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Eye Hospital

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Management of Macular Edema: Ugandan Perspective

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Dr. AGARWAL'S EYE HOSPITAL, Kampala, Uganda

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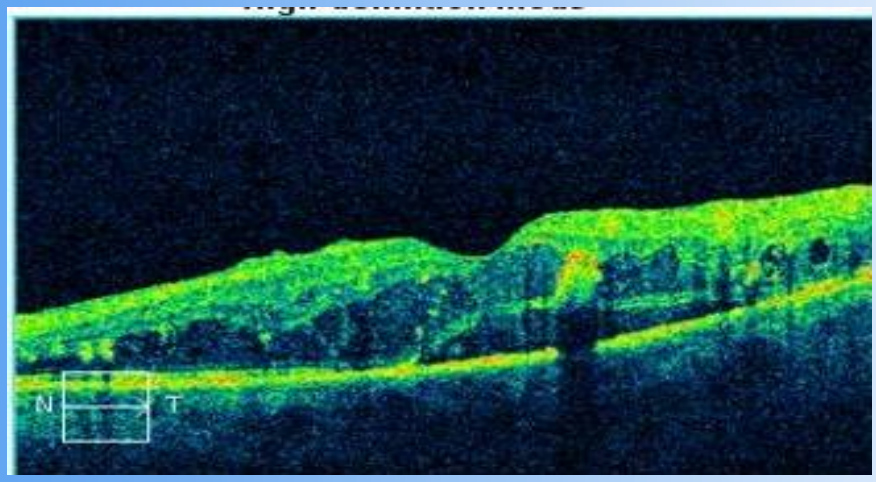
Causes of Macular Edema

There are many conditions that can leak fluid into the retina and cause macular edema, including:

1. DIABETES. With diabetes, high blood sugar levels damage blood vessels, which leak into the macula.

What IS DME?

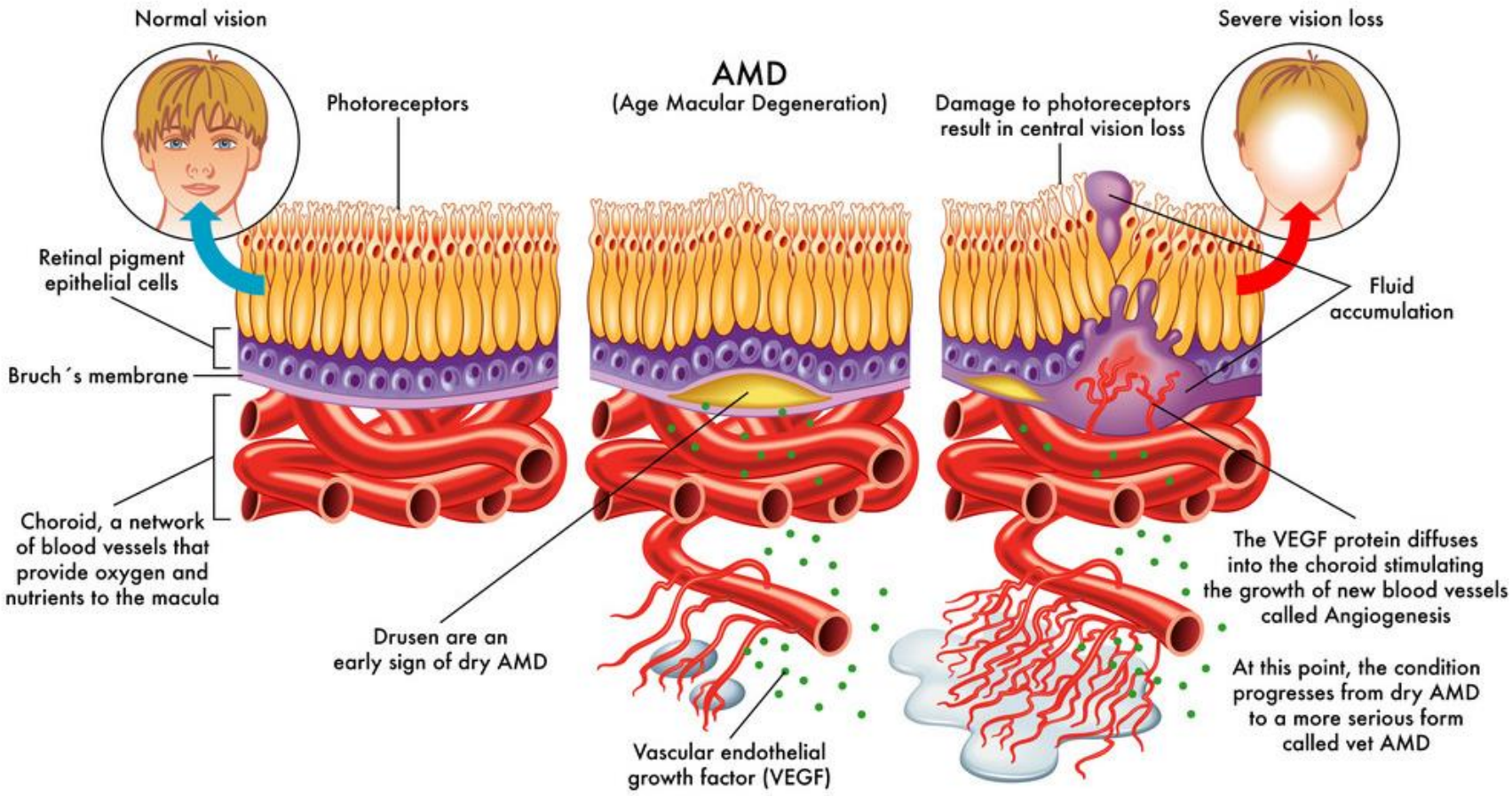
- Fluid accumulation and retinal thickening within the macula as a result of diabetes mellitus



