

Diabetic Retinopathy

Leading Cause of Preventable BLINDNESS

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Fellow Vitreo Retina

New York Eye Infirmary of Mount Sinai, USA

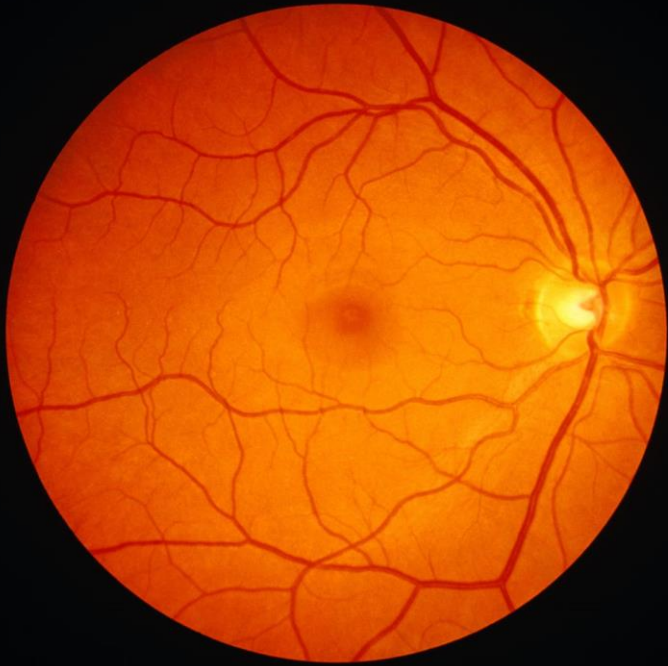
Al Shifa Trust Eye Hospital, PAKISTAN

Professor, AD DIN WOMENS MEDICAL COLLEGE & HOSPITAL

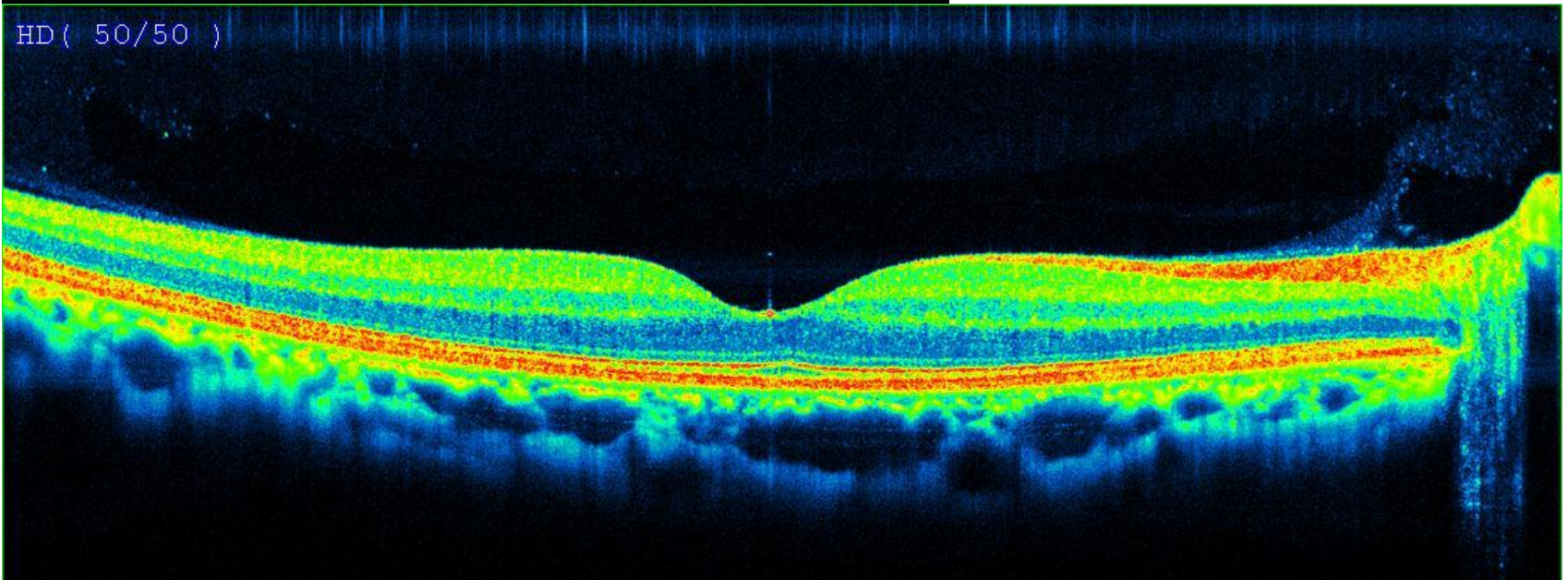
Diabetes and vision loss

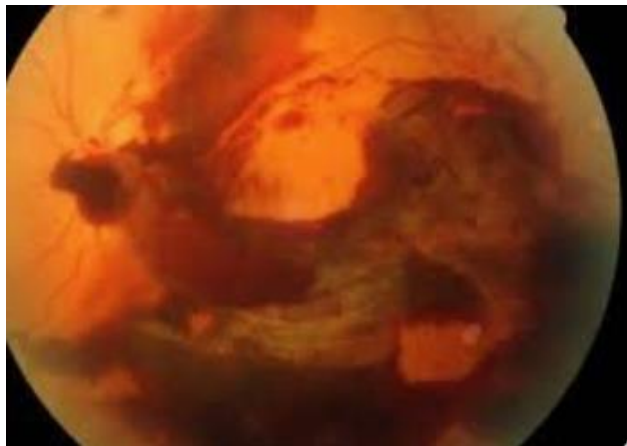
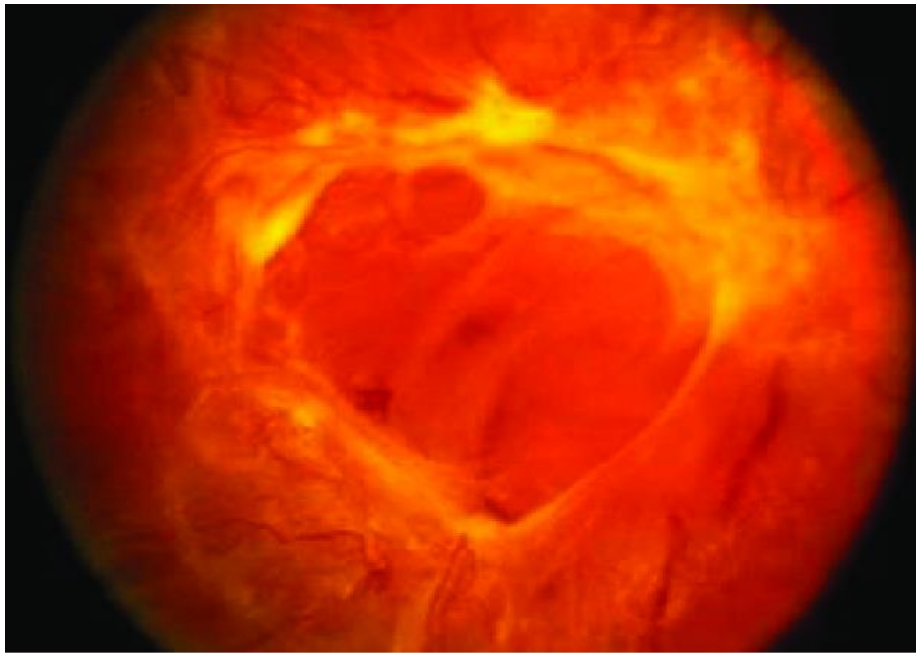
- Diabetes mellitus (DM) is a prevalent disease.
- Diabetic retinopathy (DR) is a common microvascular complication of diabetes
- About 8% of diabetic patients develop DME with visual impairment⁵

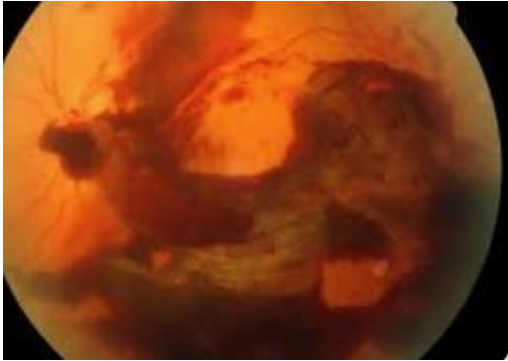
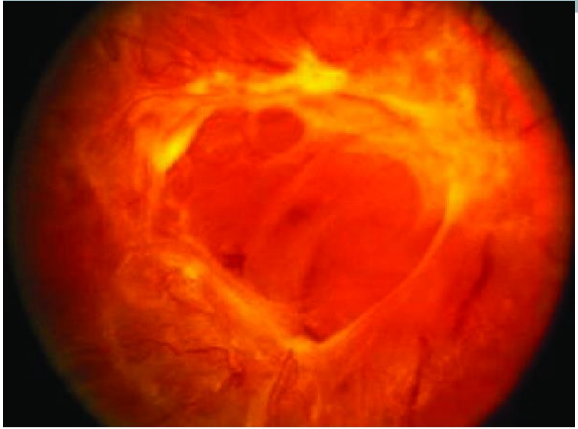
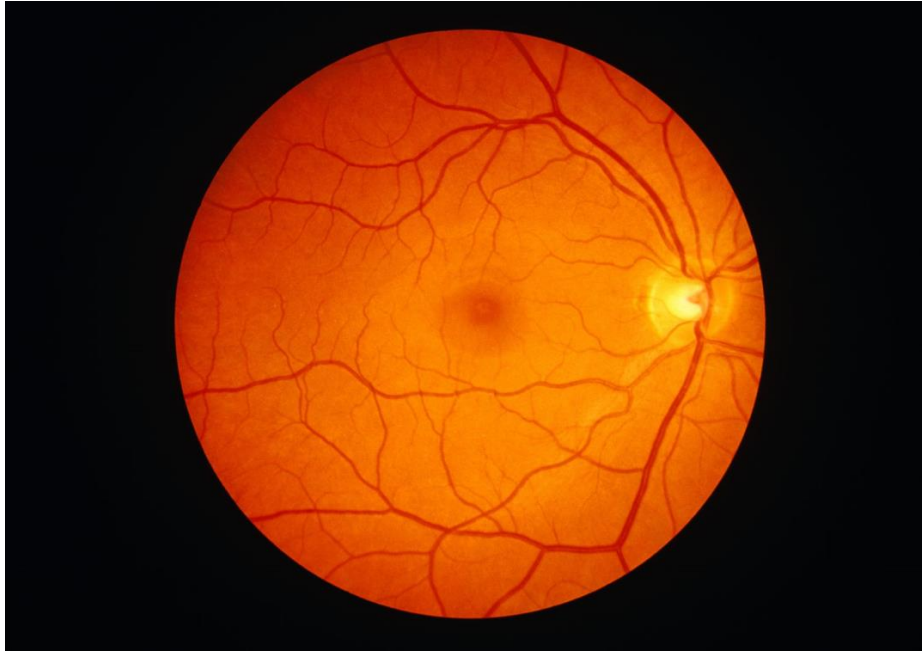
Royal College of Ophthalmology. Diabetic Retinopathy Guidelines 2005. <http://www.rcophth.ac.uk/docs/publications/publishedguidelines/DiabeticRetinopathyGuidelines2005.pdf>. Accessed February 2009; ³Watkins. BMJ 2003; 326: 924-926; ⁴Klein et al. Ophthalmology 1998; 105: 1801-1815; ⁵Calculated from: Ling et al. Eye 2002; 16: 140-145; Broadbent et al. Eye 1999; 13: 160-165; Knudsen et al. Br J Ophthalmol 2006; 90: 1404-1409; Hove et al. Acta Ophthalmol Scand 2004; 82: 443-448; Romero-Aroca et al. Arch Soc Esp Oftalmol 2007; 82: 209-218; Zietz et al. Dtsch Med Wochenschr 2000; 125: 783-788; Kristinsson. Acta Ophthalmol Scand Suppl 1997; 223: 1-76



HD (50/50)

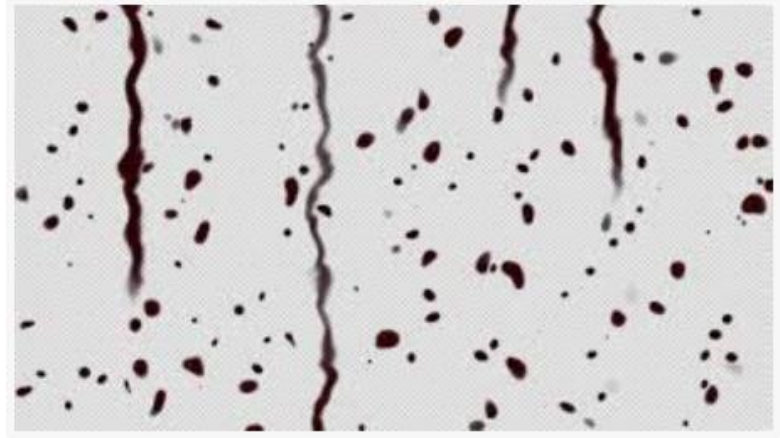


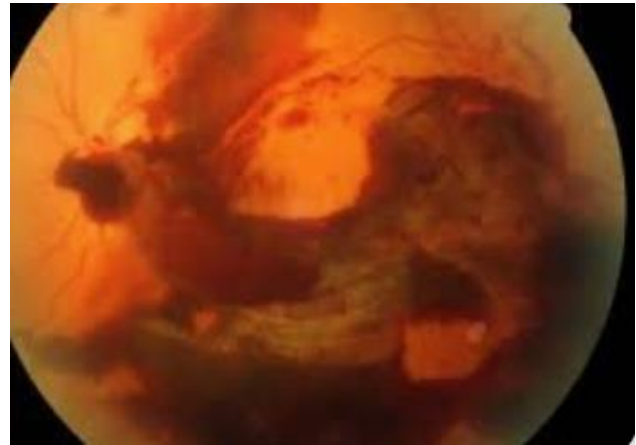
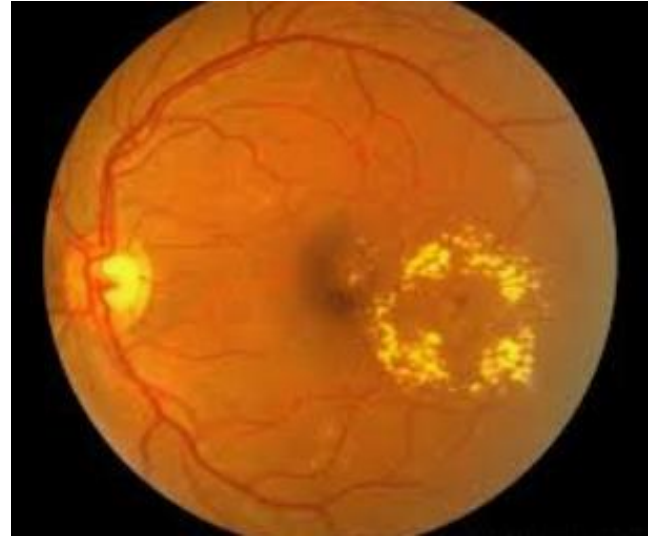
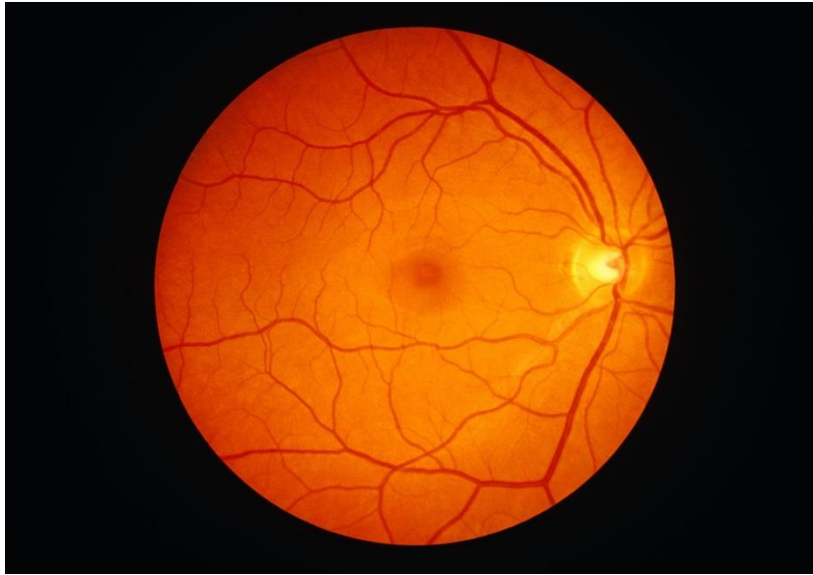


