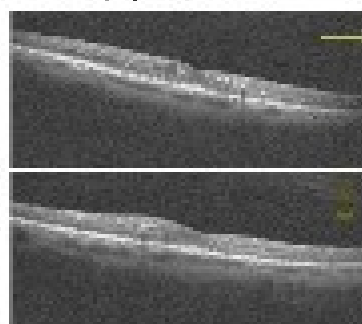
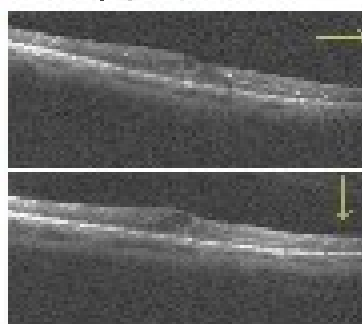
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Date: 01/17/2024, SSI = 47.2



Date: 04/22/2024, SSI = 52.3



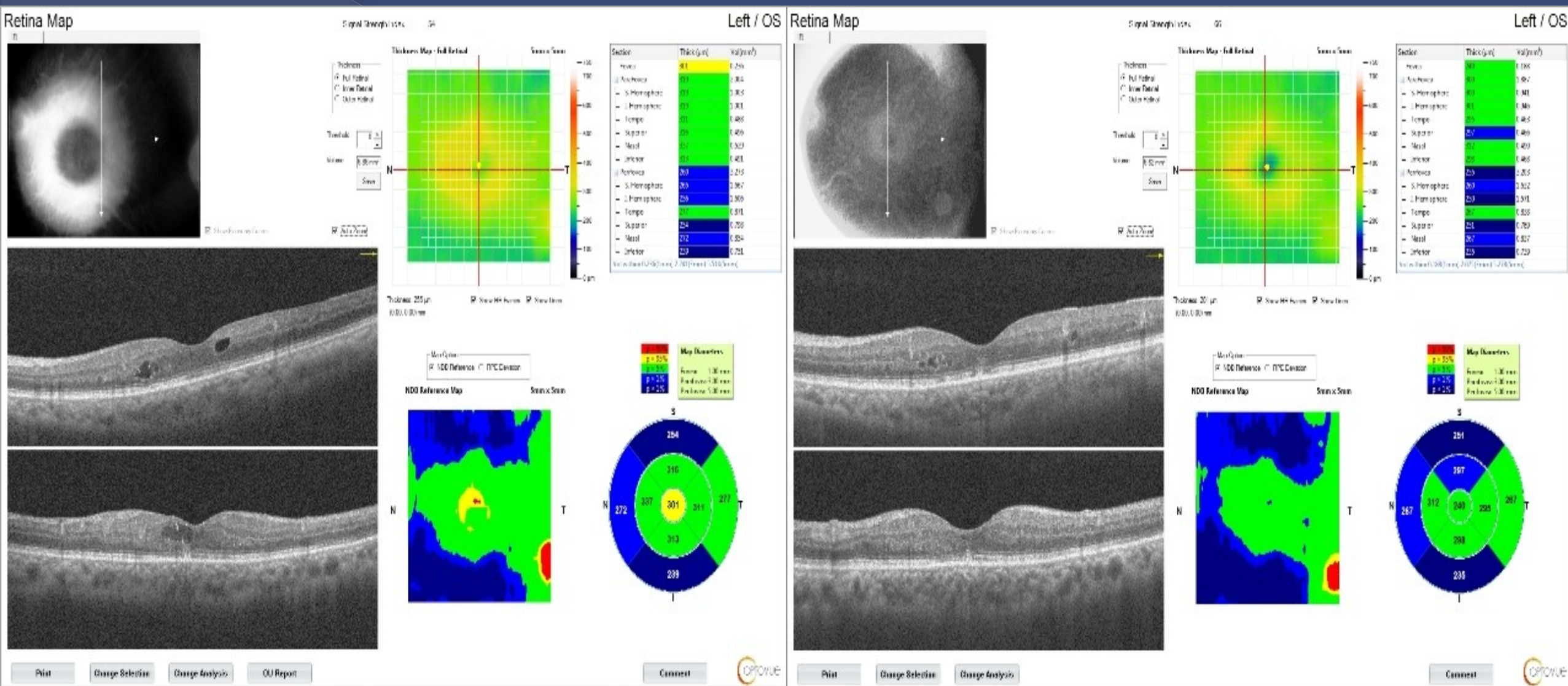
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Change Analysis

OU Report

(BCVA of Rt Eye 6/9, 6 months post laser ttt)

(BCVA of Lt Eye 6/18 pre laser)



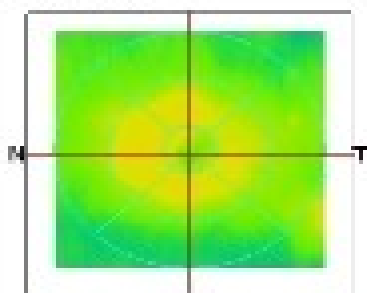
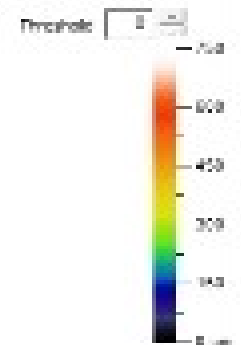
☐ ETDRS Change

☐ RRC Deviation

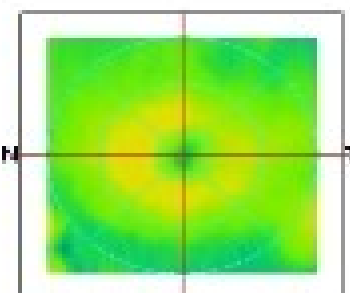
Retina Map Change Analysis

Full Retina Thickness Map

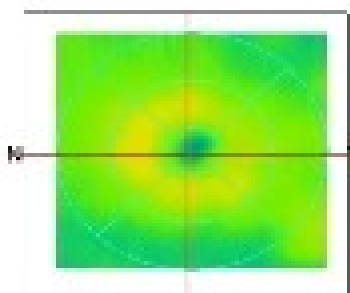
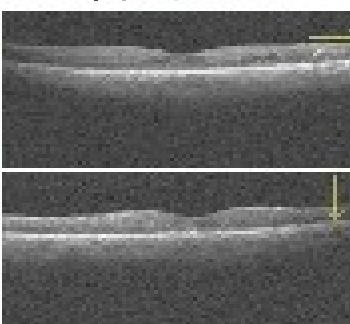
Left / OS



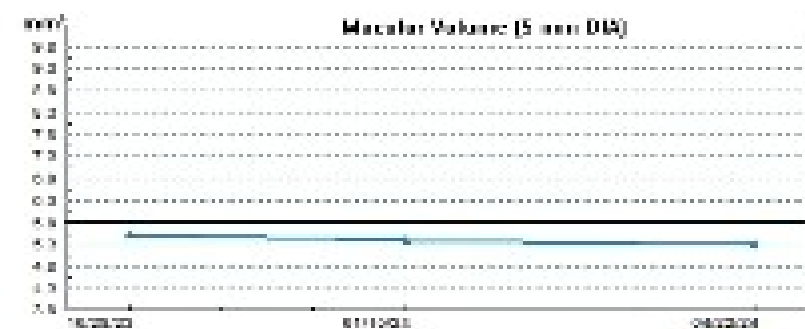
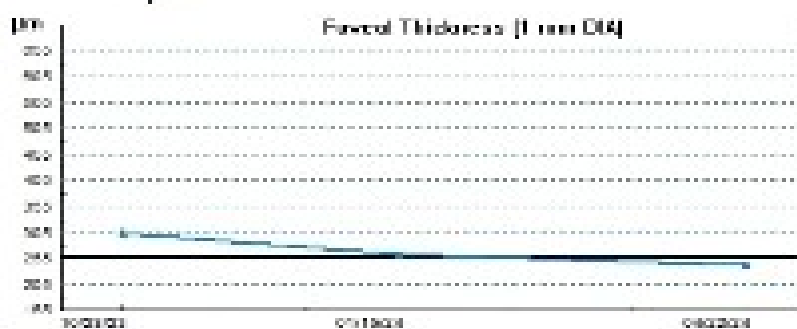
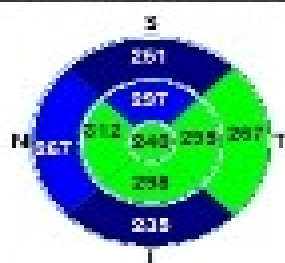
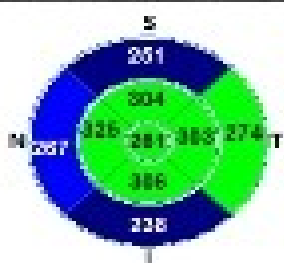
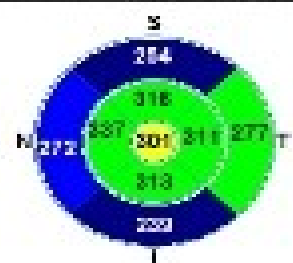
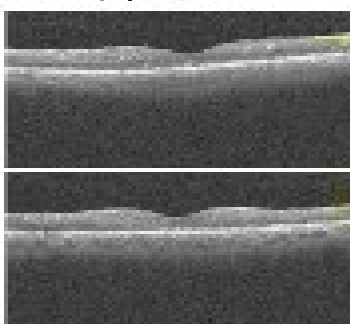
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Date: 04/25/2024 SS=60.2



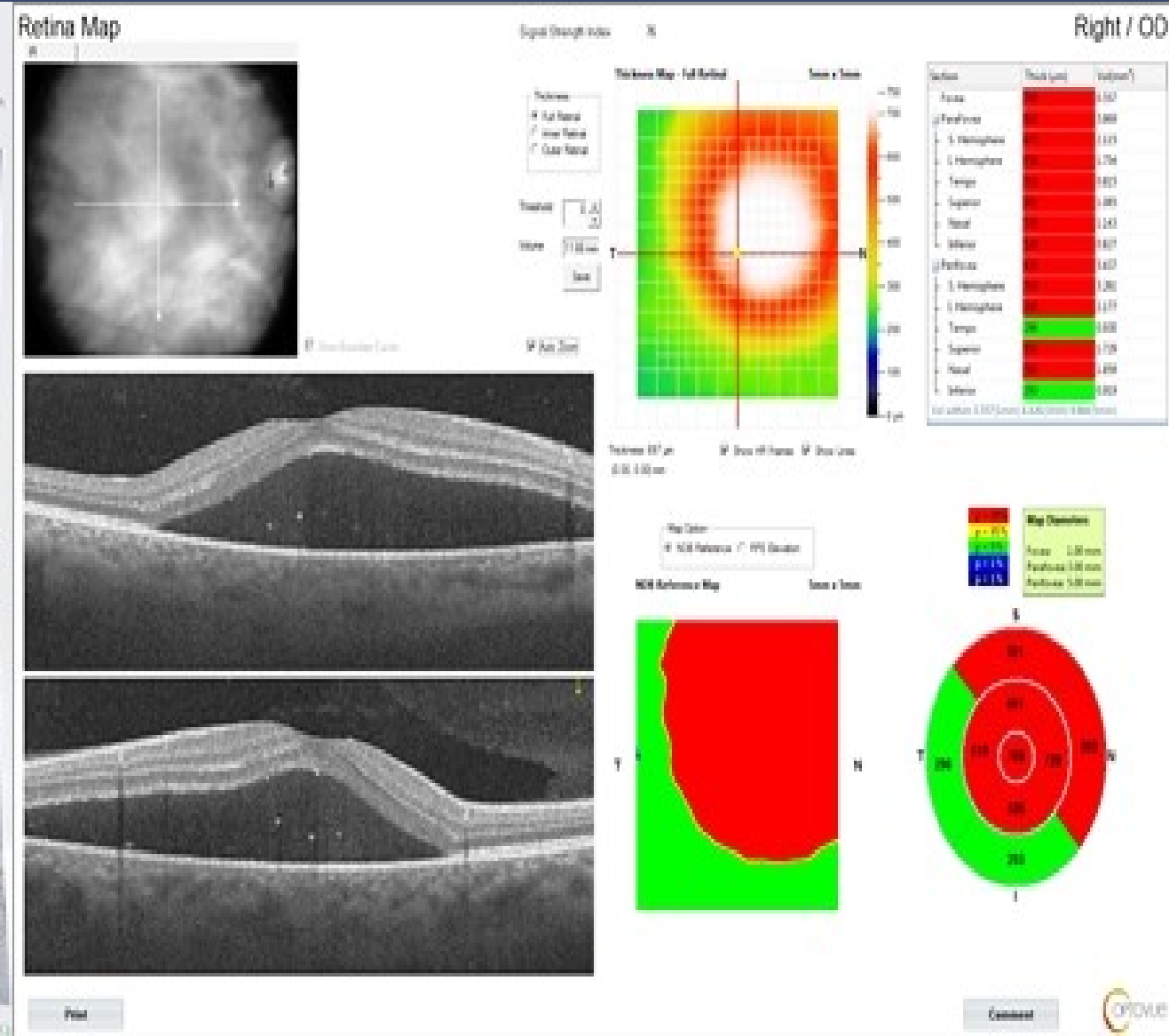
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Change Analysis

OU Report

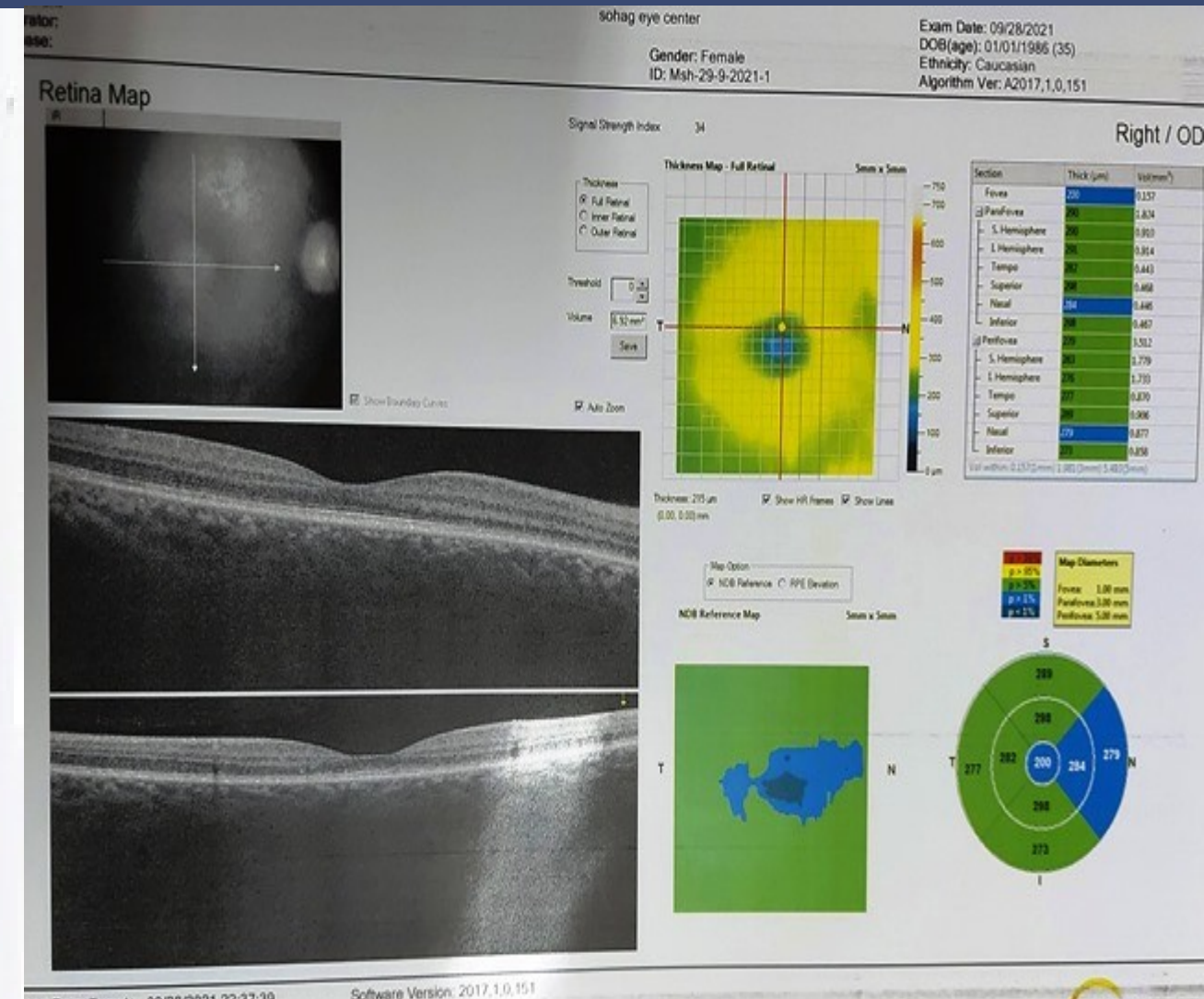
Central Serous Chorio Retinopathy

- **Case1** : 45 female patient with diminution of vision of Rt Eye



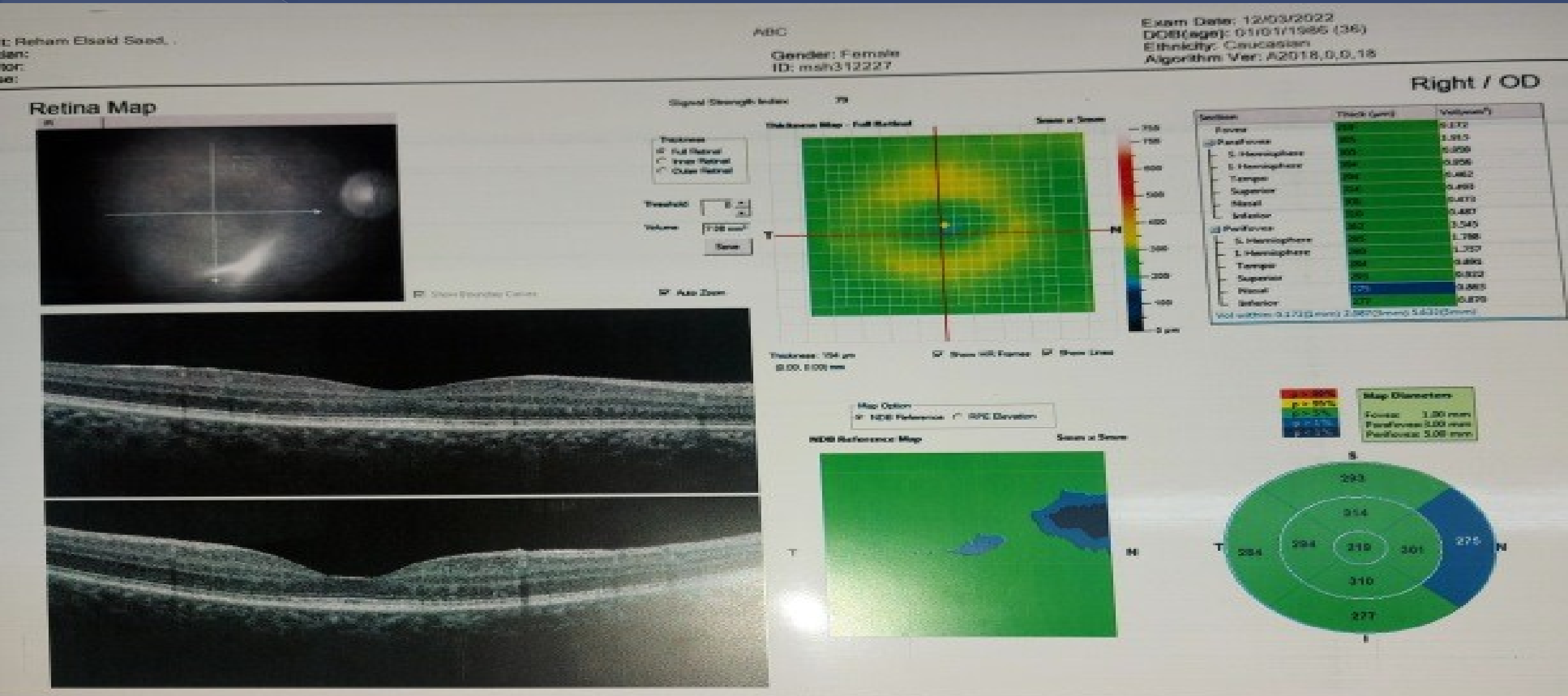
Three months post 577 subliminal laser

(BCVA of Rt Eye post laser 6/12)

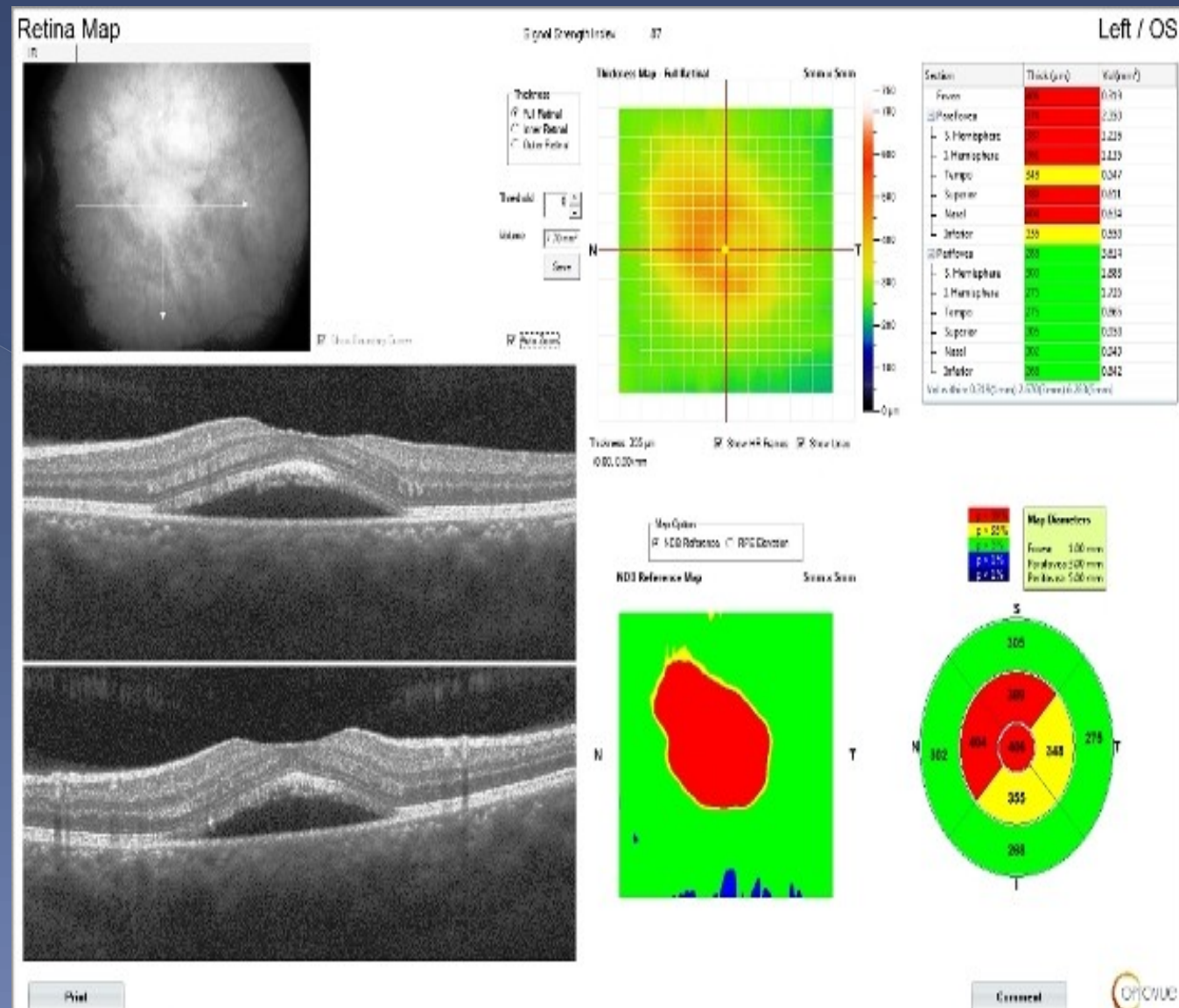
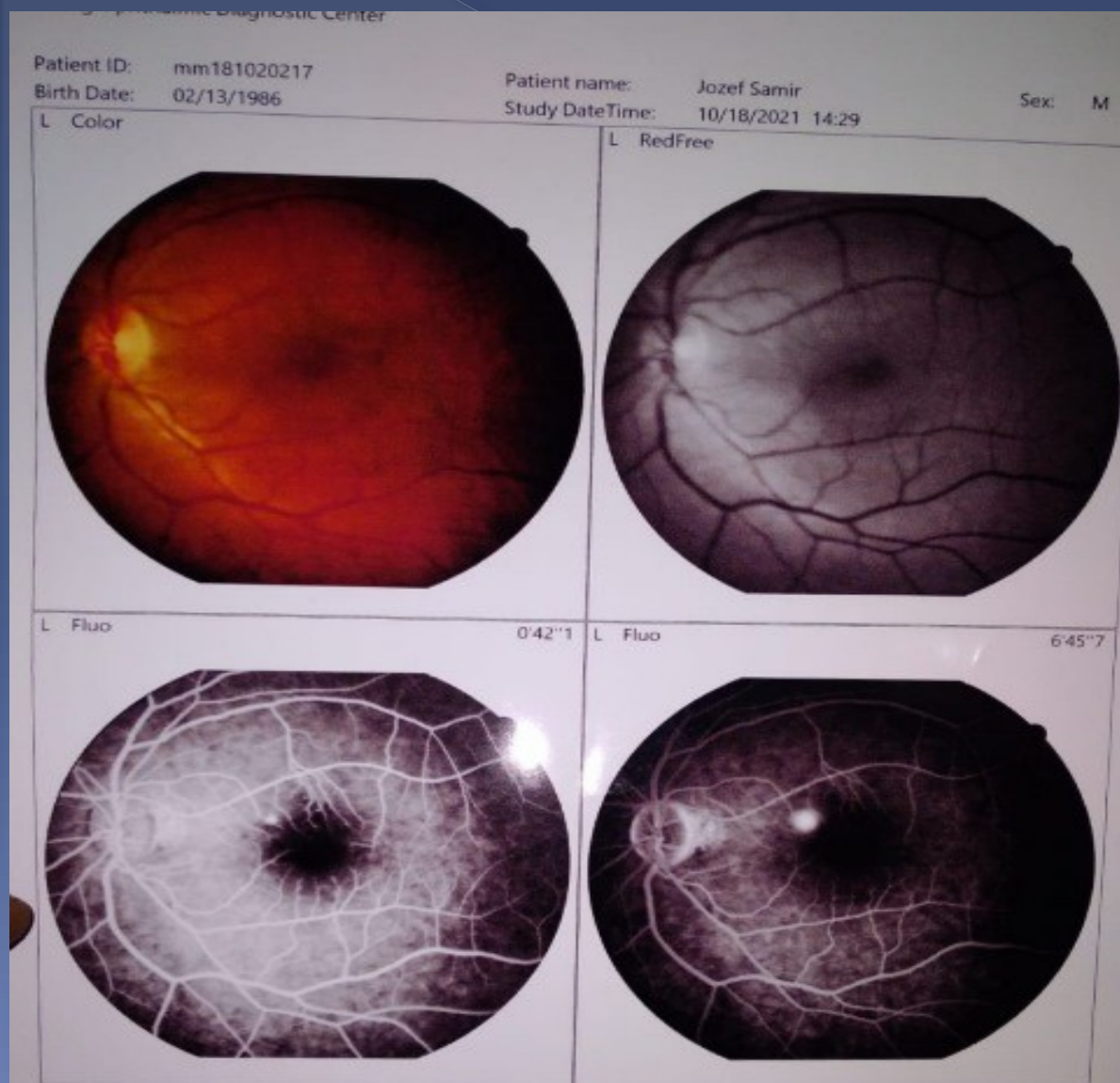