Cross-sectional view via OCT

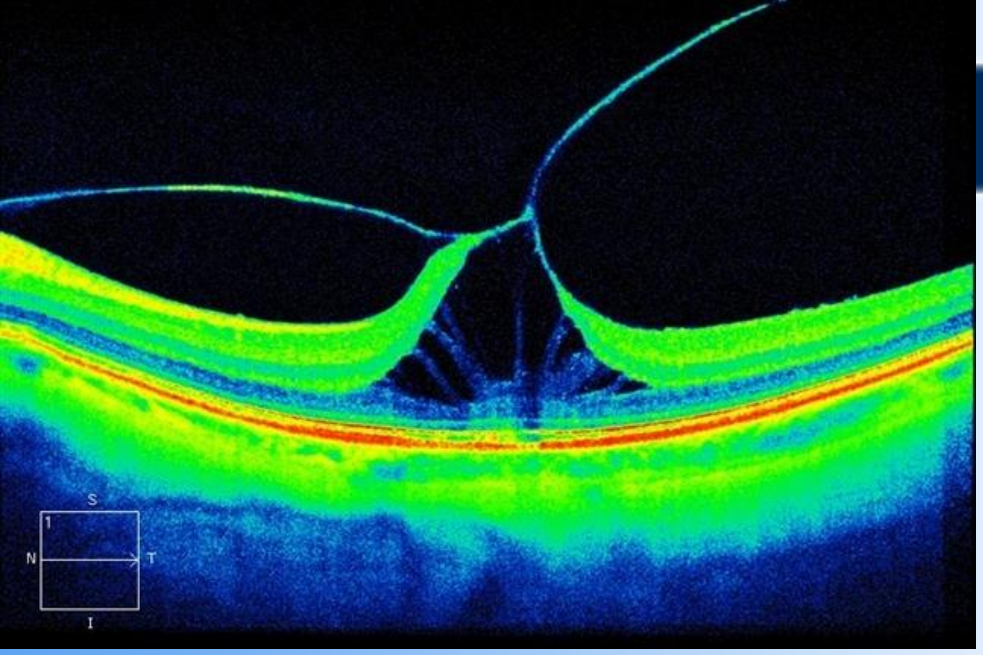
Ophthalmoscopic view of DME

2. Age-related Macular Degeneration (AMD): Abnormal blood vessels leak fluid and cause macular swelling.



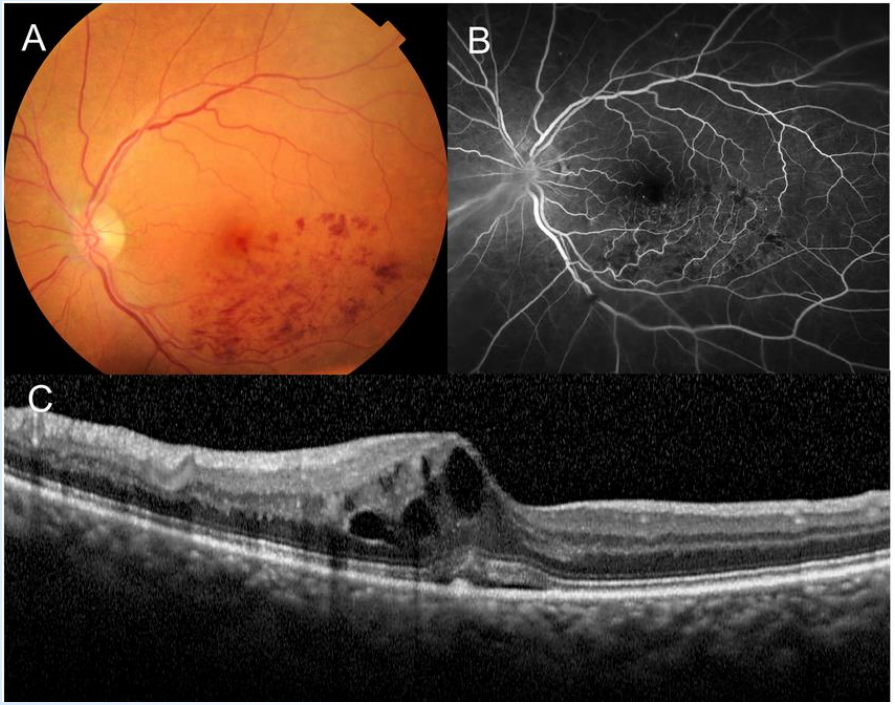
Causes of Macular Edema

3. **Macular Pucker / Vitreo-Macular Traction Syndrome:** When vitreous in the aging eye doesn't detach completely from the macula, the vitreous tugs on the macula or forms scar tissue, and pockets of fluid collect underneath it.
4. **Retinal Vein Occlusion :** With blood vessel diseases like RVO, veins in the retina become blocked. Blood and fluid then leak out into the macula.



VMTS

BRVO + Mac. Edema



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Causes of Macular Edema

5. **Hereditary/genetic disorders (passed from parent to child)**, such as retinoschisis or retinitis pigmentosa
6. **Inflammatory eye diseases.** Conditions like uveitis, where the body attacks its own tissues, can damage retinal blood vessels and cause swelling of the macula.

Causes of Macular Edema

- **Drugs causing macular edema:**

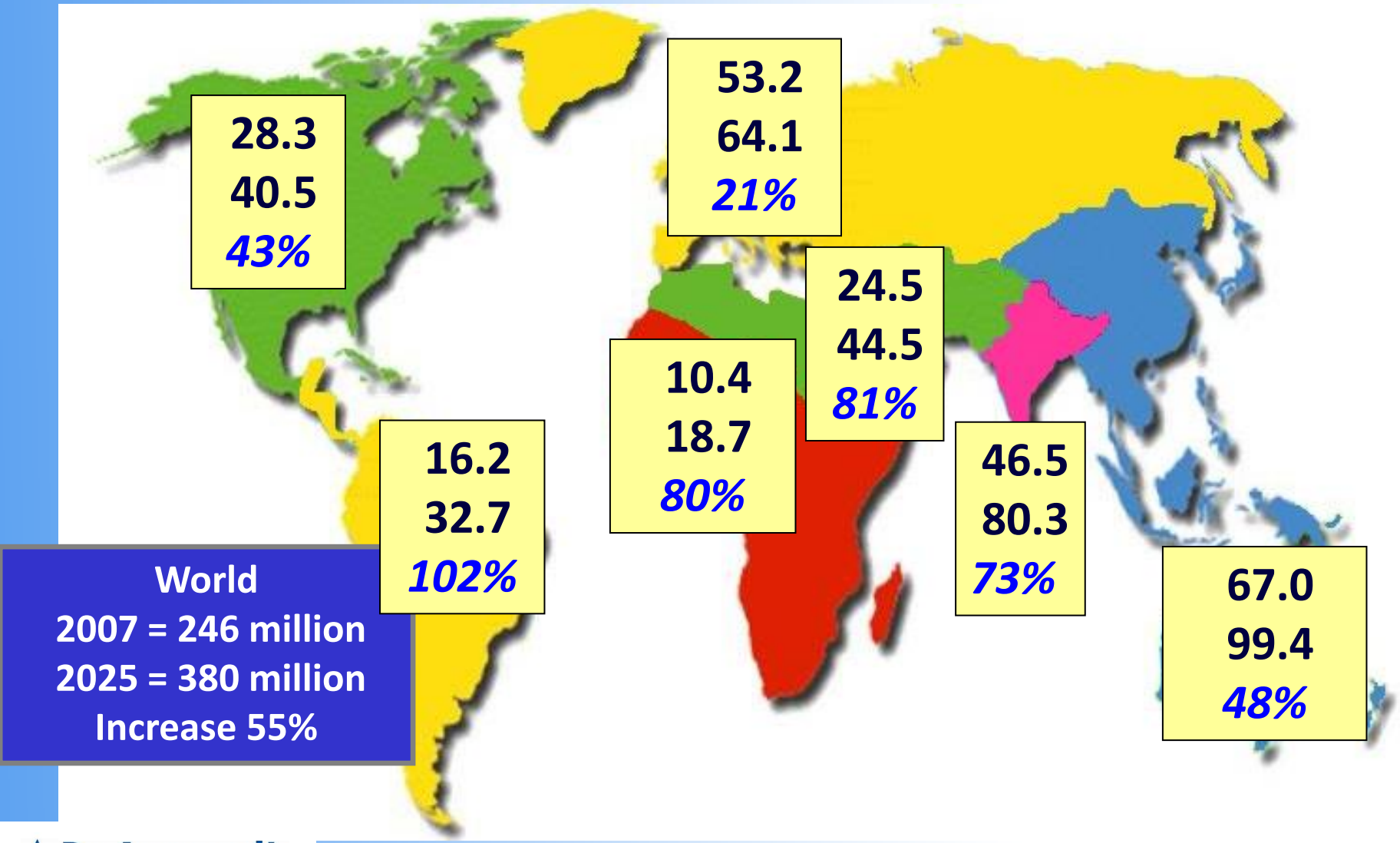
a) topical epinephrine
b) nicotinic acid,
c) topical prostaglandin analogs (e.g., latanoprost),
d) antimicrotubule agents (paclitaxel, docetaxel),
e) fingolimod, imatinib, glitazones (rosiglitazone, pioglitazone), and trastuzumab.

- In most cases, the CME resolves with discontinuation of the medication. topical anti-inflammatory agents, sub-Tenon or intravitreal corticosteroids, and topical or oral carbonic anhydrase inhibitors.

- **Eye tumors:** Both benign and malignant tumors can lead to macular edema.
- **Eye surgery:** It's not common, but sometimes after glaucoma, retinal or cataract surgery, you can get macular edema.
- **Injuries:** Trauma to the eye.

DIABETIC RETINOPATHY

Global projections for the diabetes epidemic: 2007-2025 (millions)



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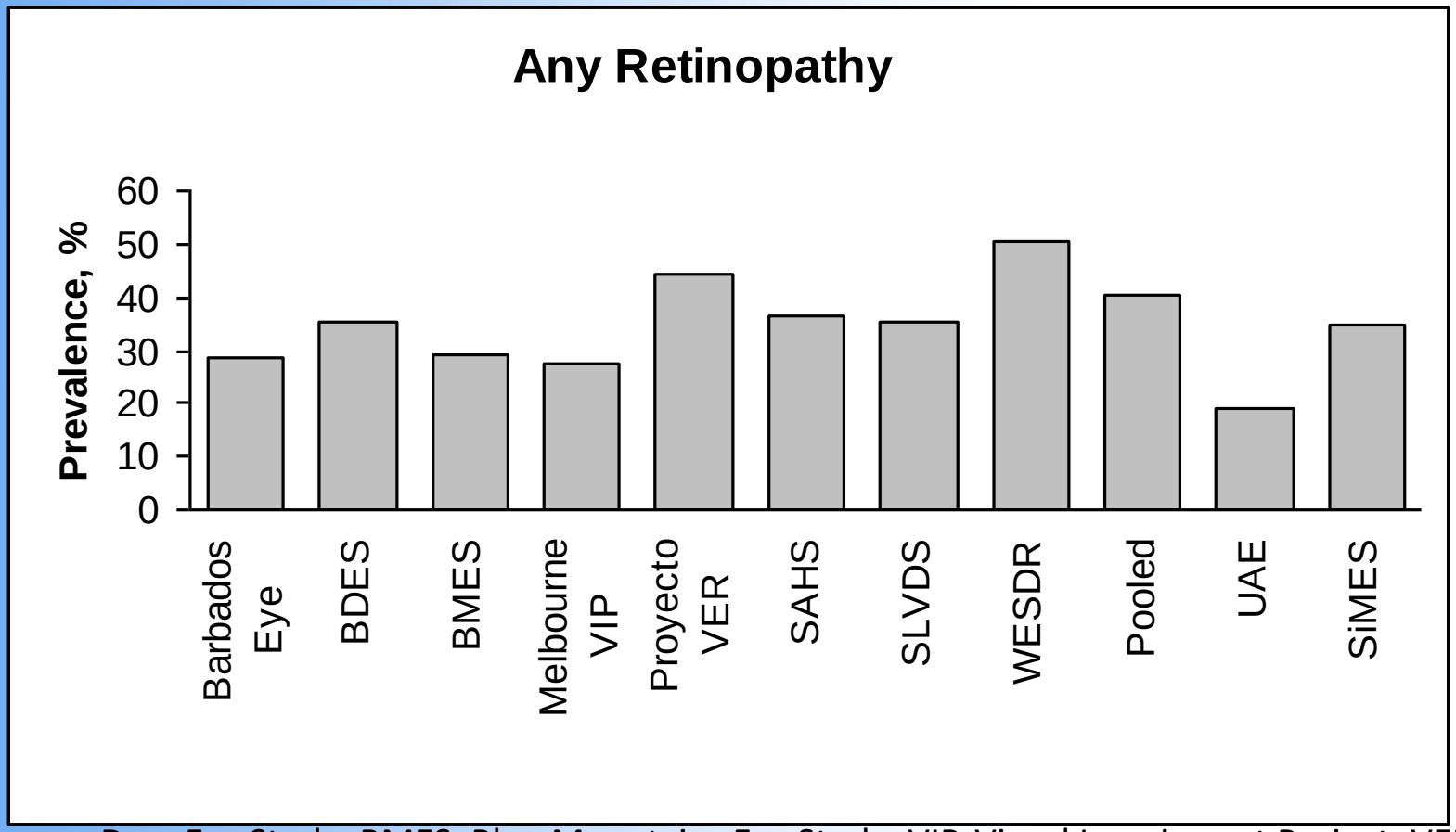
Sicree, Shaw, Zimmet. *Diabetes Atlas.* IDF www.idf.org. 2006