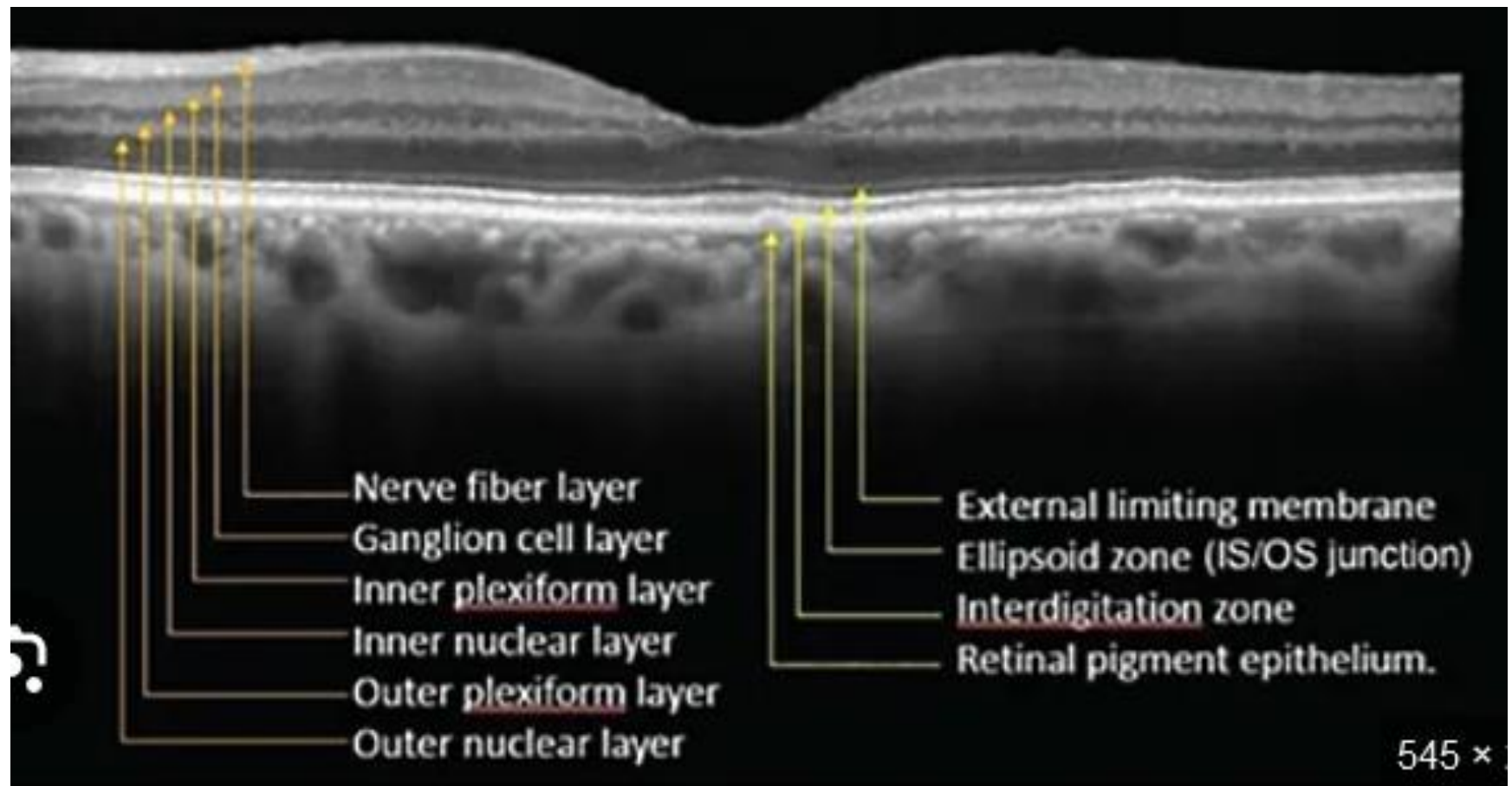


- Pathophysiology
- Clinical feature
- Treatment modalities
- Surgery
- Prevention

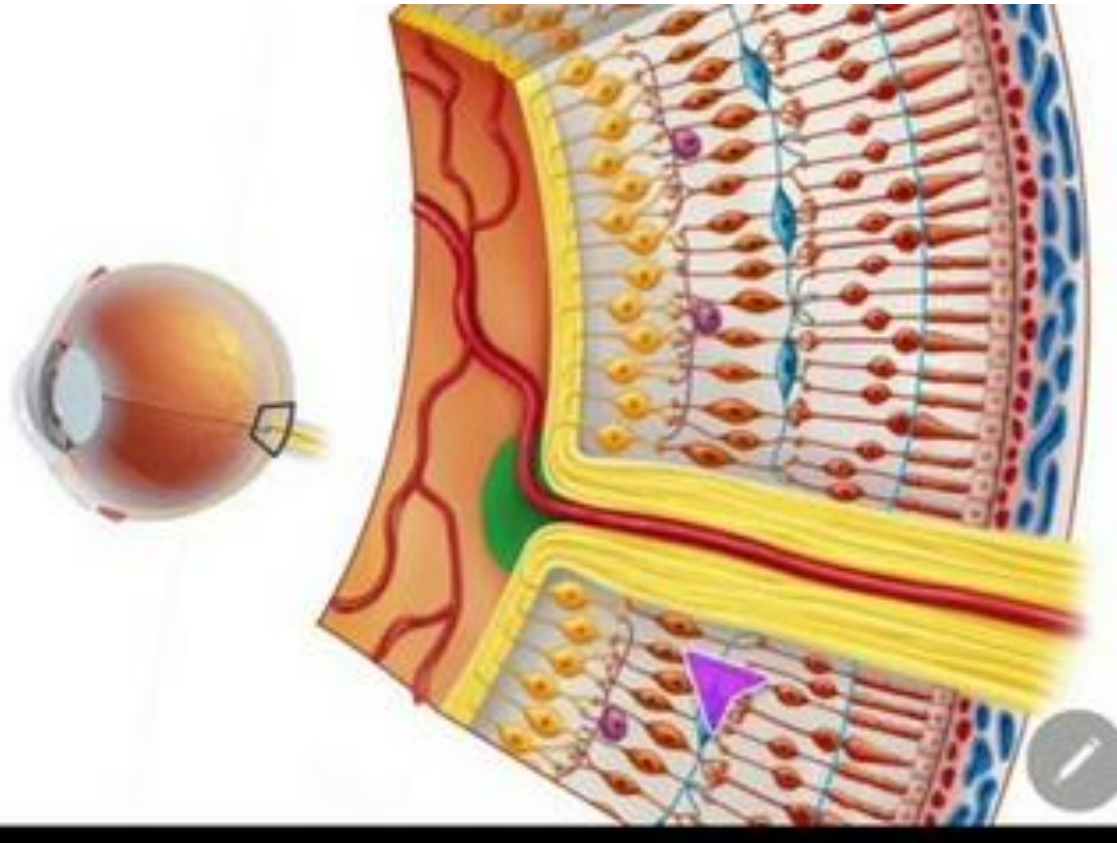
RETINA= MIRROR







- ane
9. Nerve fiber layer
 8. Nuclei of ganglion cells
 7. Inner plexiform layer
 6. Nuclei of bipolar cells (inner nuclear layer)
 5. Outer plexiform layer
 4. Nuclei of photoreceptor cells (outer nuclear layer)
 3. Outer limiting membrane
 2. Processes of photoreceptor cells



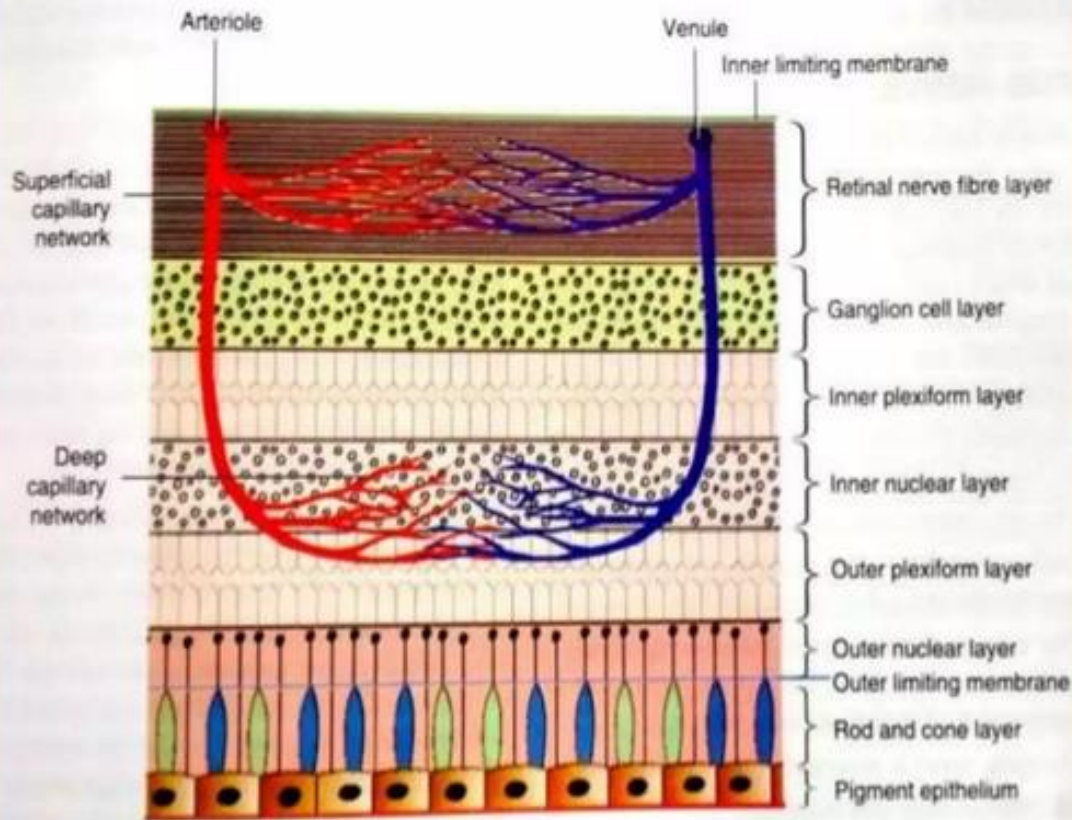
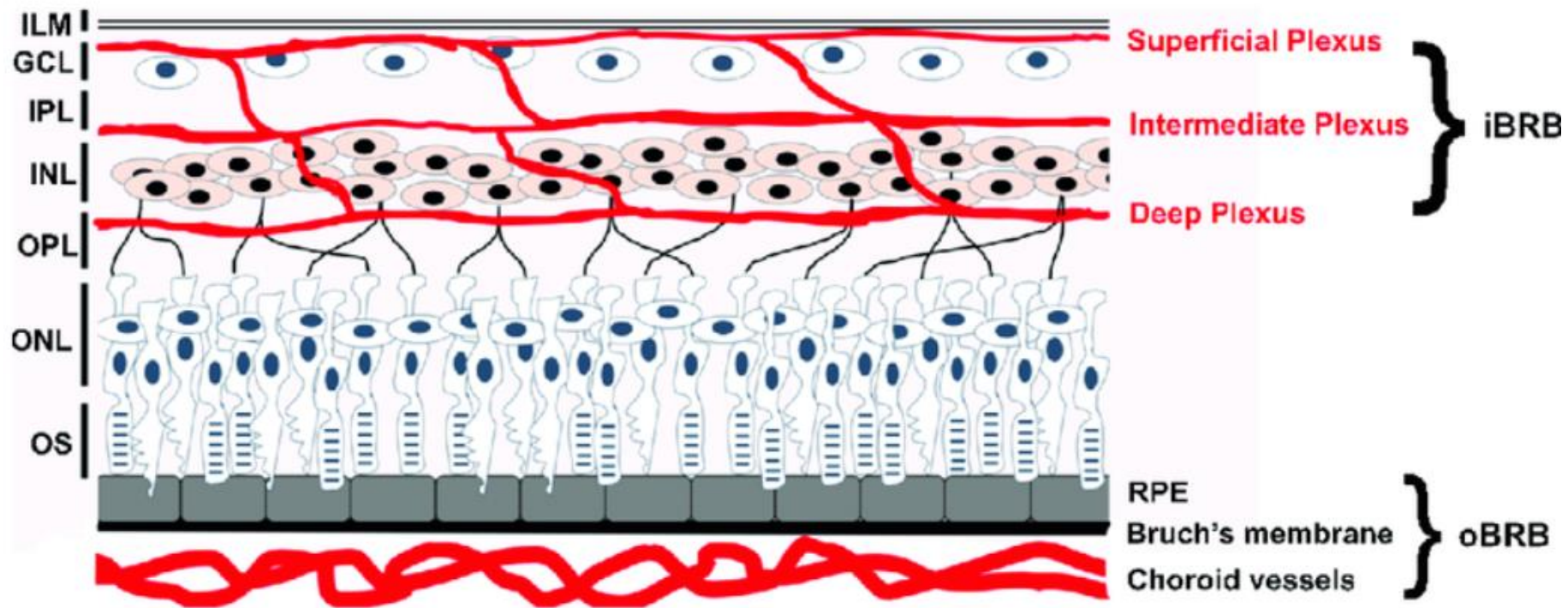
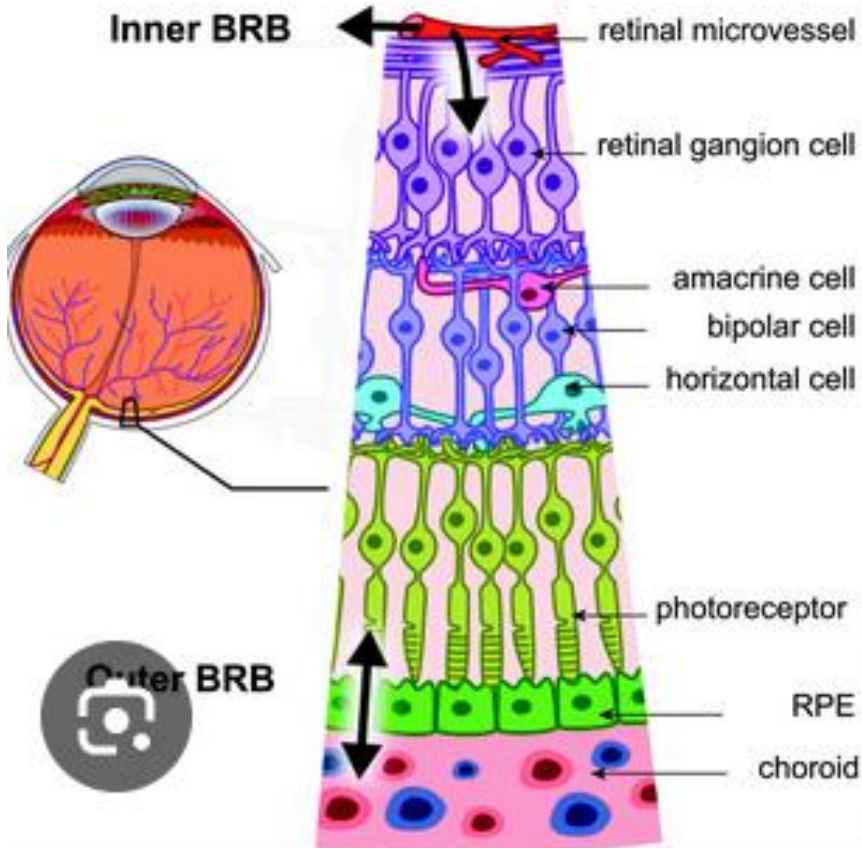


Fig. 6.11. Arrangement of retinal capillaries.

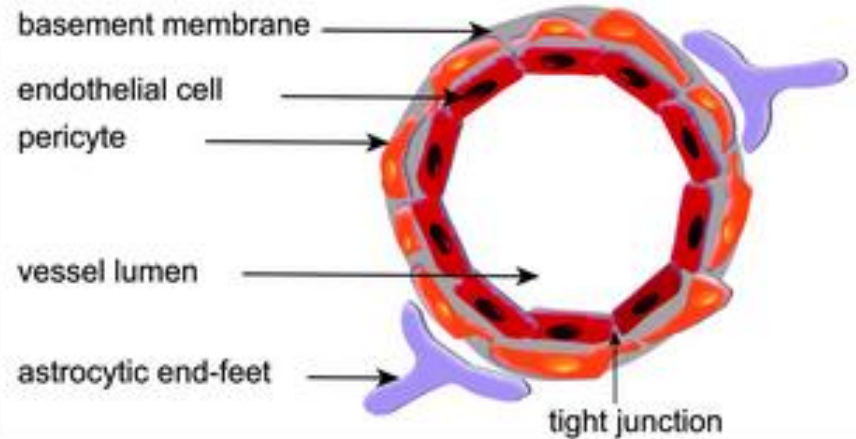
- BRB compartmentalises the neurosensory retina from the vascular component of the eye.
- Inner BRB is formed by tight junctions between the retinal vascular endothelial cells and glial cells .
- Outer BRB by tight junctions between RPE (zonula occludens



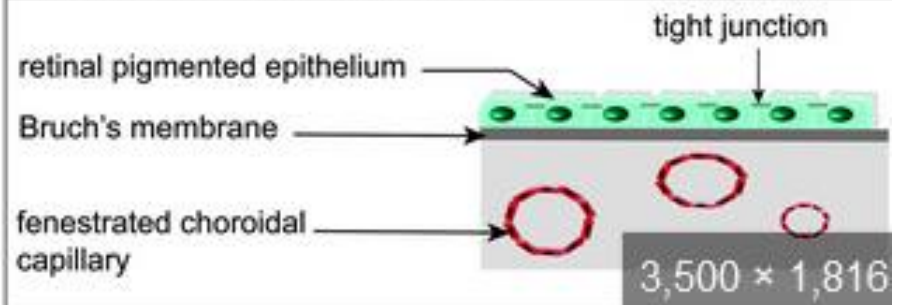
etina structure

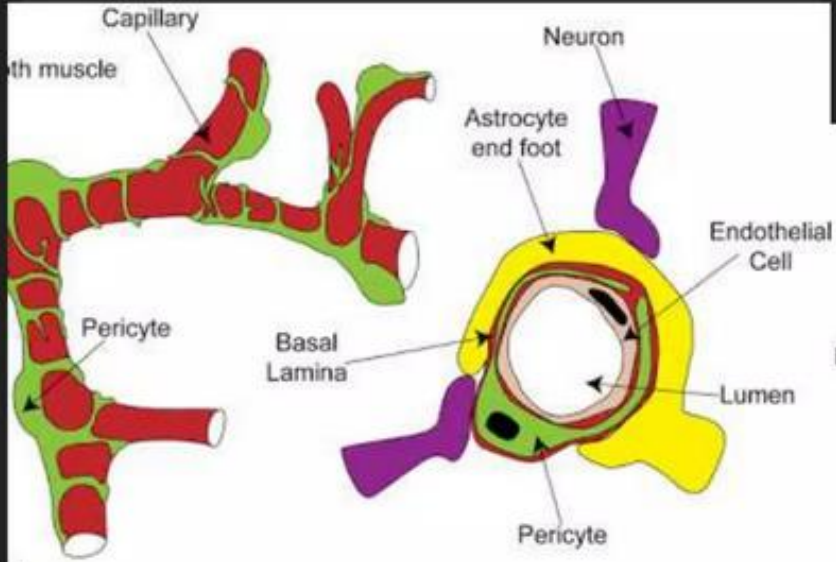


Inner BRB - endothelial barrier

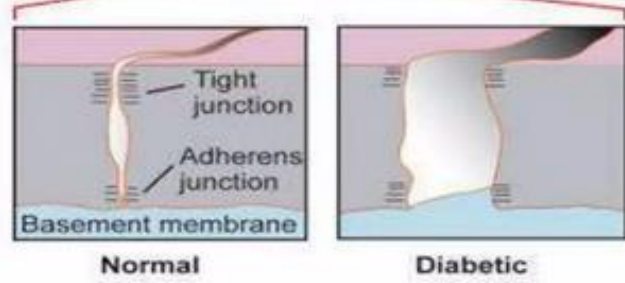
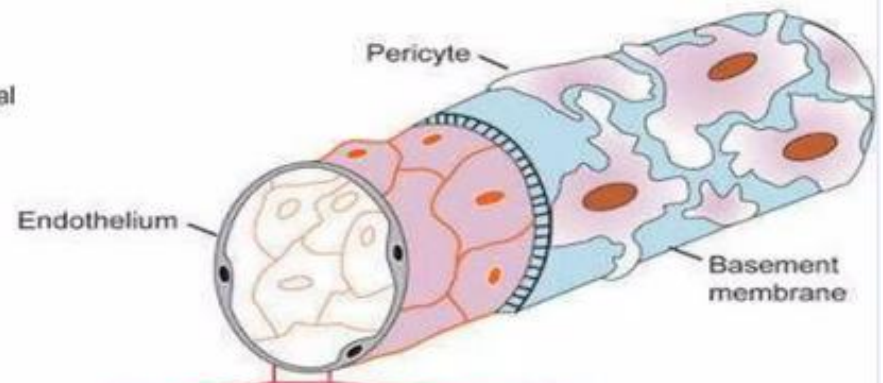


Outer BRB - epithelial barrier





- The pericytes are wrapped around the capillaries and are thought to be responsible for the structural integrity of the vessel wall.