Six months post 577 subliminal laser

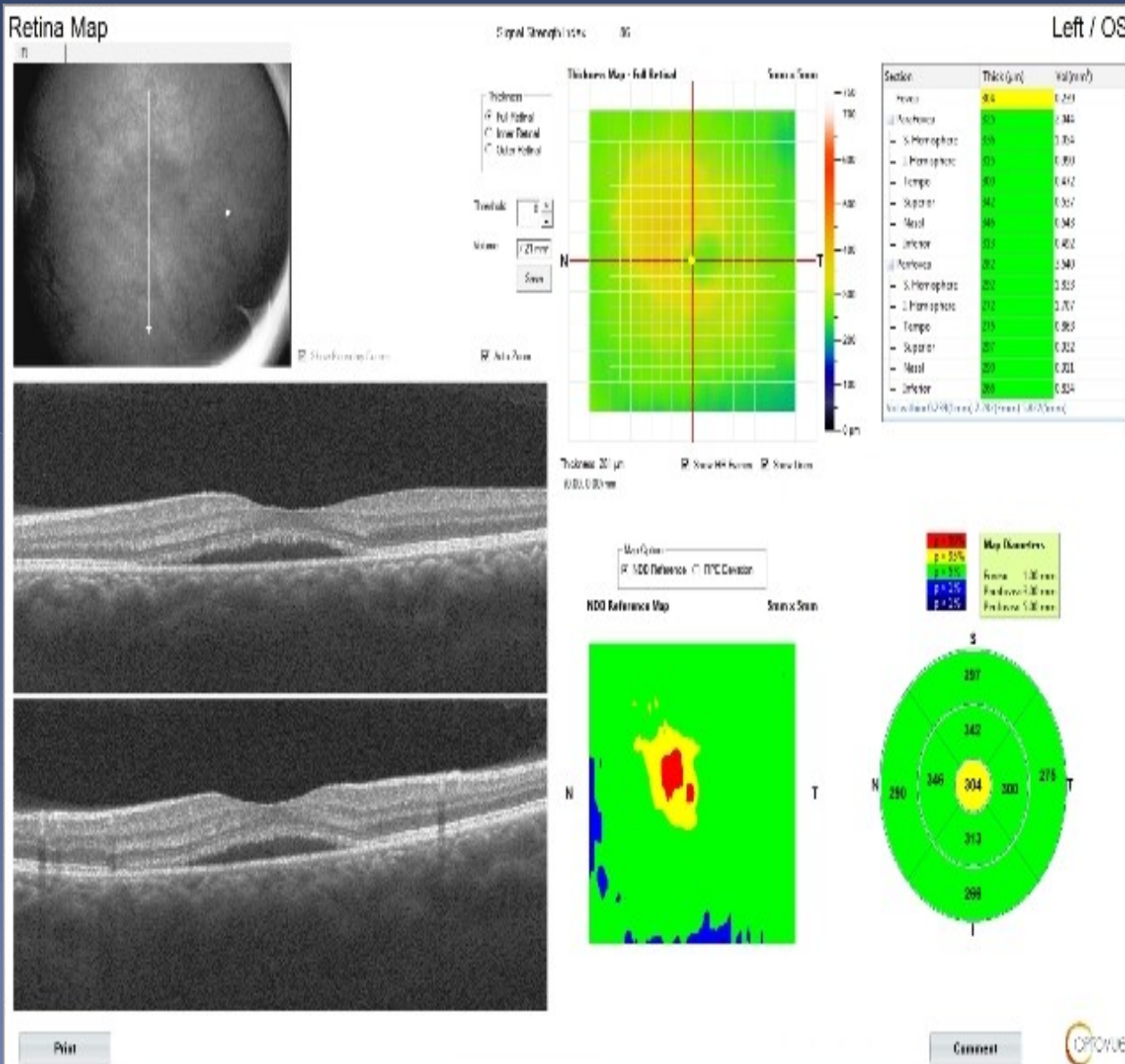
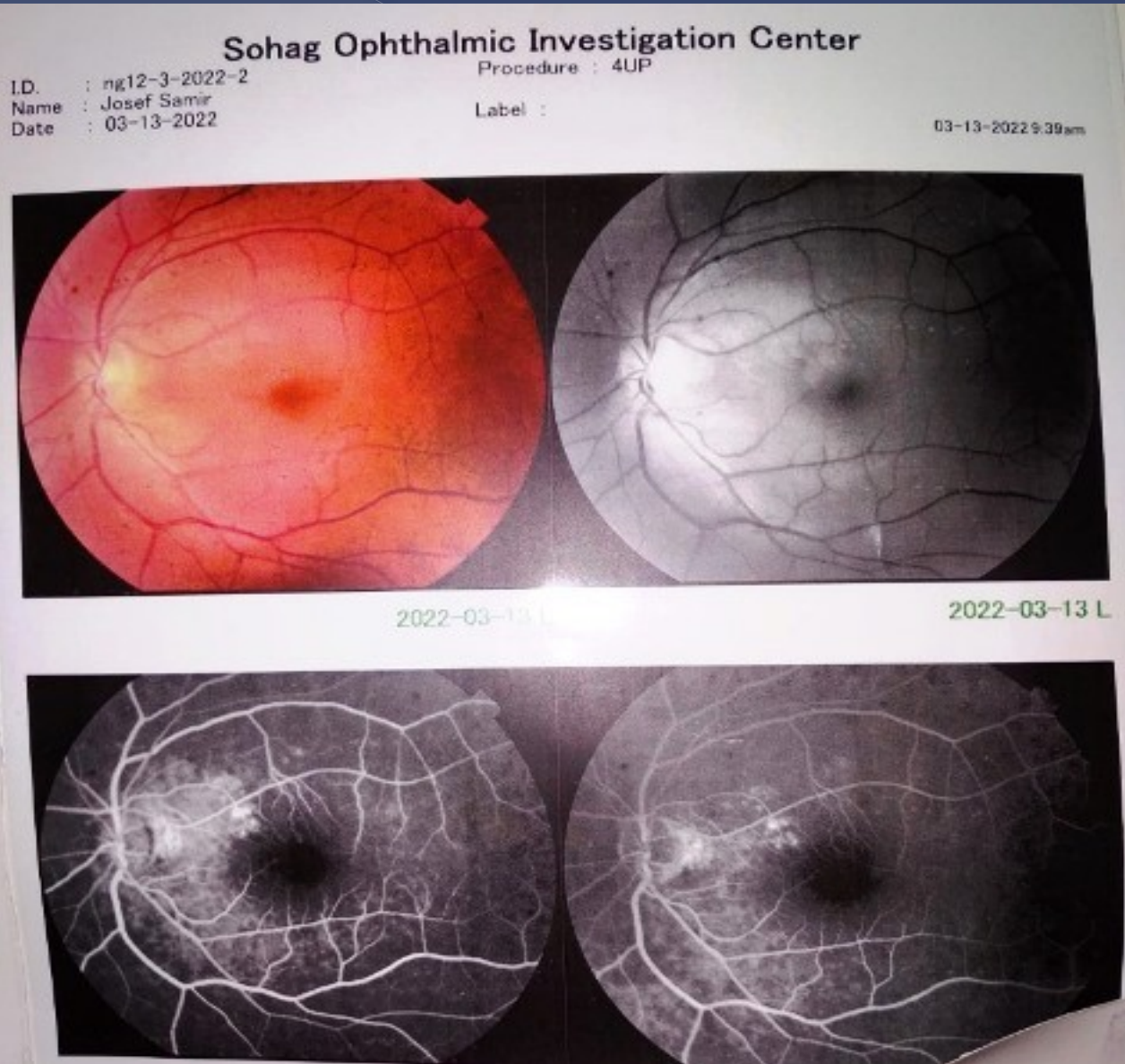
(BCVA of Rt Eye post laser 6/9)

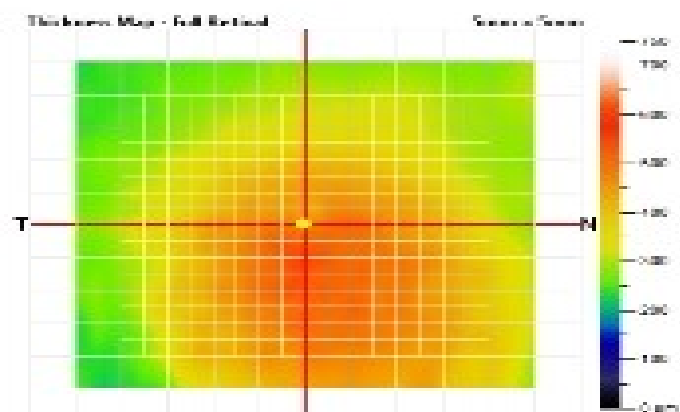
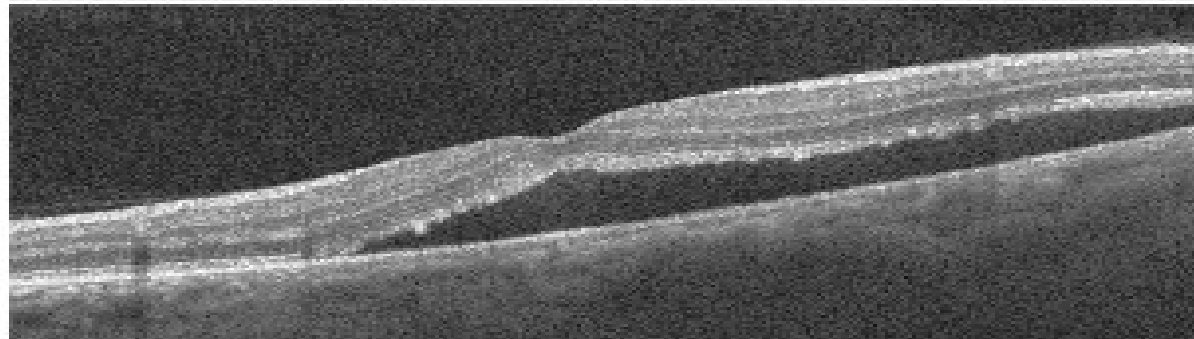
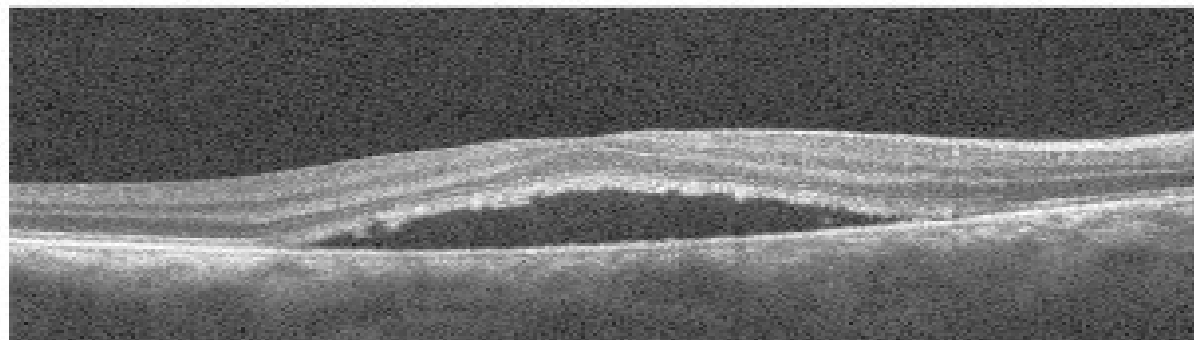
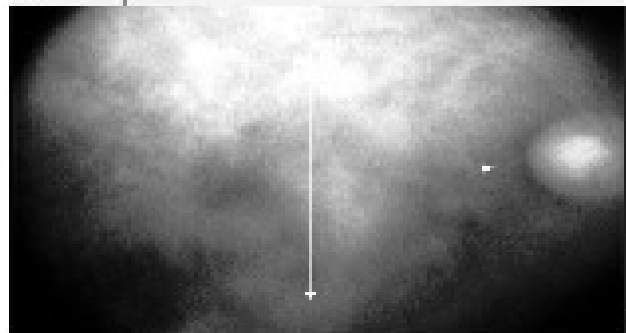


- **Case2** : 42 male patient with diminution of vision of Lt Eye (BCVA of Lt Eye 6/36)



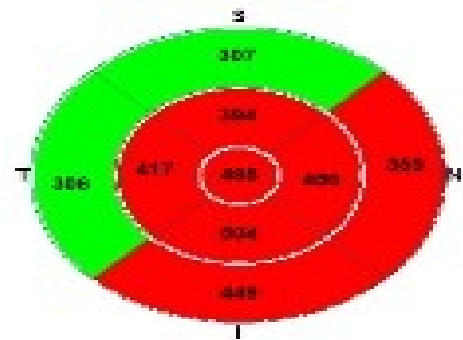
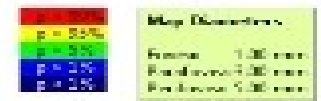
One month post 577 subliminal laser



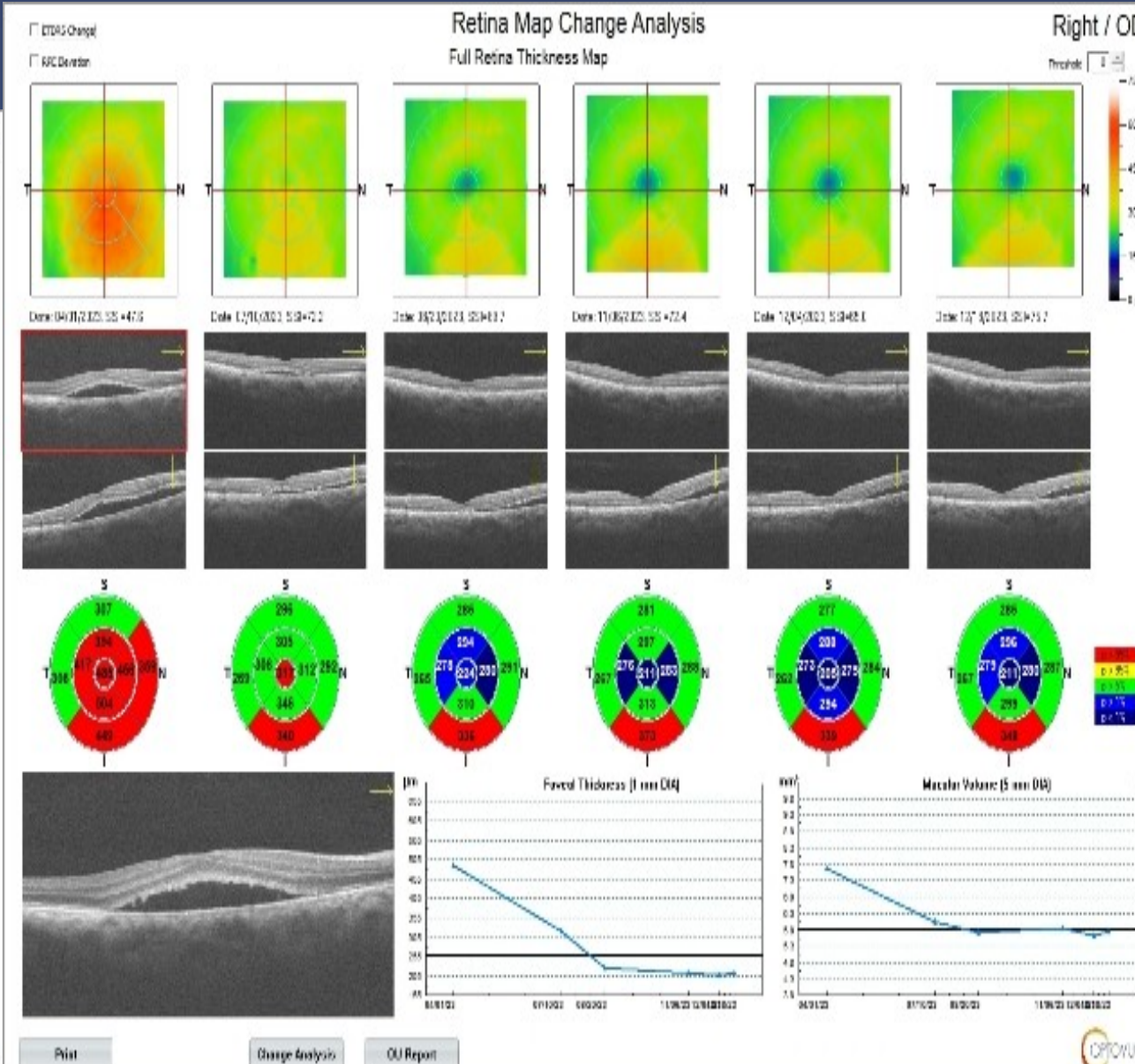


Section	This is Quin?	Wal (yearly)
Proverbs	900	0.481
1st Psalm/Psalms	947	0.471
— 1st Psalm/Psalms	947	0.468
— 2nd Psalm/Psalms	900	0.505
— Temples	917	0.505
— Supper for	900	0.500
— Mass of	900	0.499
— Confession	900	0.498
2nd Psalm/Psalms	900	0.481
— 1st Psalm/Psalms	900	0.481
— 2nd Psalm/Psalms	900	0.490
— Temples	900	0.481
— Supper for	900	0.484
— Mass of	900	0.487
— Confession	900	0.490

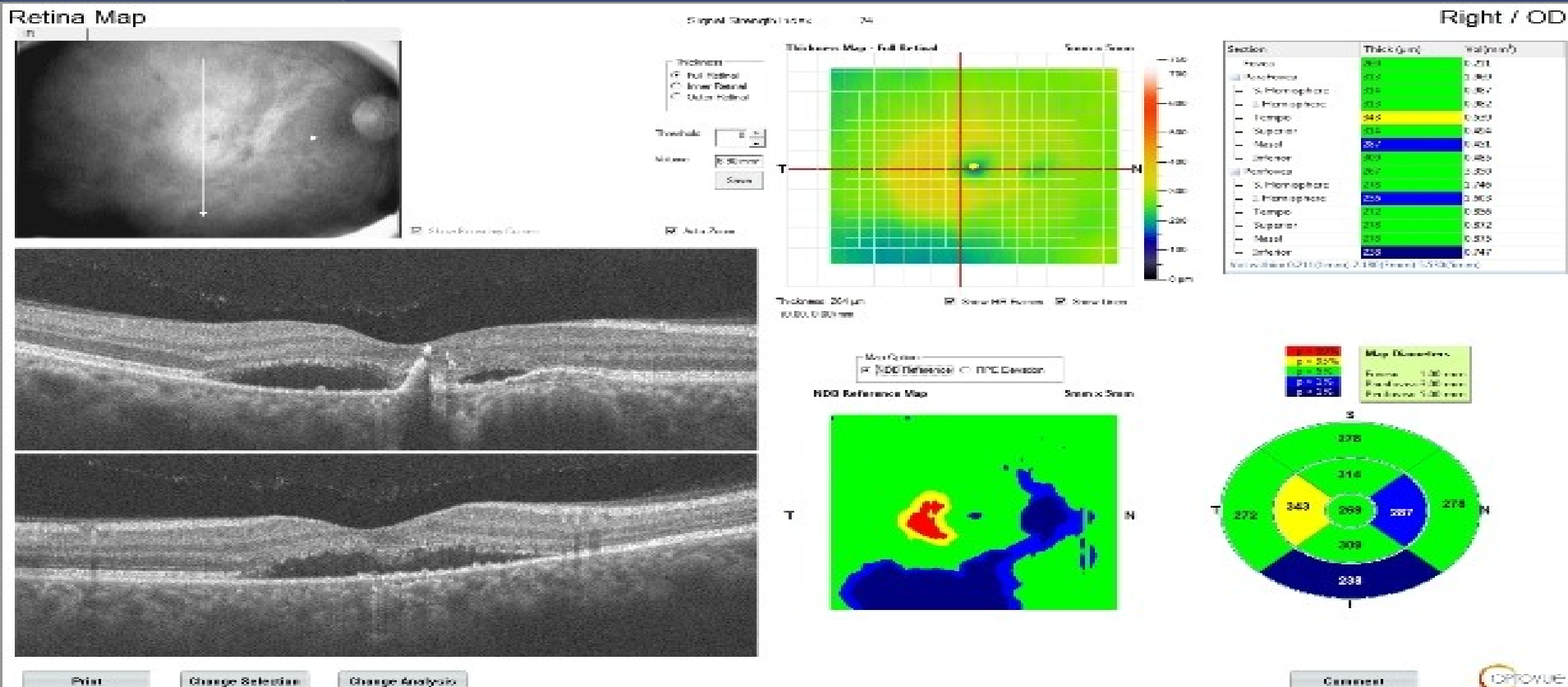
Notes: 1st Psalm/Psalms (1st year) = 0.481 (1st year) = 0.481 (1st year)



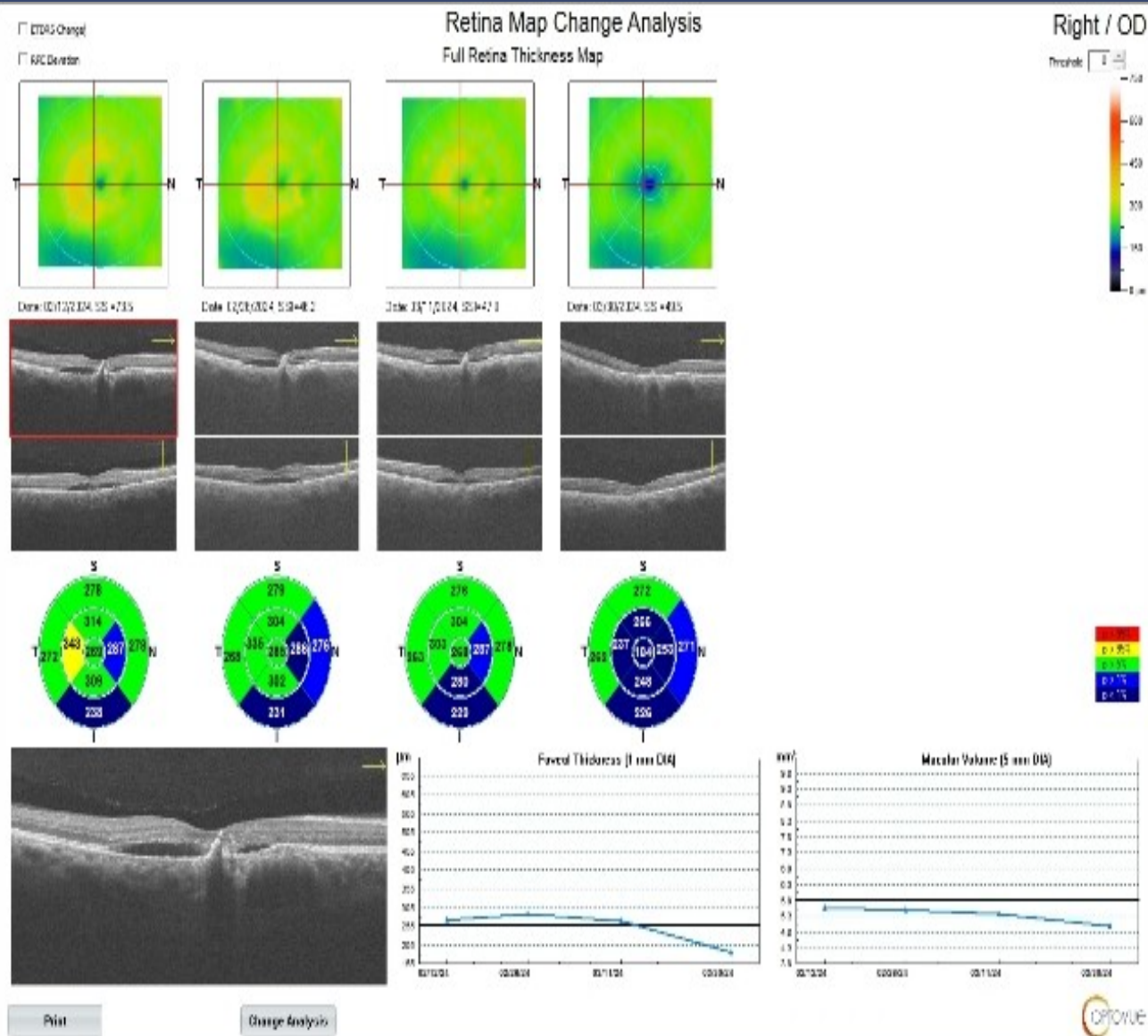
(BCVA of Rt Eye post laser 6/12)



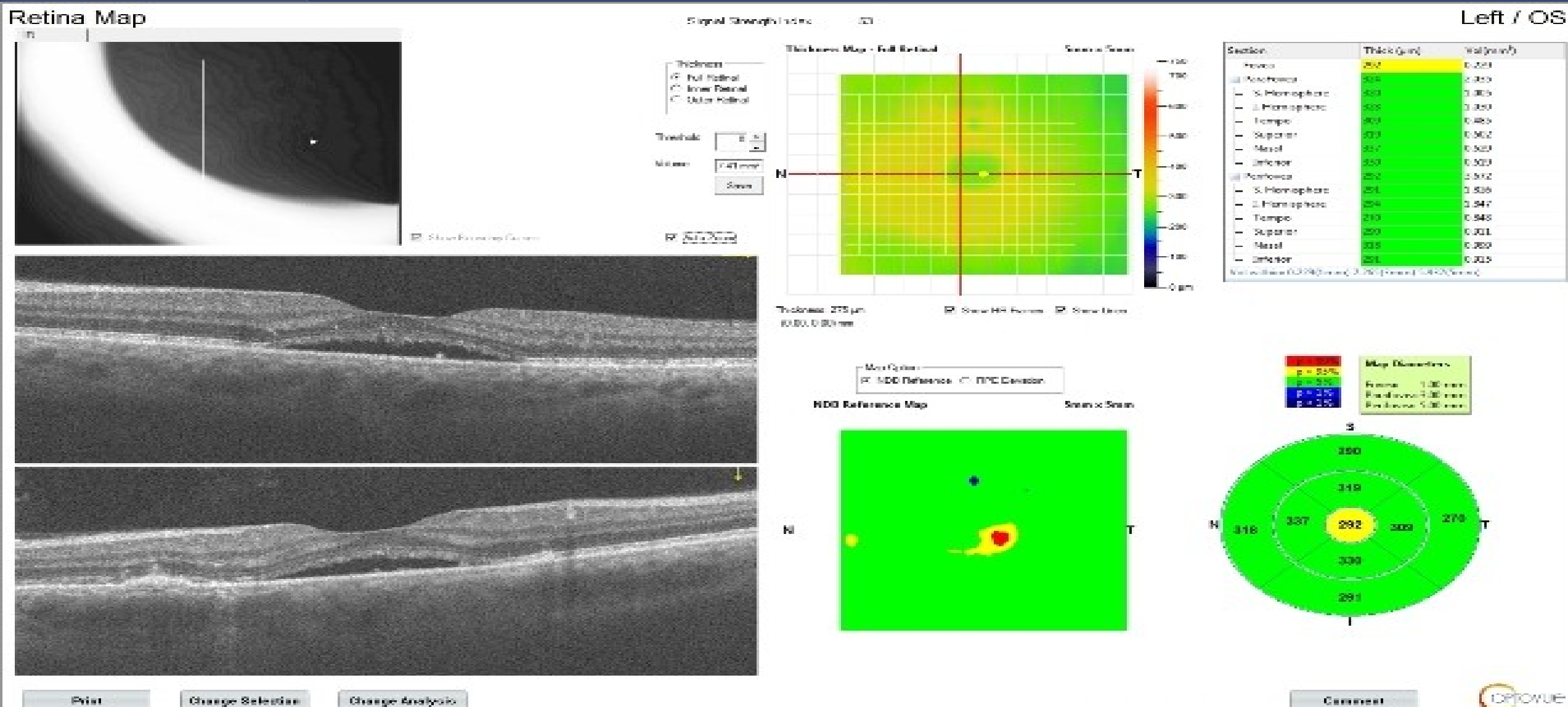
- **Case 4** : 56 male patient with diminution of vision of Rt Eye (BCVA of Rt Eye 6/36) chronic CSCR