IDF Atlas 2003

Fact #1: 20 - 40% have DR

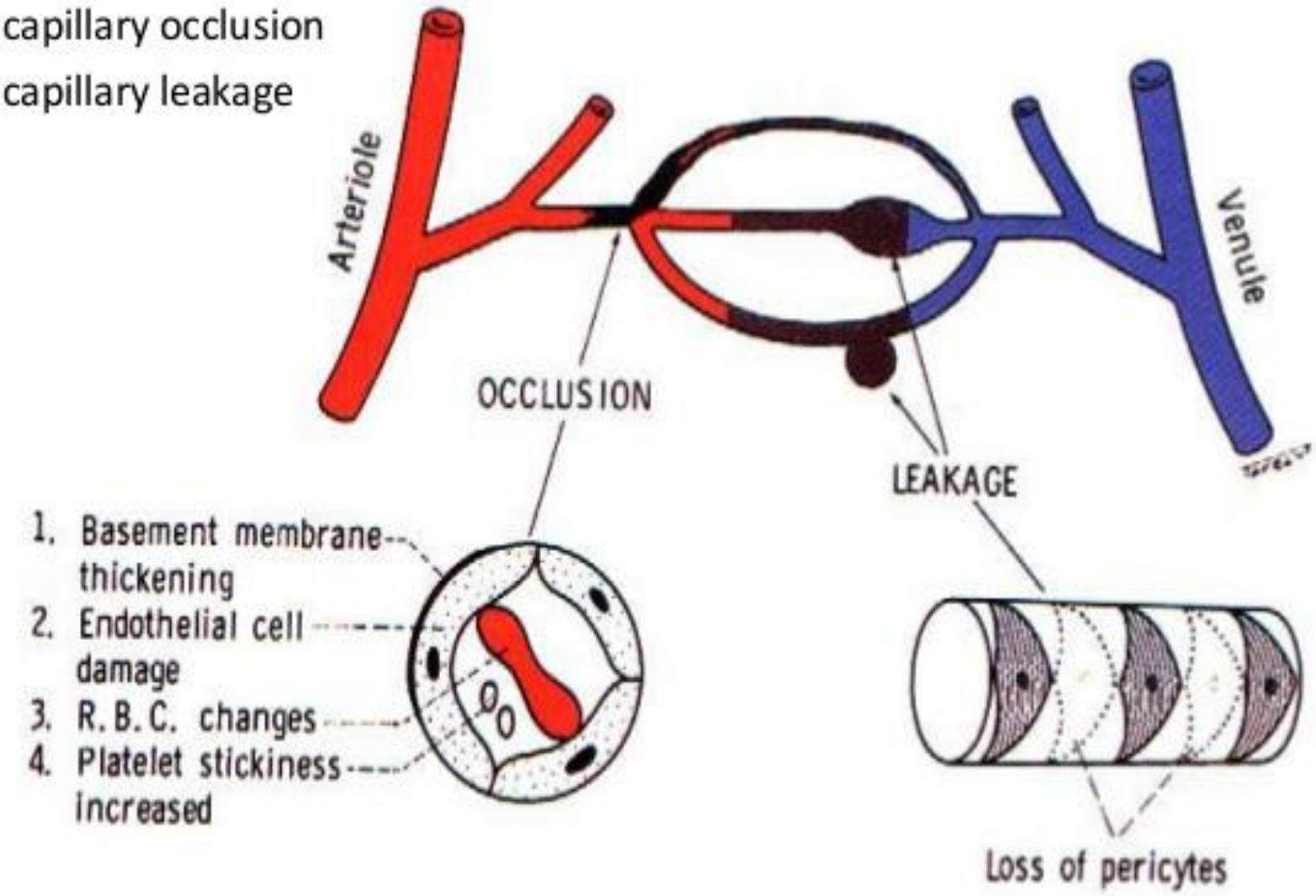


BDES, Beaver Dam Eye Study; BMES, Blue Mountains Eye Study; VIP, Visual Impairment Project; VER, Vision Evaluation Research; SAHS, San Antonio Heart Study; SLVDS, San Luis Valley Diabetes Study; WESDR, Wisconsin Epidemiologic Study of Diabetic Retinopathy;

PATHOGENESIS

It is a microangiopathy caused by effect of hyperglycemia on small blood vessels leading to -

- Retinal capillary occlusion
- Retinal capillary leakage



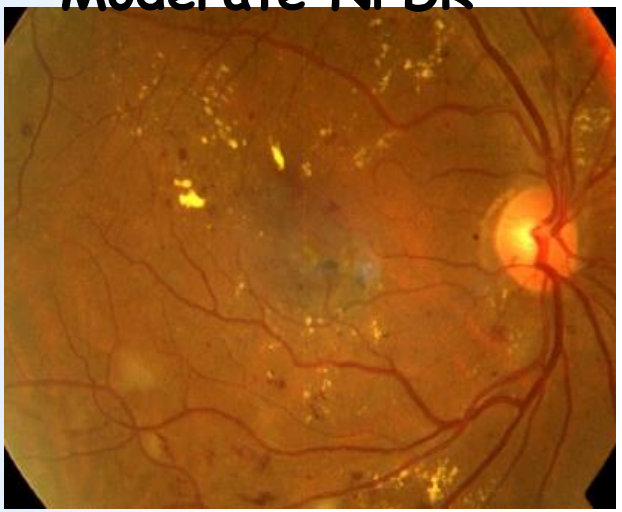
ABBREVIATED EARLY TREATMENT DIABETIC RETINOPATHY STUDY (ETDRS) CLASSIFICATION

CATEGORY	MANAGEMENT
NON-PROLIFERATIVE DIABETIC RETINOPATHY (NPDR)	
NO DR	Review in 12 months
VERY MILD ▪Microaneurysms only	Review most patients in 12 months
MILD ▪Any or all of: microaneurysms, retinal hemorrhages, exudates, cotton wool spots	Review range 6-12 months, depending on severity of signs, stability, systemic factors, and patient's personal circumstances
MODERATE ▪Severe retinal haemorrhages in 1-3 quadrants or mild IRMA ▪Significant venous beading in no more than 1 quadrant ▪Cotton wool spots	Review in approximately 6 months (PDR in up to 26%, high-risk PDR in up to 8% within a year)
SEVERE The 4-2-1 rule- ▪Severe retinal haemorrhages in all 4 quadrants ▪Significant venous beading in ≥2 quadrants ▪Moderate IRMA in ≥1 quadrants	Review in 4 months (PDR in up to 50%, high-risk PDR in up to 15% within a year)
VERY SEVERE ▪≥2 of the criteria for severe	Review in 2-3 months (High-risk PDR in up to 45% within a year)

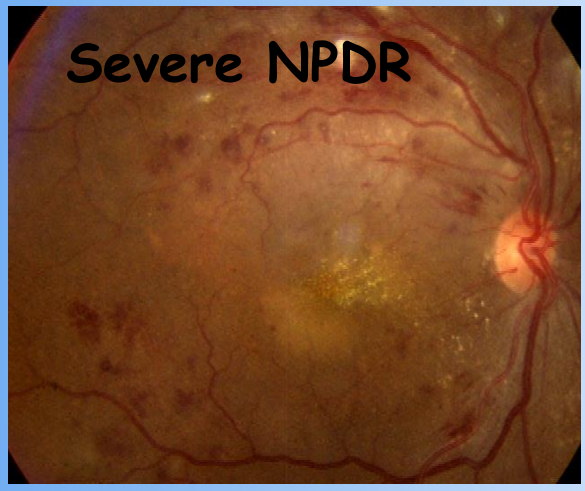
Visual loss is a late symptom of Diabetic Retinopathy