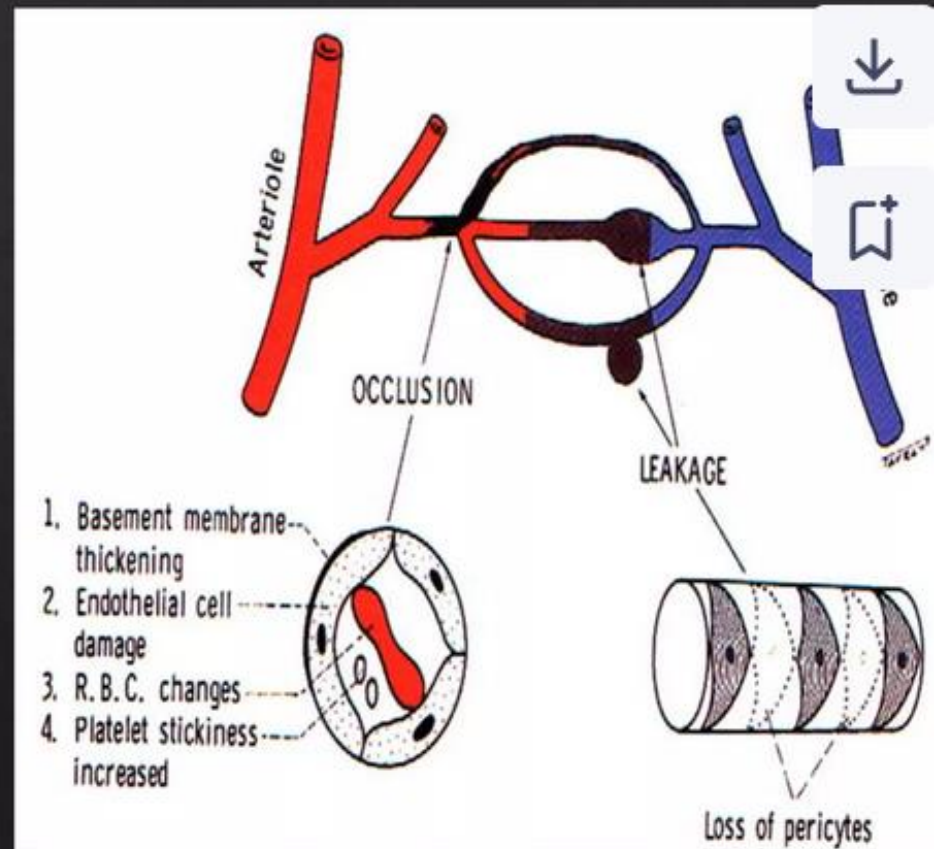


◇ Diabetic retinopathy is a microangiopathy affecting the retinal precapillary arterioles, capillaries and venules .

◇ Retinopathy has features of both:

- microvascular leakage.
(mild- mod NPDR)

- microvascular occlusion .(sever NPDR-PDR)



Microvascular leakage

Degeneration and loss of pericytes

Capillary wall weakening

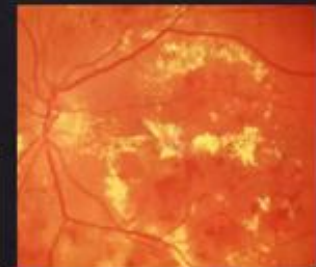
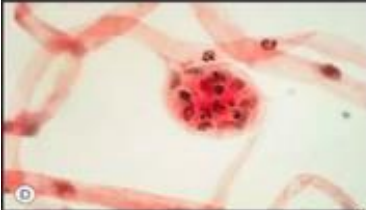
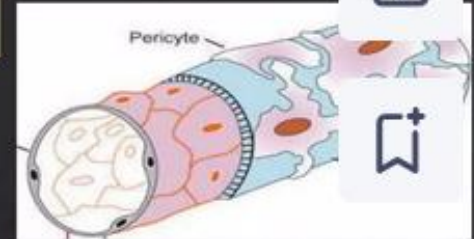
Plasma leakage

Retinal edema

Hard exudate
(Circinate pattern)

outpouching of capillaries
at structurally weak points

microaneurysm



❖ Microaneurysms

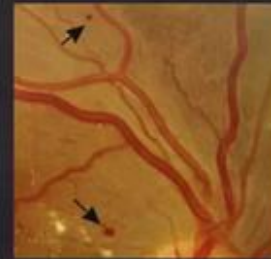
-Earliest & most specific sign.

- 10 to 100 microns in diameter, and appear as red dots.

microaneurysm

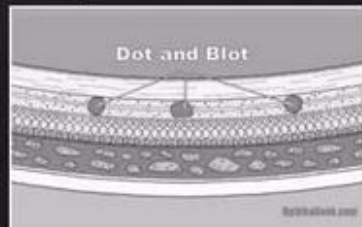
rupture

Intraretinal
hemorrhage



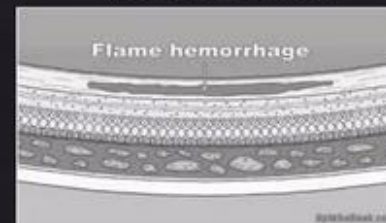
Dot blot h'age

(outer plexiform and inner nuclear)



Flame shaped h'age

(nerve fiber layer)