(BCVA of Rt Eye post laser 6/18)



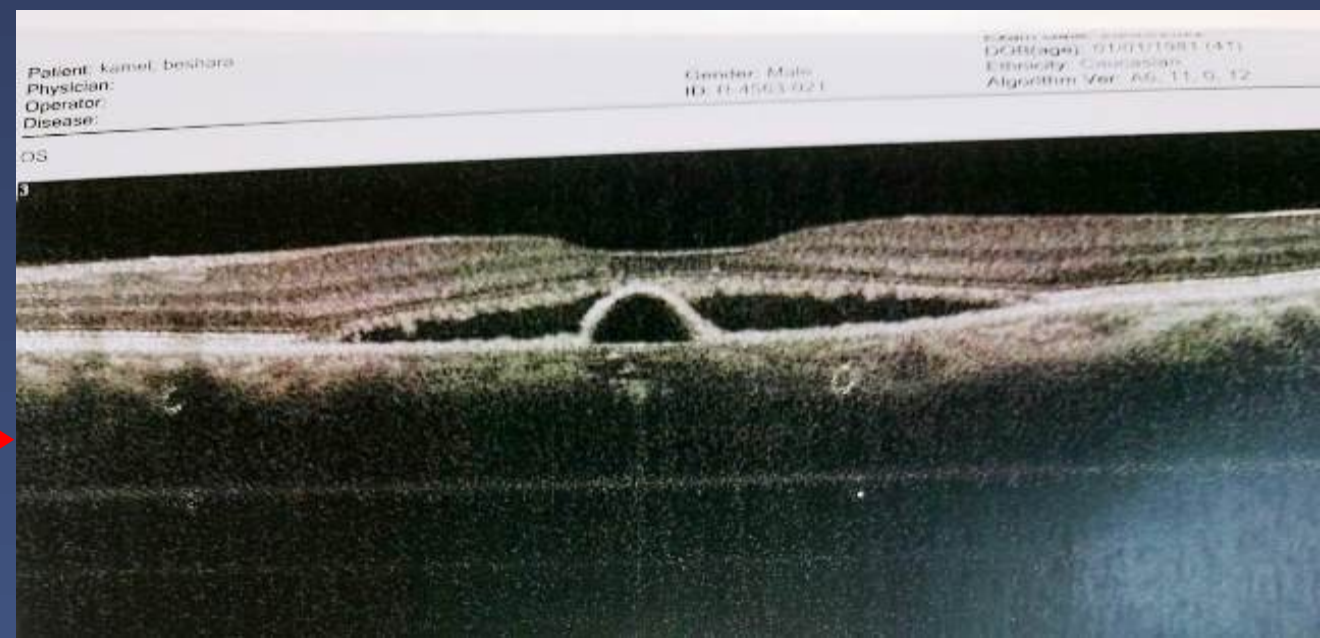
- **Case 5**: 52 female patient with diminution of vision of Lt Eye (BCVA of Lt Eye 6/18) early CSCR



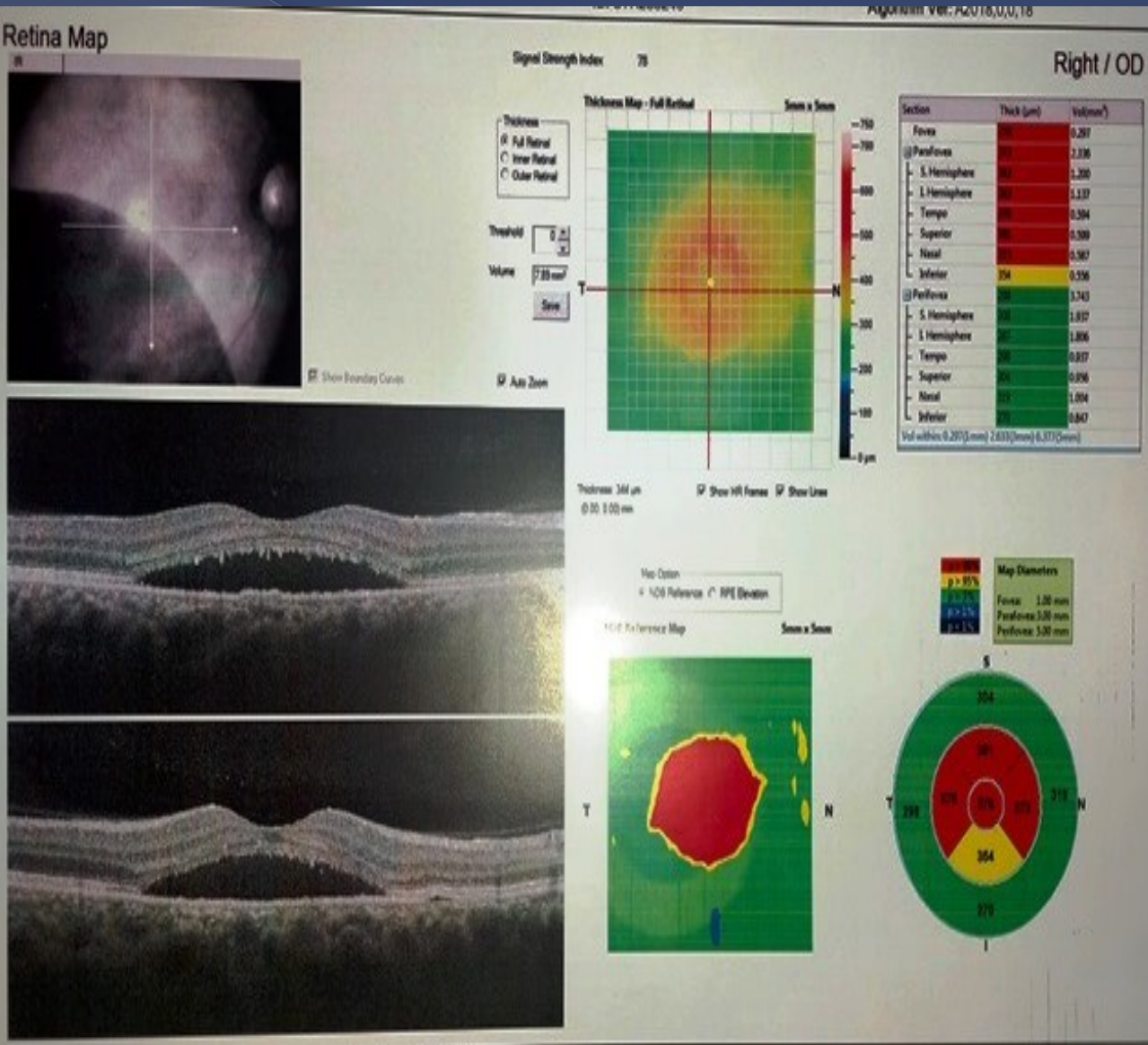
- *Why we should treat CSCR early ? We can wait*

42 years M patient with early CSCR, mild PED in Lt Eye
BCVA 6/18 advised by waiting without intervention

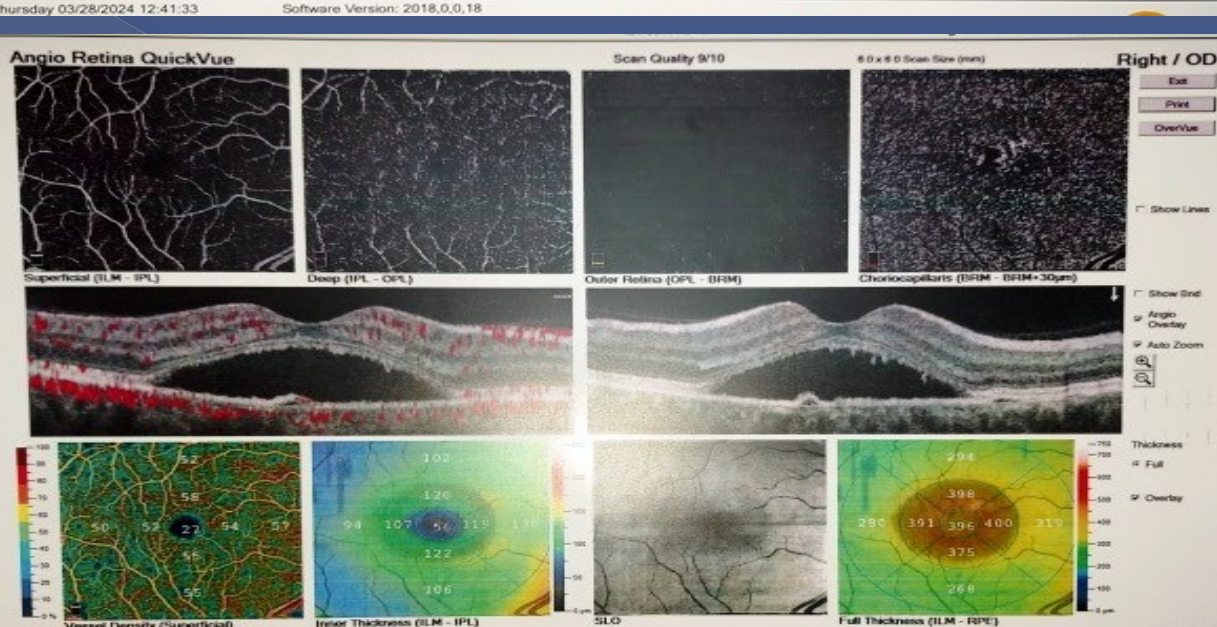
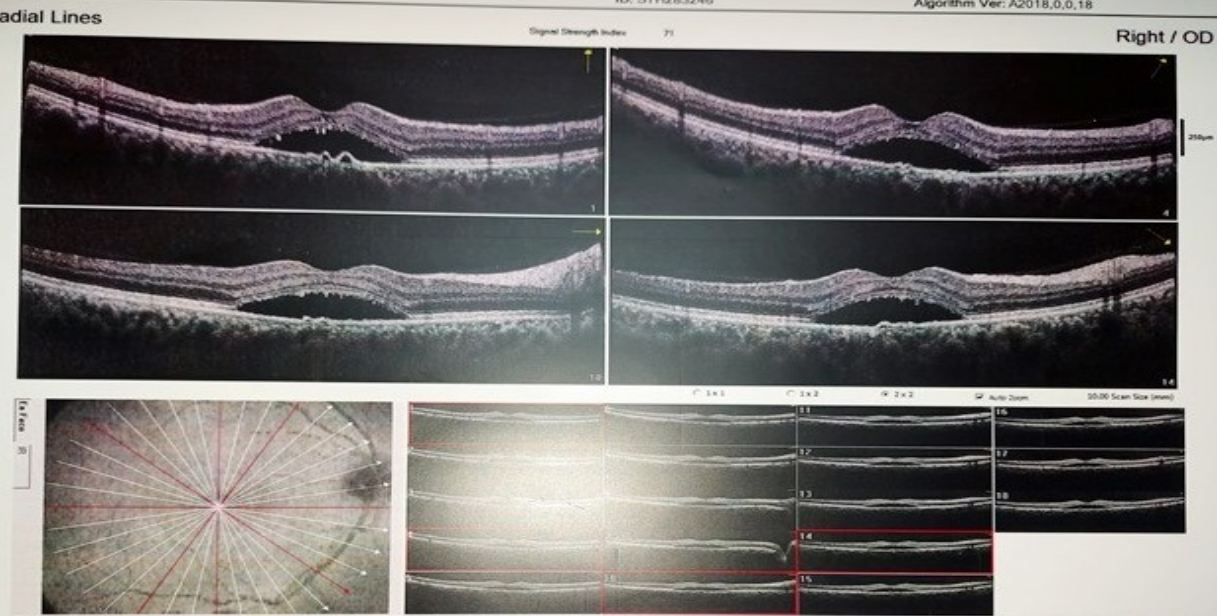
After 9 months of waiting changed to chronic CSCR, multiple PEDs, CNV type I (occult CNV)



Early mild CSCR

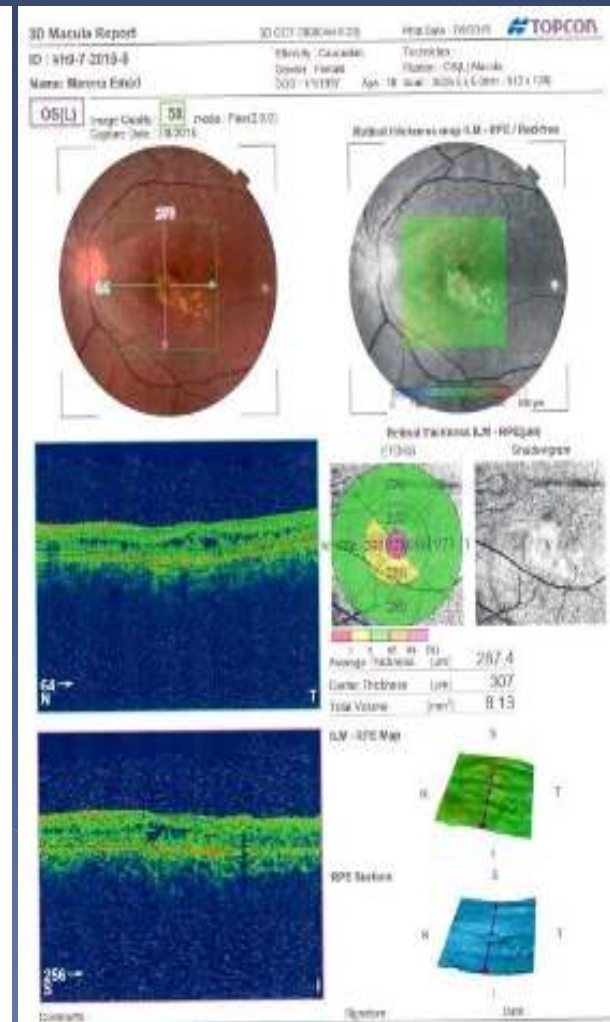
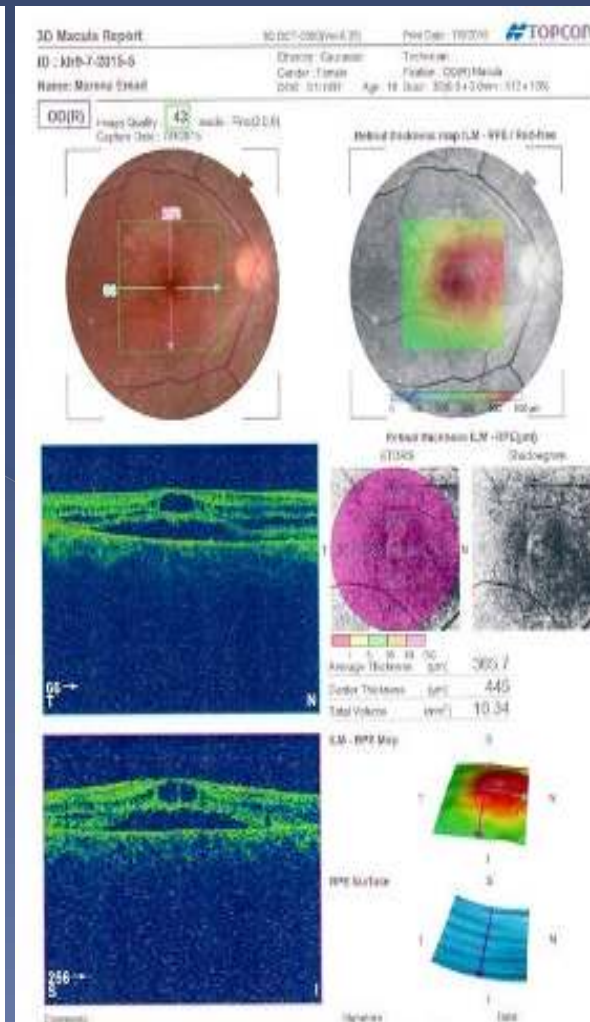
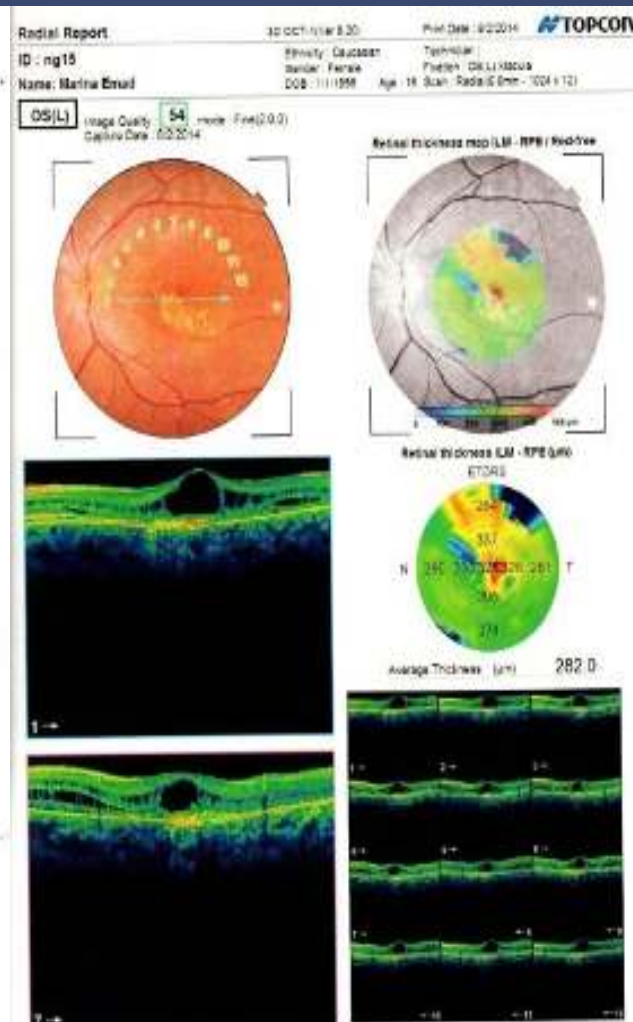
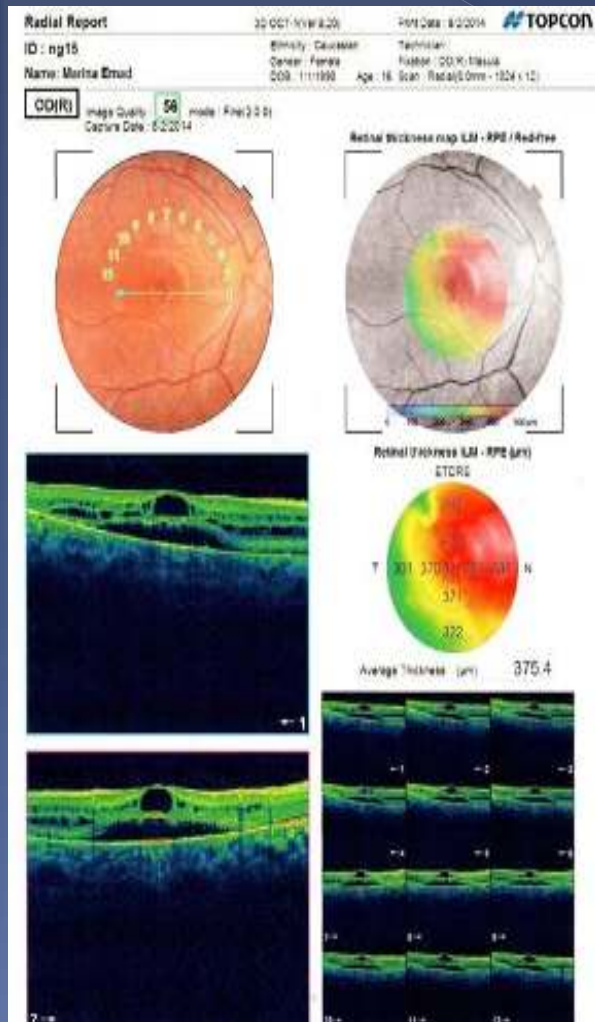


After 6 months of waiting without ttt changed to chronic CSCR, occult CNV



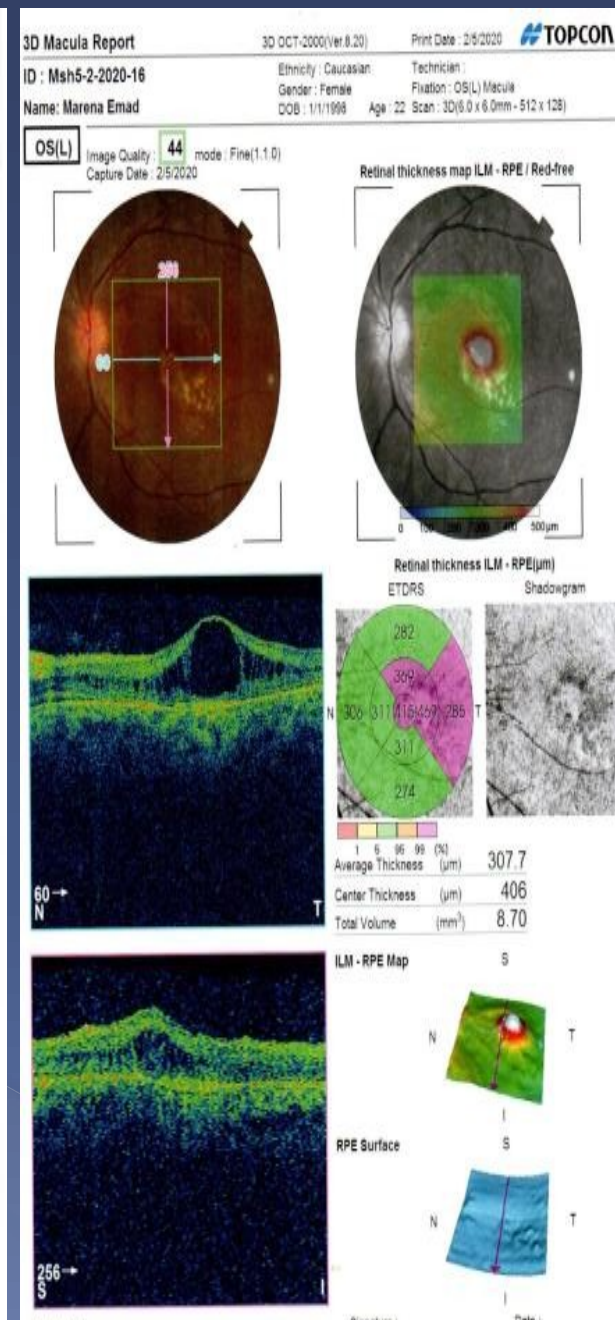
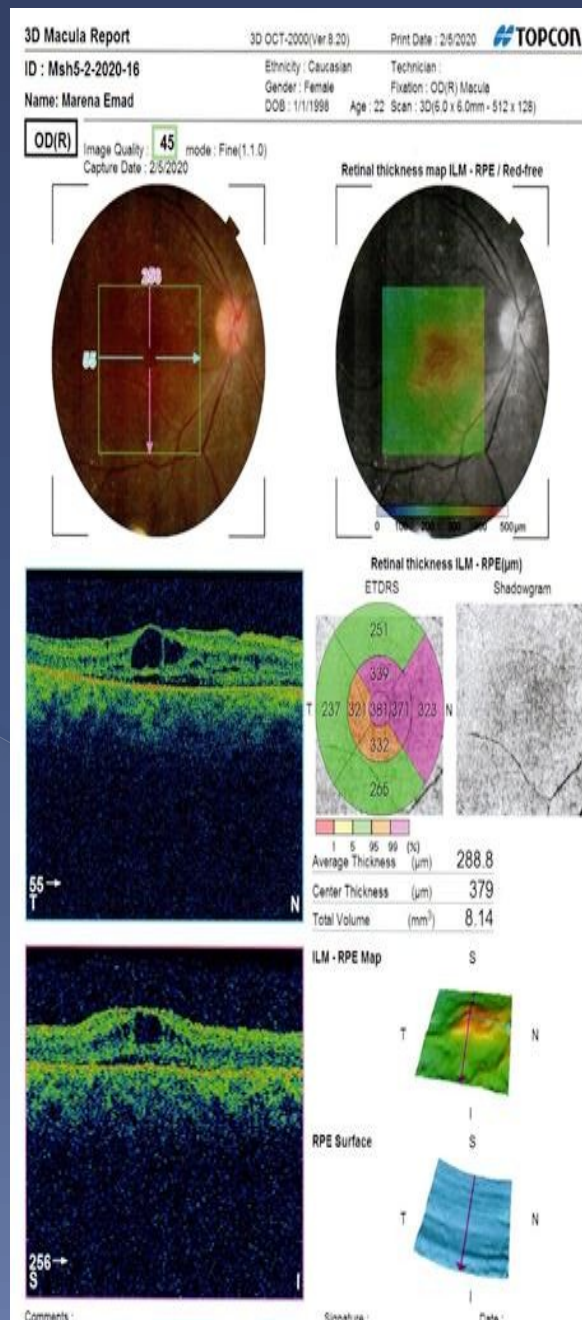
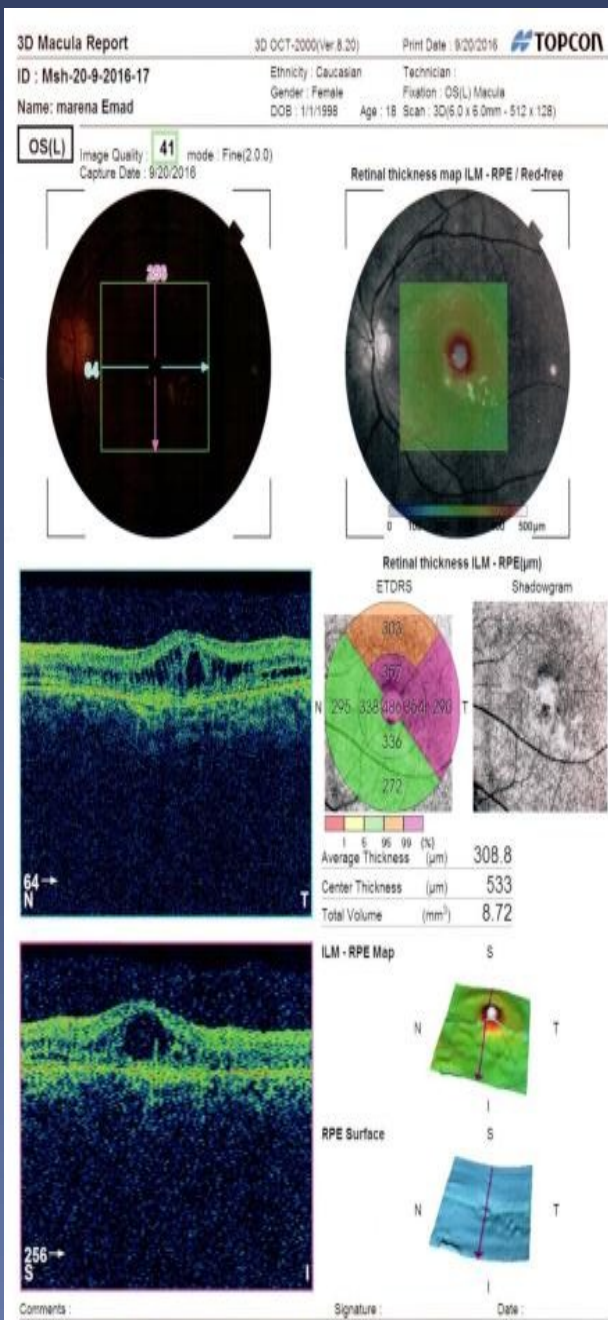
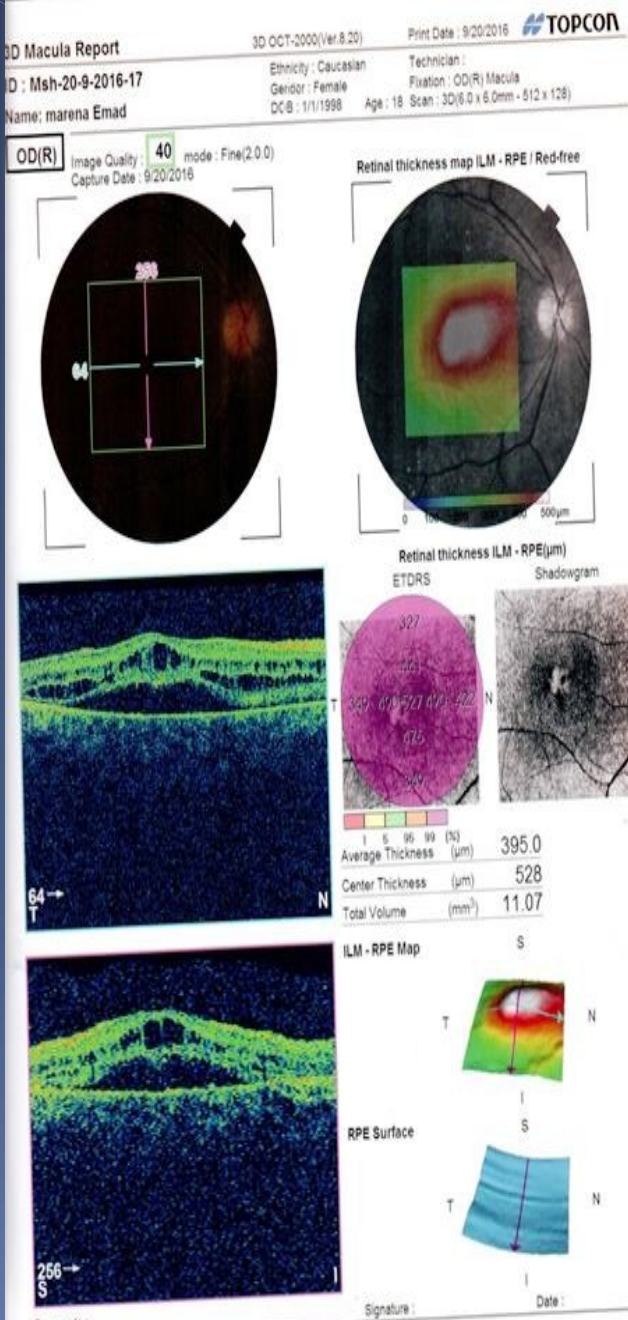
Dominant hereditary Foveo-schisis