Mild NPDR

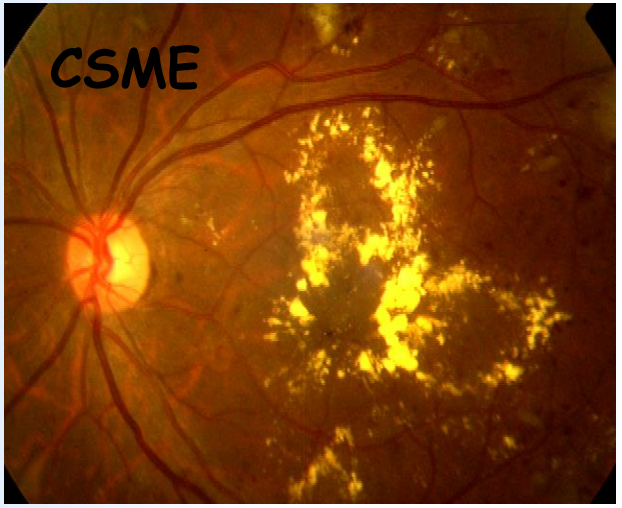
Moderate NPDR



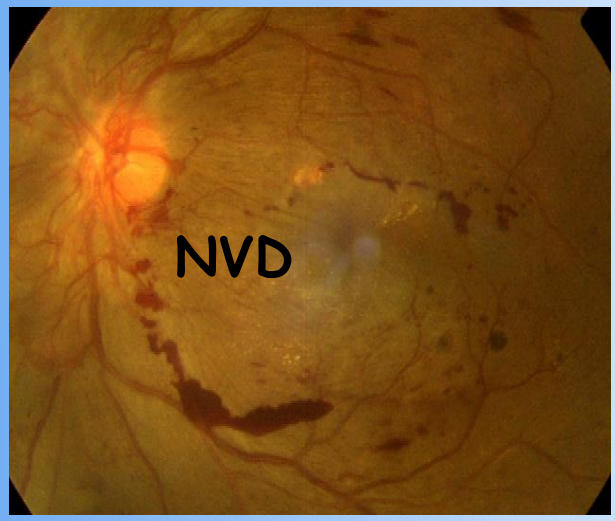
Severe NPDR

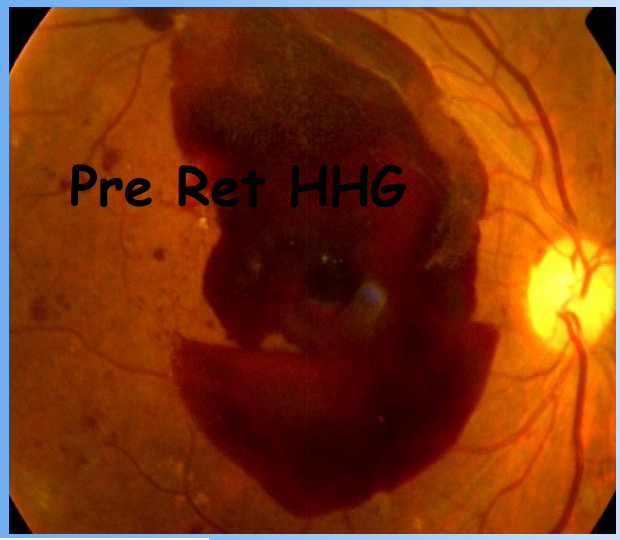


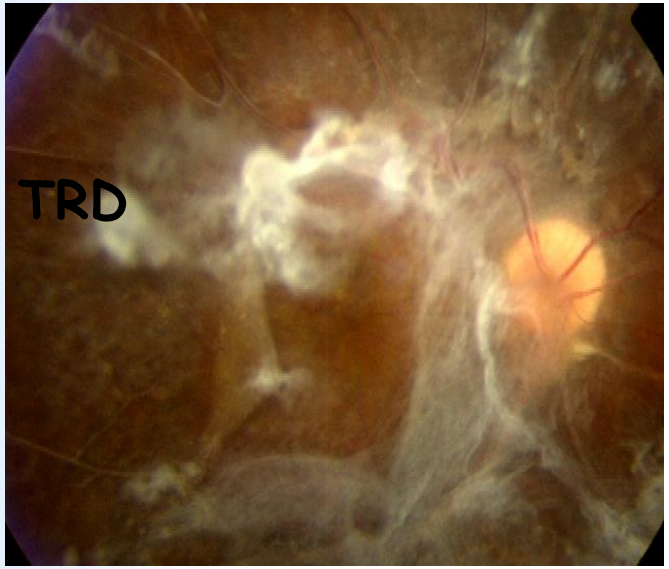
CSME



Proliferative Diabetic Retinopathy

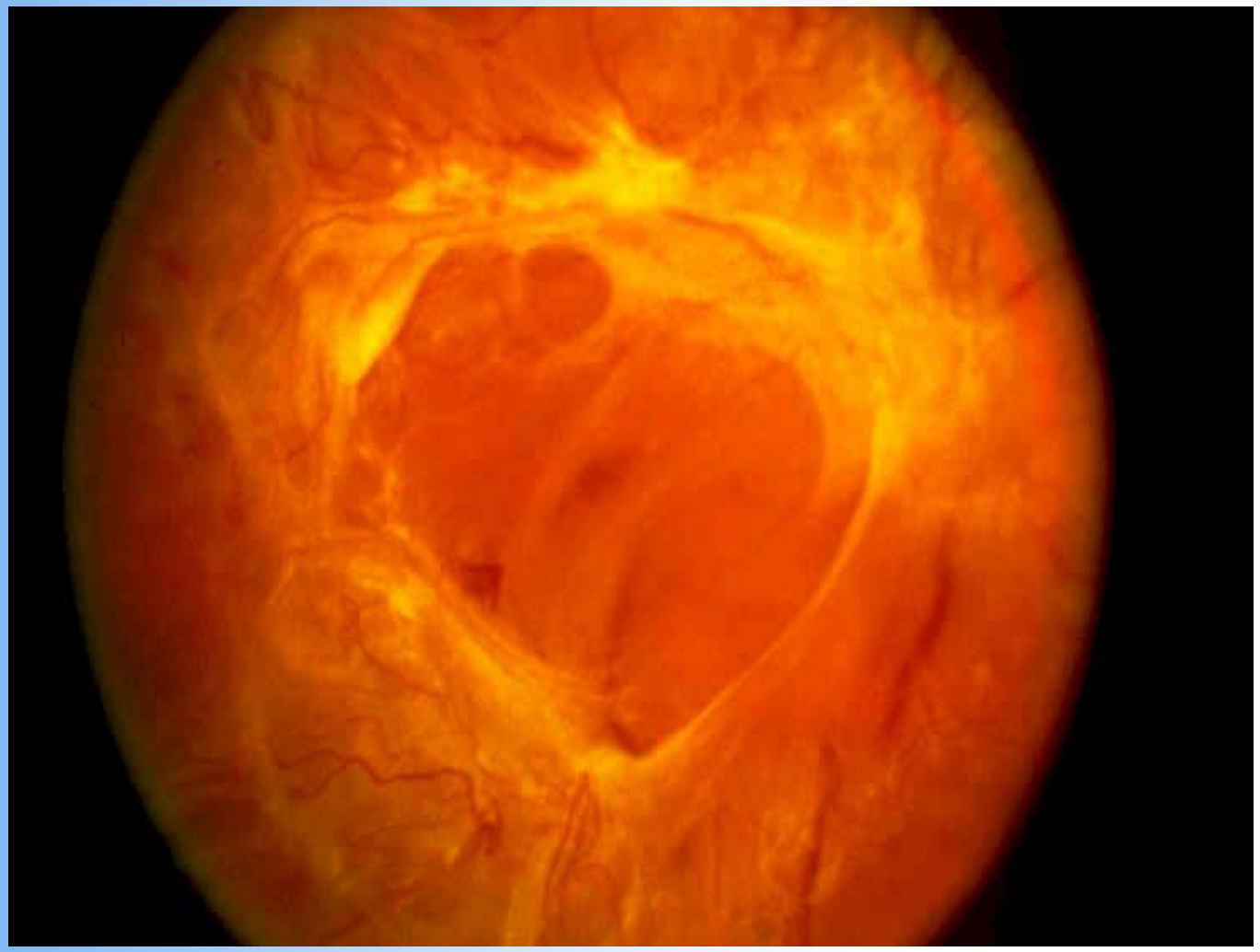




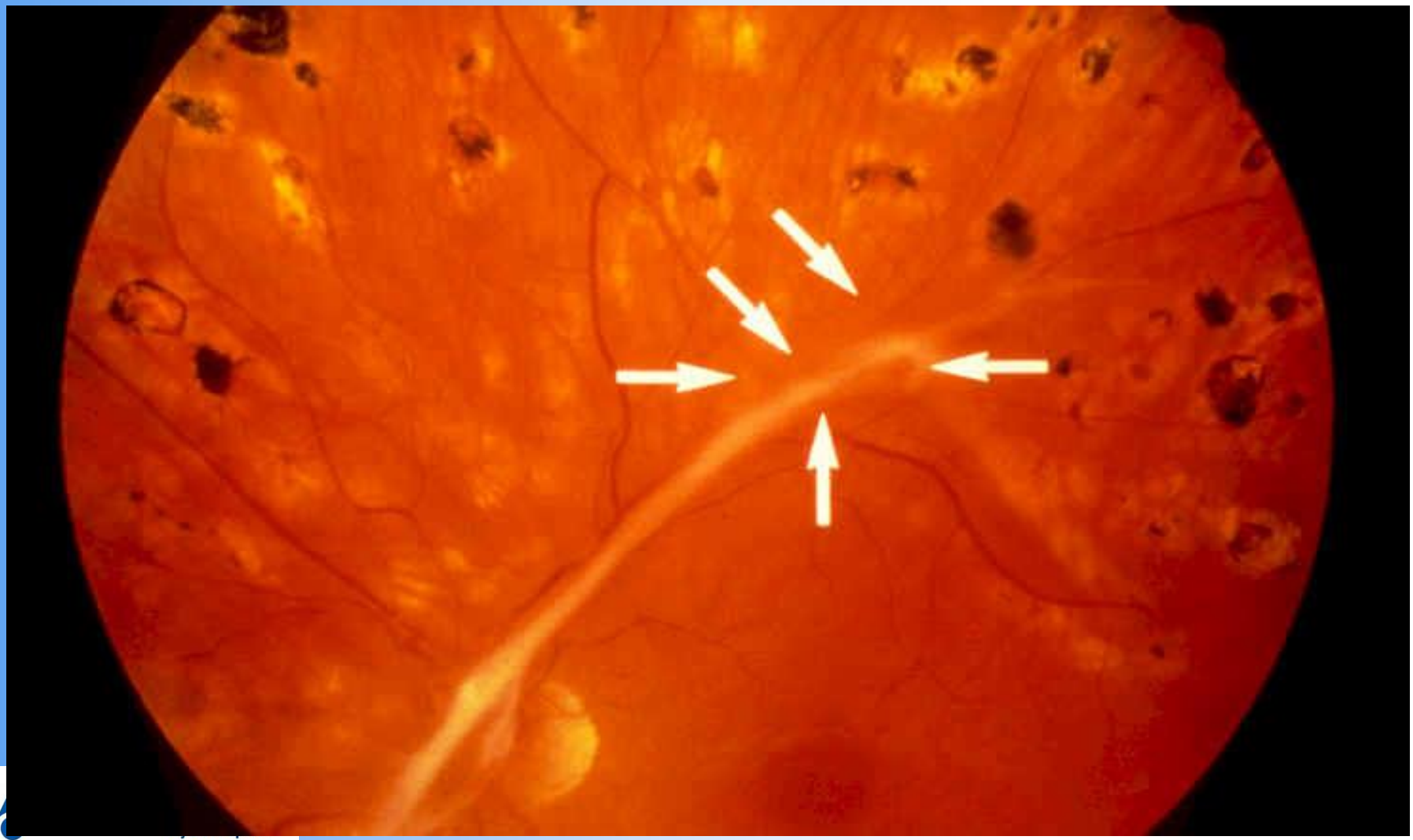


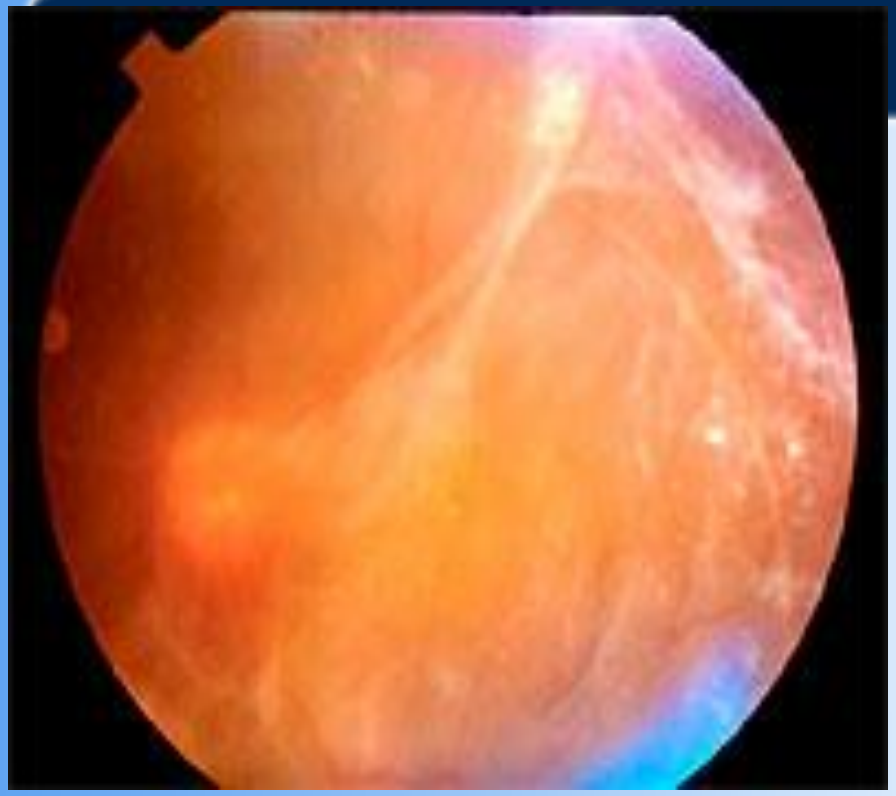
VITREOUS HAEMORRHAGE

ADVANCED PDR



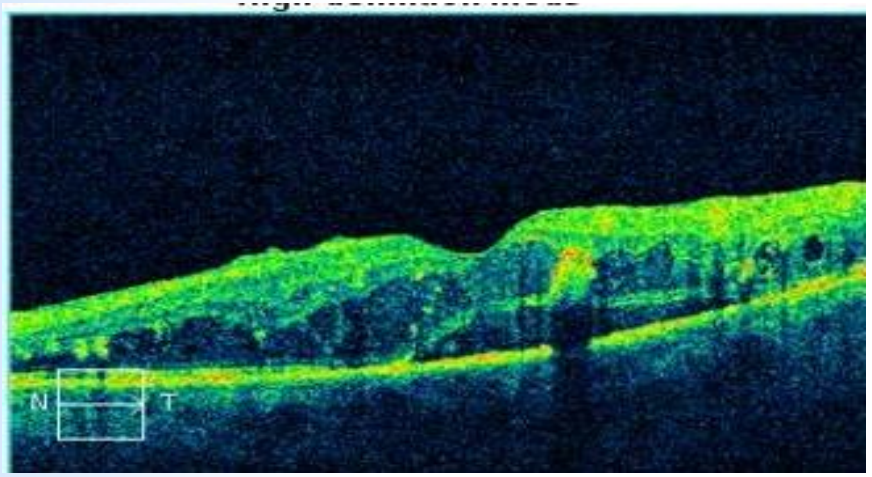
TRACTIONAL DETACHMENT





What IS DME?

- Fluid accumulation and retinal thickening within the macula as a result of diabetes mellitus