Microvascular occlusion

Capillary basement membrane thickening

Endothelial cell damage and proliferation

Increased plasma viscosity
Deformation of RBC
Increased platelets stickiness

Decreased capillary blood flow
and perfusion

Retinal hypoxia

VEGF

A-V shunt
IRMA*



Neovascularization
and fibrovascular proliferation

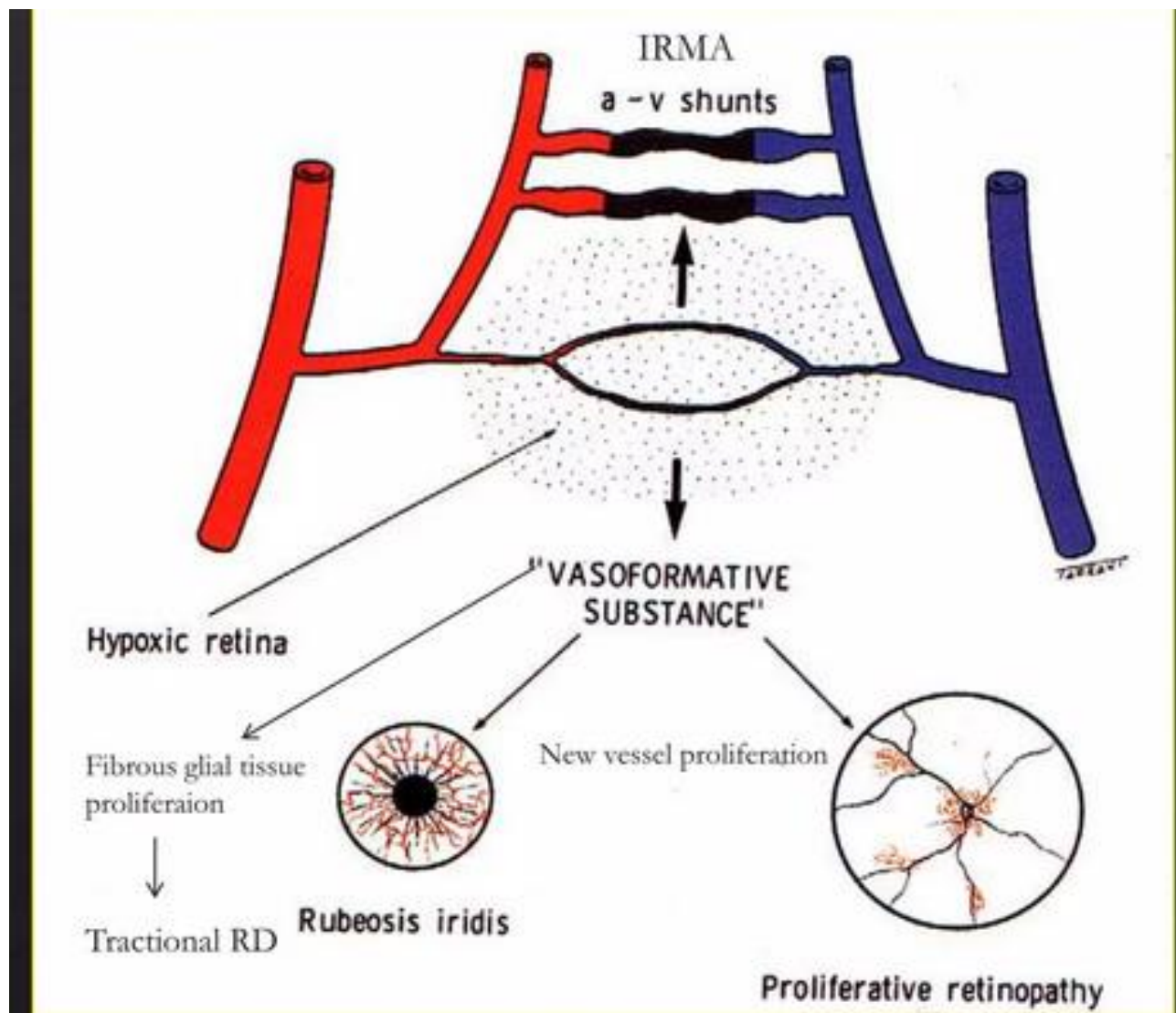
Rubeosis
iris



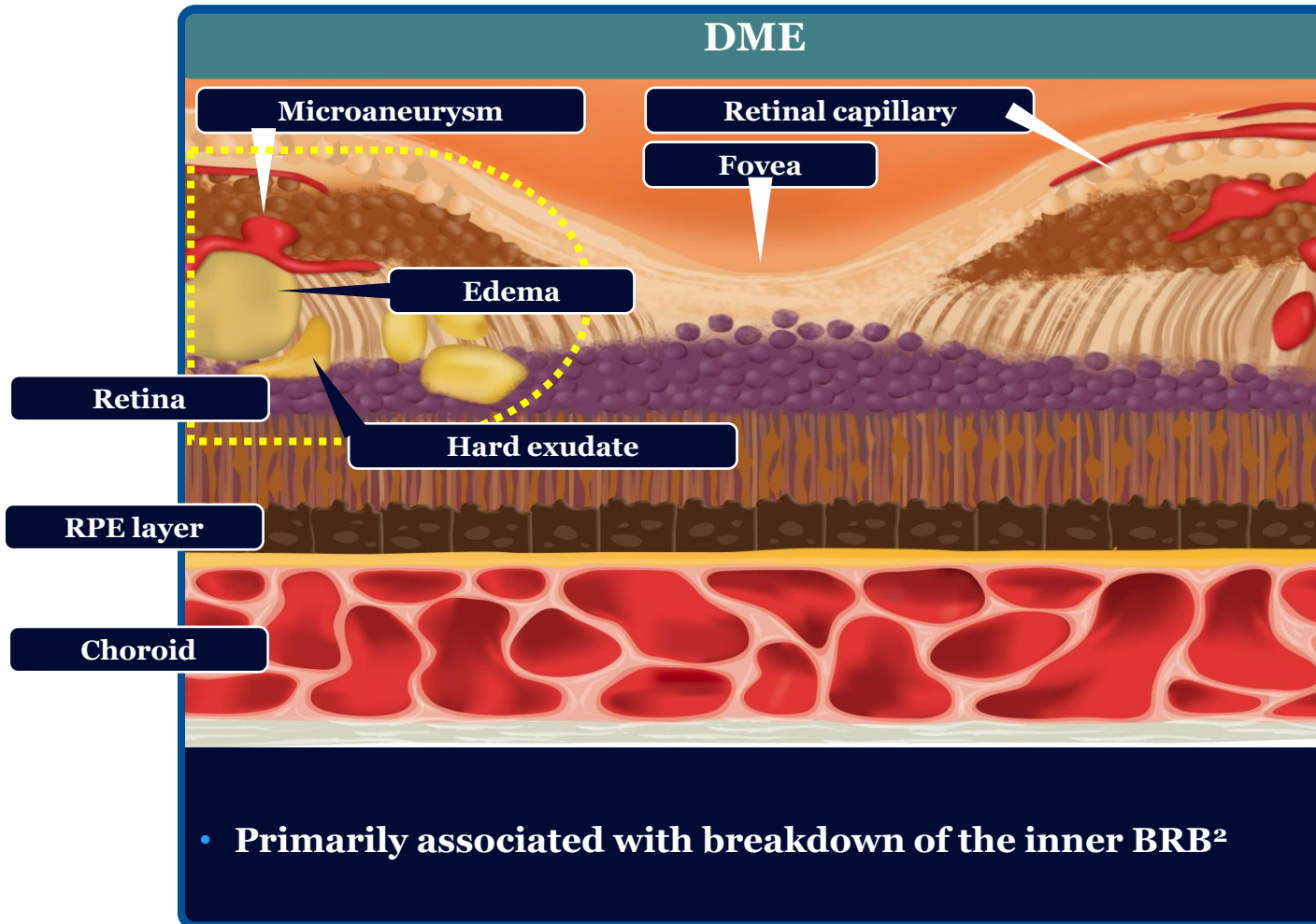
Proliferative
retinopathy



*intraretinal microvascular abnormalities



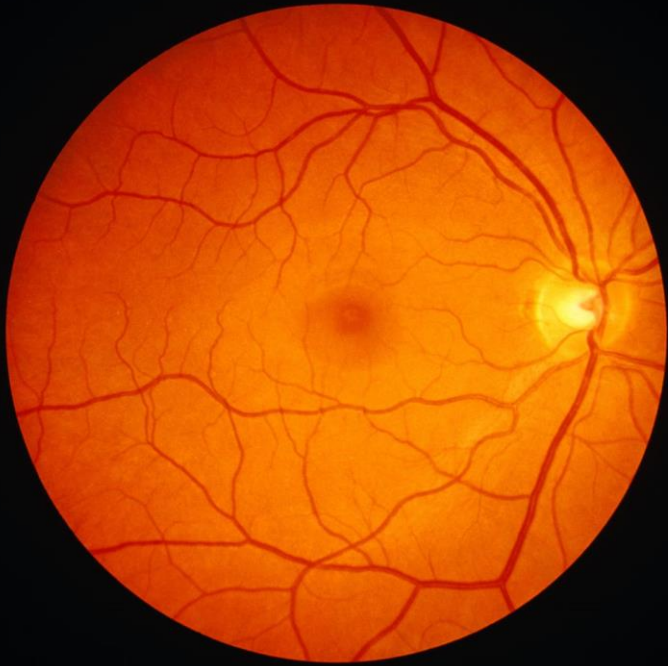
DME primarily affects inner BRB



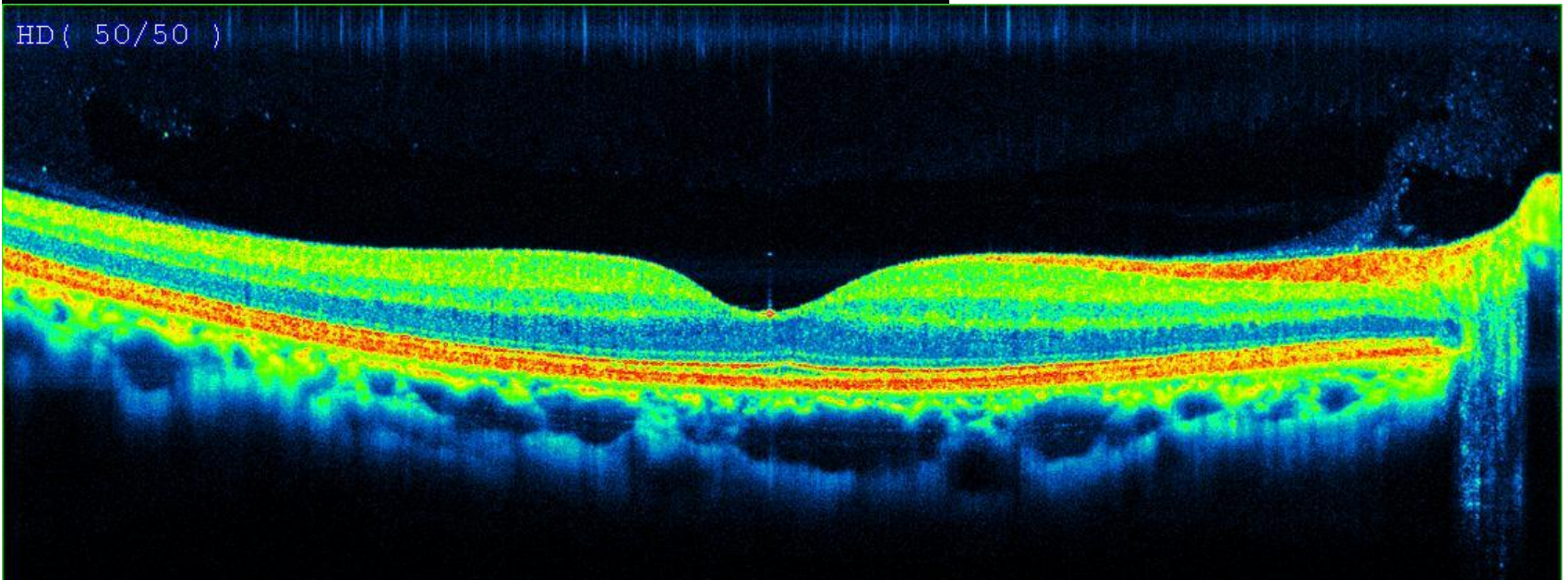


DIABETIC RETINOPATHY

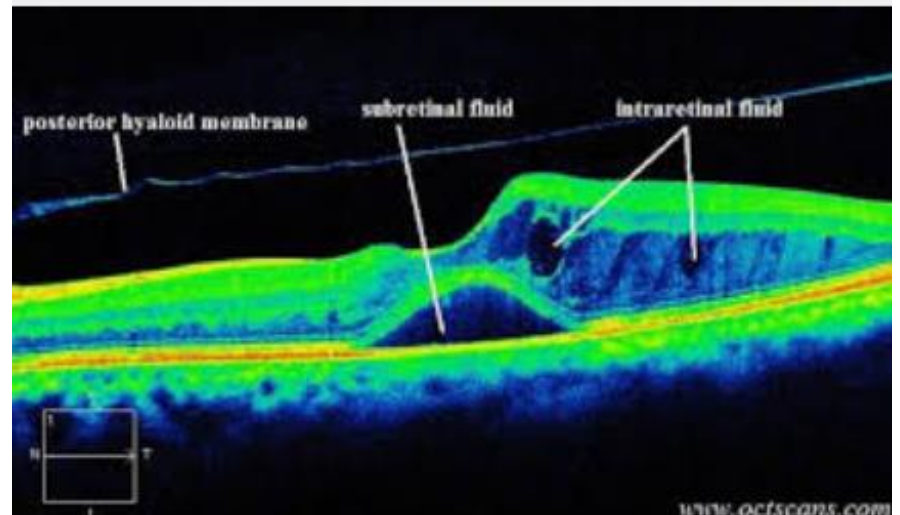
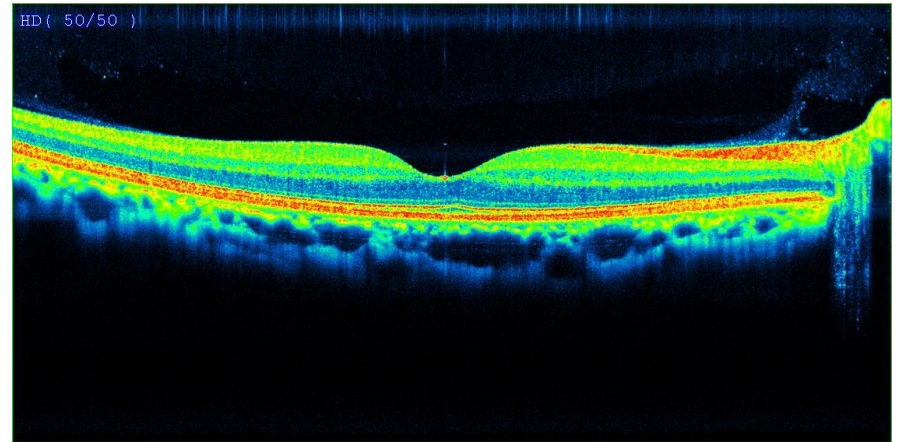
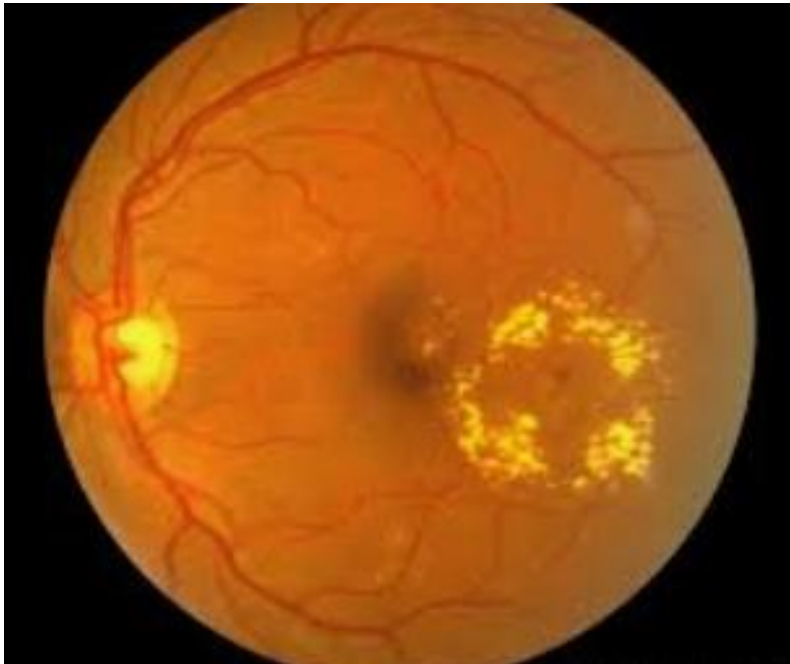
- MACULA INVOLVED-CSME
- NON MACULA –NPDR-MILD/MODERATE/SEVERE
- --PDR
- --ADED



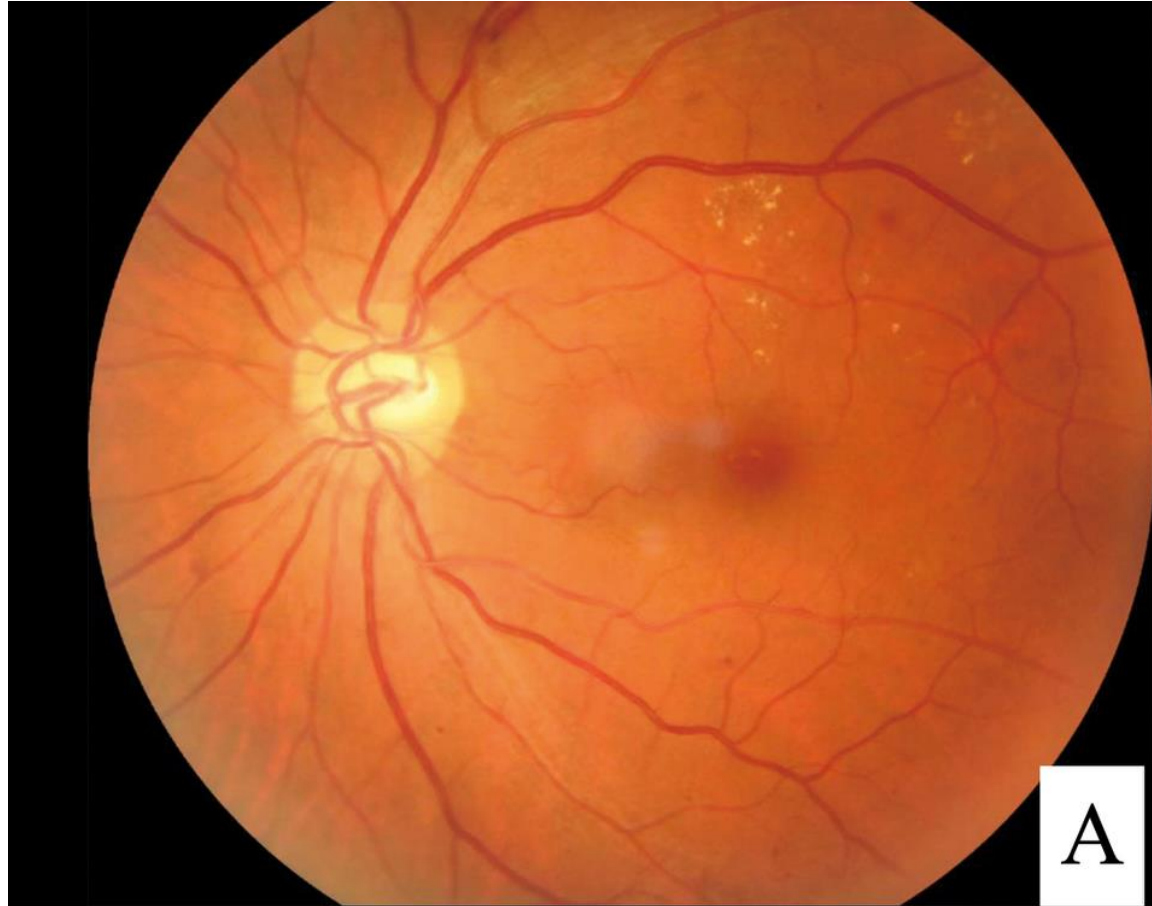
HD (50/50)



CSME



MILD



MODERATE



SEVERE

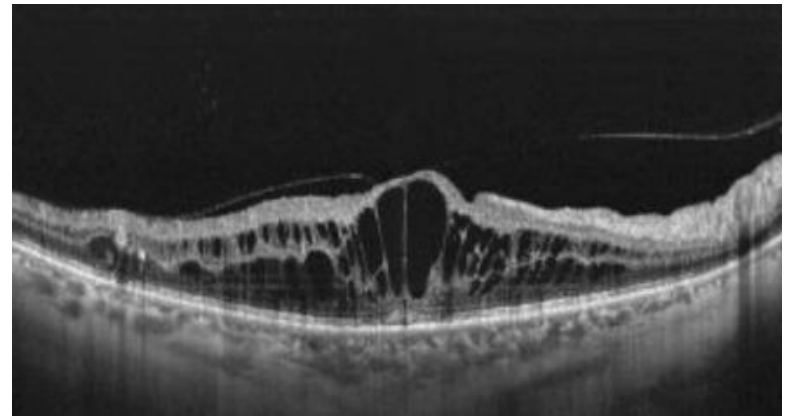


PDR

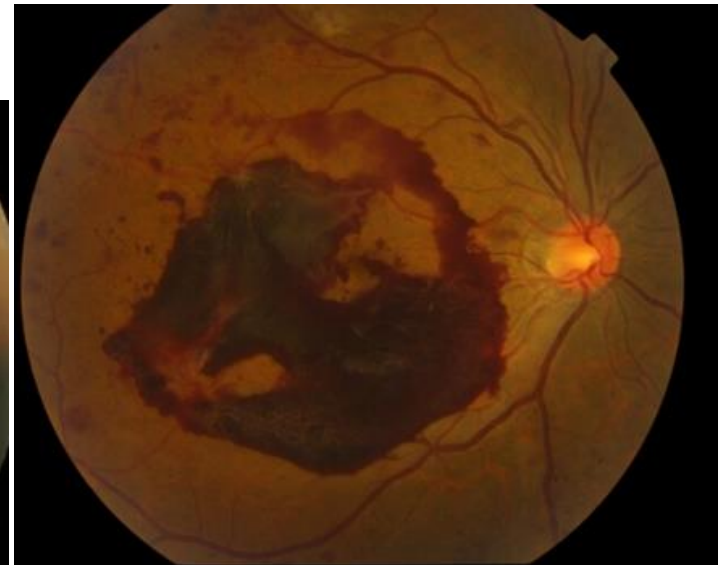
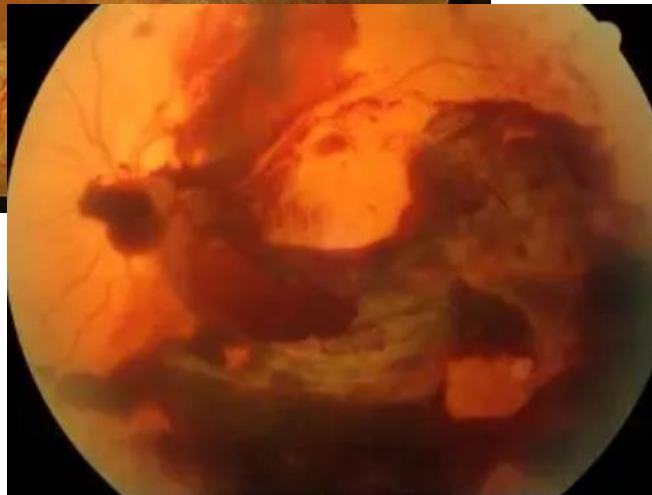
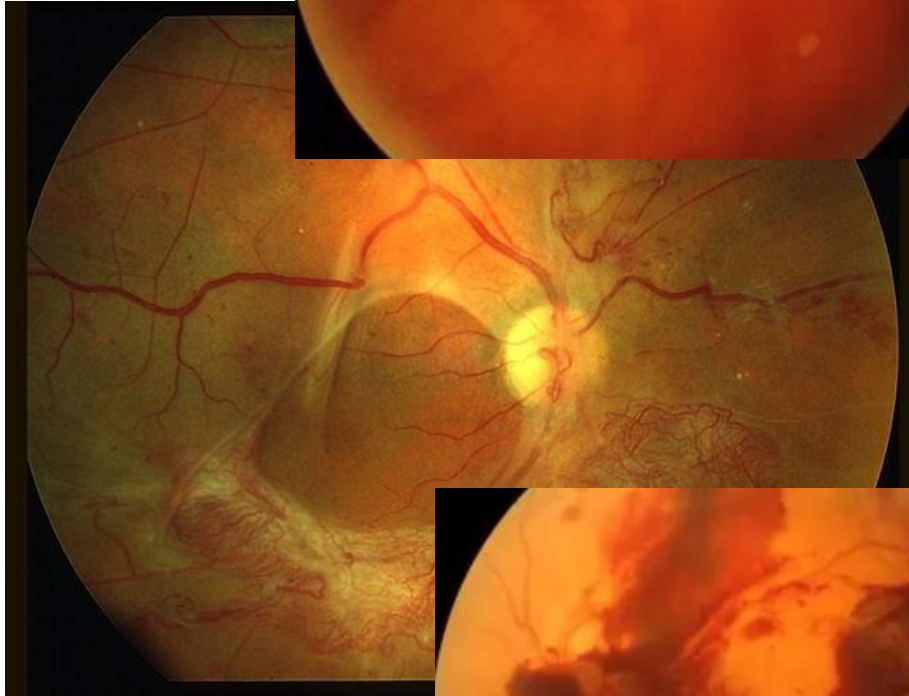
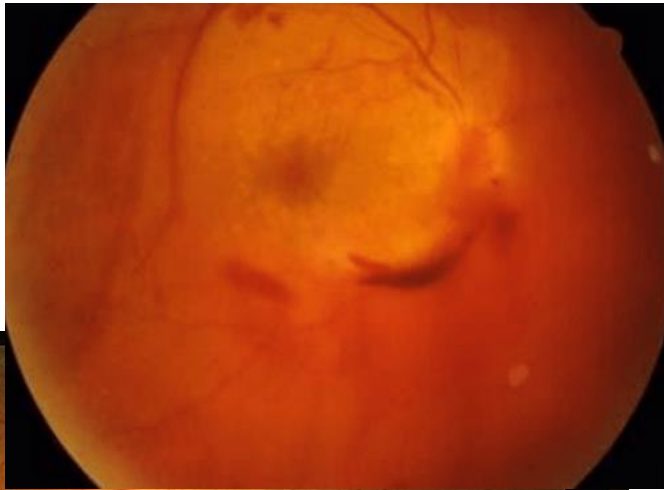


Figure 2. Proliferative diabetic retinopathy with preretinal hemorrhage.