○ **Case1** : 27 female patient with diminution of vision of both Eyes complaining since 2014



2014

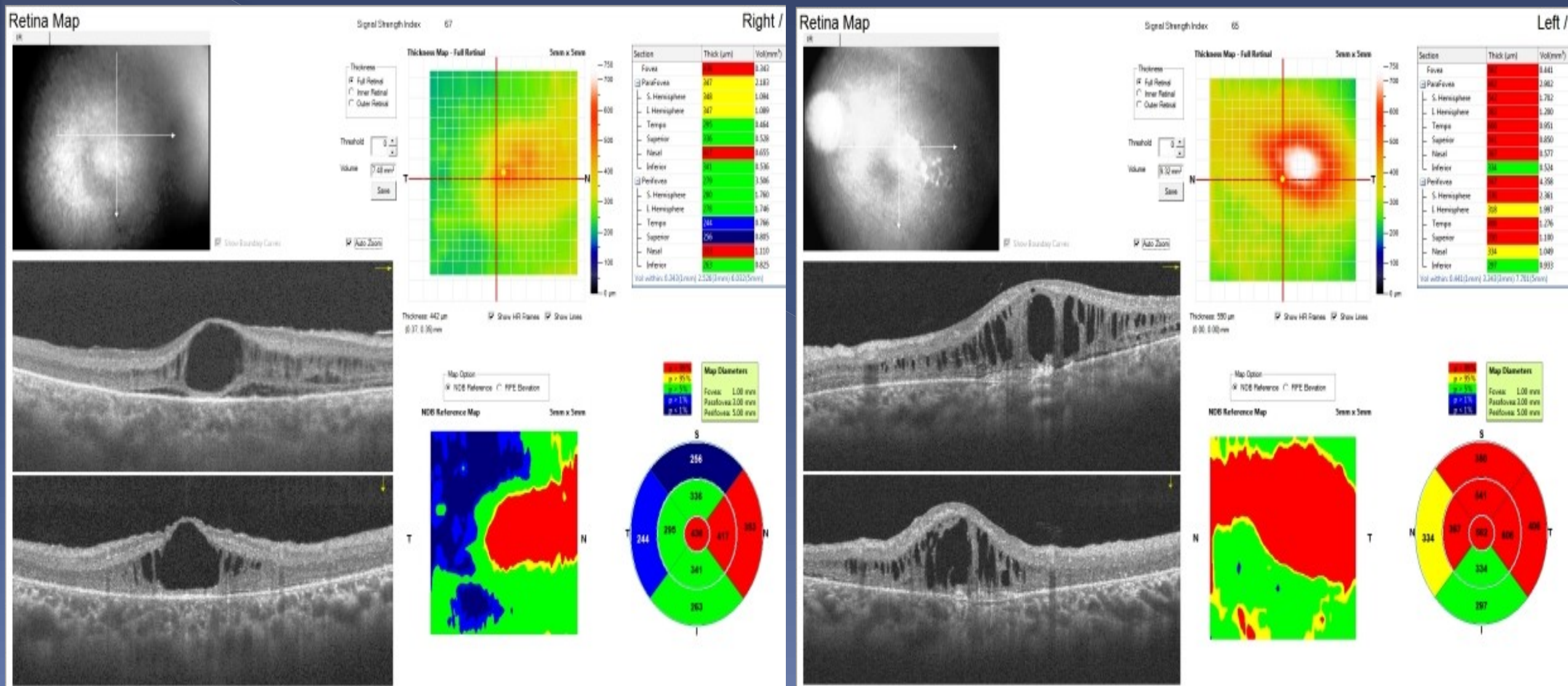
2015



2016

2020

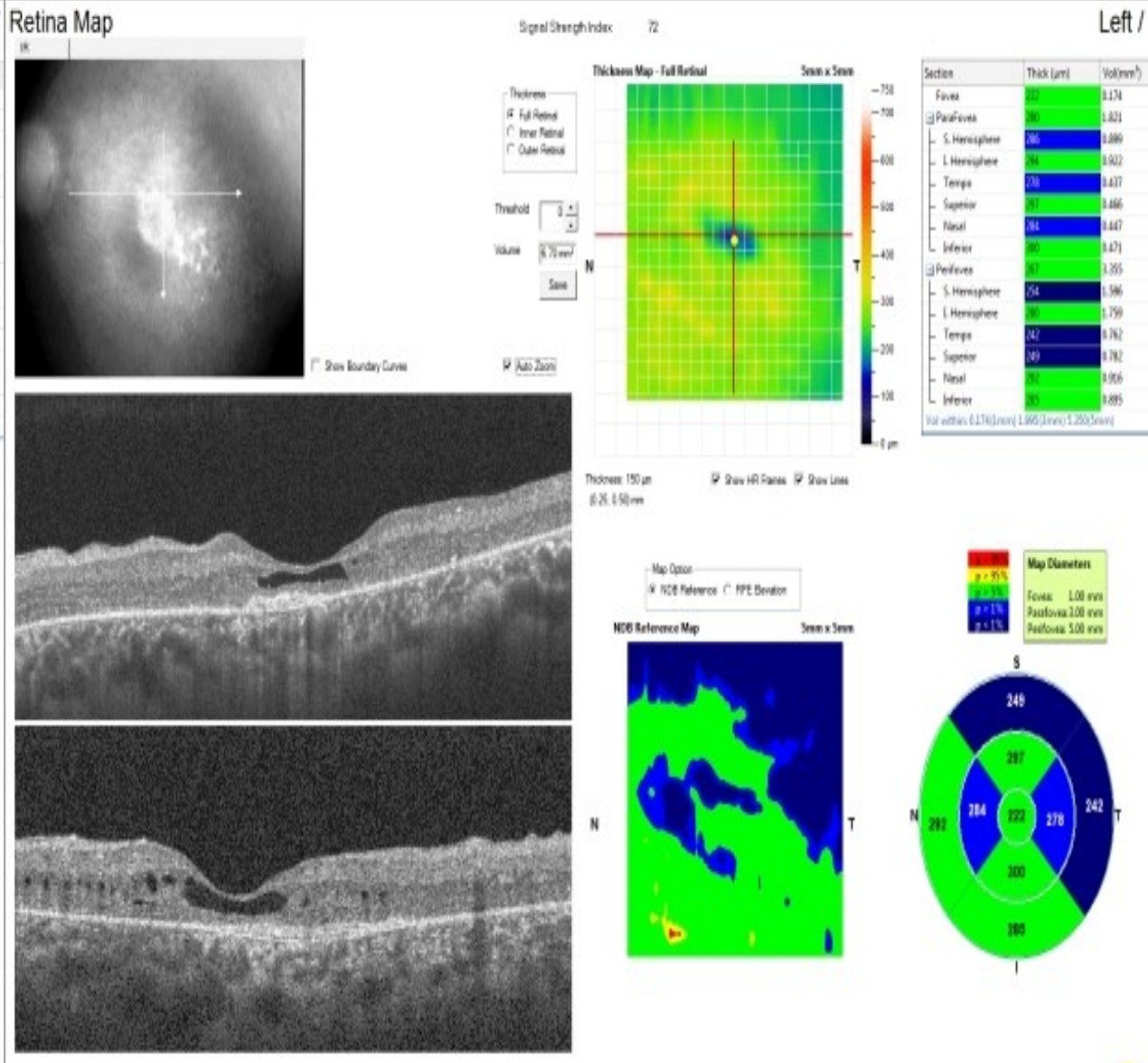
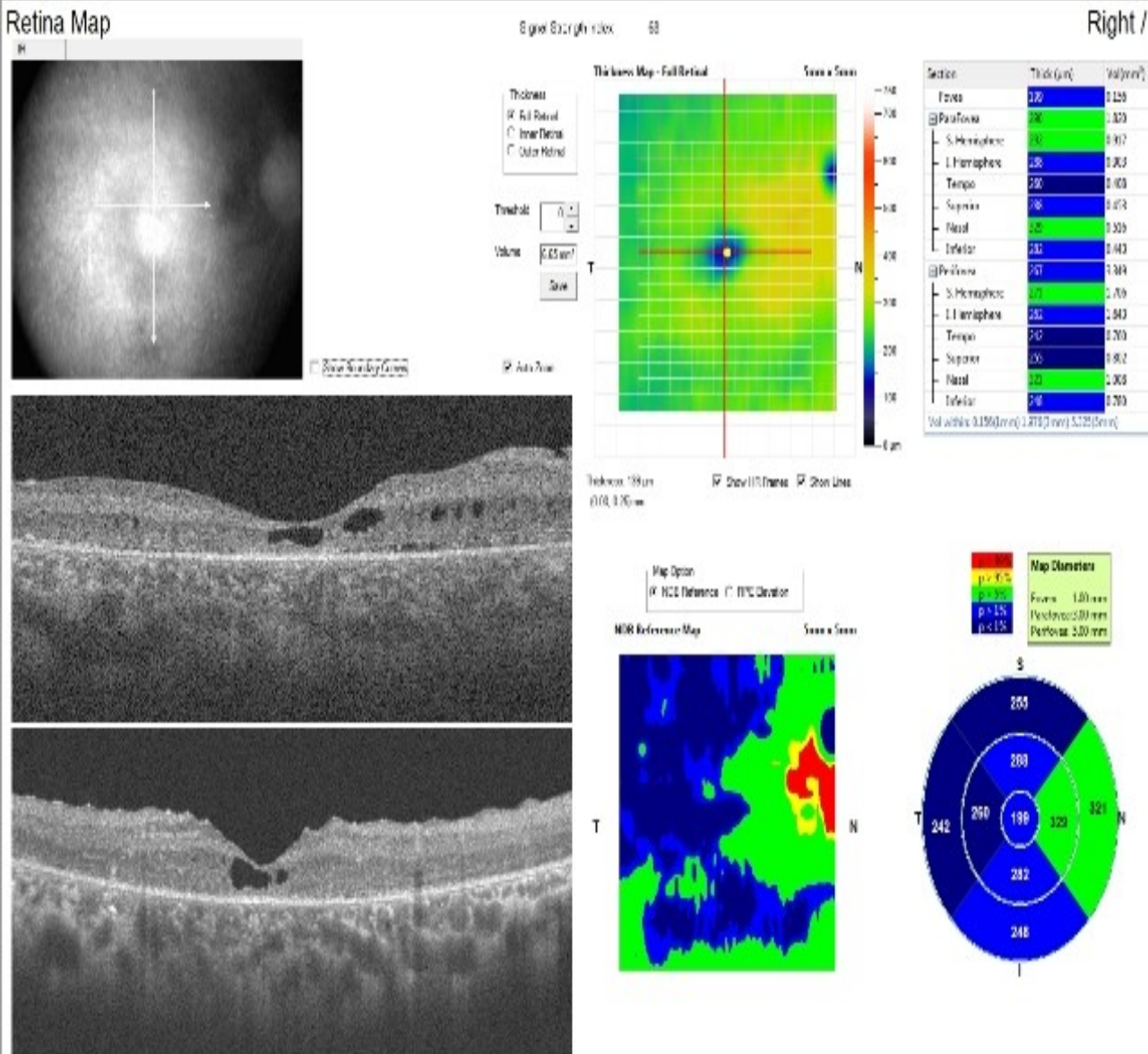
◎ **2023**: Pre ttt with 577 subliminal laser (BCVA of Rt Eye 5/60, Lt Eye 6/60)



2023

Six months post 577 subliminal laser

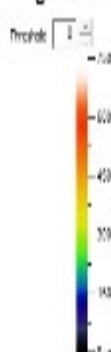
(BCVA of Rt Eye post laser 6/18, BCVA of Lt Eye 6/18)



Retina Map Change Analysis

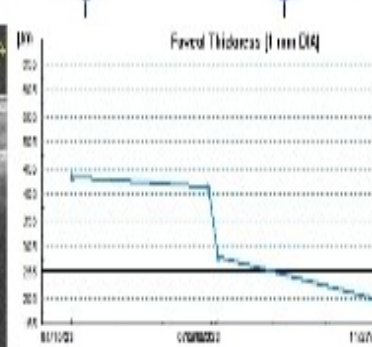
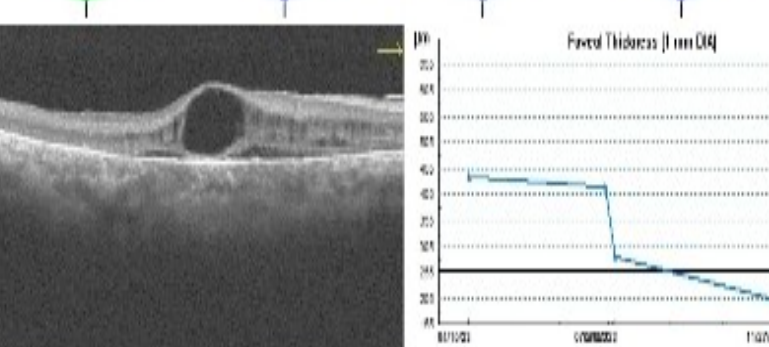
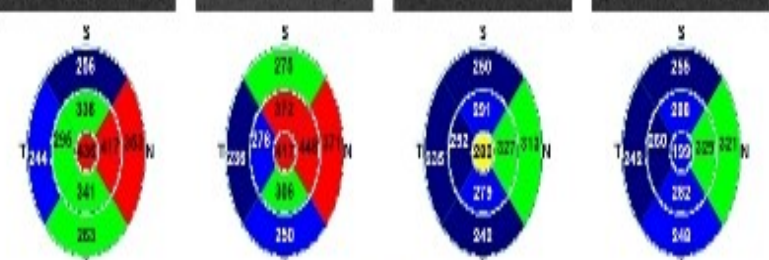
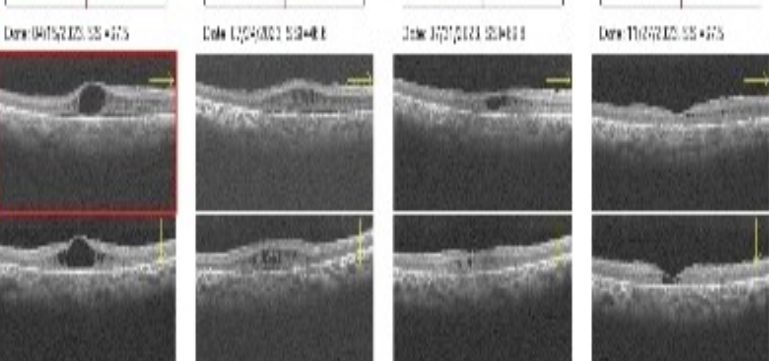
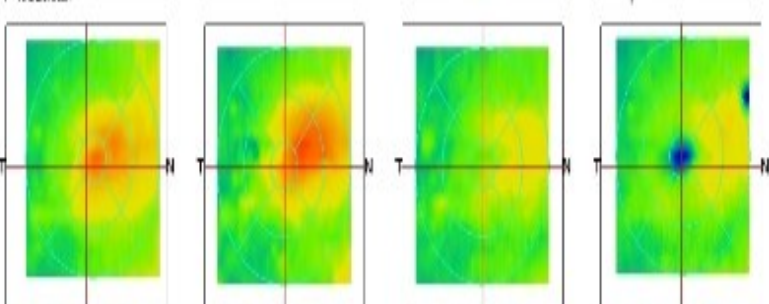
Full Retina Thickness Map

Right / OD



☐ DTAG Change

☐ RRC Deviation



Print

Change Analysis

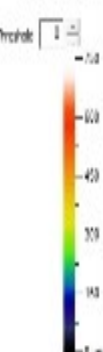
OU Report



Retina Map Change Analysis

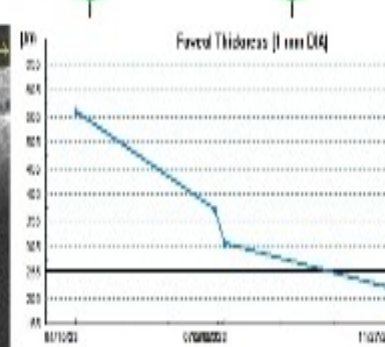
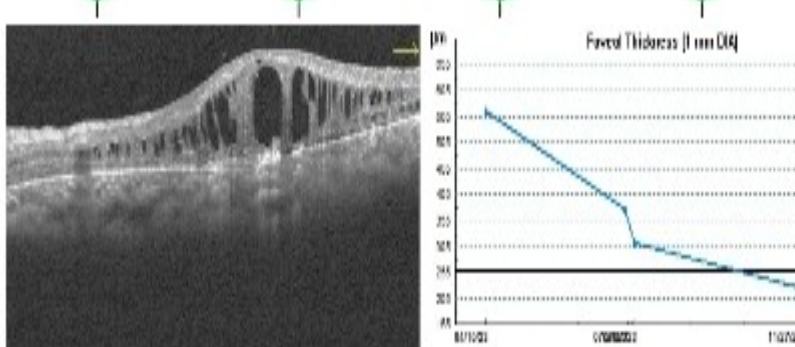
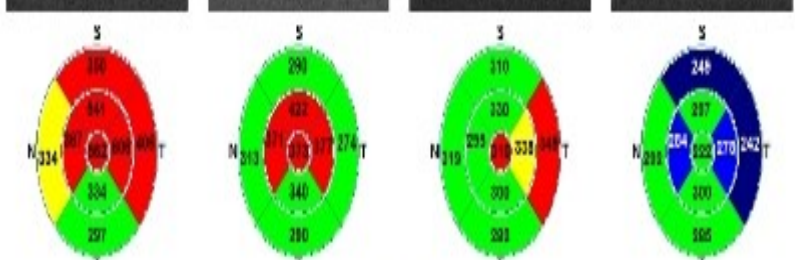
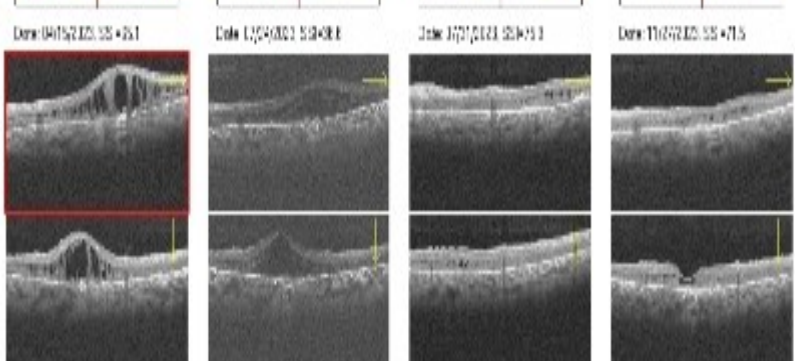
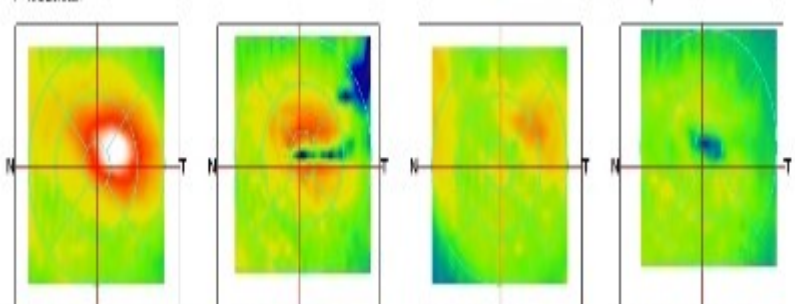
Full Retina Thickness Map

Left / OS



☐ DTAG Change

☐ RRC Deviation



Print

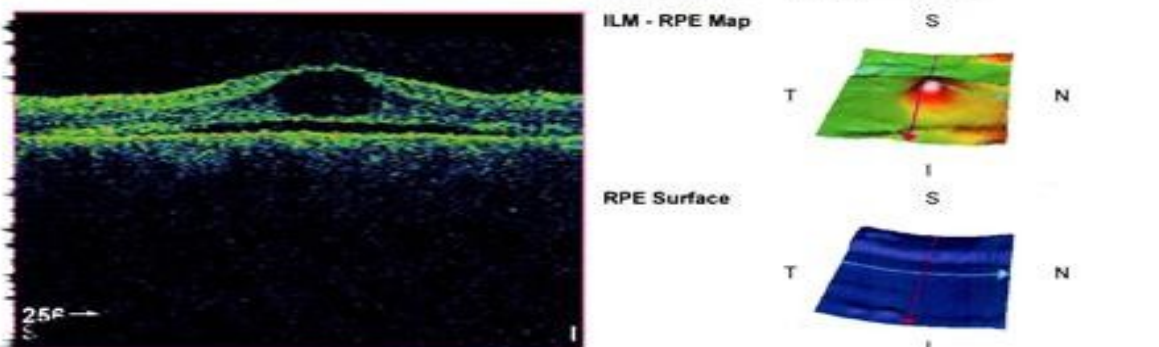
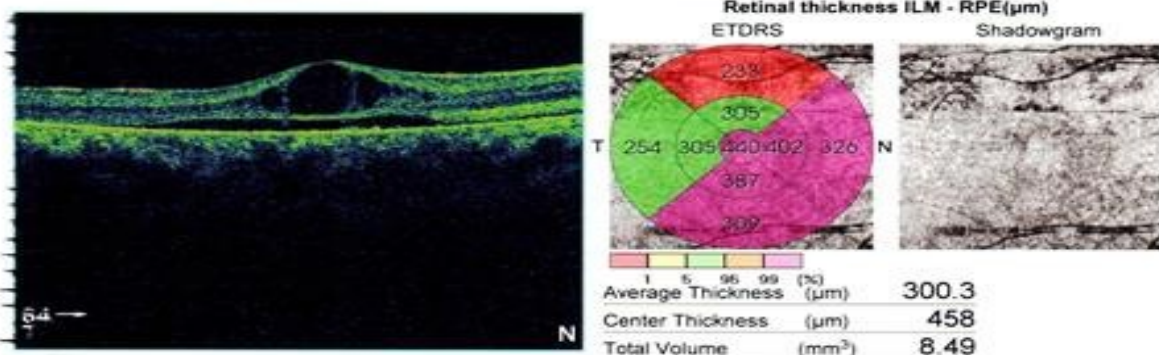
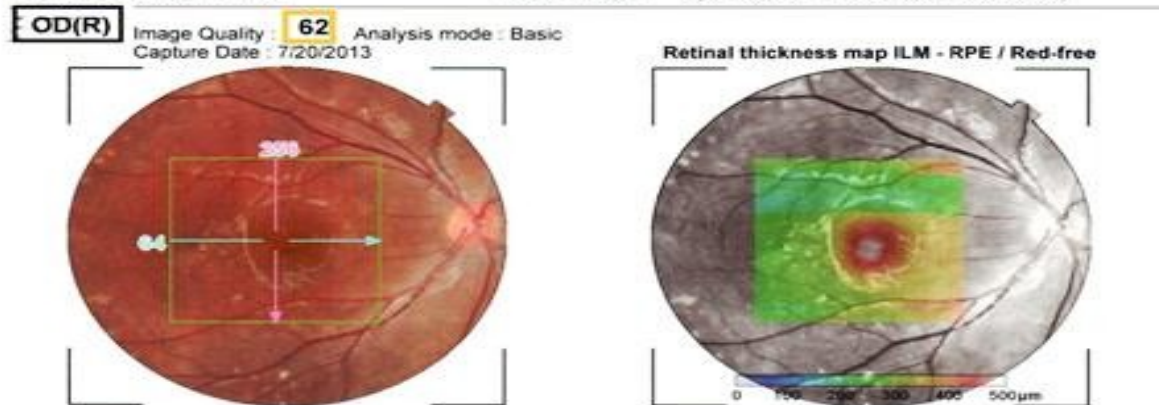
Change Analysis