Cross-sectional view via OCT

Ophthalmoscopic view of DME

What Are The Symptoms?

- Often asymptomatic in the earliest stages that are most amenable to treatment
- More severe disease results in visual distortion, loss of color perception & loss of detail vision
  - May result in 'legal blindness' but not total blindness, unless concomitant proliferative retinopathy with tractional retinal detachment

What Are the Risk Factors?

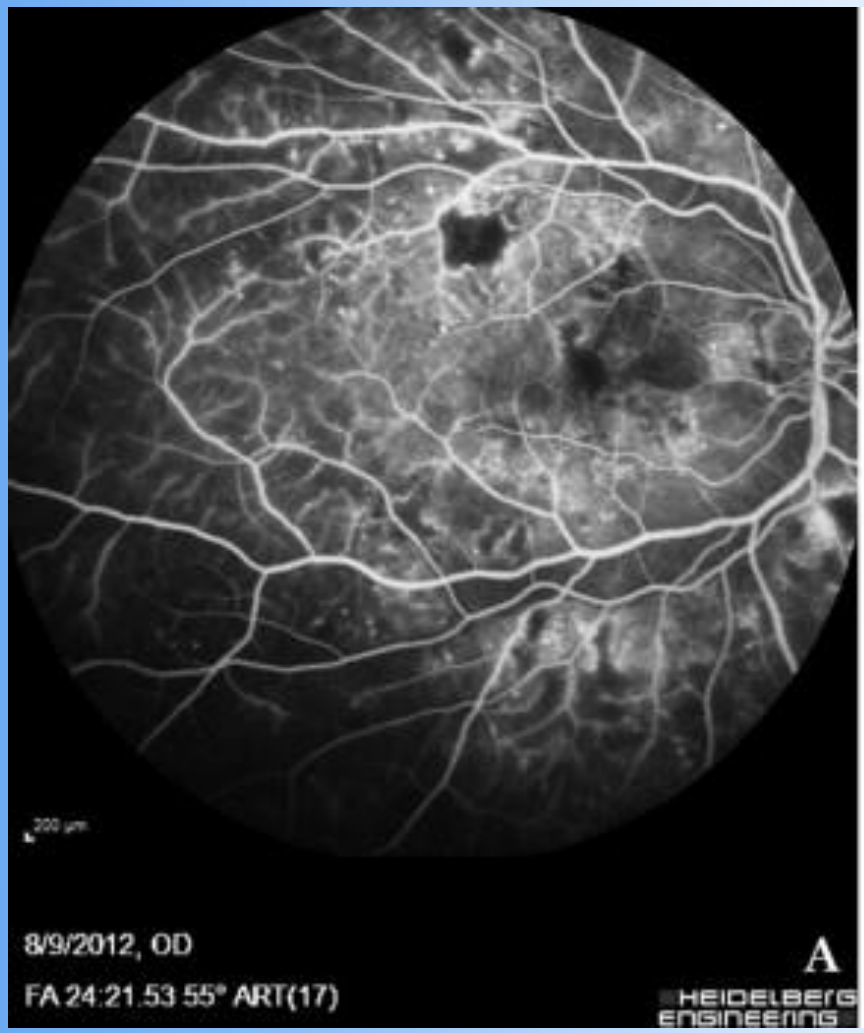
- Established risk factors for diabetic macular edema include disease duration, HbA1c, BP, obstructive sleep apnea and cigarette smoking