SEVERE NPDR CSME



ADED



Management

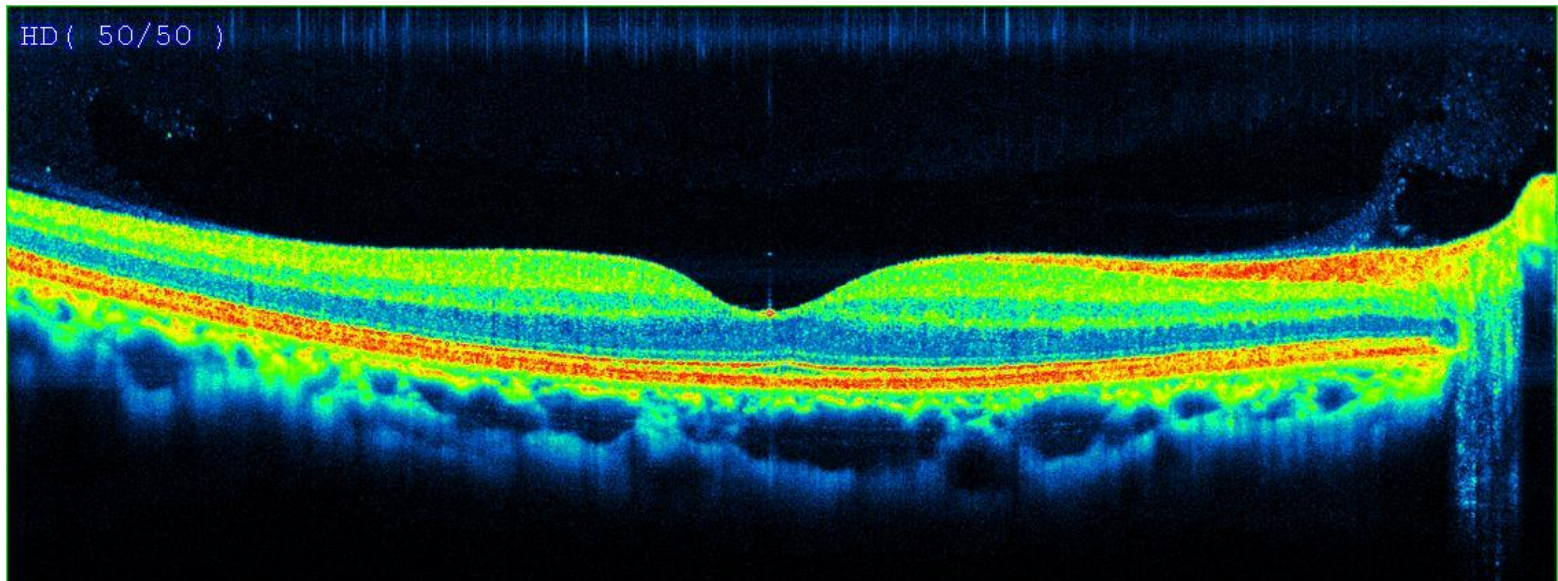
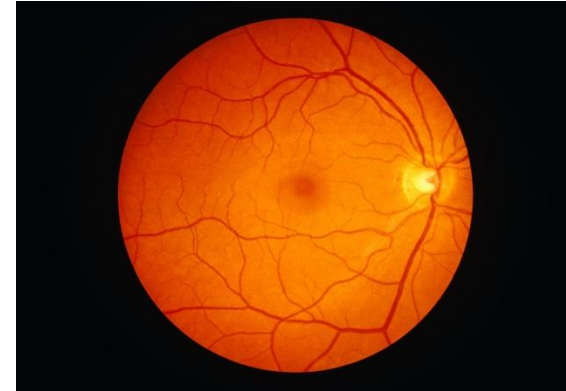
- **SYSTEMIC CONTROL**
- **LASER**
- **INJ ANTI VEGF**
- **SURGERY**

Treatment

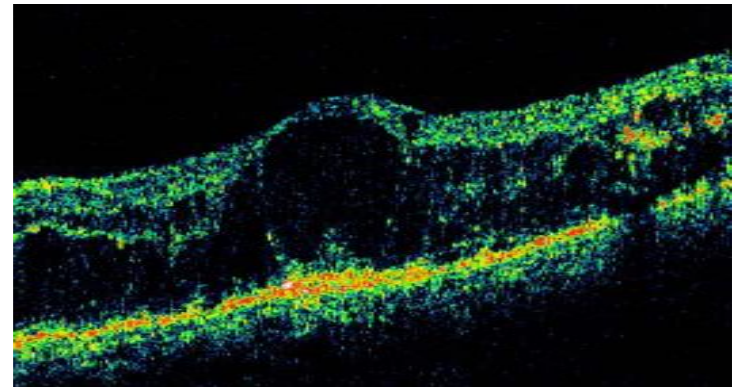
- Systemic treatment
 - glucose control
 - blood-pressure control
 - blood-lipid control
 - multifactorial metabolic interventions
 - Correction of Anaemia
 - Correction of kidney disease

Investigation-ocular

- CFP
- OCT MACULA



- Foveal leaking CFT (OCT stratus) $>250\ \mu\text{m}$ - treated with Inj Anti VEGF

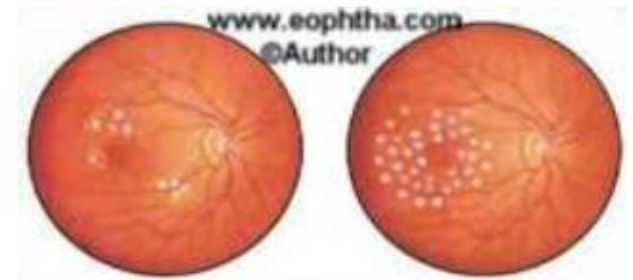


- Leaking microaneurysms in areas of 500-3000 μm from the center of macula - treated with photocoagulation

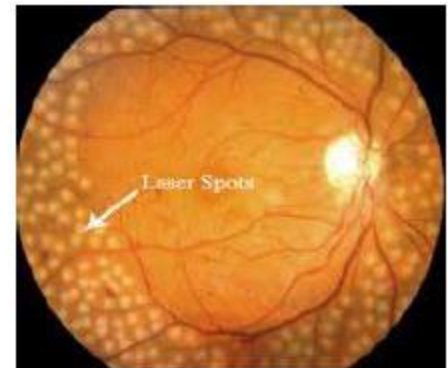
Photocoagulation : technique

Clinically significant macular edema (CSME)

- - Focal treatment
- - Grid treatment



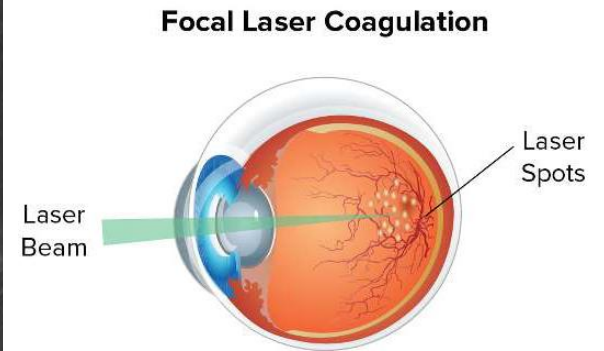
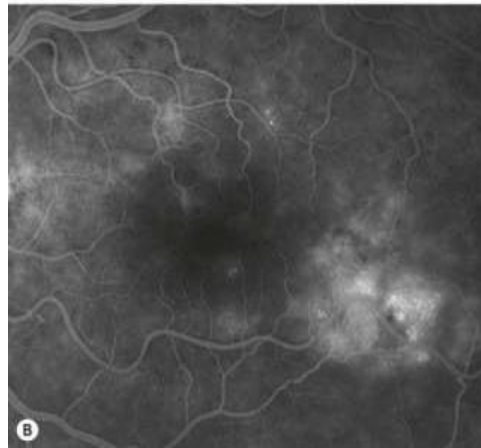
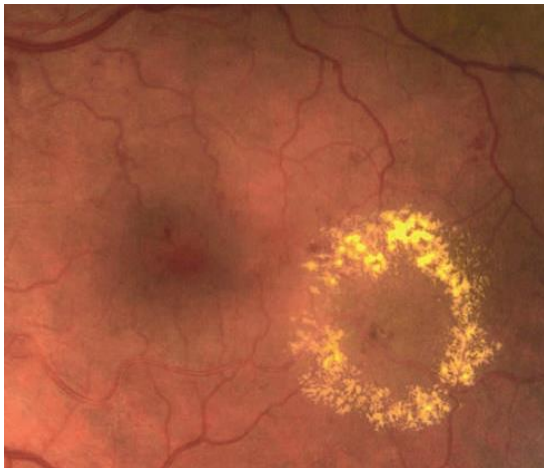
- • Proliferative diabetic retinopathy (PDR)
- - Panretinal photocoagulation (PRP)



How laser works

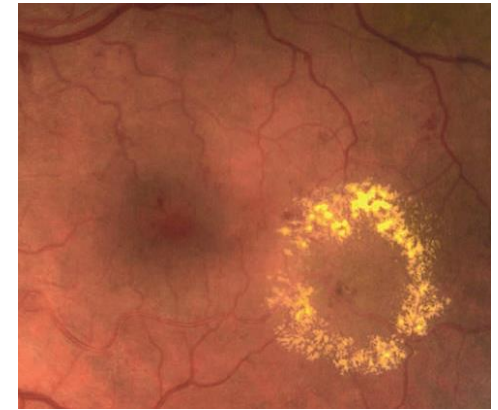
- Focal laser
- PRP Laser

Focal laser

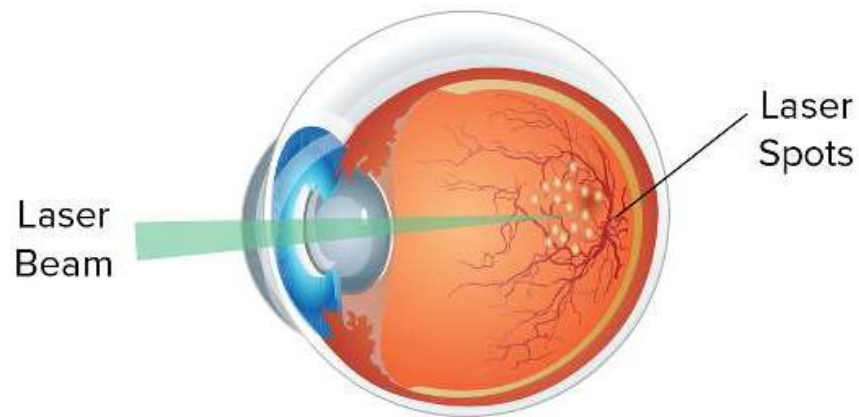


Focal photocoagulation

- Focal maculopathy
- Laser used- Argon
- • Spot size 50 - 100 μm
- • Exposure time 0.1 sec

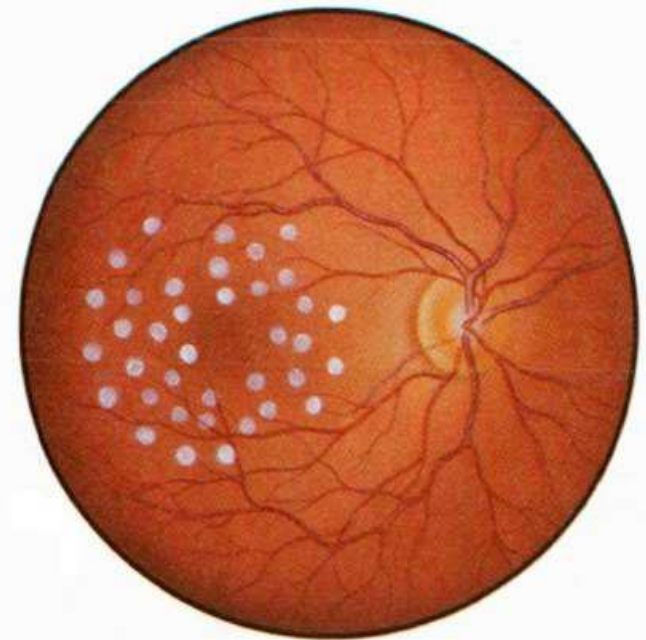


Focal Laser Coagulation



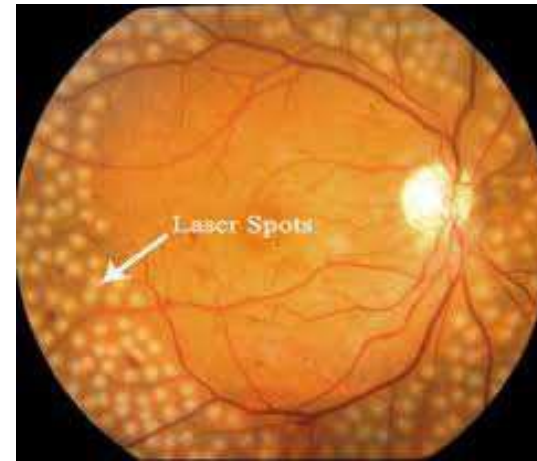
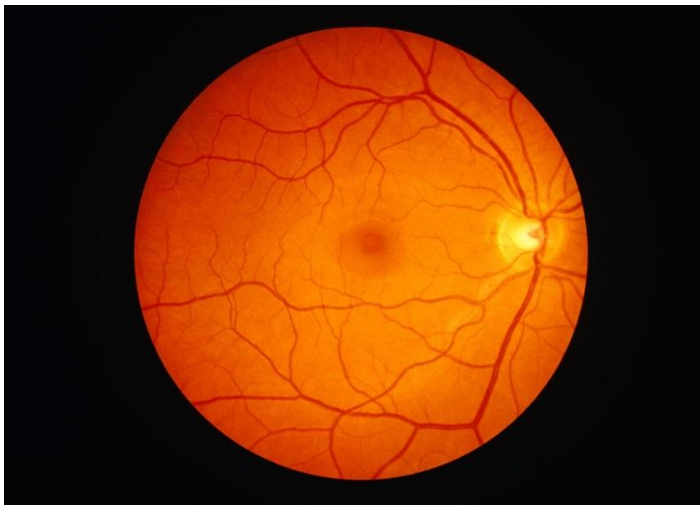
Grid pattern photocoagulation

- Burns applied to all areas of diffuse retinal thickening more than 500 μm from centre of macula and 500 μm from the temporal margin of optic disc
- • Laser used- Argon/Fd Nd Yag
- • Spot size 50-100 μm
- • Exposure time 0.1 sec
- • Light intensity burns



How PRP acts

- Ischaemic retina turns into anoxic retina

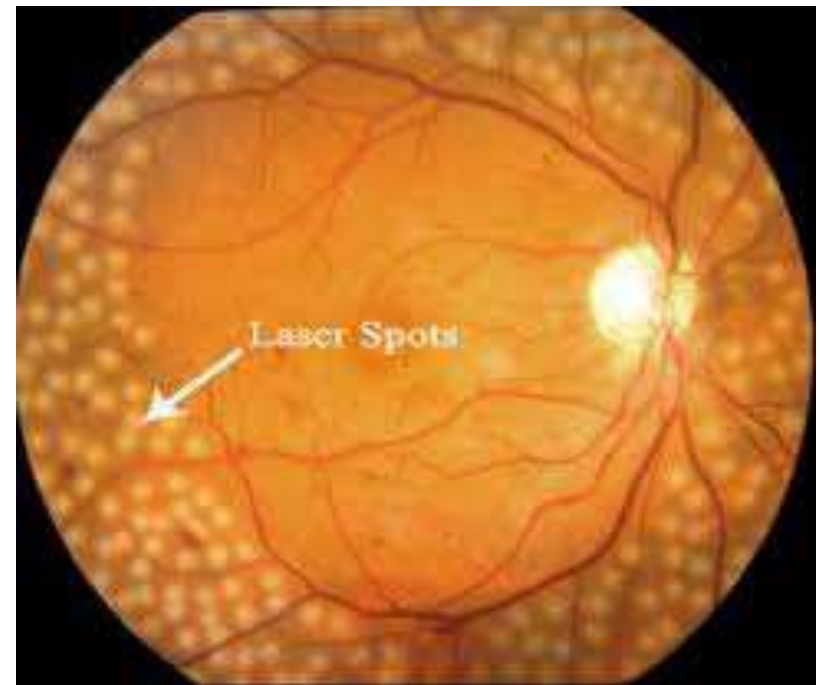


Pan retinal Photocoagulation

- • **PDR and severe NPDR**
- • Lasers used: Argon, Diode, Krypton red
- • **Avoided**
- Fibrovascular membranes
- Vitreoretinal traction
- Tractional RD

PRP technique

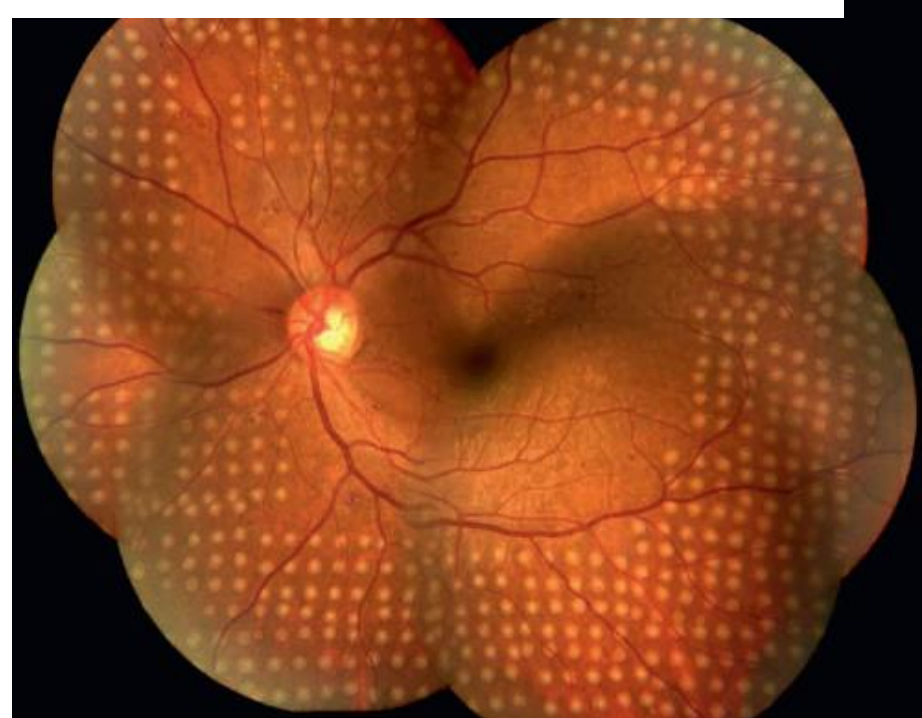
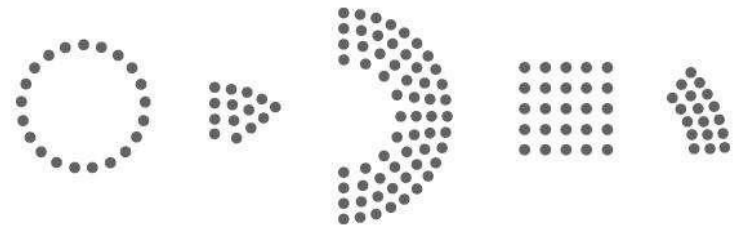
- 1500- 2000 burns
- • Size: 200-500 μm for Goldmann lens
- 100-300 μm for Panfundoscopic lens
- • One burn width apart
- • Duration: 0.05- 0.1 second
- • Power: 200-600mW



Laser treatment: recent development *Pattern scanning laser (PASCAL)*

Multiple laser spots with short pulse duration of 10-30ms (upto 56 shots)