OU Report

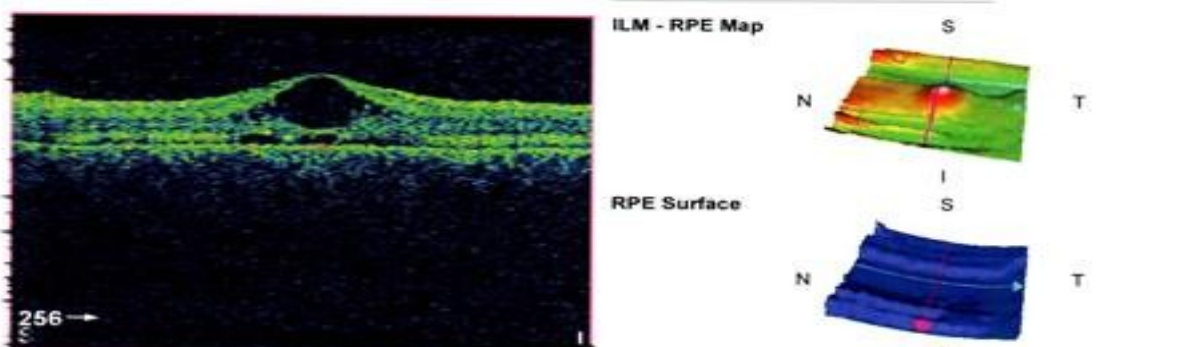
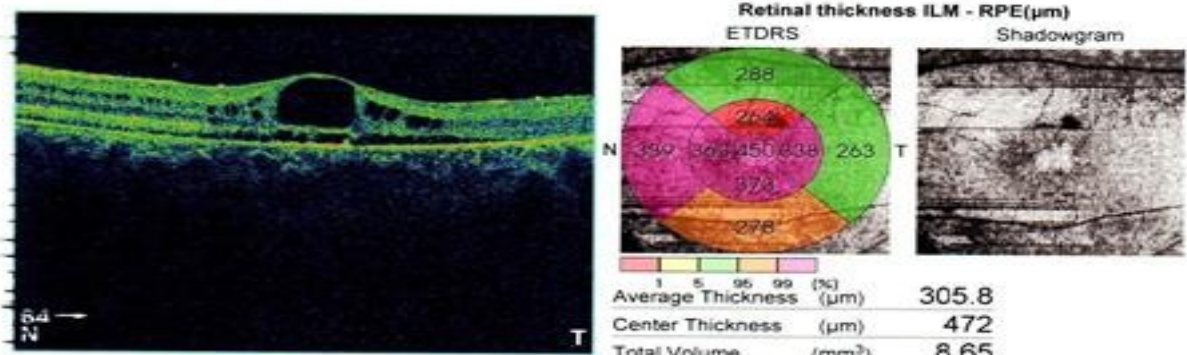
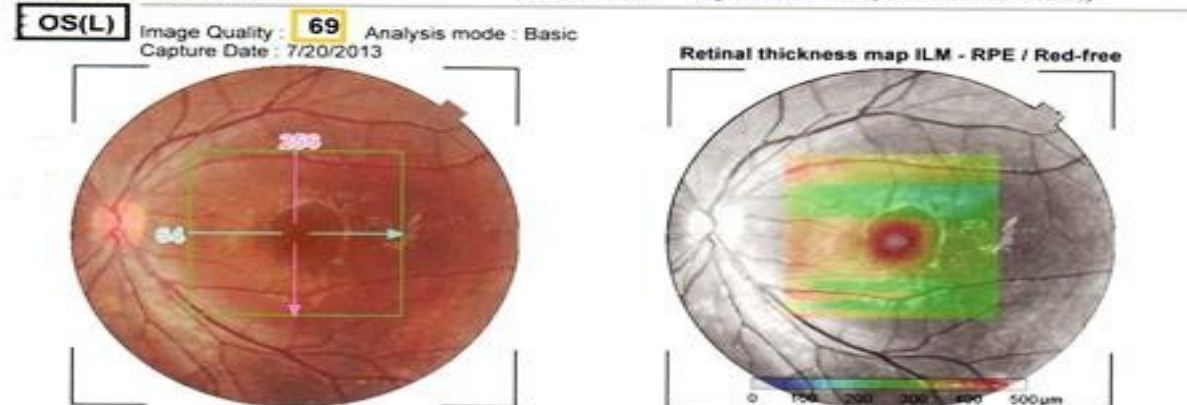


○ **Case 2** : 25 female patient with diminution of vision of both Eyes (**BCVA of Rt Eye 5/60, Lt Eye 6/60**)

ID : 20720131
 Name: Remondah Emad
 Ethnicity :
 Gender : Female
 DOB : 1/1/1998
 Technician :
 Fixation : OD(R) Macula
 Age : 15
 Scan : 3D(6.0 x 6.0mm - 512 x 128)

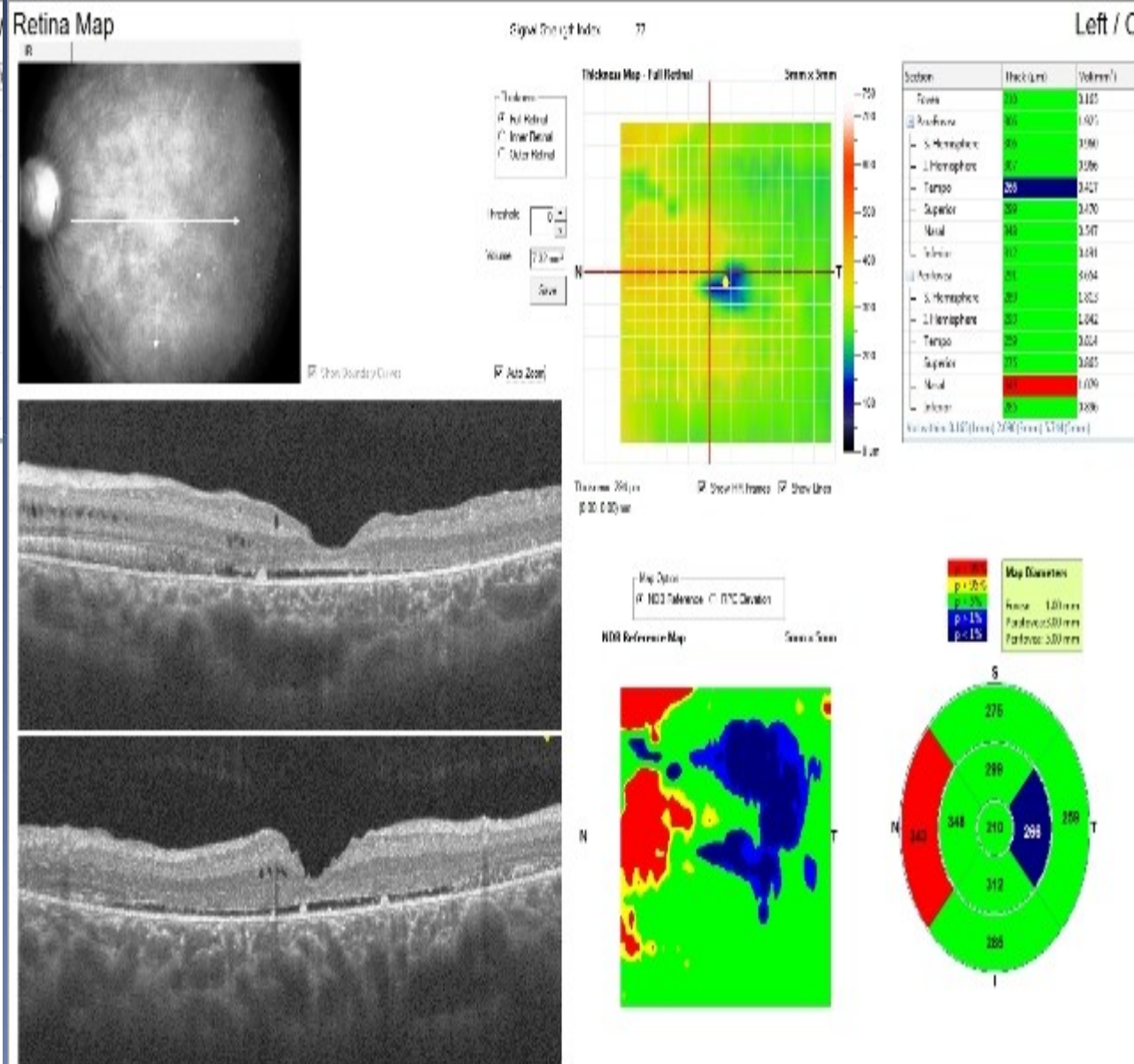
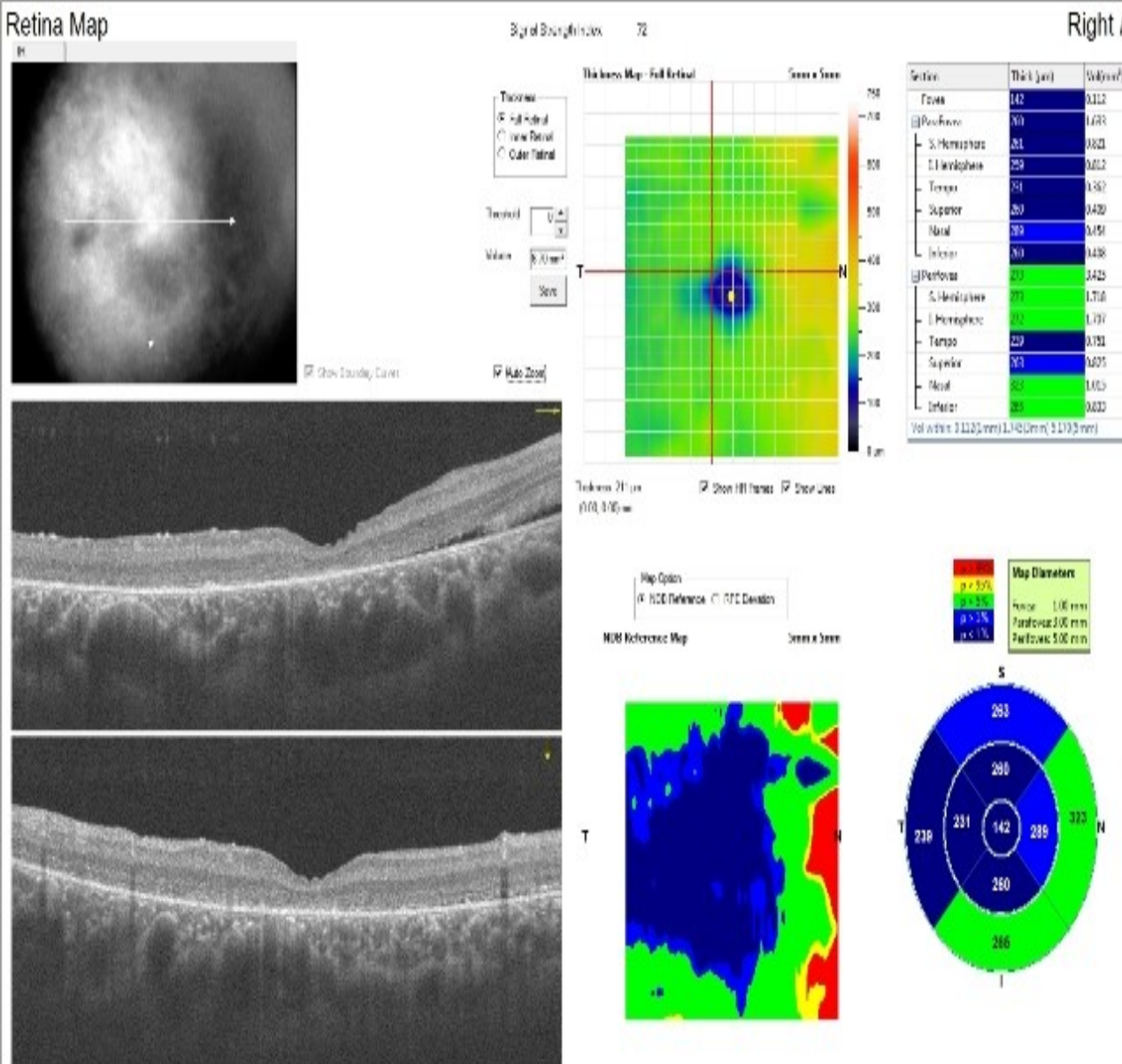


ID : 20720131
 Name: Remondah Emad
 Ethnicity :
 Gender : Female
 DOB : 1/1/1998
 Technician :
 Fixation : OS(L) Macula
 Age : 15
 Scan : 3D(6.0 x 6.0mm - 512 x 128)



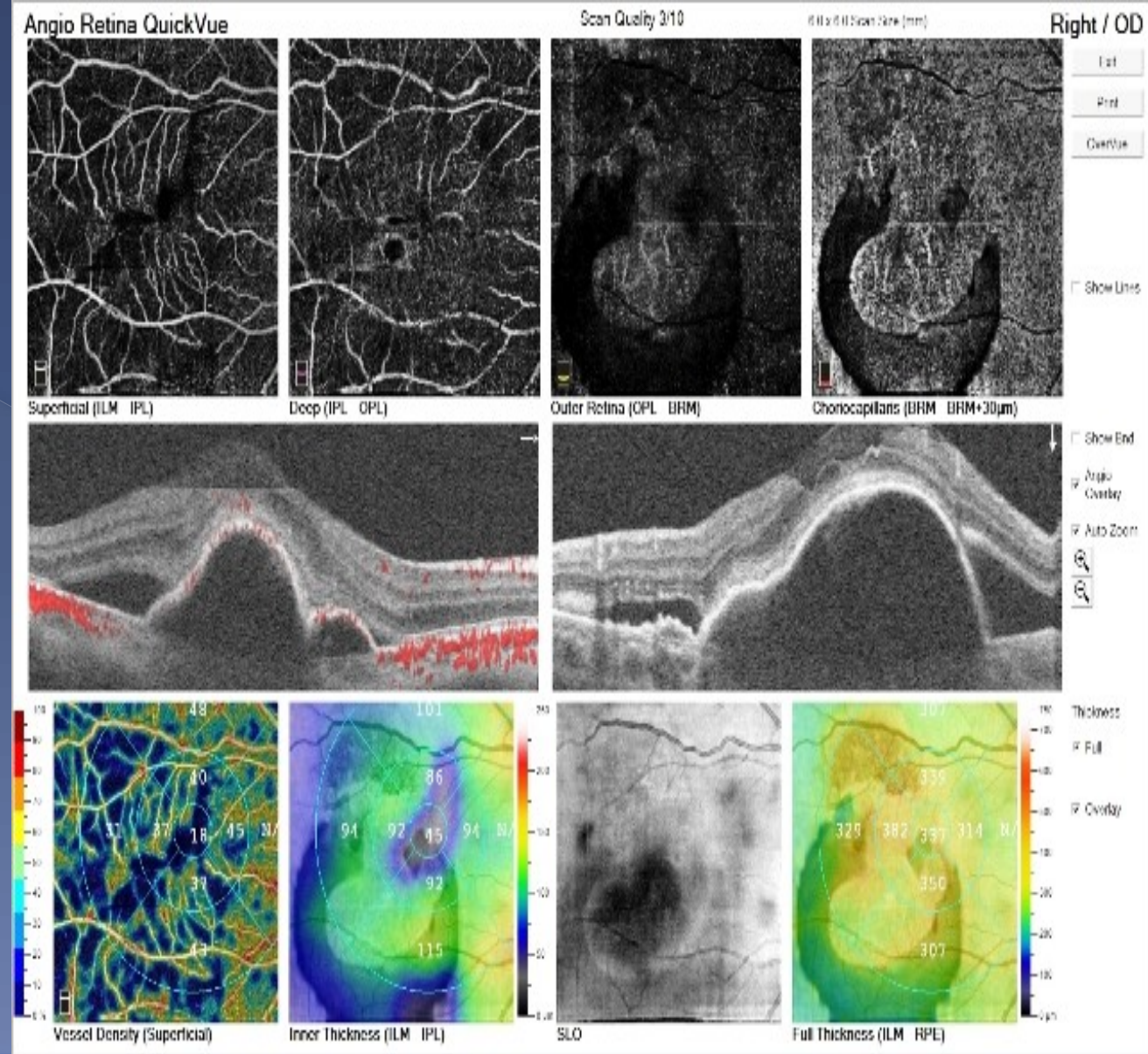
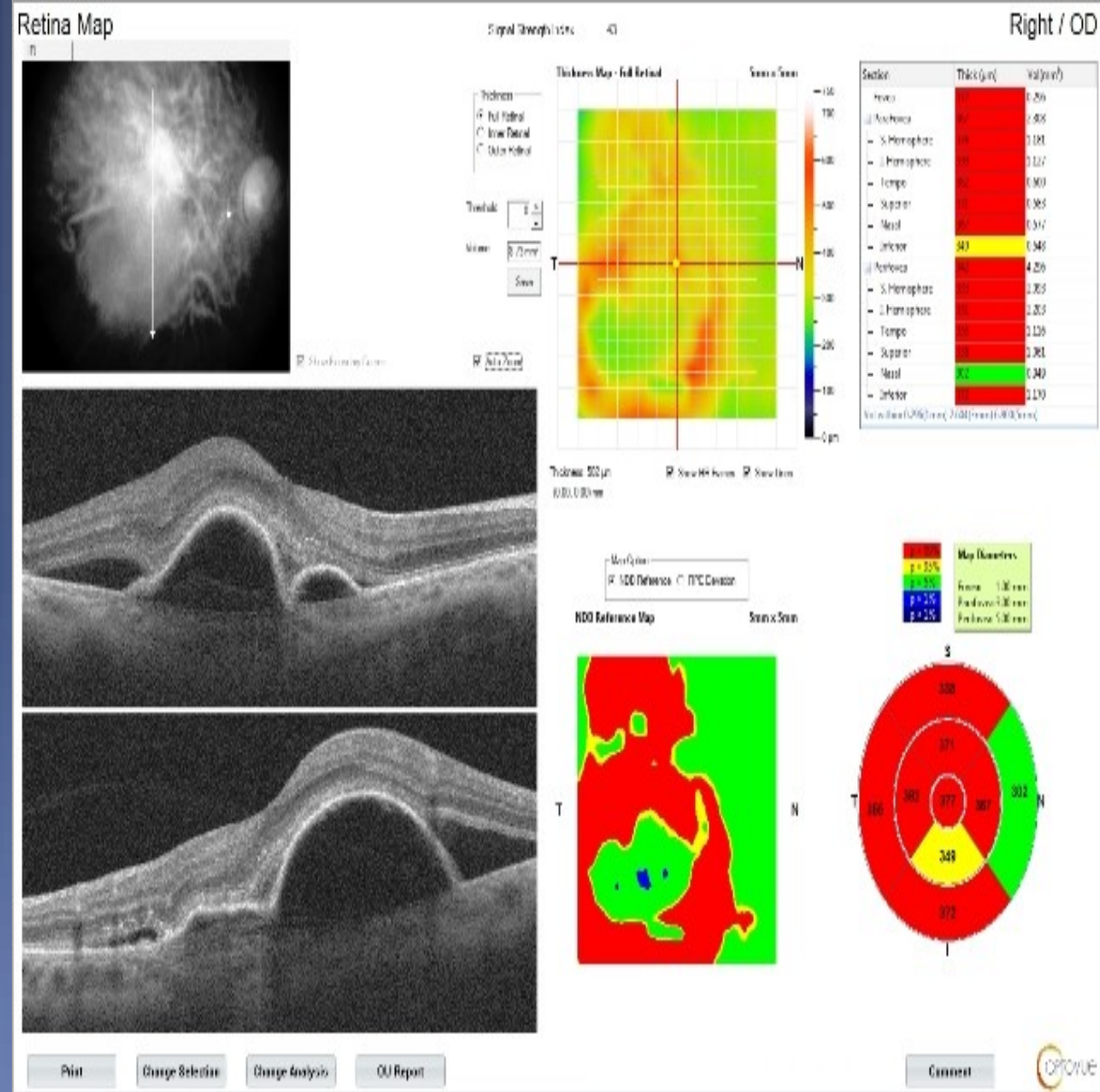
Six months post 577 subliminal laser

(BCVA of Rt Eye post laser 6/18, BCVA of Lt Eye 6/18)



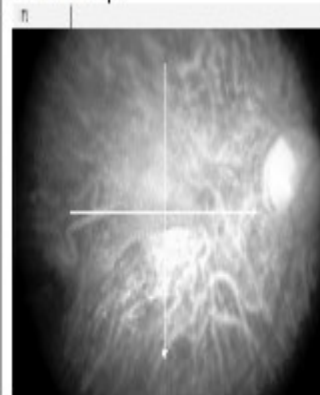
PCV

- (BCVA of Rt Eye 5/60 pre laser ttt)



Six months post 577 laser ttt (BCVA of Rt Eye 6/18)

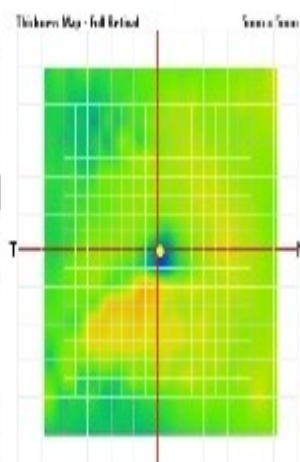
Retina Map



Signal Strength: 100%

Right / OD

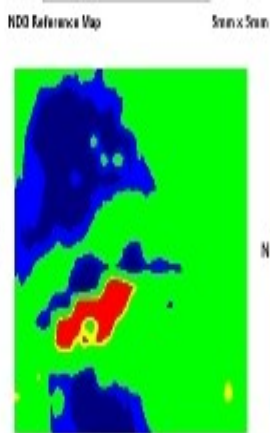
Thickness
☒ Full Retinal
☐ Inner Retinal
☐ Outer Retinal
☐ Choroid
 Threshold: 10.0
 Area: 8.5 mm²
 Save



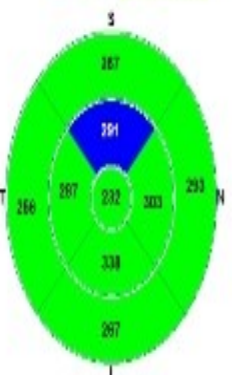
Section	Thick (µm)	Vol (mm³)
Neuro	52.1	0.125
Inner	45.1	0.103
S. Photoreceptor	25.1	0.054
Outer	25.1	0.054
Tempo	25.1	0.054
Superior	25.1	0.054
Medial	25.1	0.054
Inferior	25.1	0.054
Choroid	25.1	0.054
S. Photoreceptor	25.1	0.054
Outer	25.1	0.054
Tempo	25.1	0.054
Superior	25.1	0.054
Medial	25.1	0.054
Inferior	25.1	0.054

Thickness: 172 µm
 1.000, 0.000 mm

Max Q: 100
☒ NDO Reference
☐ NTC Control



Map Diameter
 p = 25%
 p = 50%
 p = 75%
 p = 100%
 Area: 1.00 mm²
 Perimeter: 1.00 mm
 Perimeter: 1.00 mm

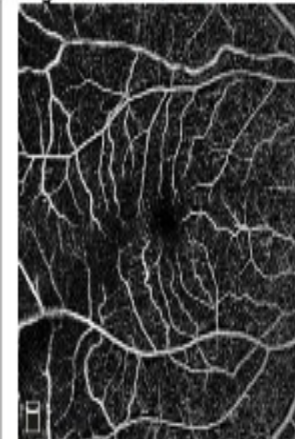


Angio Retina QuickVue

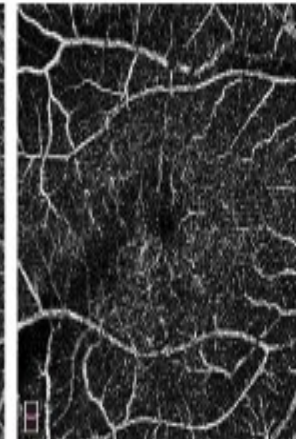
Scan Quality: 8/10

6.0 x 6.0 Scan Area (mm)

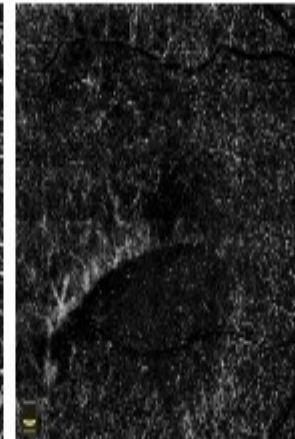
Right / OD



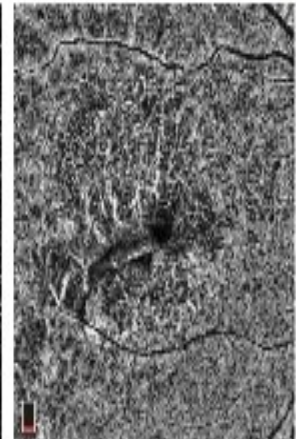
Superficial (ILM - IPL)



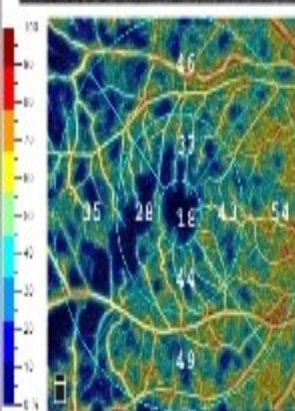
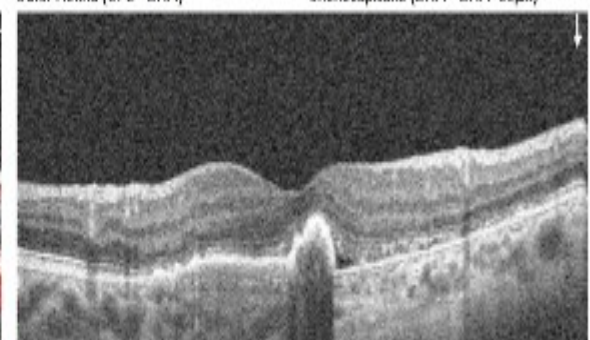
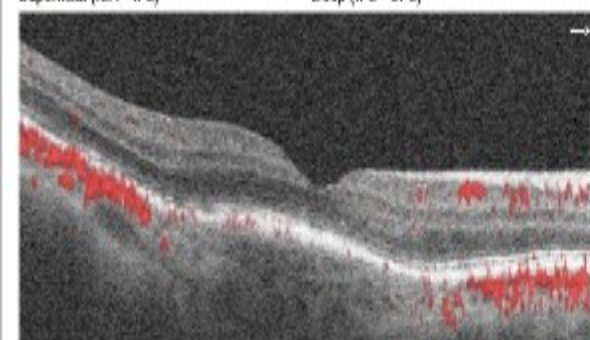
Deep (IPL - OPL)