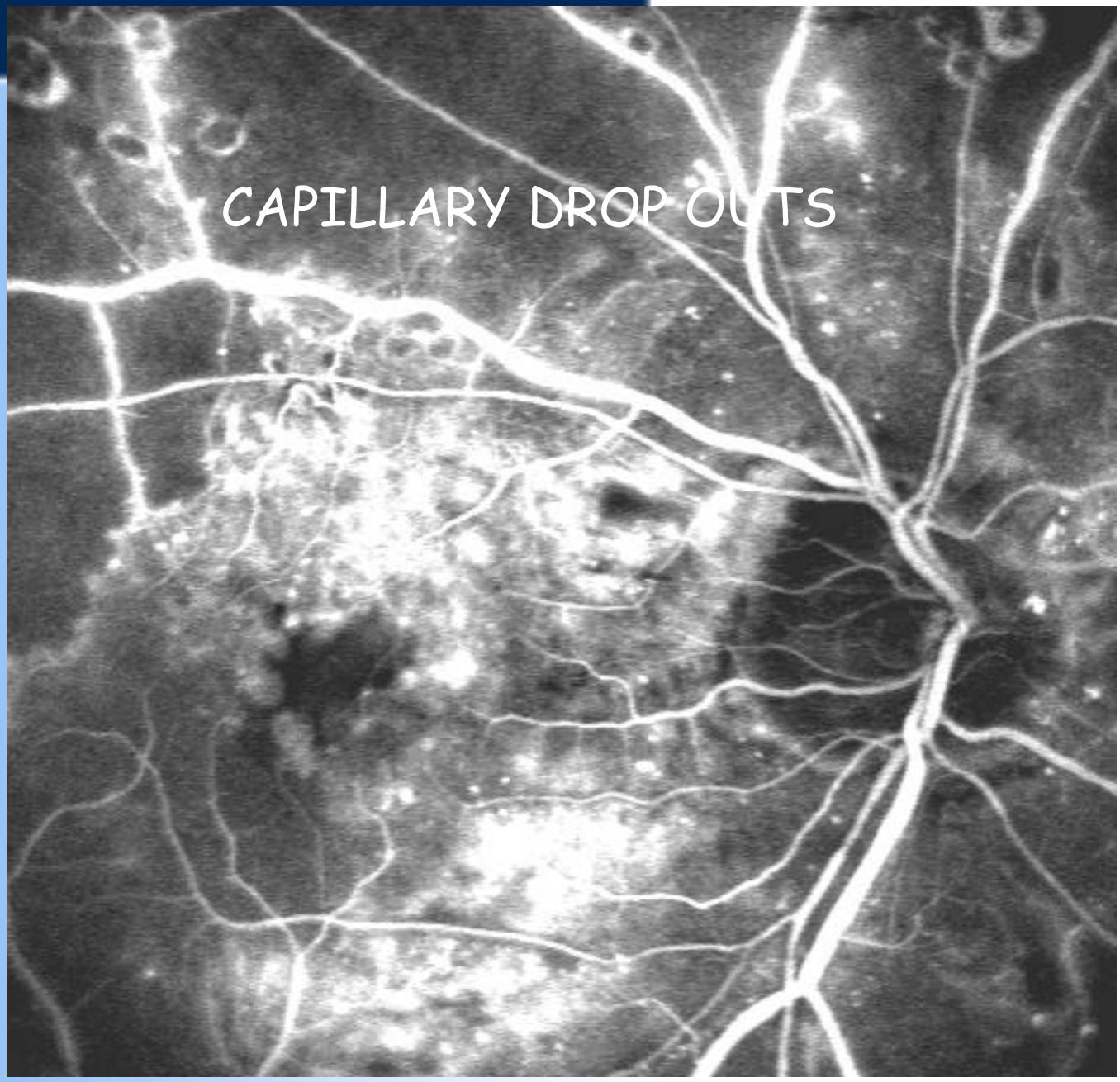
Ophthalmology. 2009 Mar;116(3):497-503 Retina. 2012 Oct;32(9):1791-8.
Diabetes Res Clin Pract. 2013 Jun;100(3):298-305

- T1DM, Latino race, African race, HTN, diabetic nephropathy and neuropathy significantly increase risk per recent retrospective analysis of 440,000 patients