- - Laser used: Nd:YAG
- - Advantages:
 - Shorter treatment duration
 - Increased safety
 - Uniform and precise spot placement



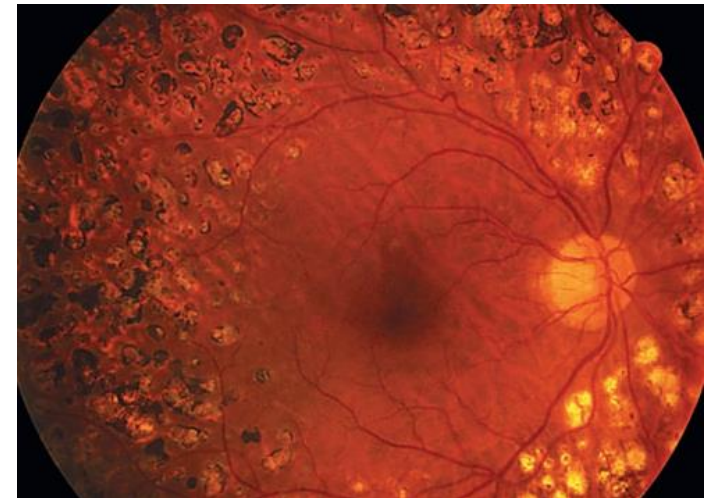
The value of PRP

Benefits

- Standard-of-care treatment for PDR over the past 20 to 30 years^{1,2}
- Regression of neovascularization¹
- 50%–60% reduction in the risk of severe VA loss¹
- When PDR regresses within the first 3 months after PRP treatment, the visual prognosis is relatively good¹

Limitations

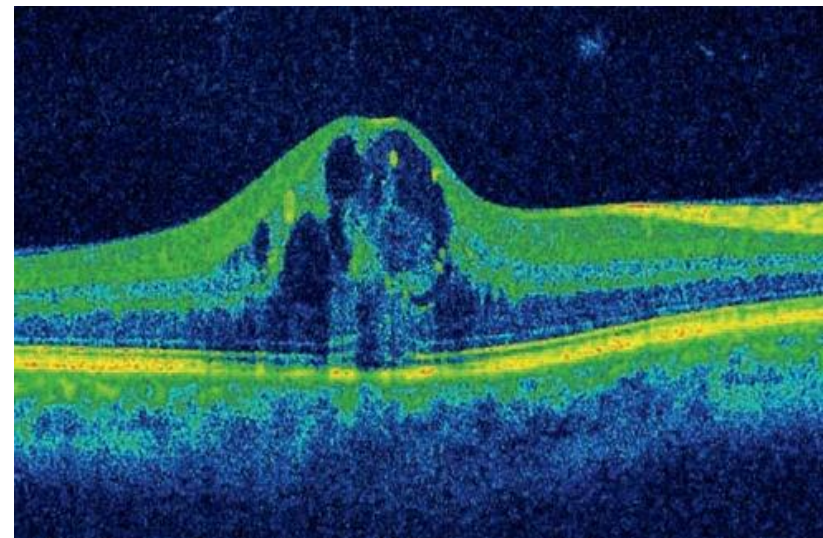
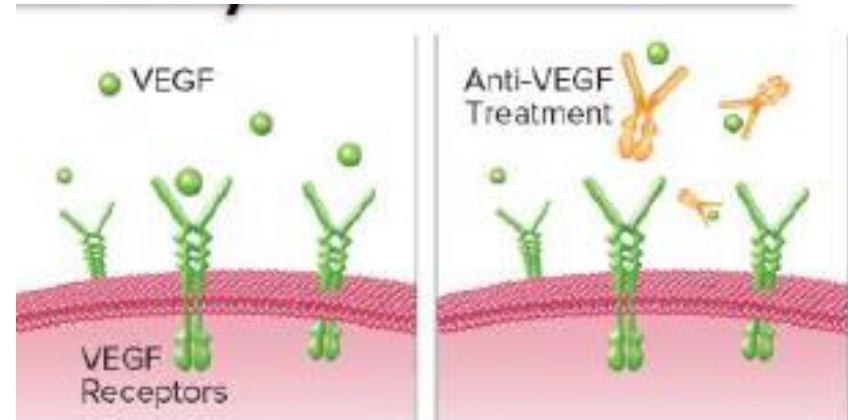
- Side-effects: decreased VA, peripheral field loss, and macular edema¹
- Most patients require ≥ 2 treatments¹
- Several patients still require supplemental laser treatment or ultimately pars plana vitrectomy¹
- Supplemental laser can lead to: restricted visual fields, night vision difficulties, loss of color vision and reduced contrast sensitivity and increased macular edema^{3–7}



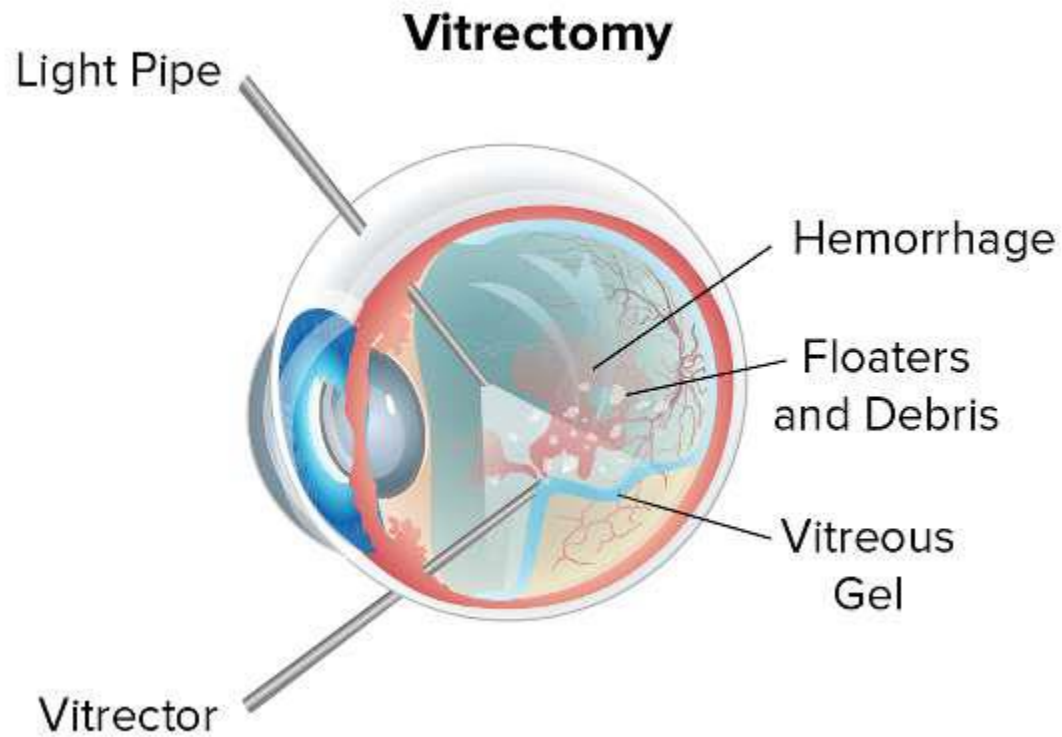
Pan Retinal
Photocoagulation

Anti VEGF

- Currently four anti- VEGF agents
 - - Pegatanib (Macugen)
 - - Ranibizumab (Lucentis)
 - - Bevacizumab (Avastin)
 - - VEGF- trap (Aflibercept)

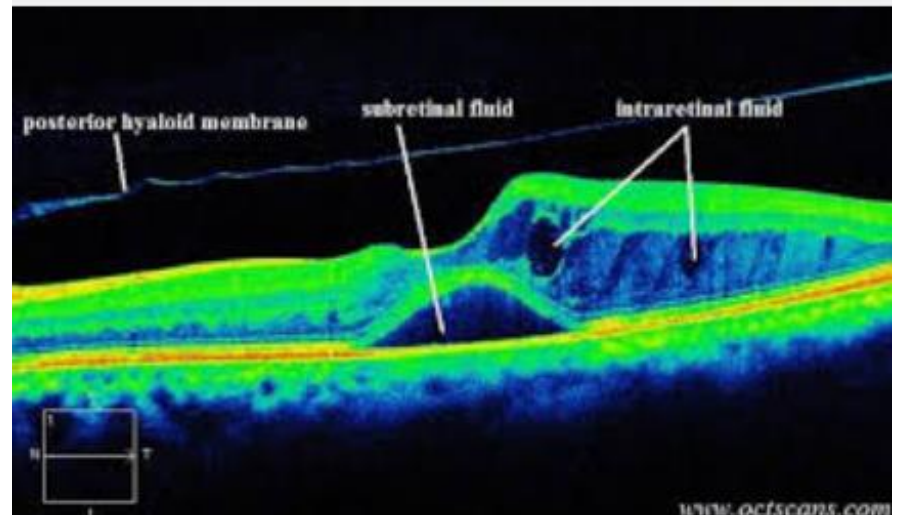
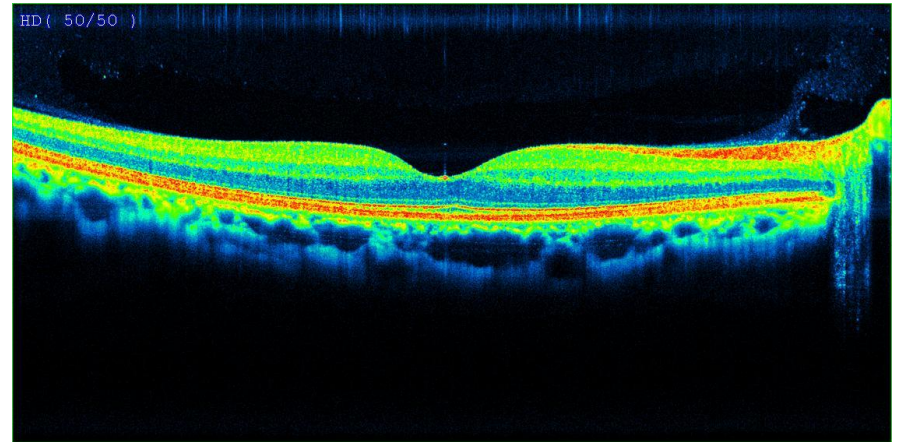
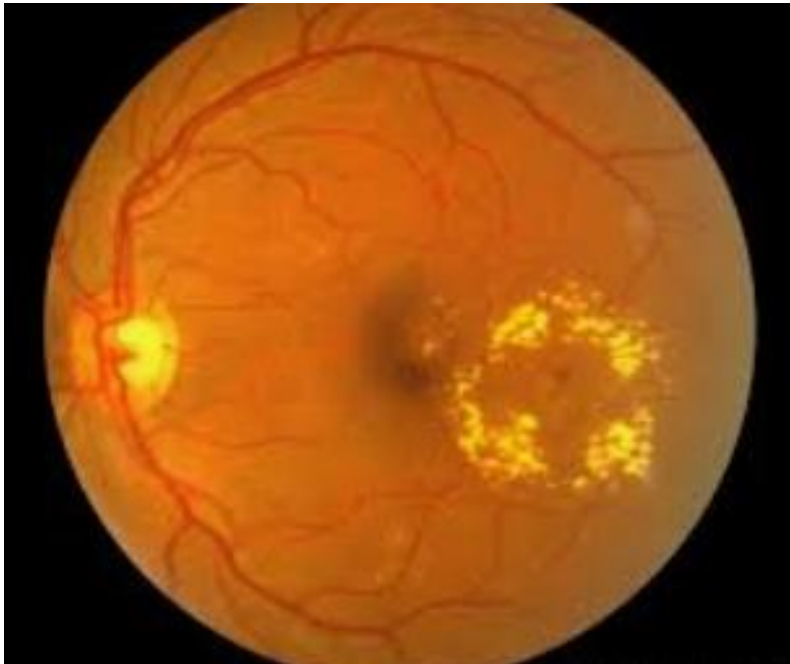


- Pars Plana vitrectomy

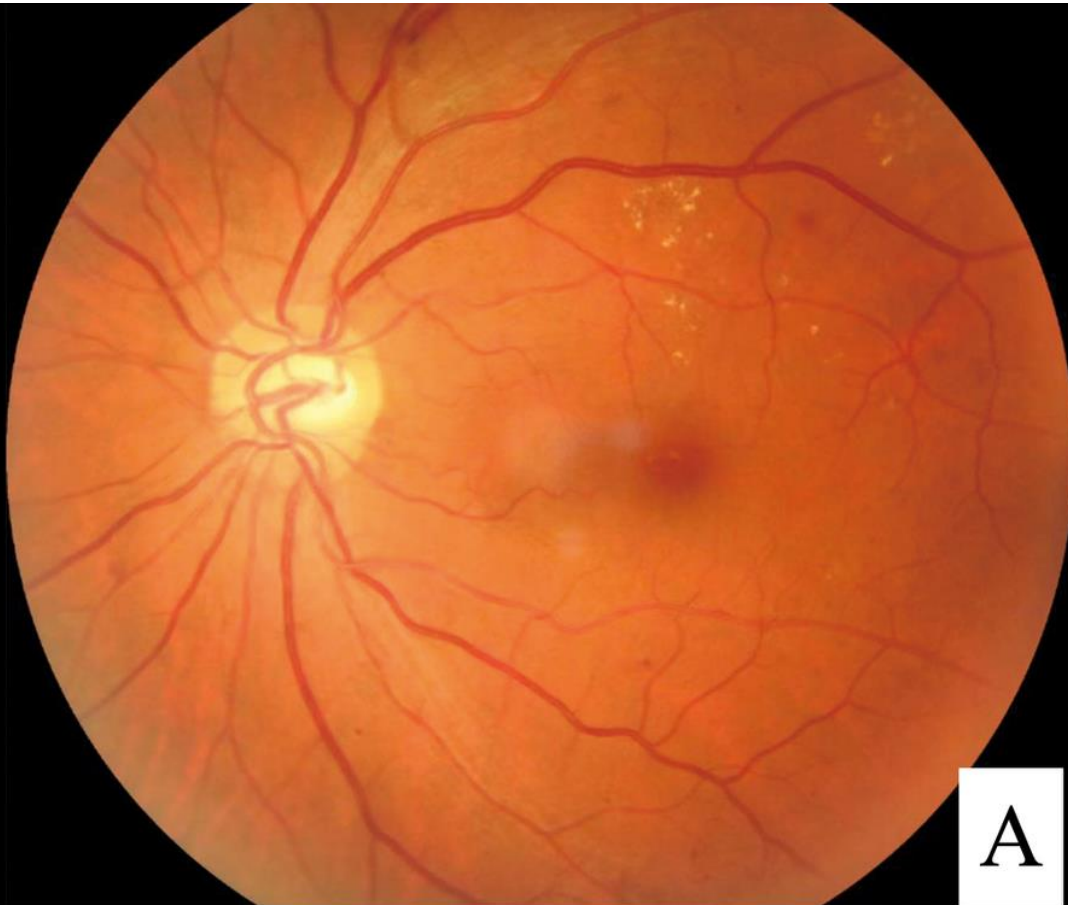


TREATMENT CASED BASE

NPDR CSME FOCAL LASER- INJ ANTI VEGF



MILD---OBSERVATION- FOLLOW UP-CNTROL SYSTEMIC FACTOR



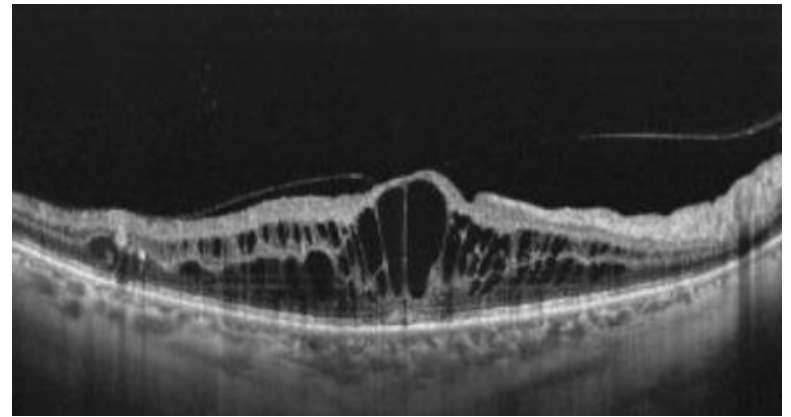
**MODERATE- --OBSERVATION-
FOLLOW UP-CNTROL SYSTEMIC FACTOR**



SEVERE- OBSERVATION- FOLLOW UP-CNTROL SYSTEMIC FACTOR-PRP



SEVERE NPDR CSME-PRP-INJ ANTI VGEF

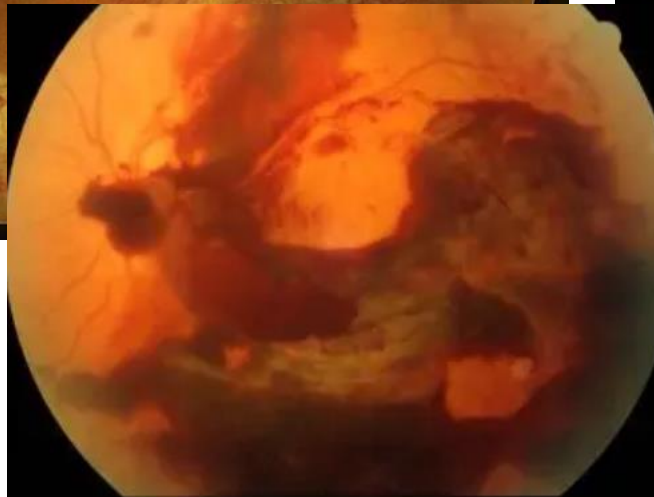
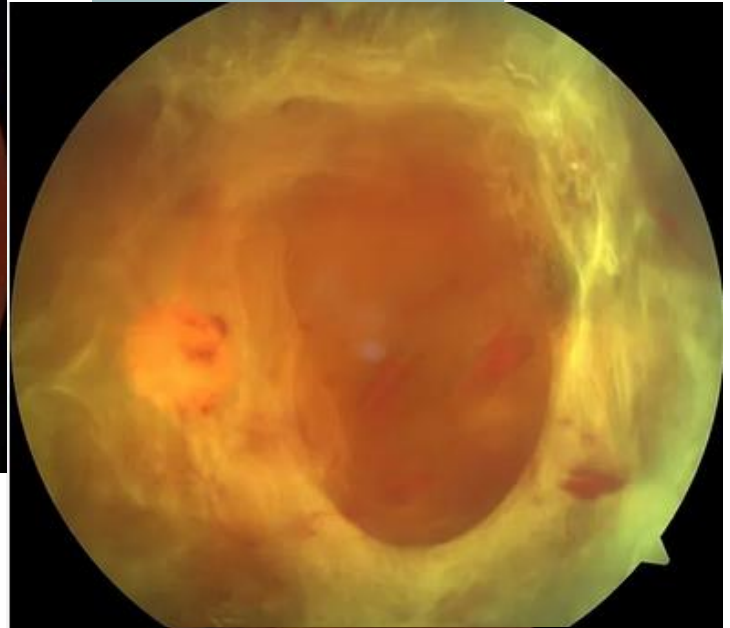
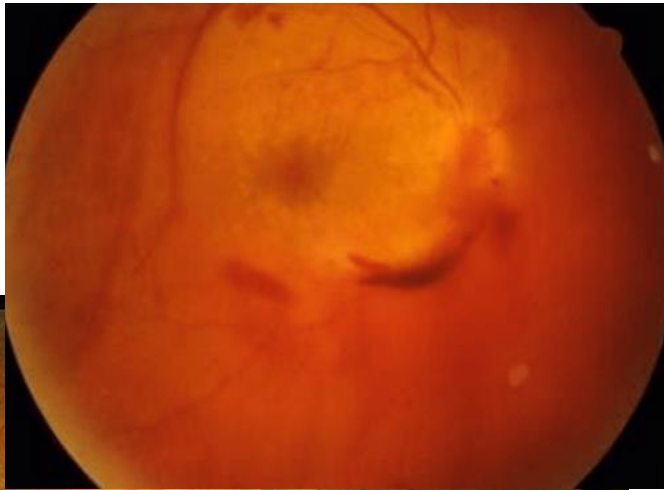