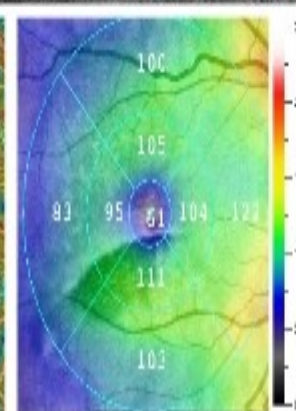
Outer Retina (OPL - BRM)



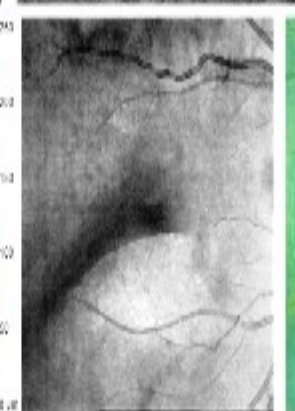
Chorocapillaries (BRM - BRM+30µm)



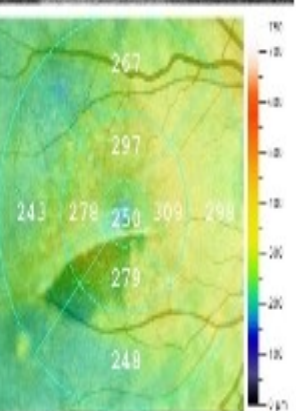
Vessel Density (Superficial)



Inner Thickness (ILM - IPL)



SLO



Full Thickness (ILM - RPE)

Print

Change Selection

Change Analysis

OU Report

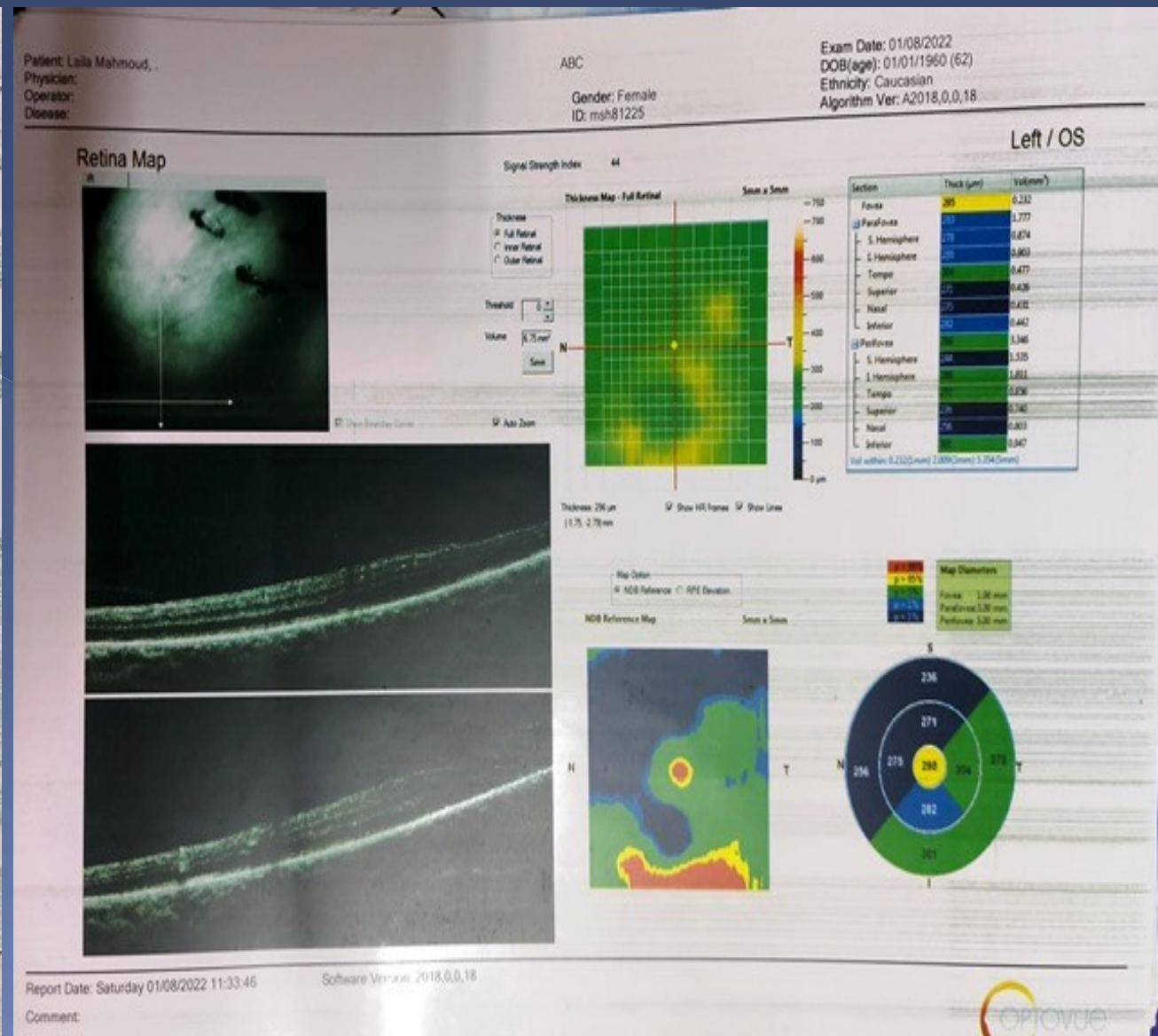
Comment



***Macular pucker, Center involved
macular edema, lamellar pseudo
macular hole, idiopathic complete
macular hole***

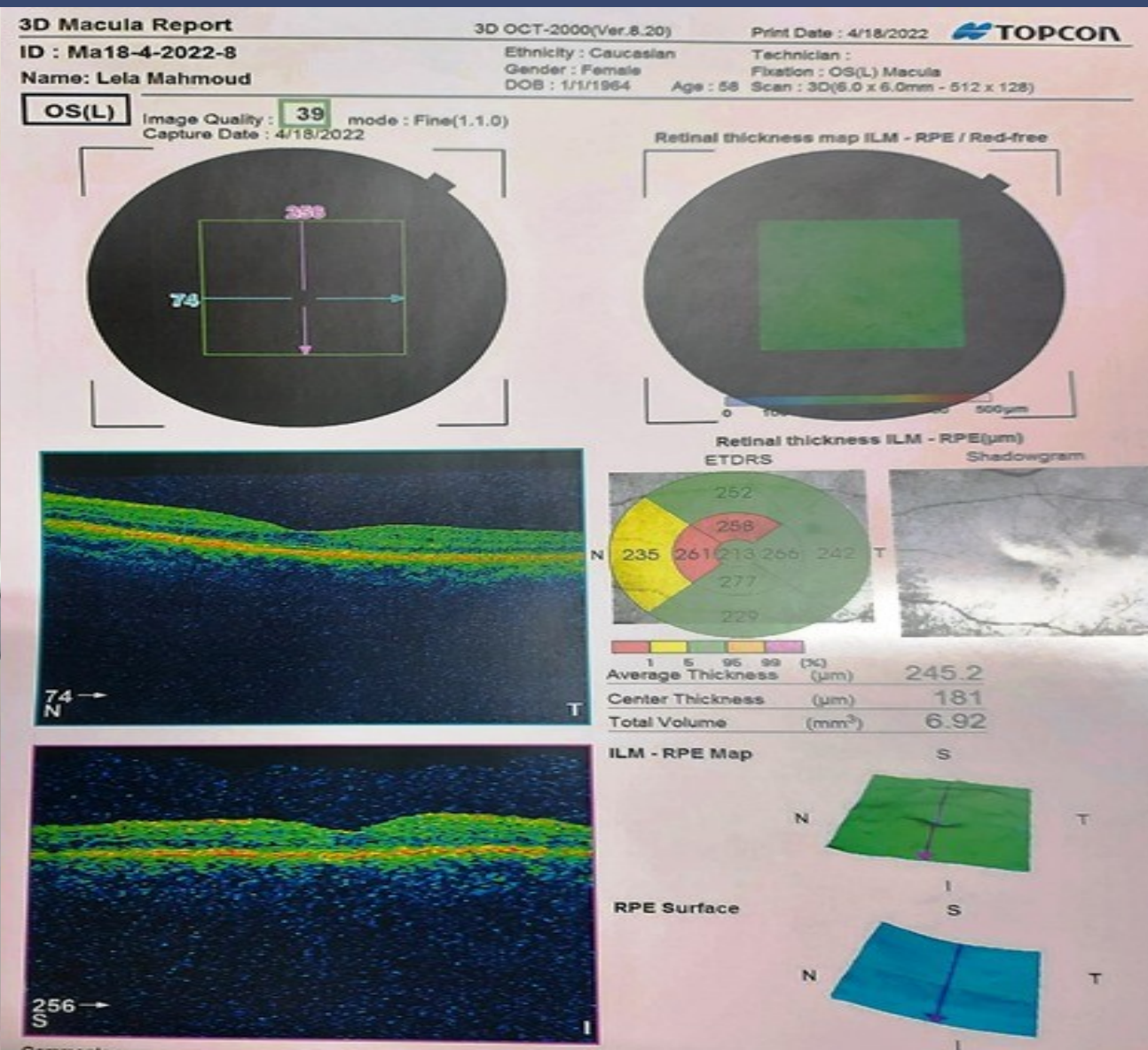
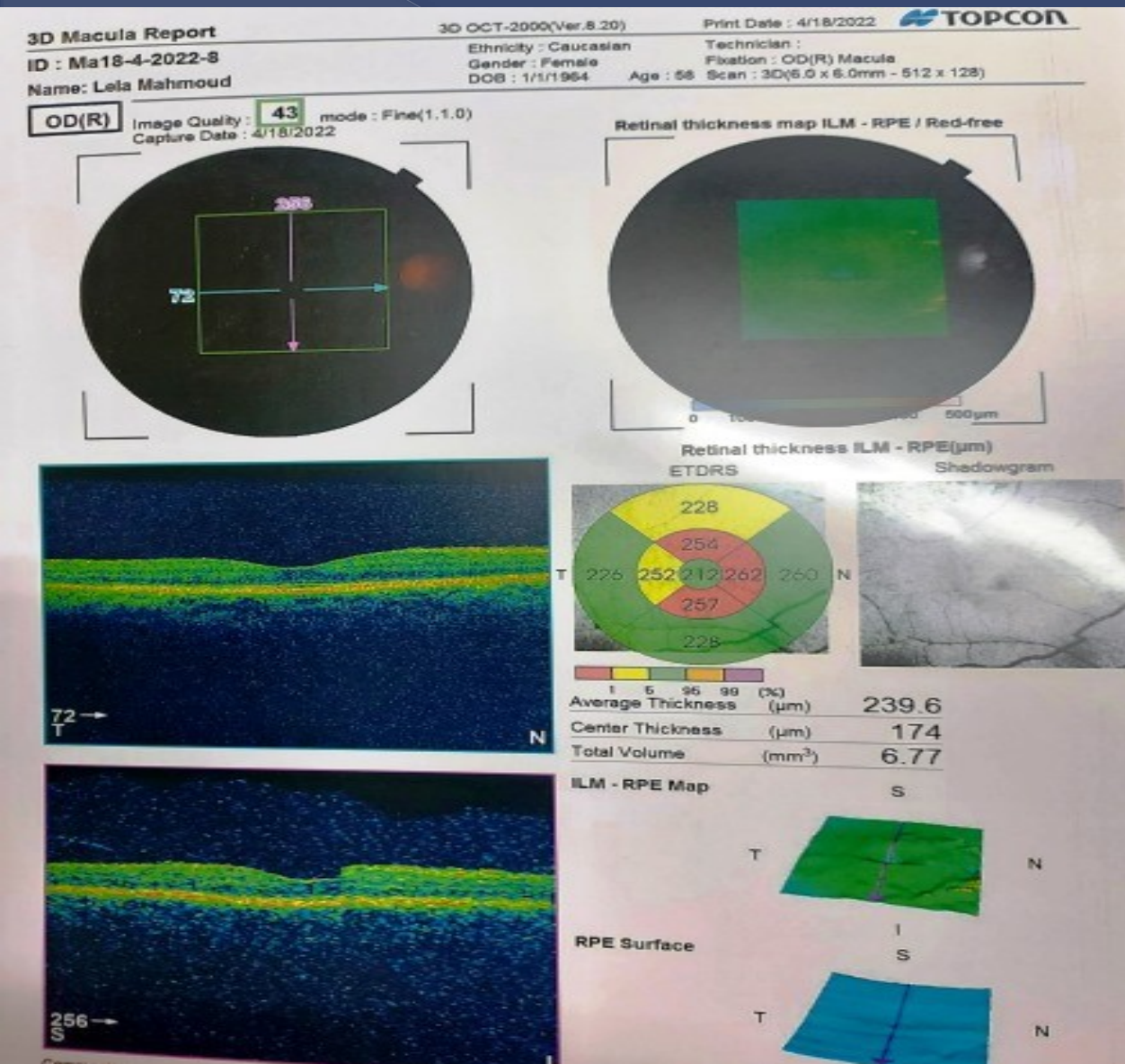
(BCVA of Lt Eye 6/24 pre laser ttt)

(BCVA of Rt Eye 6/36 pre laser ttt)



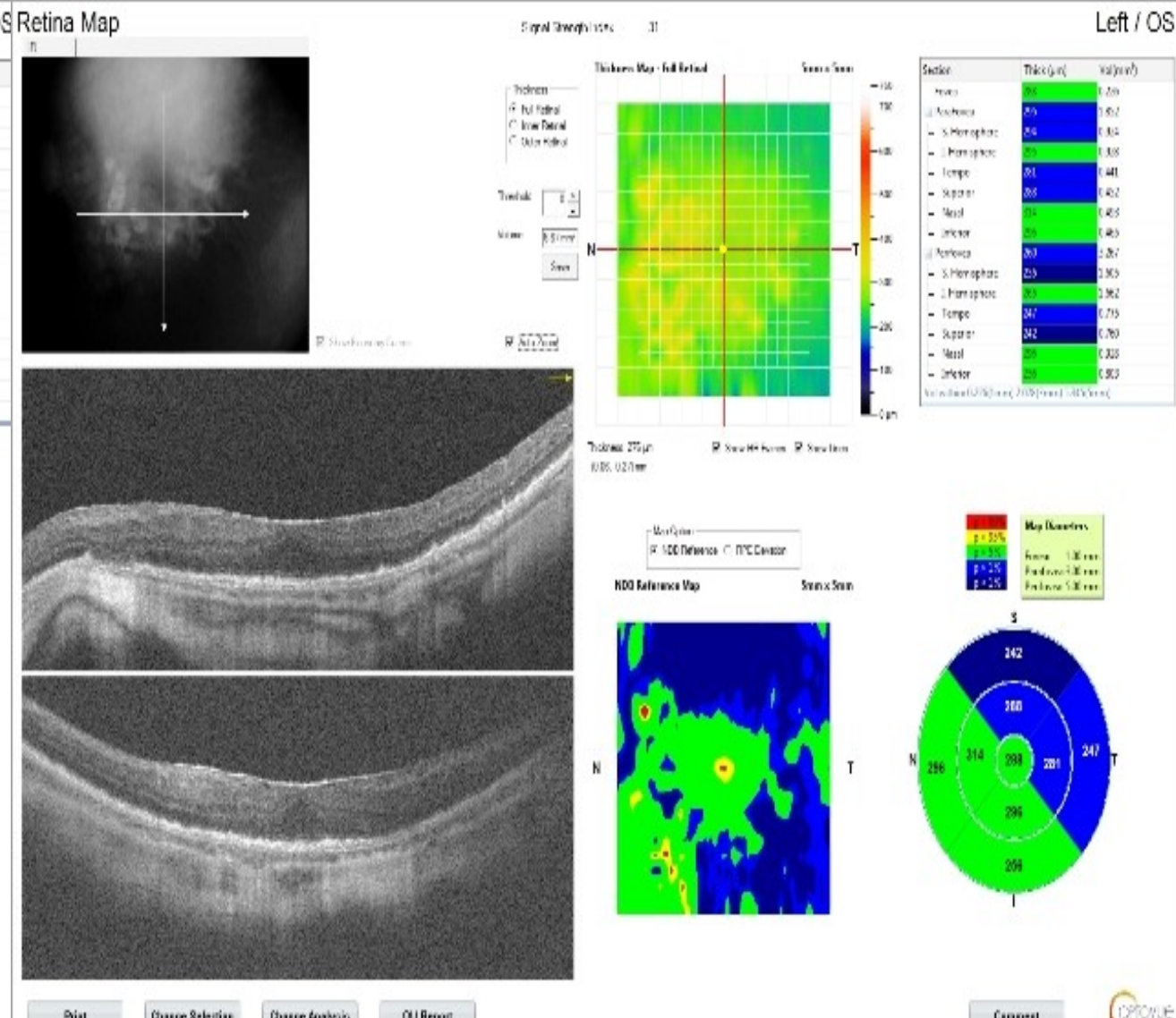
Three months post 577 subliminal laser (BCVA of Rt Eye post laser 6/12)

(BCVA of Lt Eye post laser 6/12)



(BCVA of Lt Eye 6/12 2months post laser ttt)

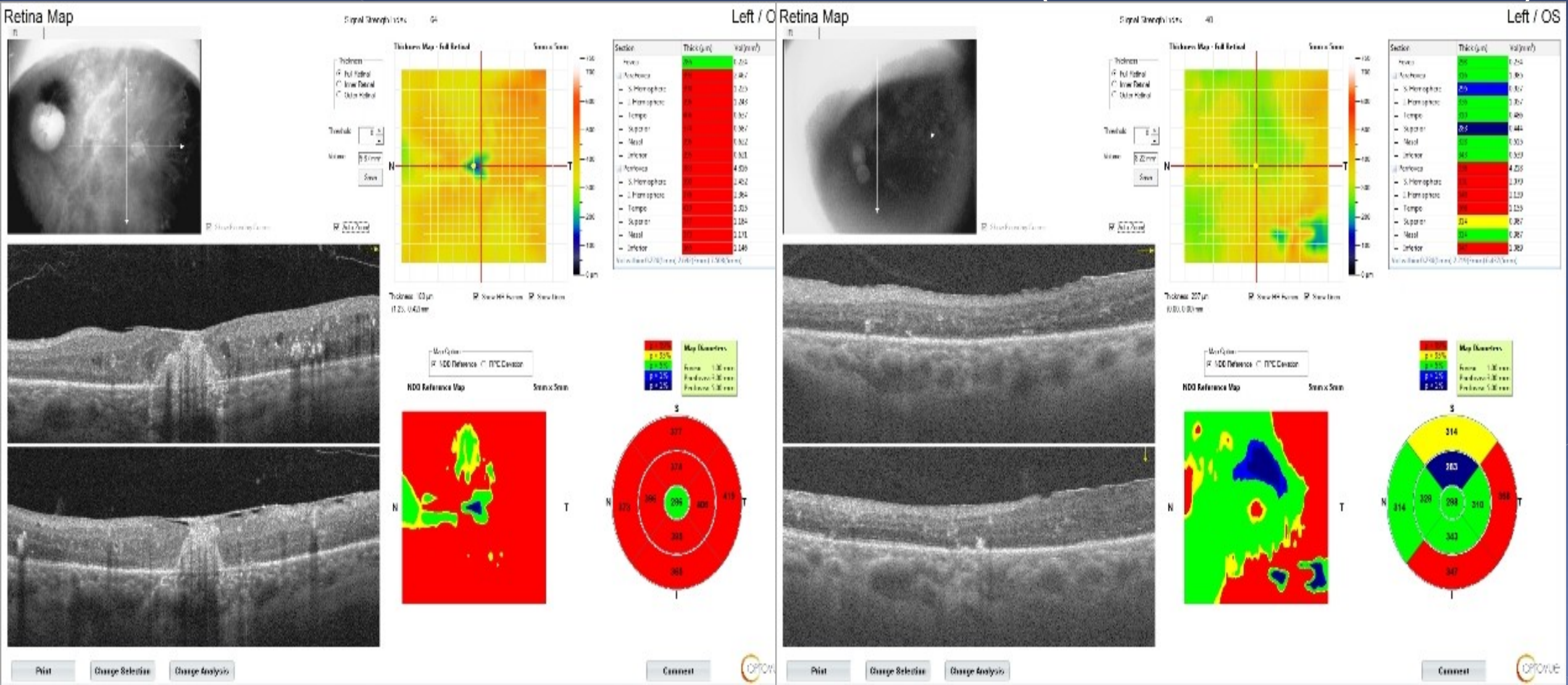
(BCVA of Lt Eye 6/24 pre laser ttt)



- **Case3** : 65 M patient , ↓ of vision of Lt Eye (***DR, Epi-macular membrane, center involved ME, sub foveal lipiod material deposition, hard exudates***)

BCVA of Lt Eye 6/18 9 months post laser)

(BCVA of Lt Eye 5/60 pre laser ttt)



☐ ETDRS Change

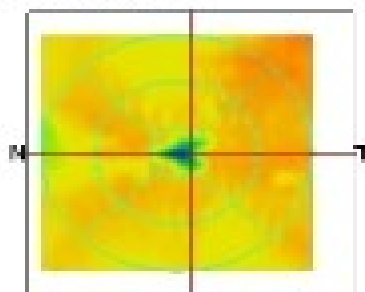
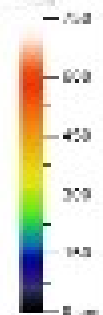
☐ ARC Deviation

Retina Map Change Analysis

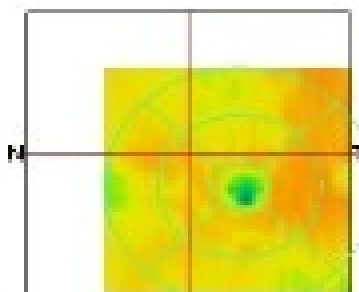
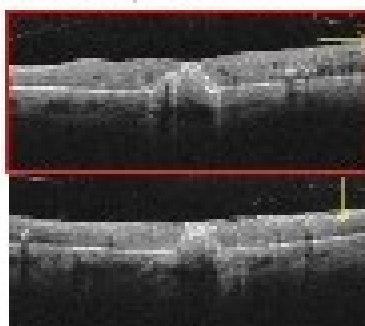
Full Retina Thickness Map

Left / OS

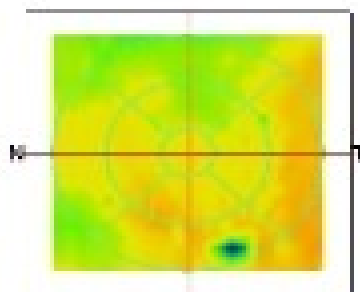
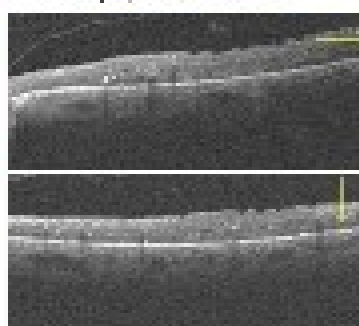
Threshold ☐ ☐



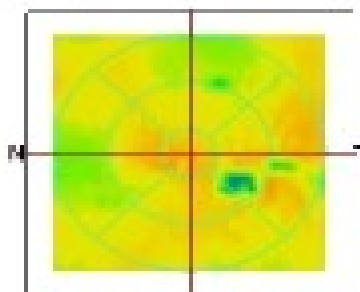
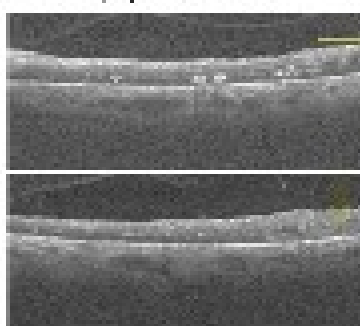
Date: 07/02/2021 SS = 34.0



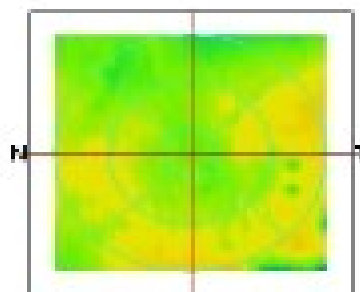
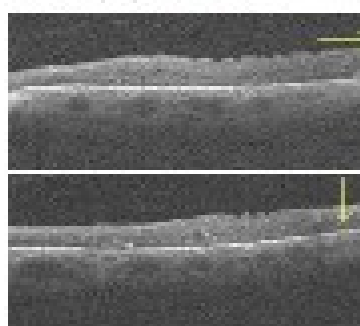
Date: 14/07/2021 SS = 50.0



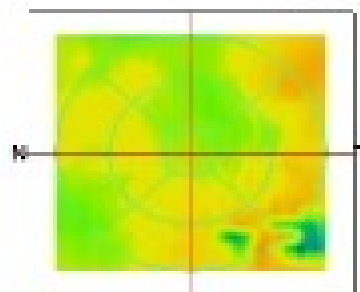
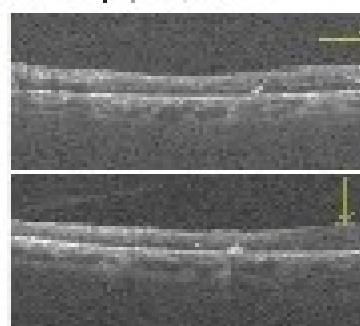
Date: 28/07/2021 SS = 42.0