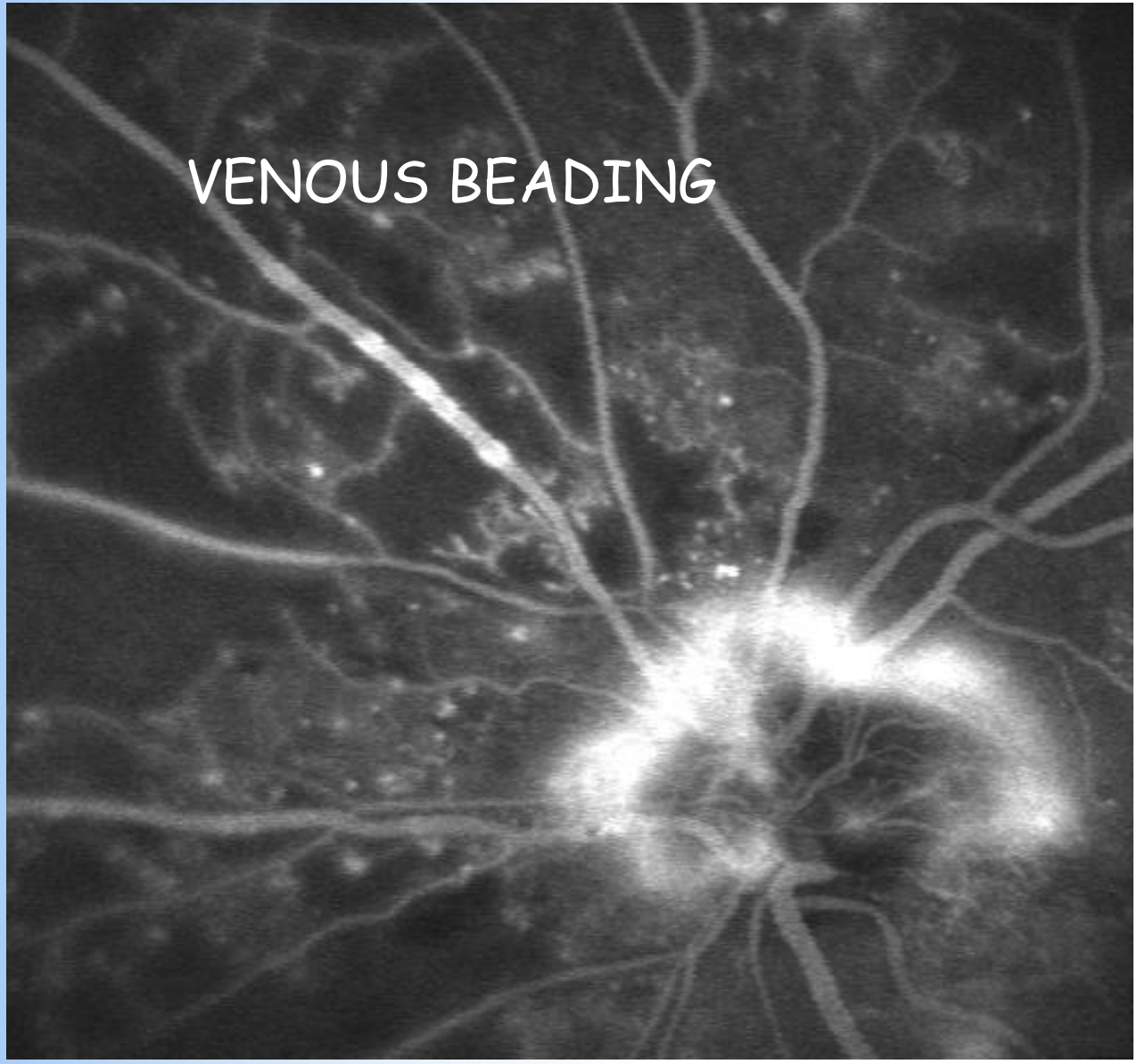
ARVO2013, Seattle

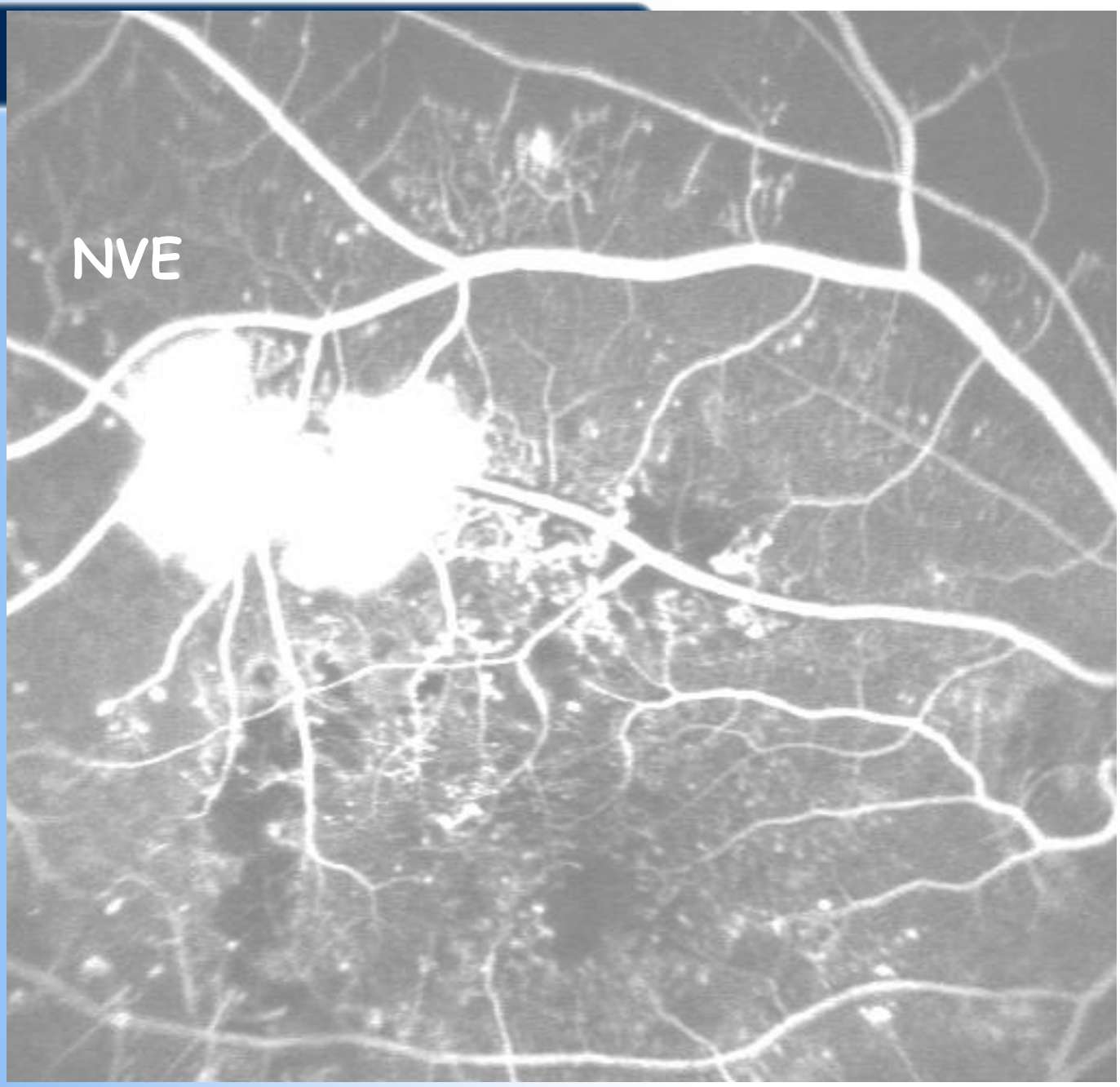
Fundus Fluorescein Angiography





PROLIFERATIVE DR





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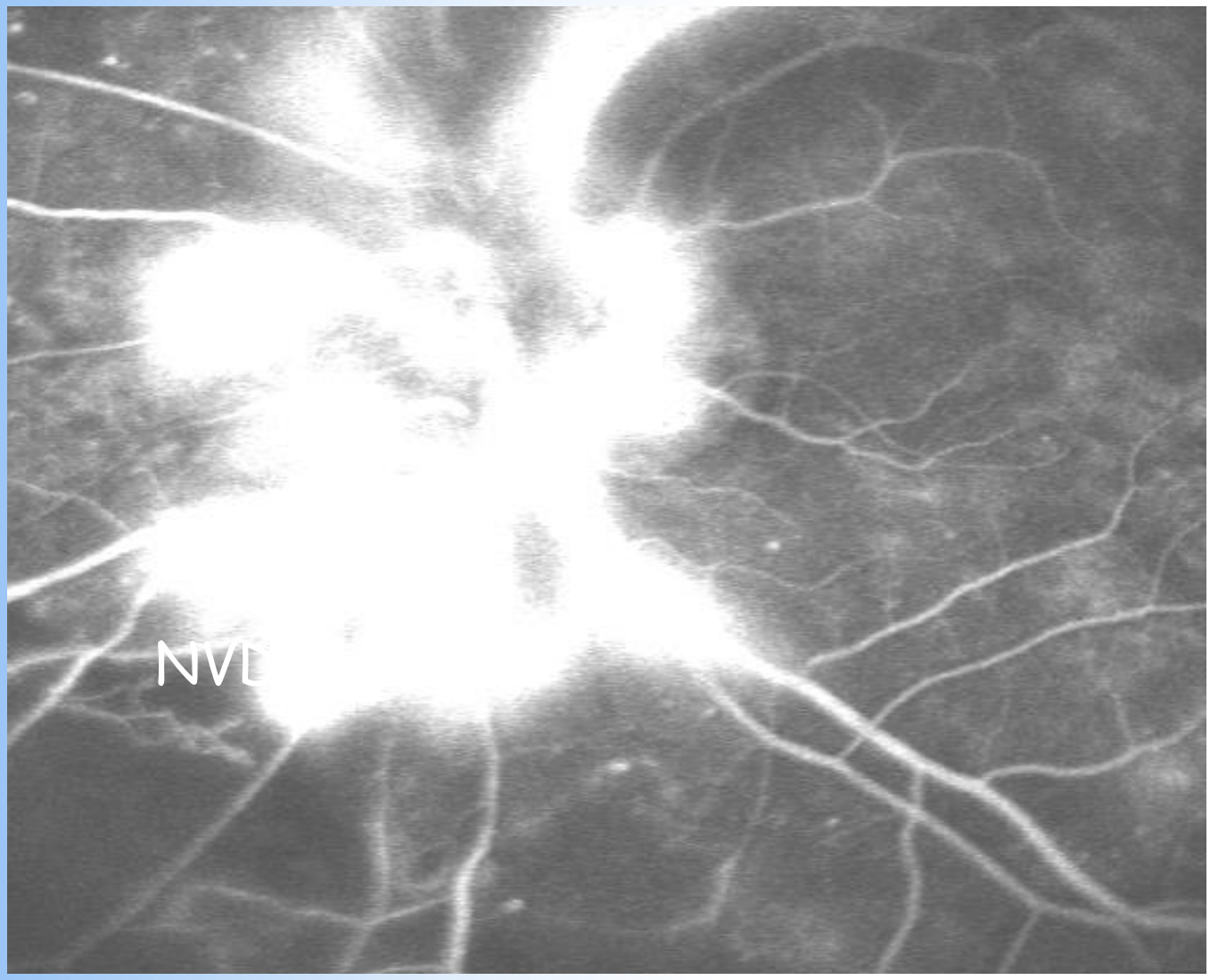
PROLIFERATIVE DR



Optical Coherence Tomography (OCT): THE Most Sensitive Tool to Detect DME (98.6% sensitivity)

- 1-1.7 um wavelength, non-ionizing light
- Resolution to 1 micron
- 17,000 scans/sec

- Can detect DME long before clinical exam
  BUT, not all detected DME requires treatment

- **30% of patients with DME detected by OCT are not detected by clinical examination**

  Ophthalmology.2004 Apr;111(4):712-5.

- **These patients are 4x more likely to develop CSME**

  Ophthalmologica.2013;230(4):201-6.