PDR-PRP

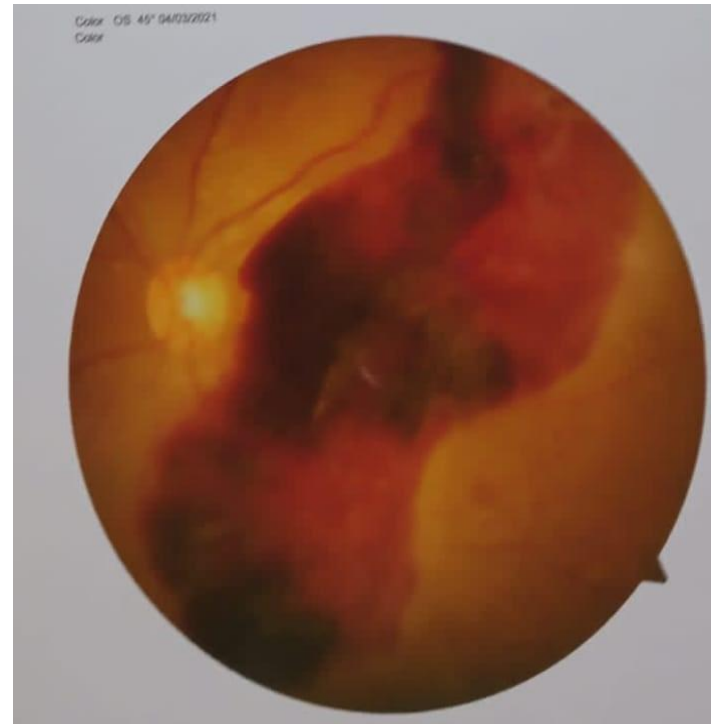


Figure 2. Proliferative diabetic retinopathy with preretinal hemorrhage.

AEDED
PPV

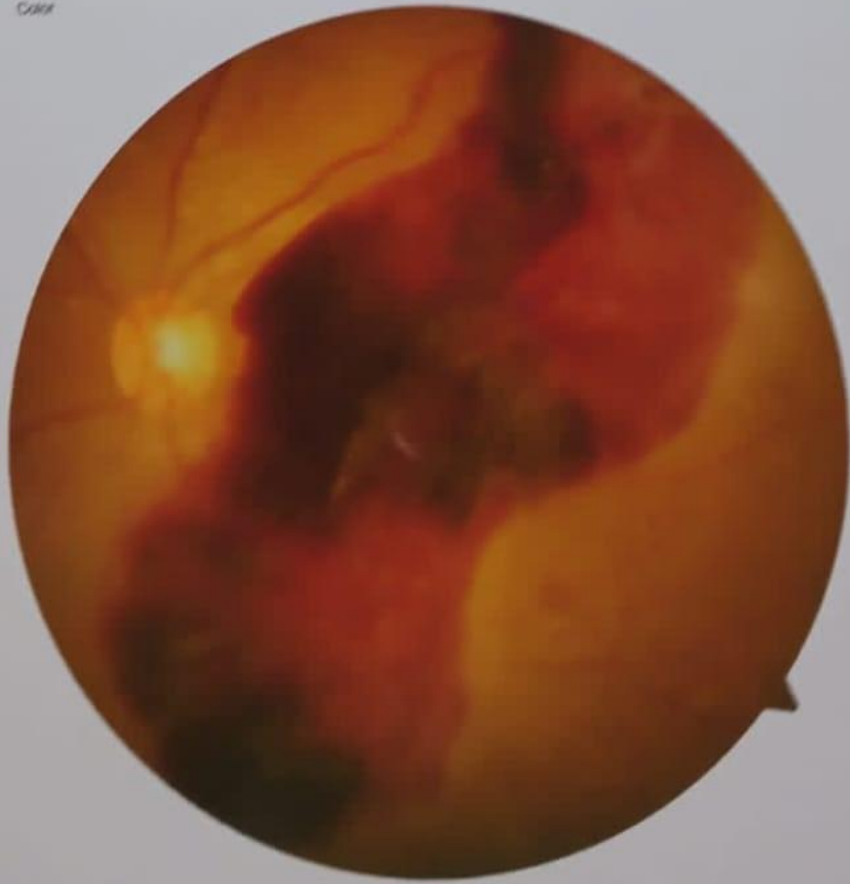


PPV-PT-1

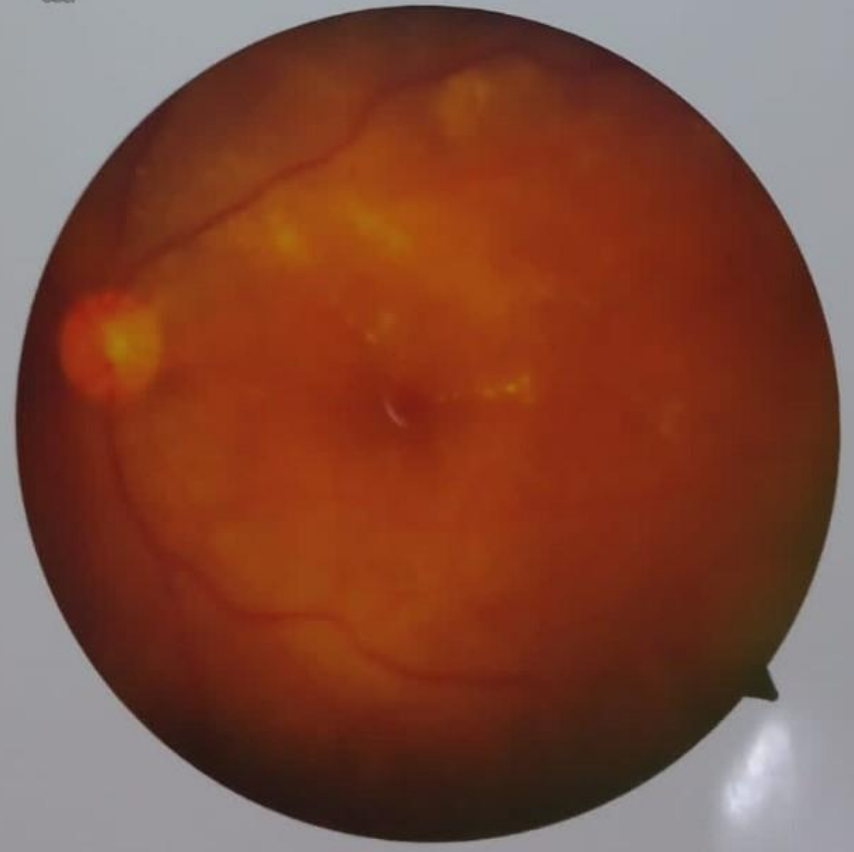


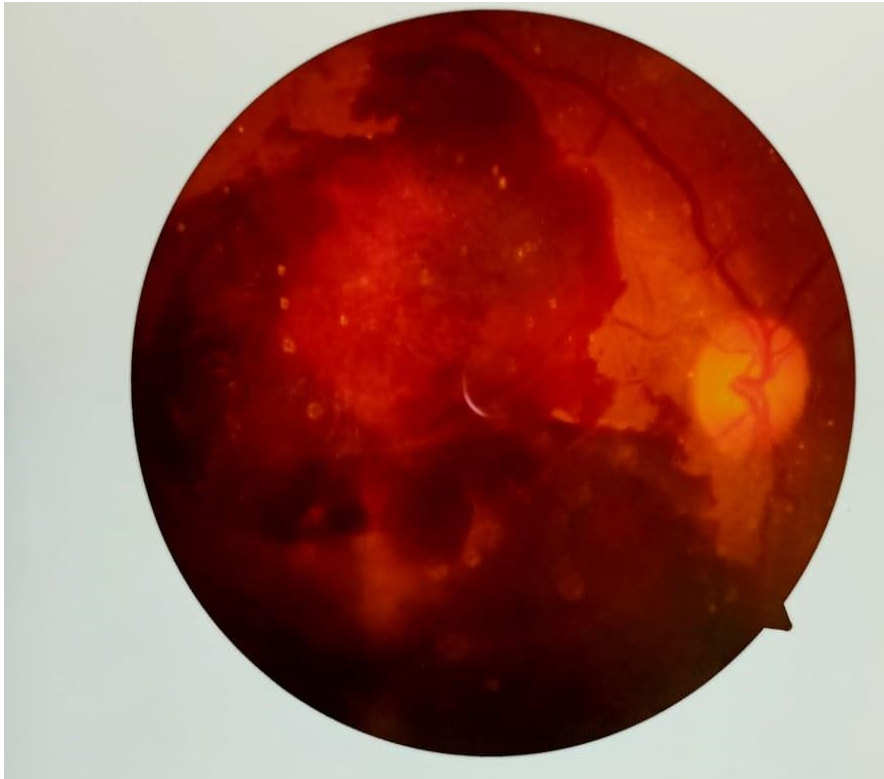
SURGERY

Color OS 45° 04/03/2021
Color



Color OS 45° 16/03/2021
Color





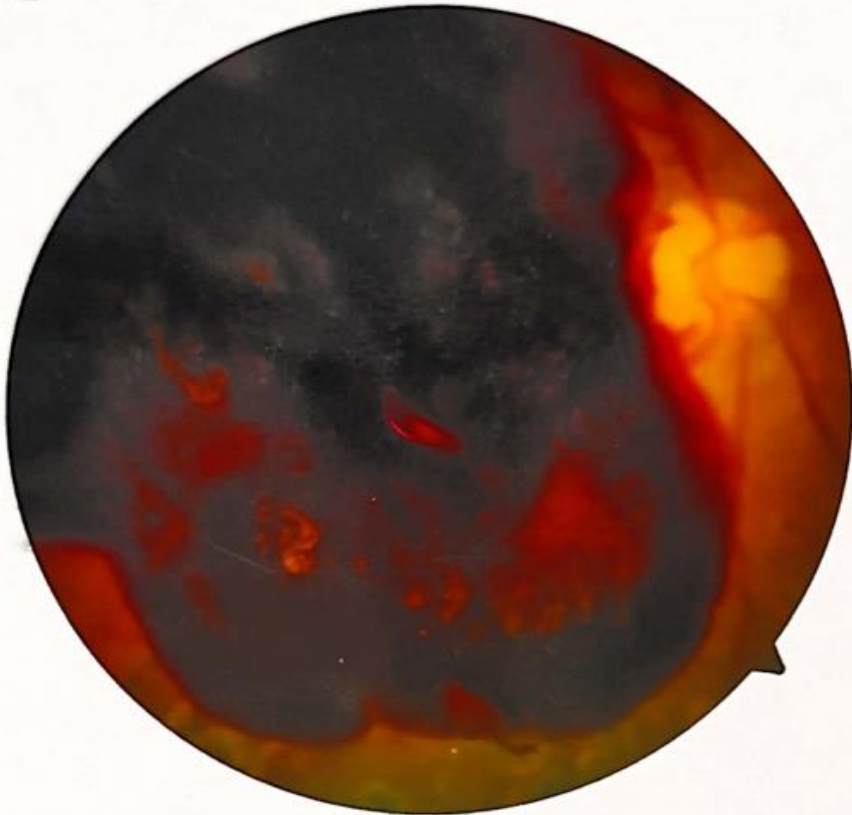
Institution:
Address:

Bangladesh Eye Care Hospital. Patient:
21/3, Zigatola, Dhanmondi, Dhaka. Patient No.:

SHYAMAL, ROY
Z7092019000001



Color OD 45° 31/05/2020
Color



Institution:
Address:

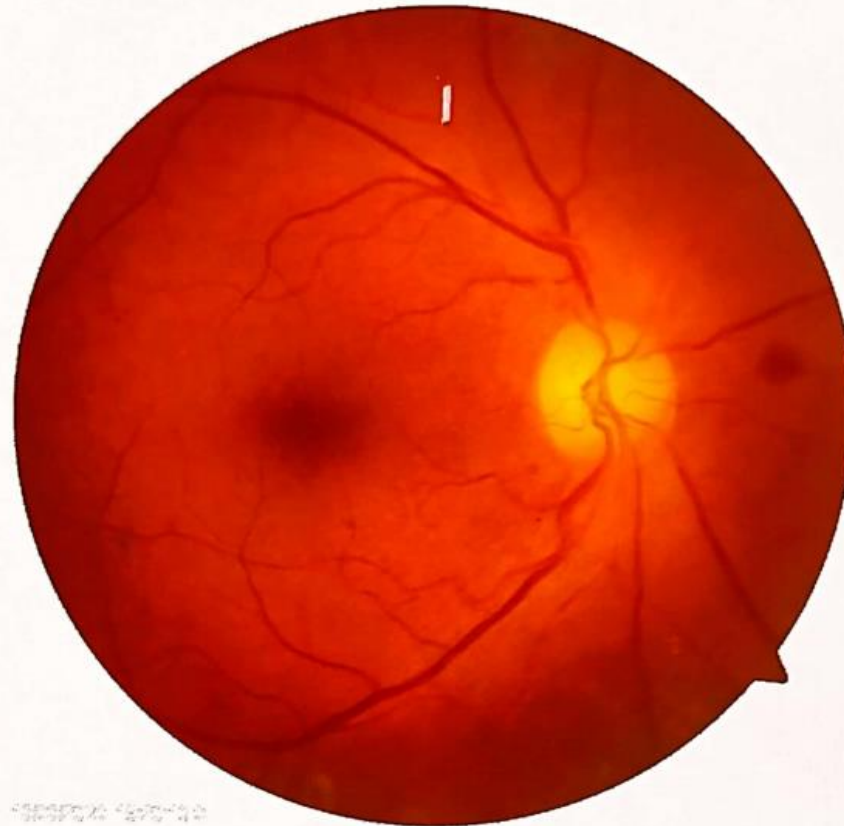
Bangladesh Eye Hospital,
Mirpur-2

Patient:
Date of birth:

Roy, Shyamal
30/12/1980



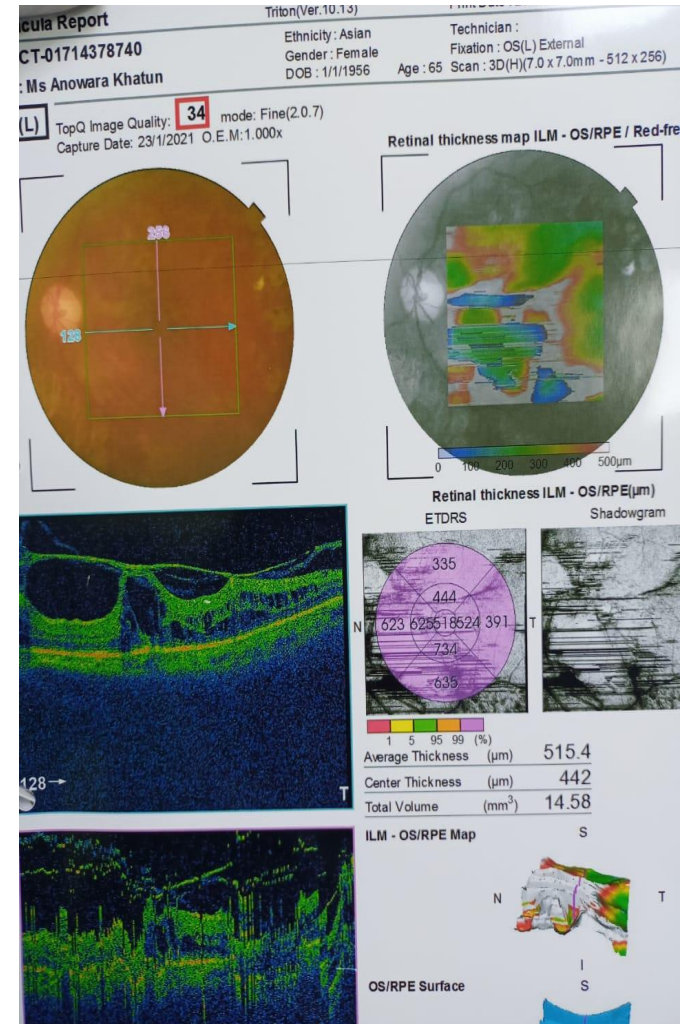
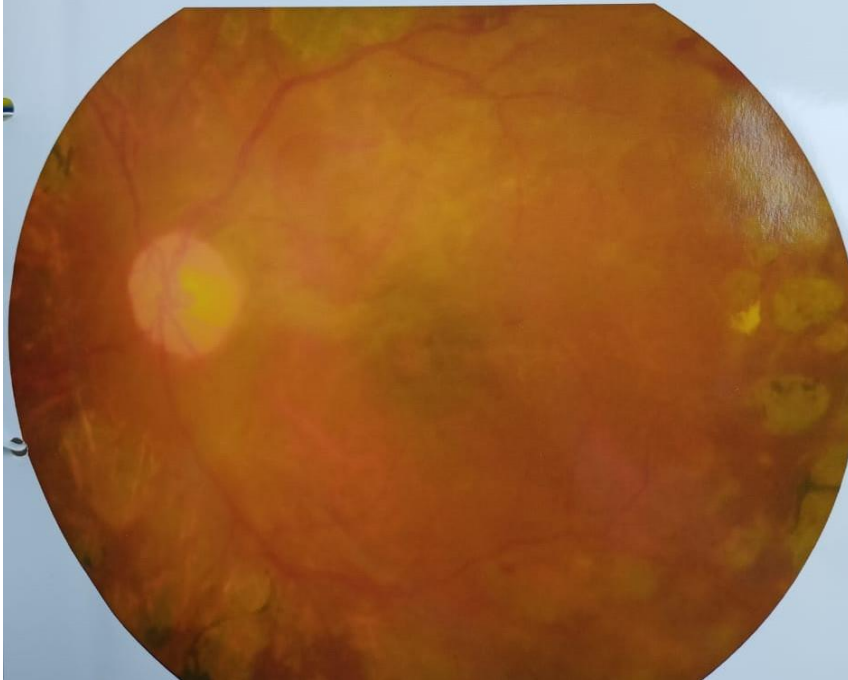
Color OD 45° 16/06/2020
Color

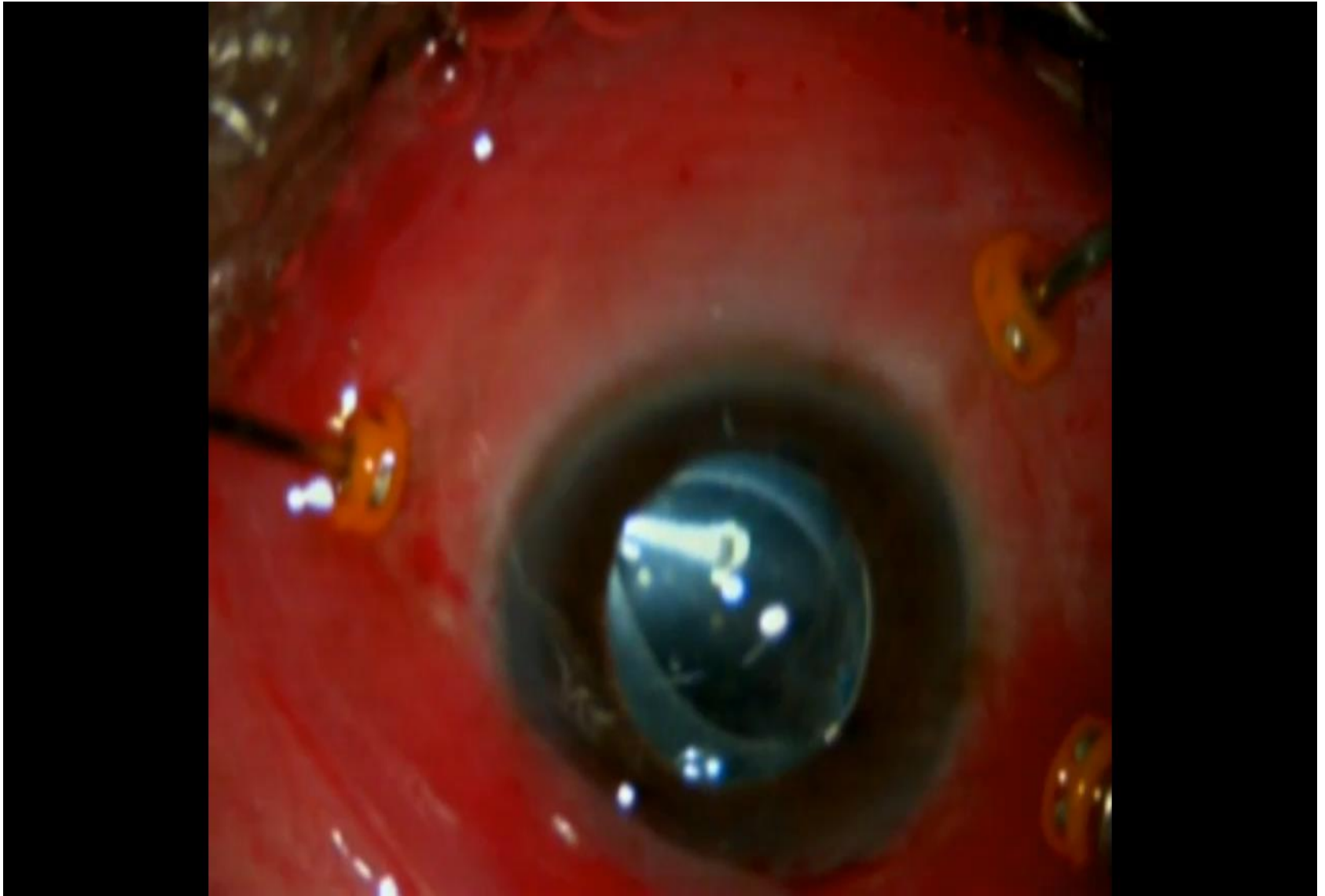


16062020 16062020

PT-2

Patient ID	: CFP-01714378740	Age	: 65 years
Patient Name	: Anowara Khatun	Capture Date	: 23-01-2021
Physicians	: Dr.Md.Arif Hayat Khan Pathan-MBBS,MCPS,FCPS,ICO(UK).		





Macula Report

CT-01714378740

Ms Anowara Khatun

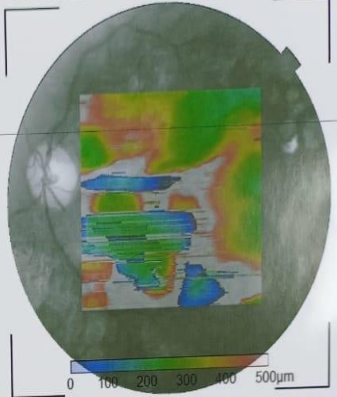
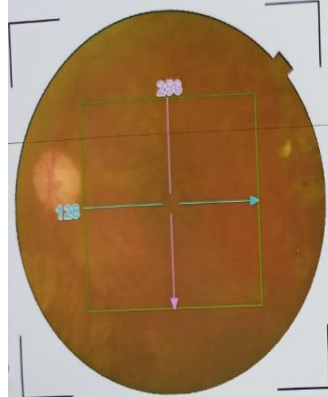
Triton(Ver.10.13)

Ethnicity: Asian
Gender: Female
DOB: 1/1/1956

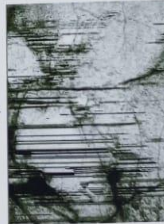
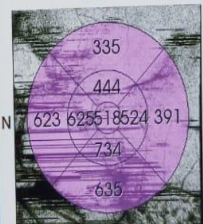
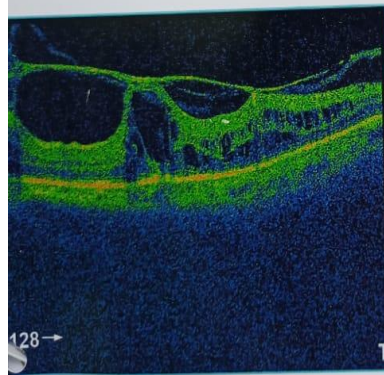
Technician :
Fixation : OS(L) External
Age : 65 Scan : 3D(H)(7.0 x 7.0mm - 512 x 256)

(L) TopQ Image Quality: **34** mode: Fine(2.0.7)
Capture Date: 23/1/2021 O.E.M.:1.000x

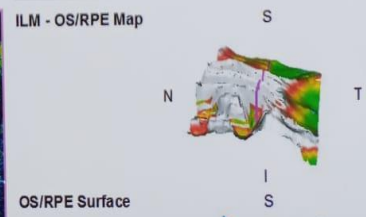
Retinal thickness map ILM - OS/RPE / Red-free



Retinal thickness ILM - OS/RPE(μm)



Average Thickness (μm)	515.4
Center Thickness (μm)	442
Total Volume (mm ³)	14.58



Macula Report

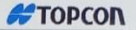
CT-01714378740

Ms Anowara Khatun

Triton(Ver.10.13)

Ethnicity: Asian
Gender: Female
DOB: 1/1/1956

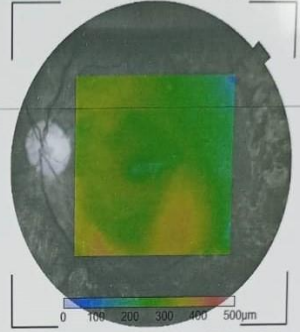
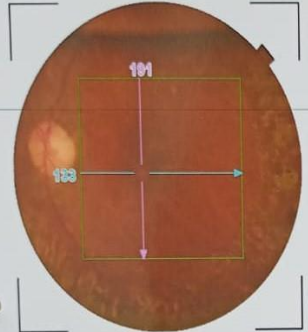
Print Date : 13/3/2021



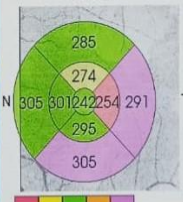
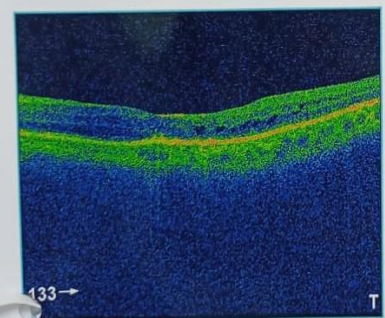
Technician :
Fixation : OS(L) Macula
Age : 65 Scan : 3D(H)(7.0 x 7.0mm - 512 x 256)

(OS(L)) TopQ Image Quality: **58** mode: Fine(2.0.7)
Capture Date: 13/3/2021 O.E.M.:1.000x

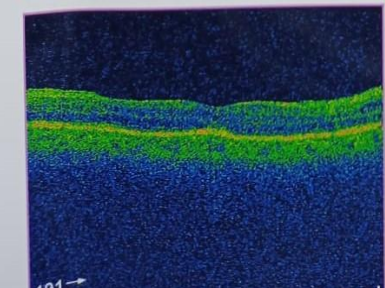
Retinal thickness map ILM - OS/RPE / Red-free



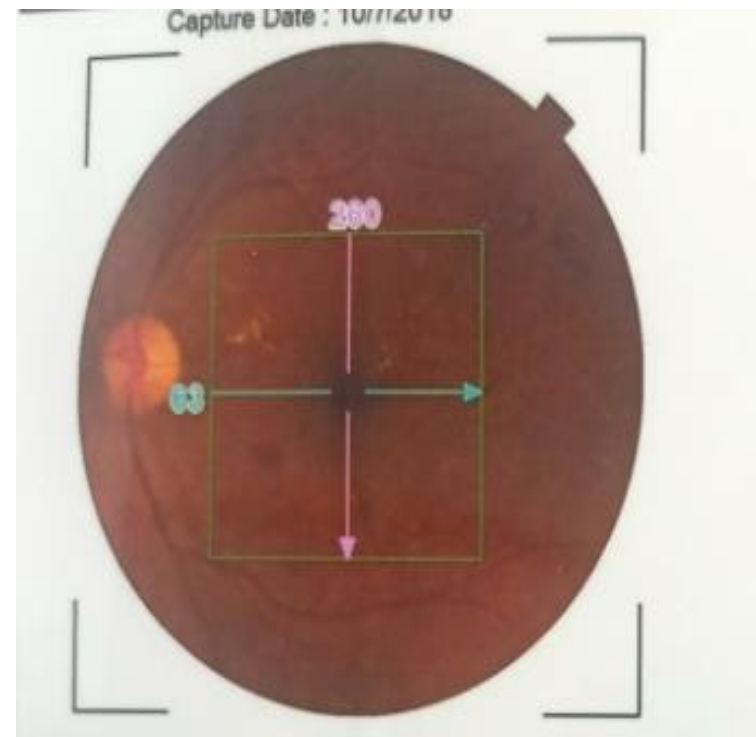
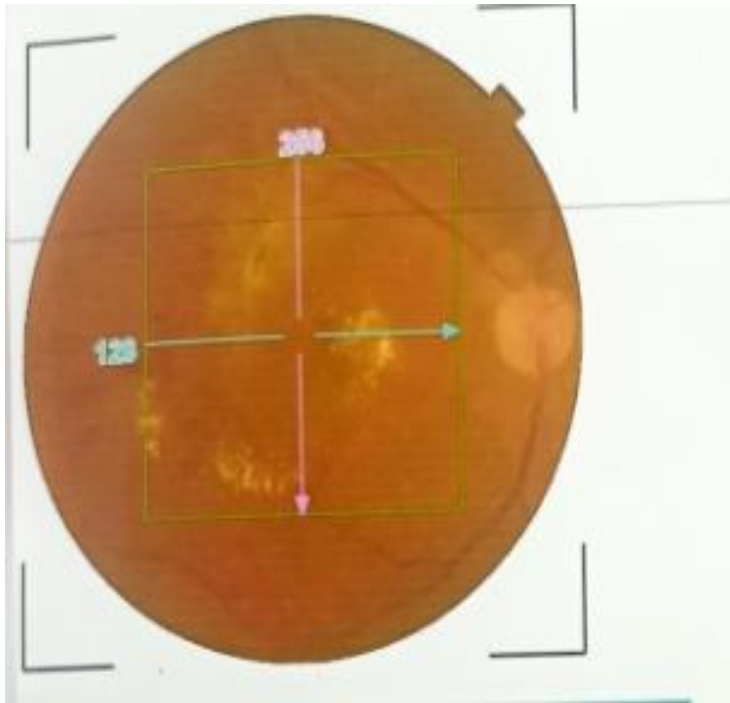
Retinal thickness ILM - OS/RPE(μm)



Average Thickness (μm)	291.2
Center Thickness (μm)	206
Total Volume (mm ³)	8.24



PT-3



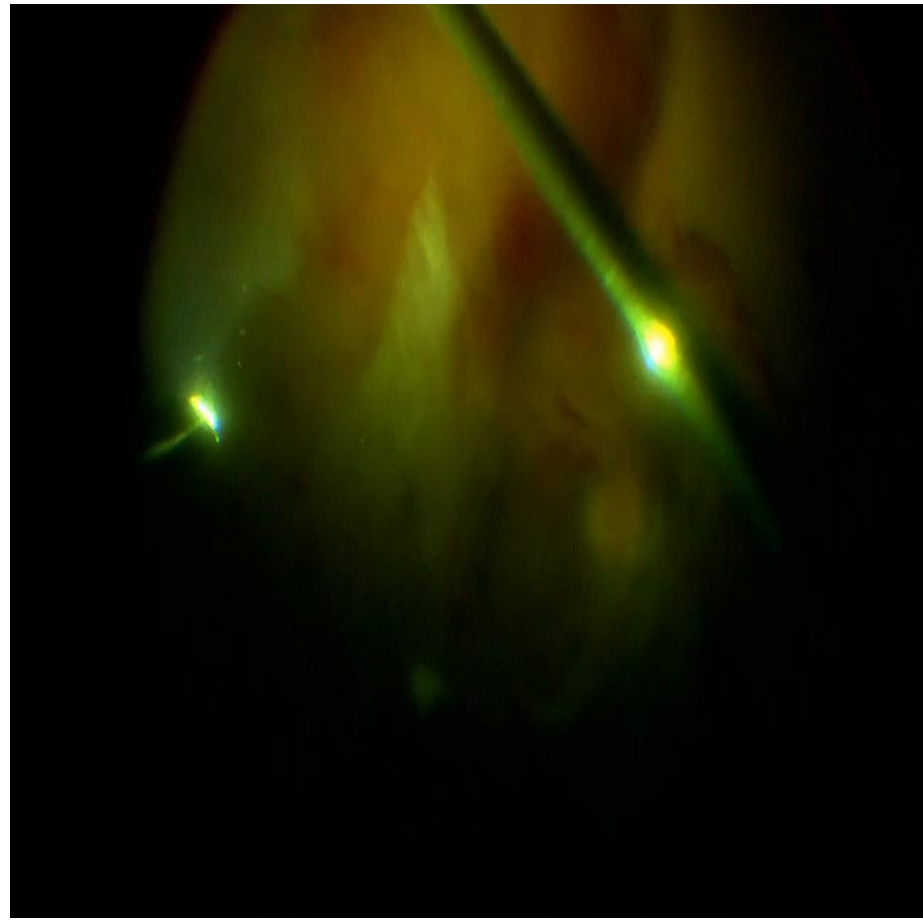
Color OS 45° 29/04/2021
Color



Color OS 45° 29/04/2021
Color



Color OS 45° 17/03/2022
Color





Problems of PPV

- Expensive
- Not available every where
- Out come not **ALWAYS** good
- Need experness

Role of primary physician

- Routine referral;
- Regular eye check up report
- Counselling

Take Home Message

- Blindness is a BURDEN
- It can be prevented easily
- Treatment is available in advanced cases



thank you