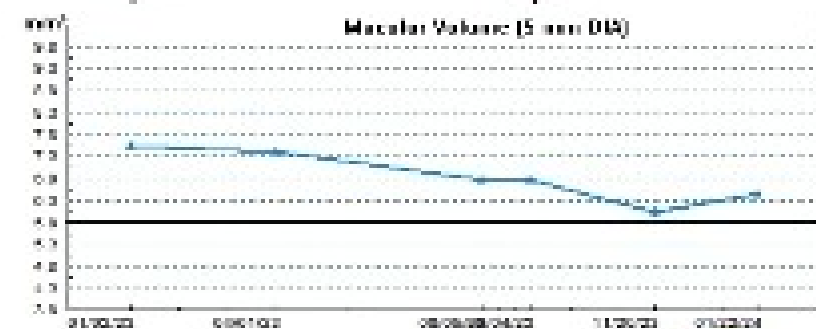
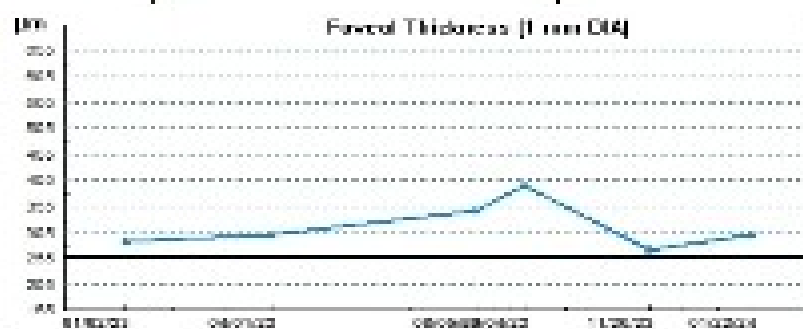
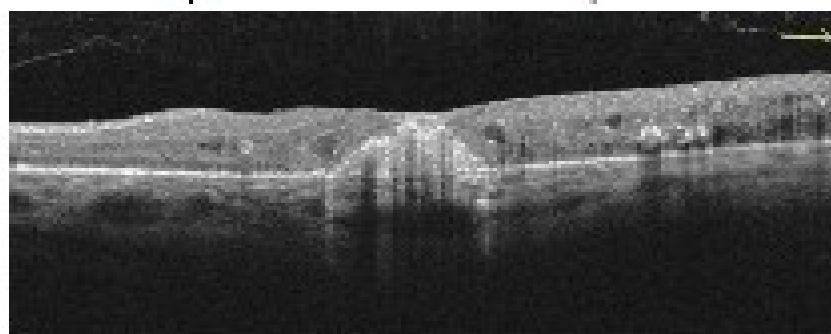
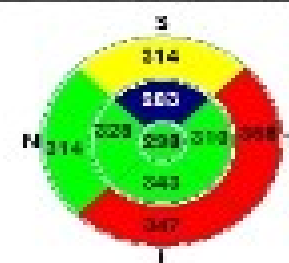
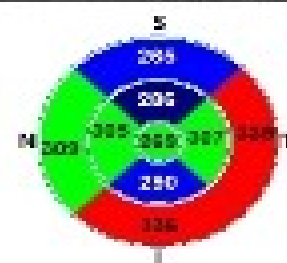
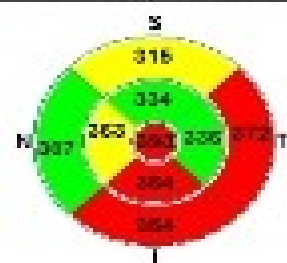
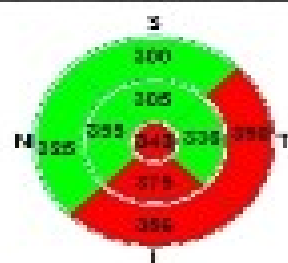
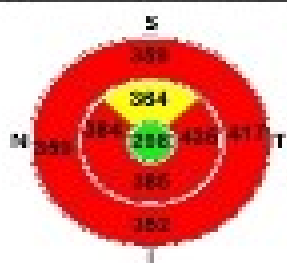
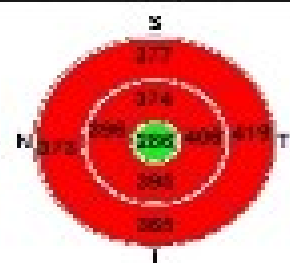
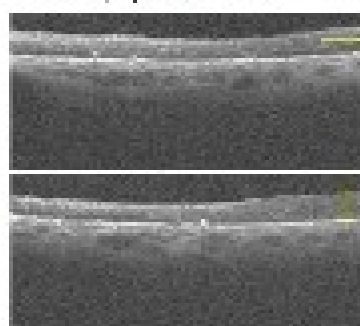
Date: 05/04/2022 SS = 37.0



Date: 11/01/2023 SS = 38.0



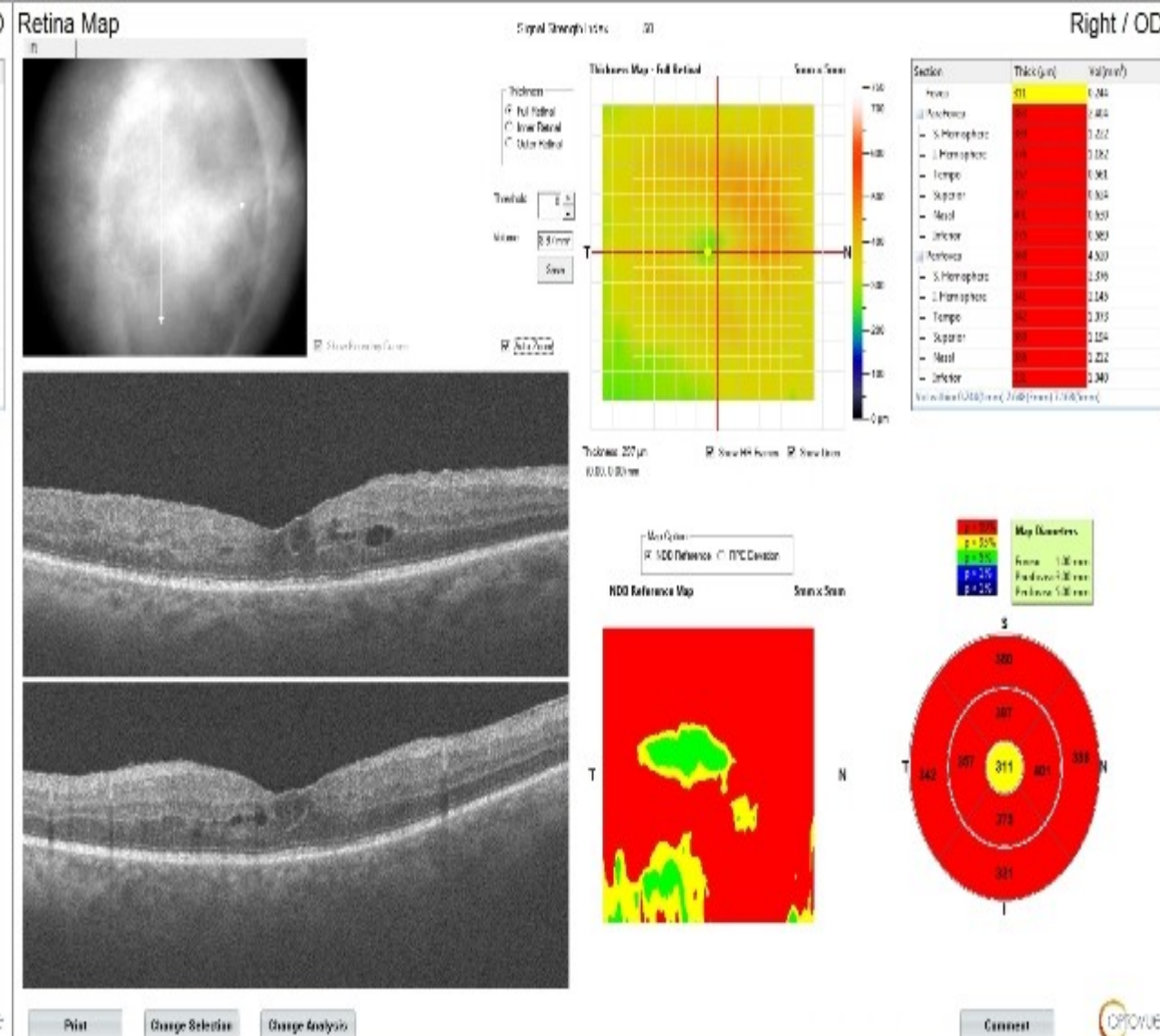
Date: 21/02/2024 SS = 43.0



Print

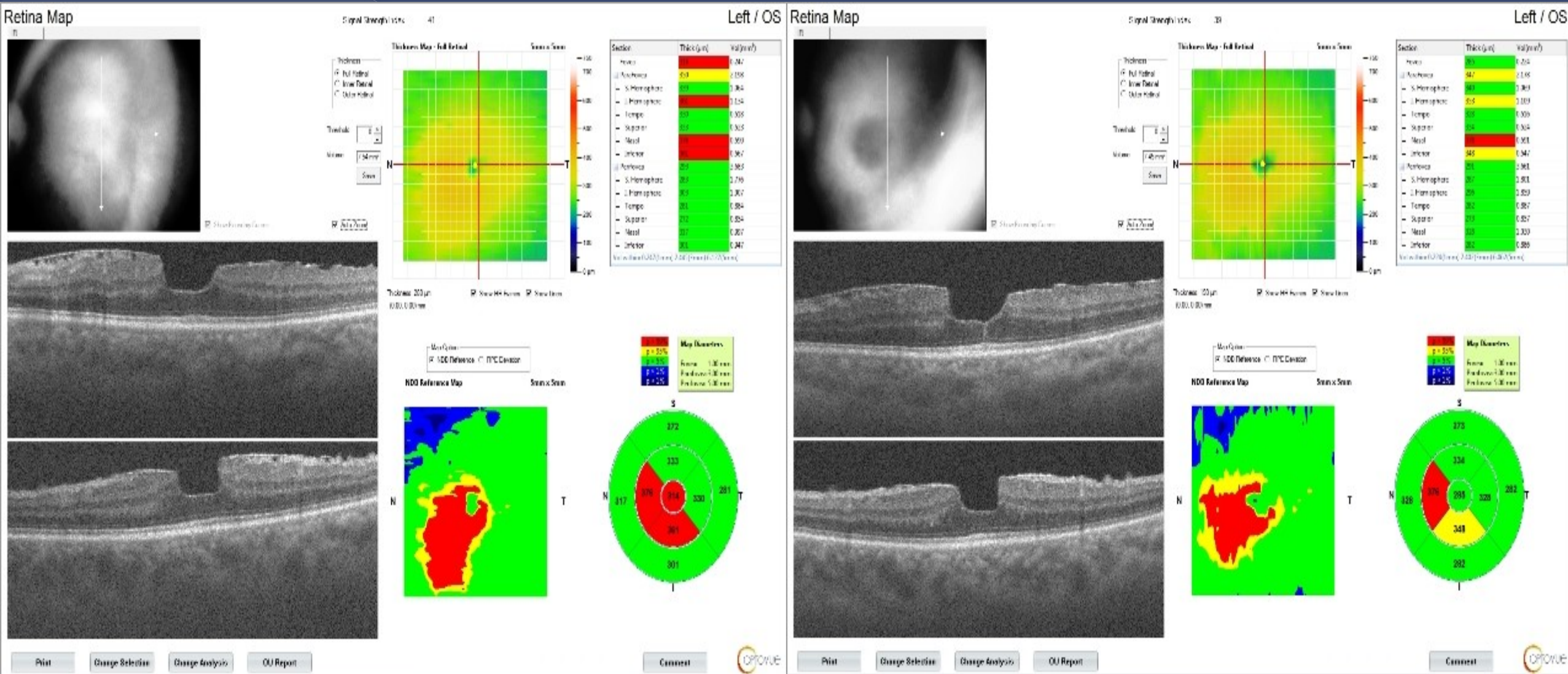
Change Analysis

(BCVA of Rt Eye 6/36 pre laser ttt)



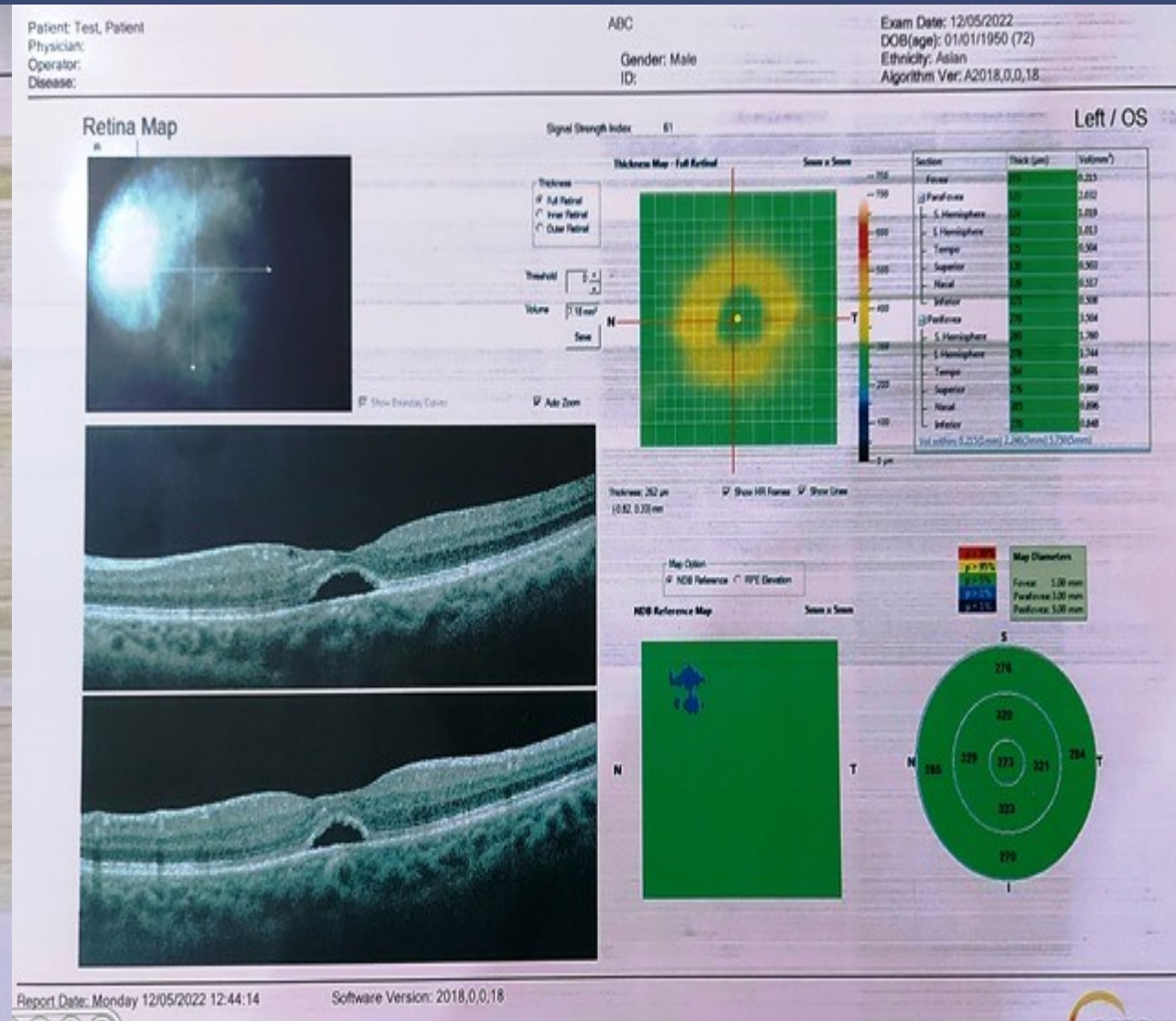
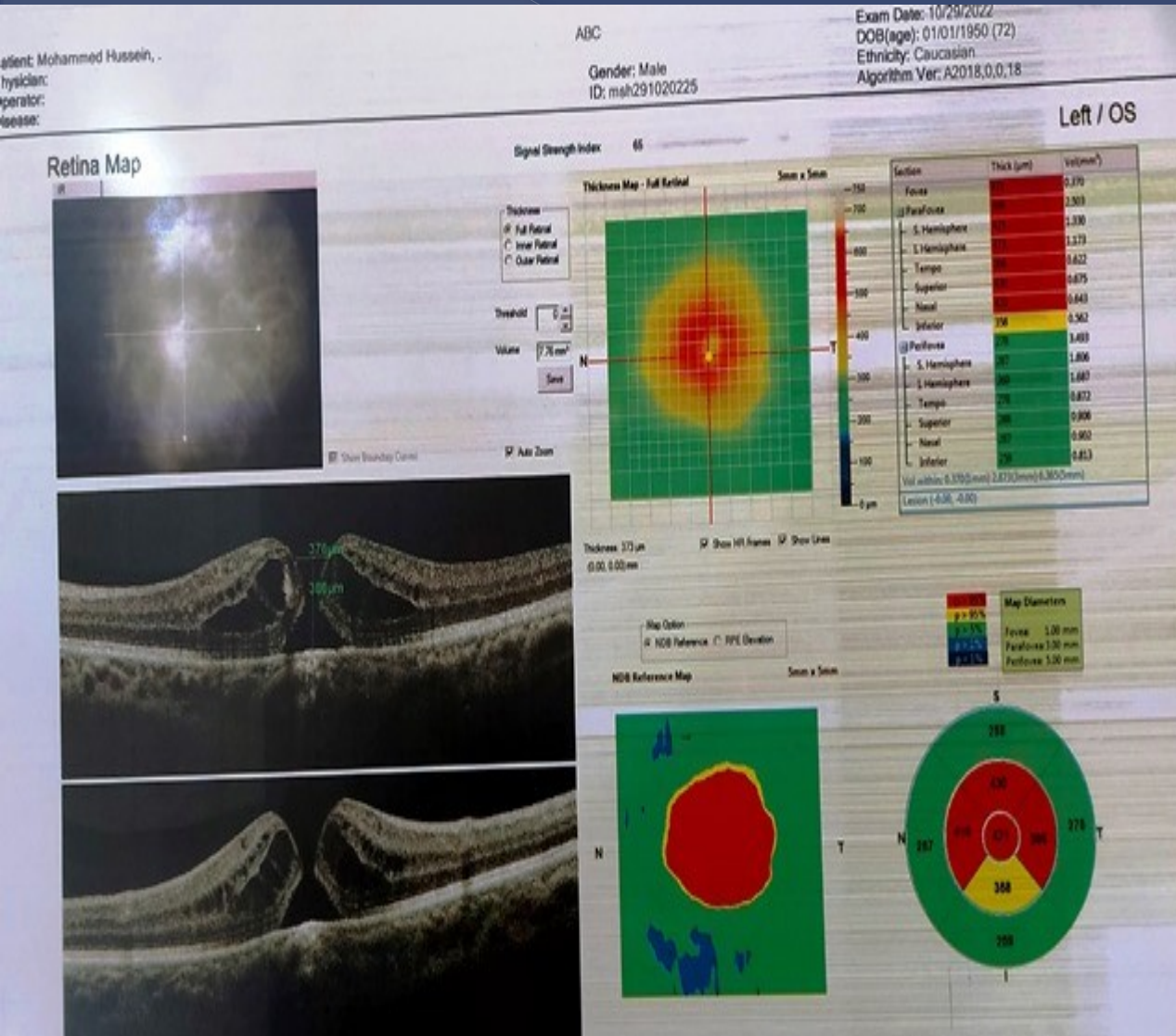
- **Case 5** : 62 F patient , ↓ of vision of Lt Eye (***ERM, pseudo lamellar macular hole, center involved ME***)

(BCVA of Lt Eye 6/24 one month post laser ttt) (BCVA of Lt Eye 6/60 pre laser ttt)



◎ **Case 6** : 69 M patient ,↓ of vision of Lt Eye (*Idiopathic macular hole*)

BCVA of Lt Eye 5/60 prepared for surgical intervention but his general condition needs long time for medical control, so we do)
(BCVA of Lt Eye 6/18 two months post laser ttt) (laser treatment until be generally fit)



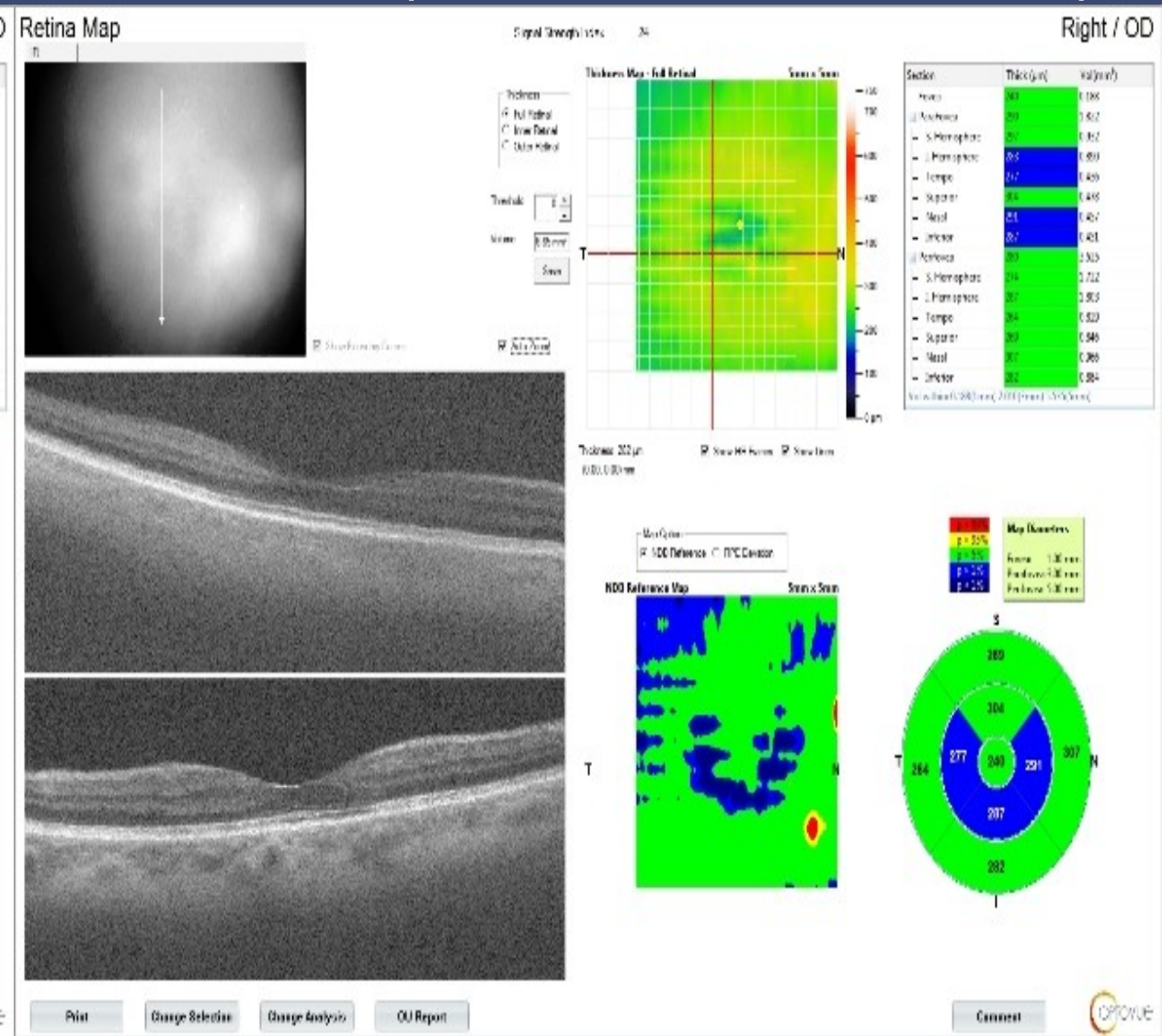
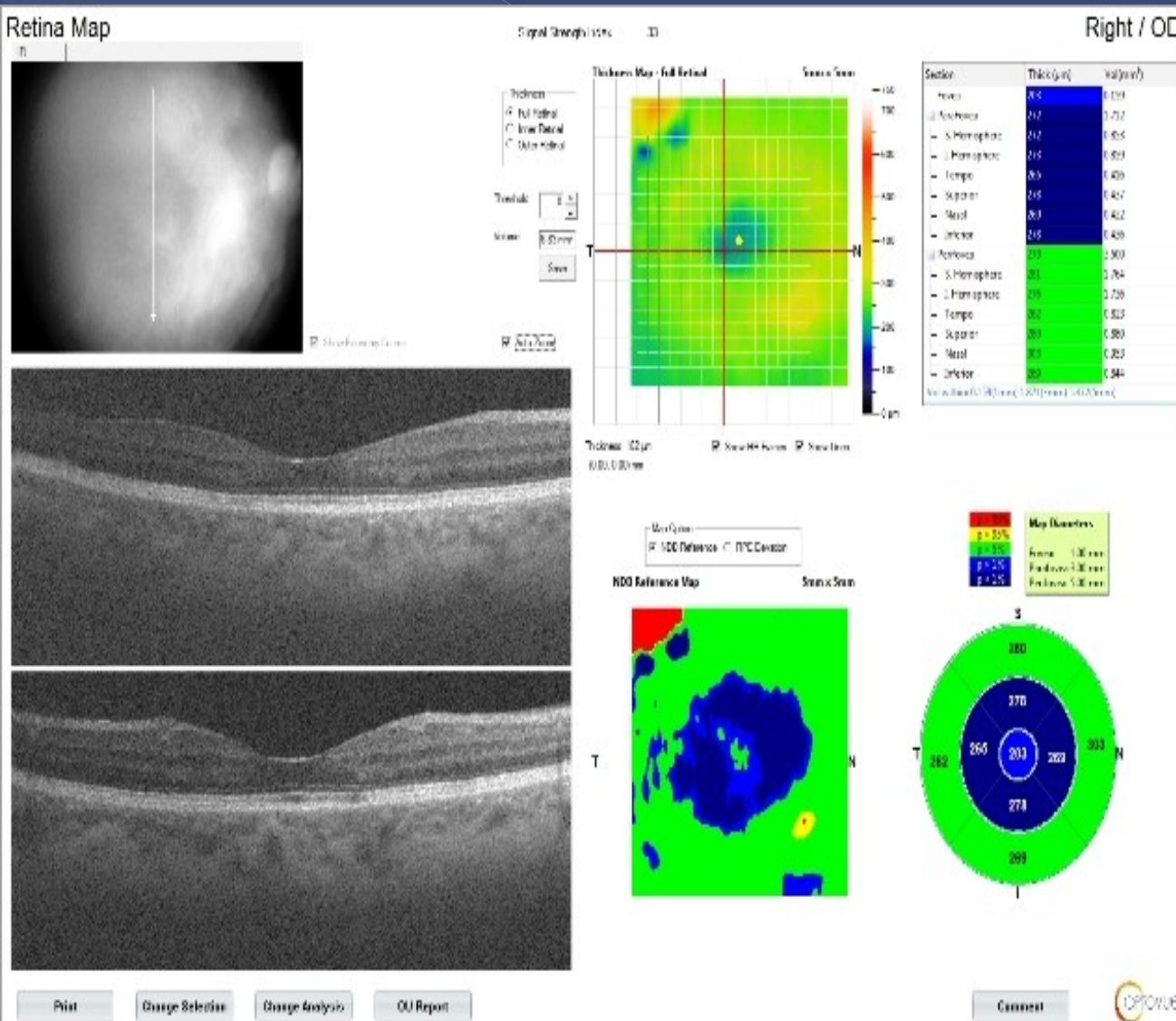
Ischemic Maculopathy

Ischemic BRVO

- 57 female patient D with chronic diminution of vision of Rt Eye (Macular thinning, ischemic maculopathy)

BCVA of Rt Eye 6/9 two months post

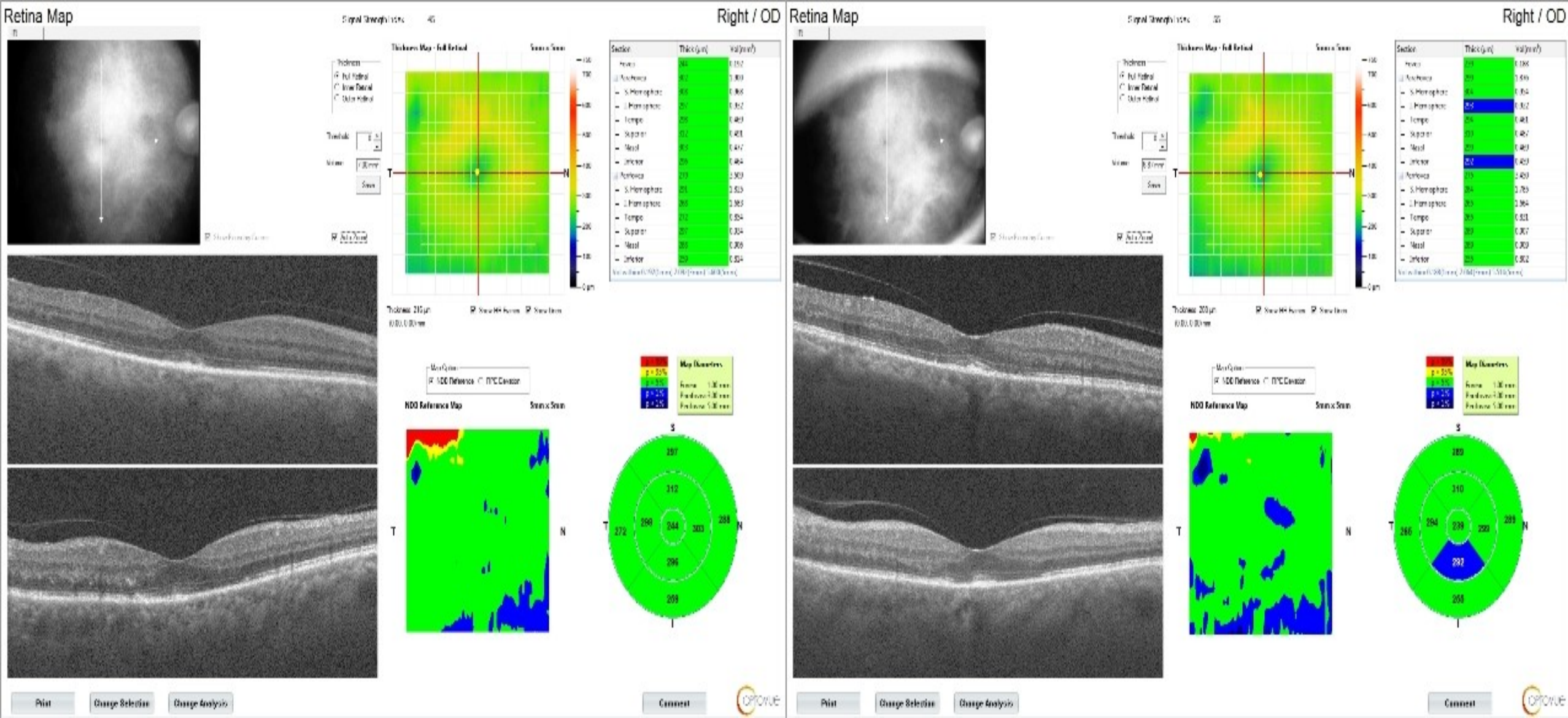
(BCVA of Rt Eye 6/18 pre laser)



- 64 M patient, ↓ of vision of Lt Eye (*Old ischemic BRVO, mild ME*)

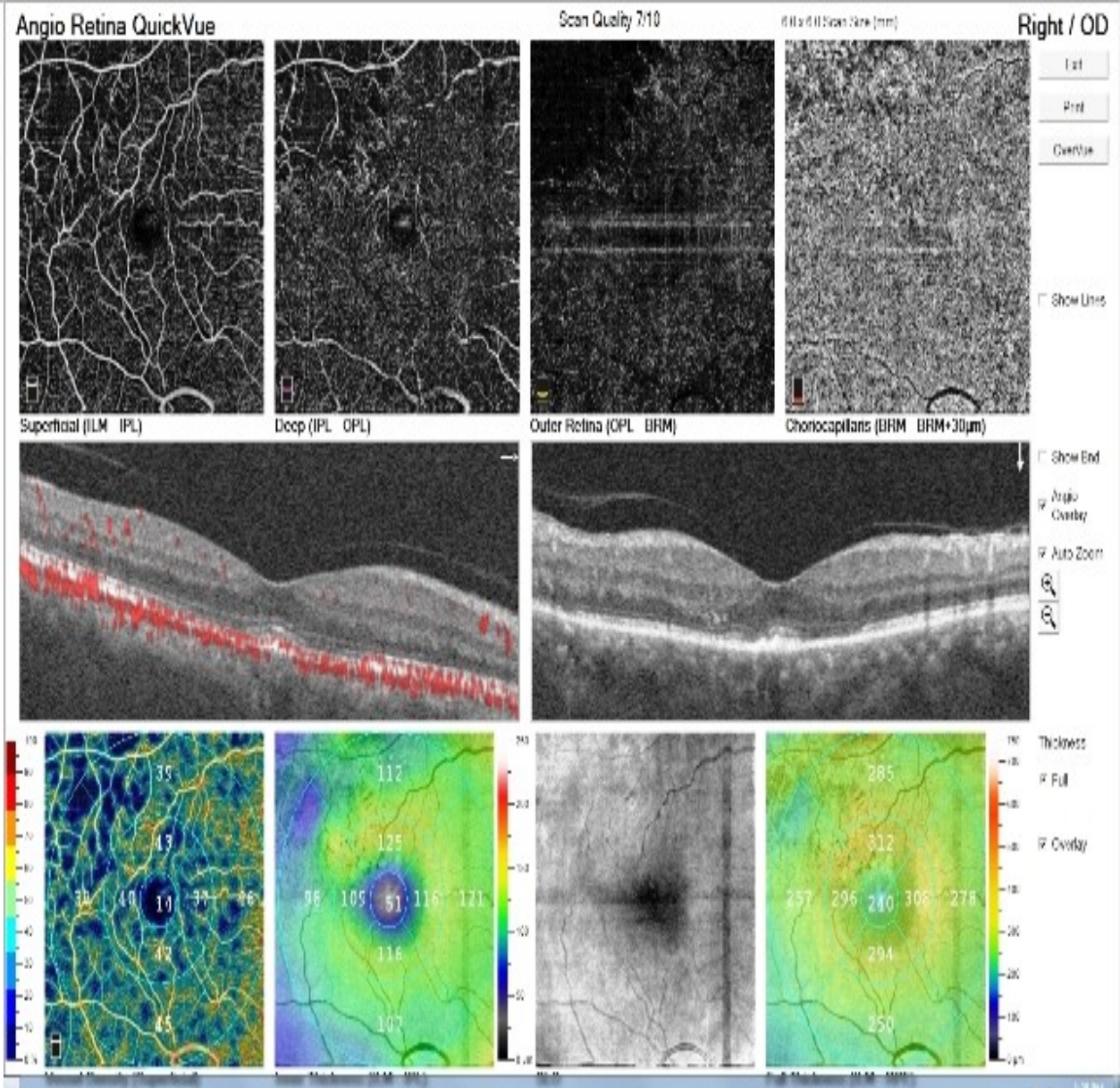
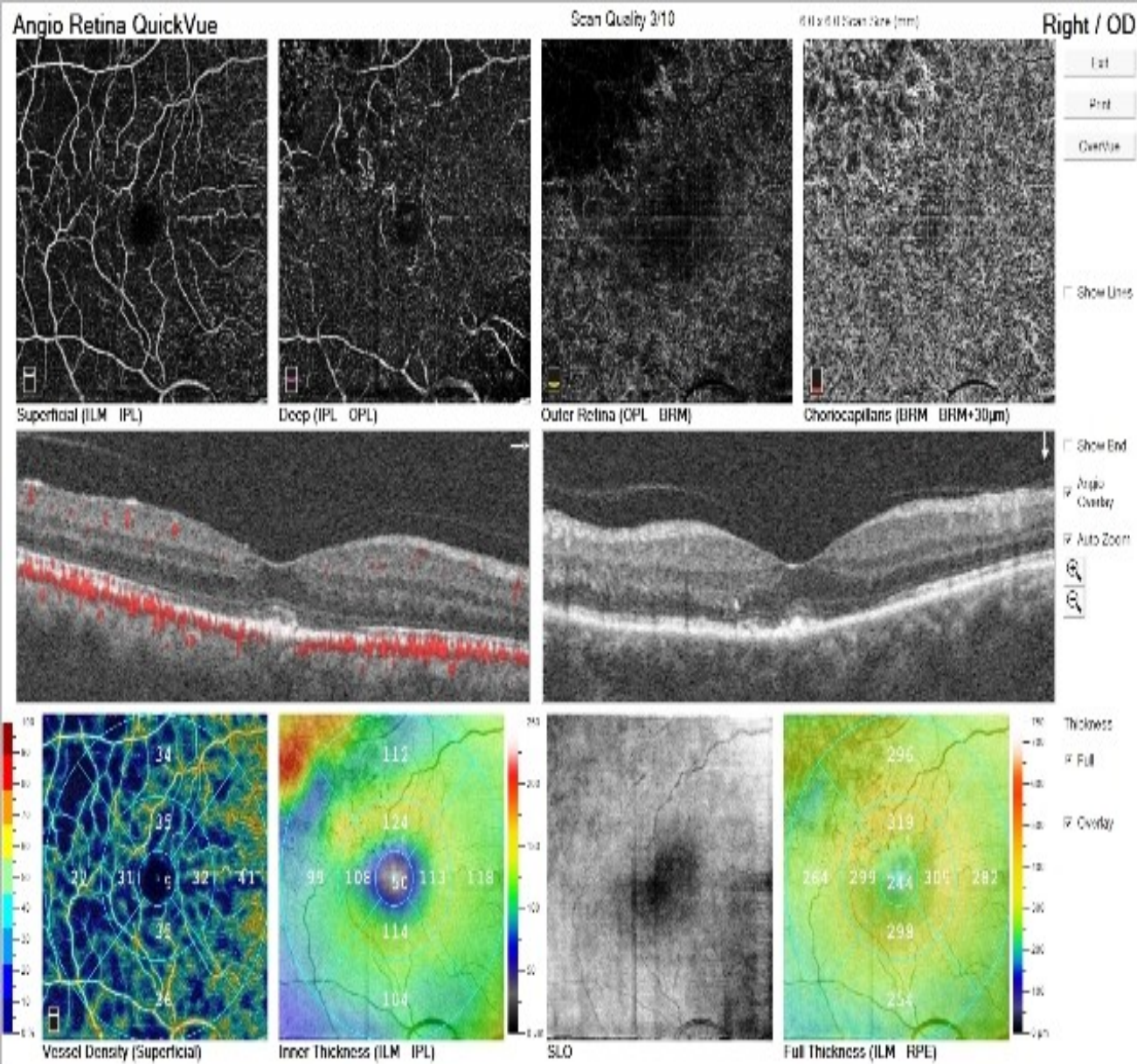
BCVA of Rt Eye 6/18 two weeks post)

(BCVA of Rt Eye 6/24 pre laser ttt)



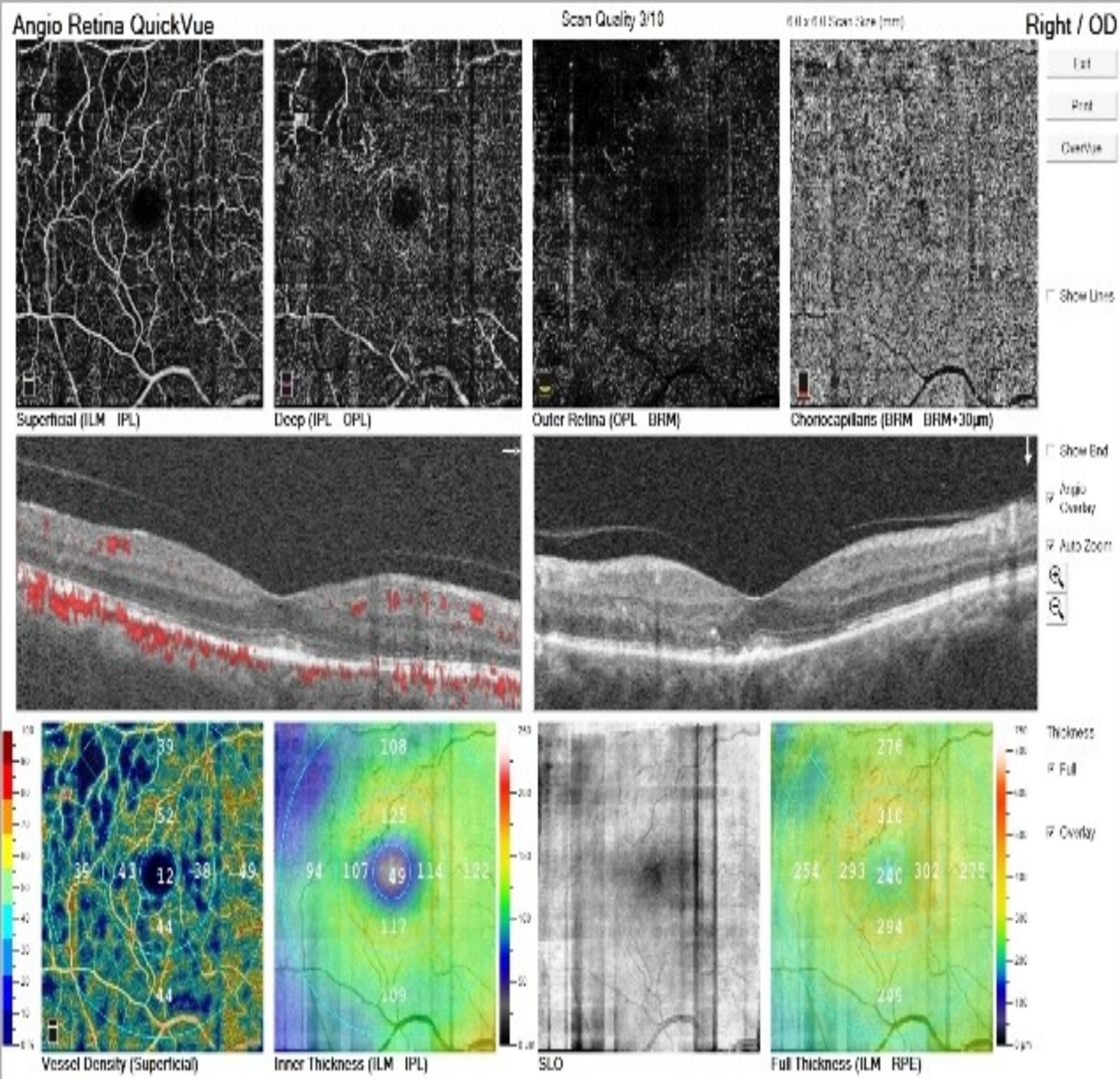
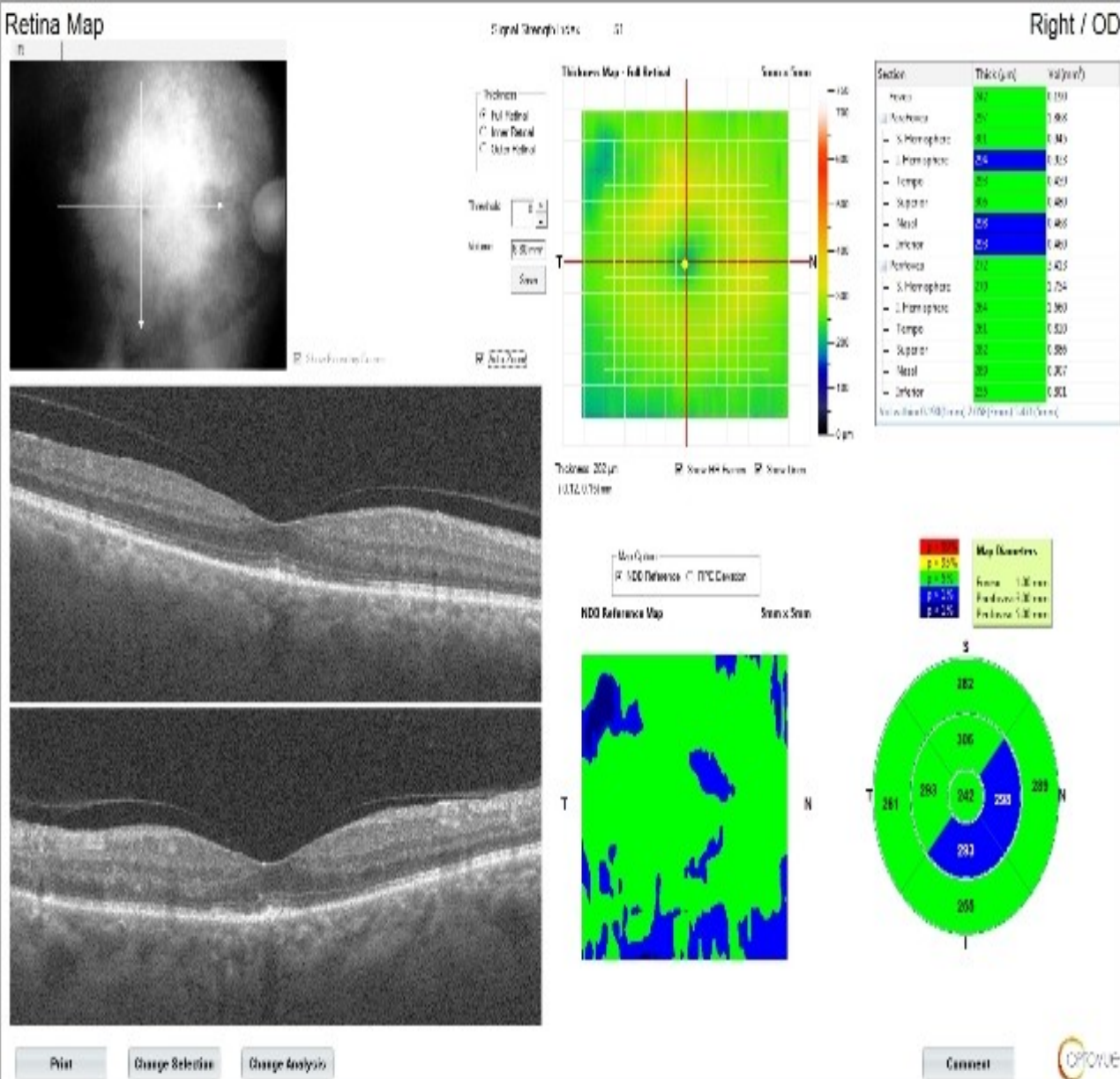
(BCVA of Rt Eye 6/24 pre laser ttt)

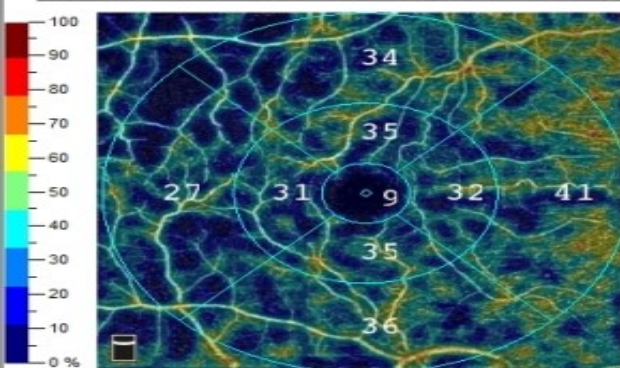
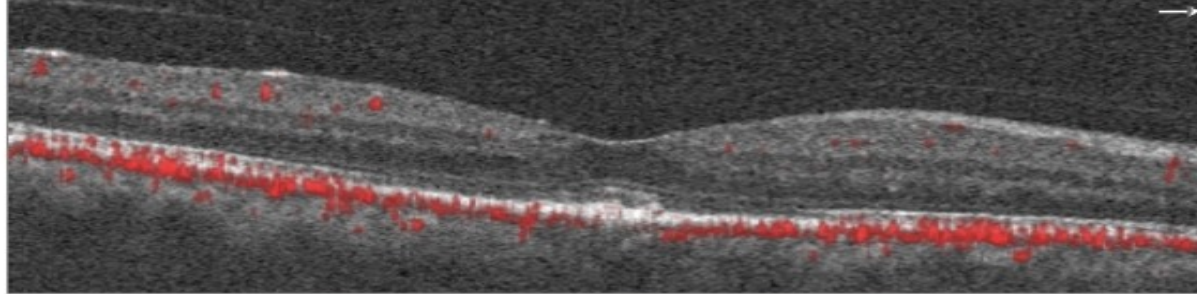
BCVA of Rt Eye 6/18 two weeks post laser ttt



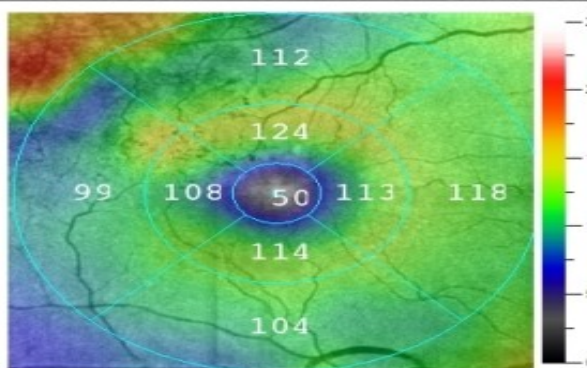
(BCVA of Rt Eye 6/24 pre laser ttt)

(BCVA of Rt Eye 6/12 one month post laser ttt)

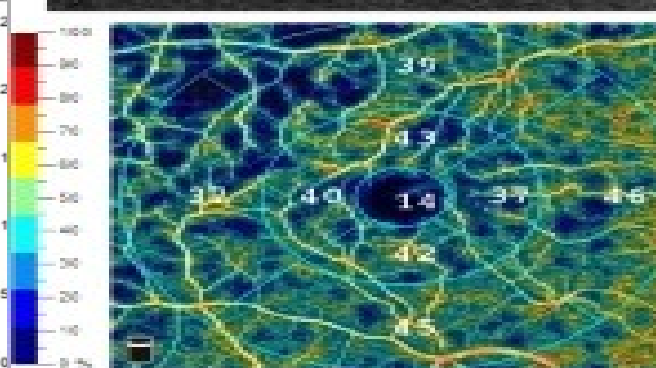
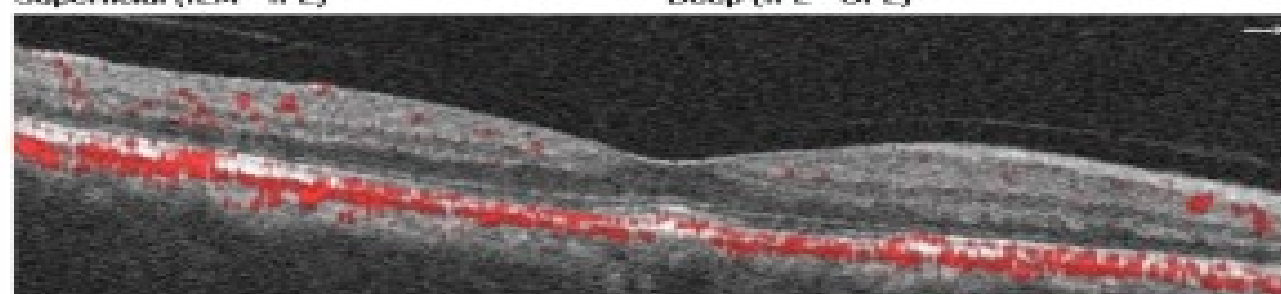




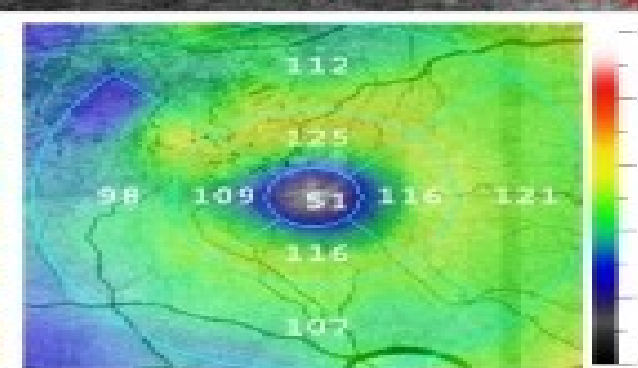
Vessel Density (Superficial)



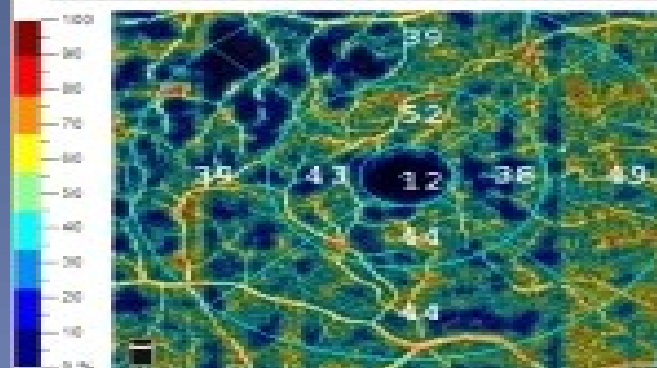
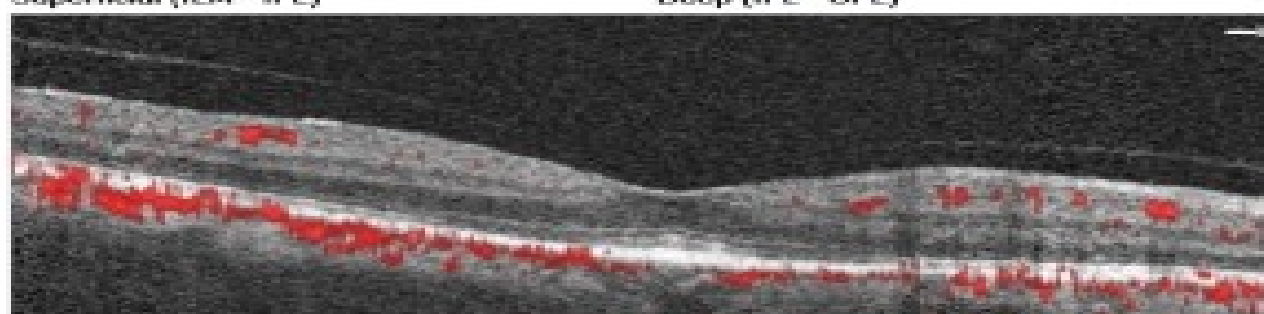
Inner Thickness (ILM - IPL)



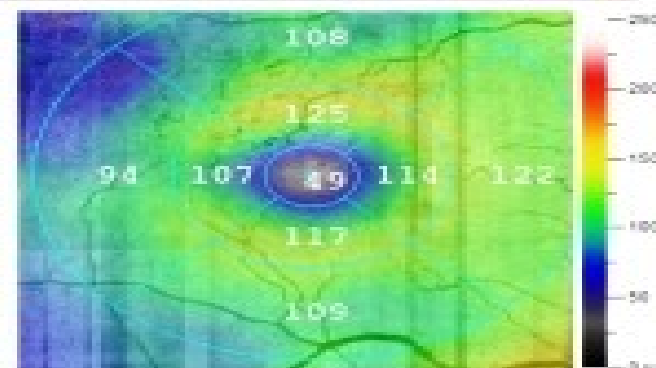
Vessel Density (Superficial)



Inner Thickness (ILM - IPL)



Vessel Density (Superficial)



Inner Thickness (ILM - IPL)

Home message

- *Sub- liminal laser treatment is a new challenge.*
- *577 sub-liminal laser is effective , safe, less invasive , economic tool for treatment of variable retinal disorders.*
- *More cases, more indications should be widely treated by 577 sub-liminal laser to get more clear results.*

Thank you