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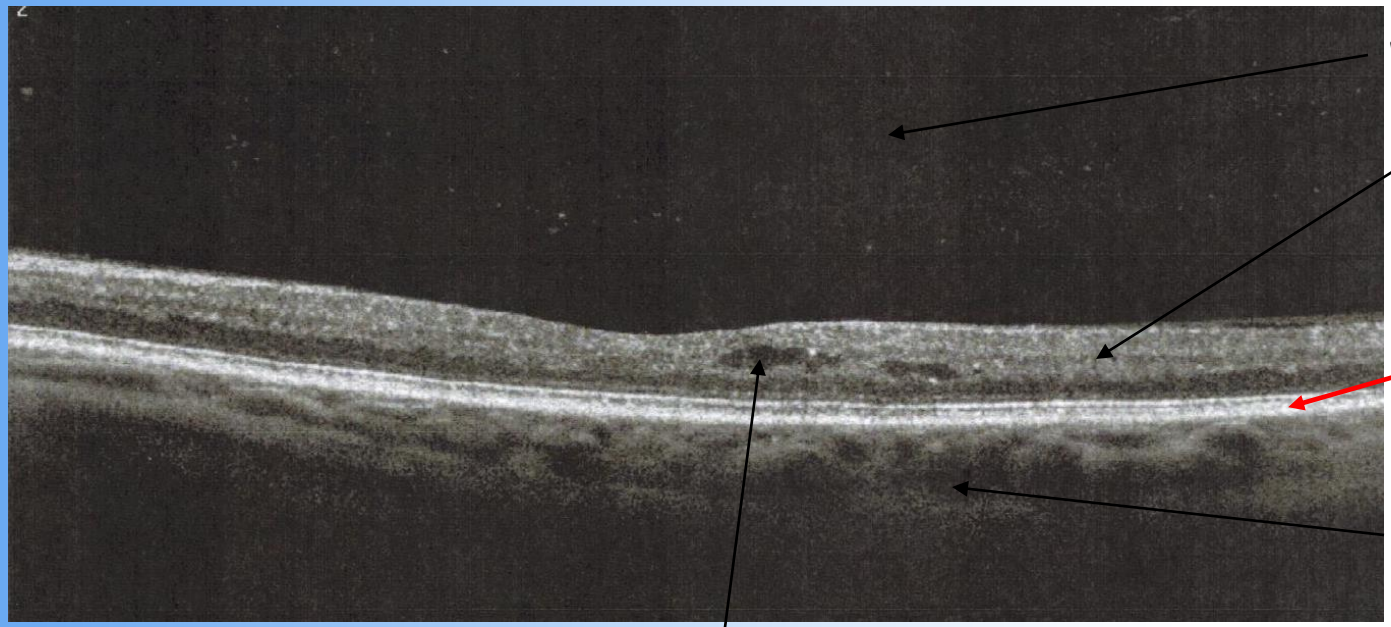
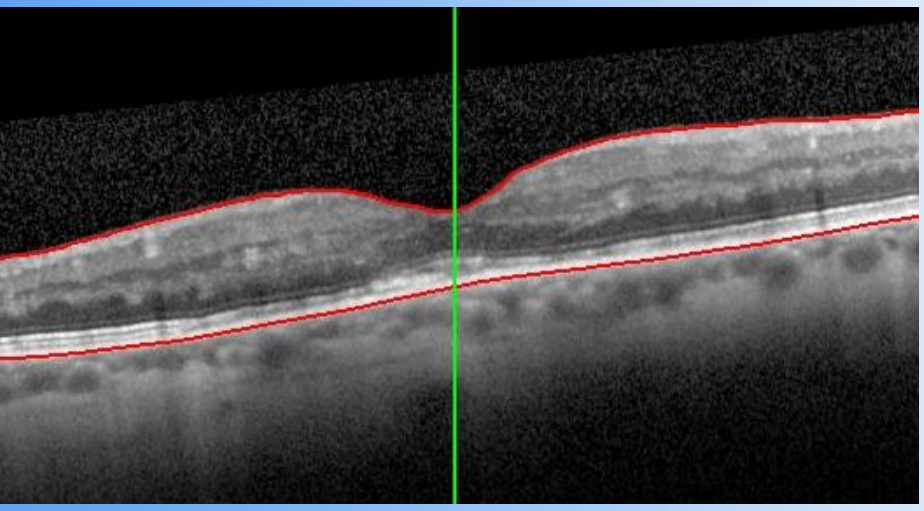
- OCT Allows histological examination of retinal anatomy in vivo

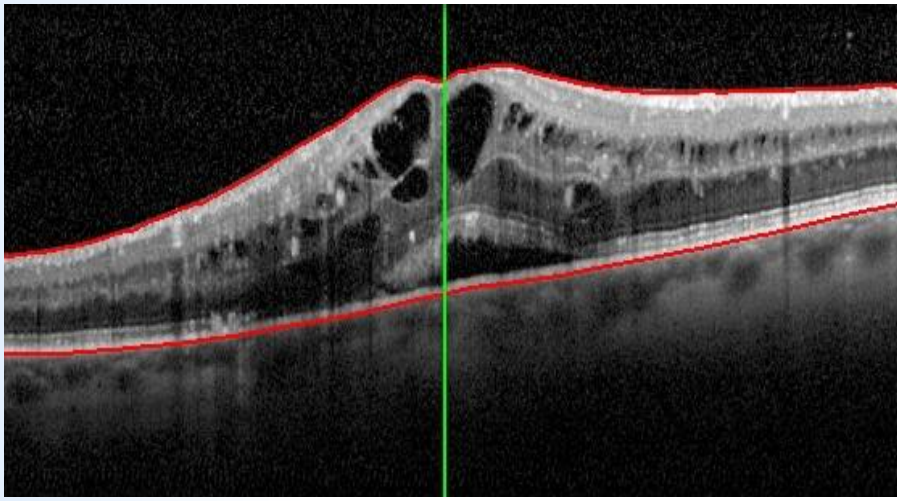


Small, perifoveal cyst
within sensory retina
Asymptomatic with 20/20 vision

Diabetic Macular Edema (DME)



Normal Macula



DME with Cysts in Fovea
20/200 vision

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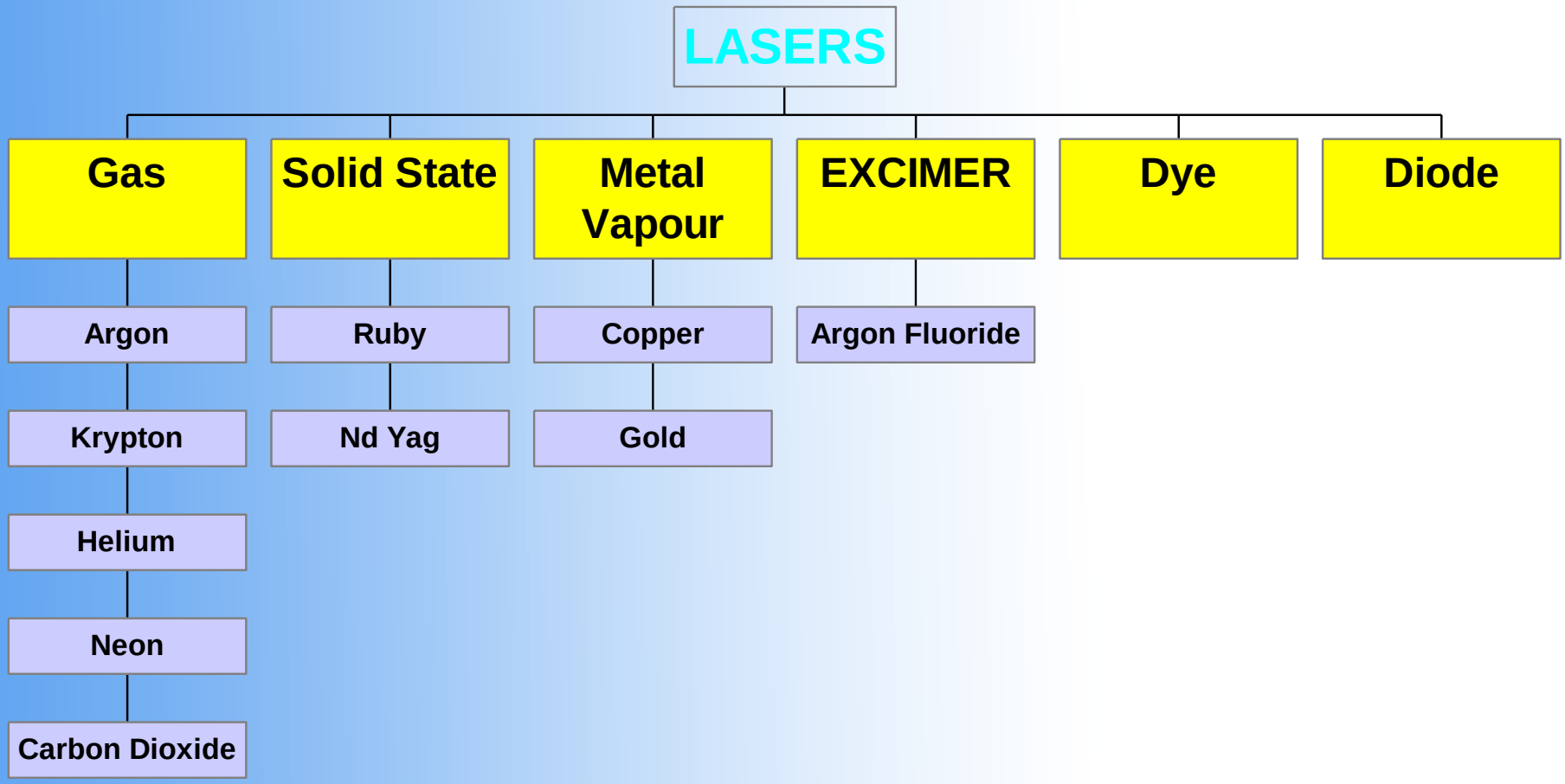
LASER THERAPY

HISTORY:

- German ophthalmologist **Prof. Gerd Meyer-Schwickerath 1920-1992**

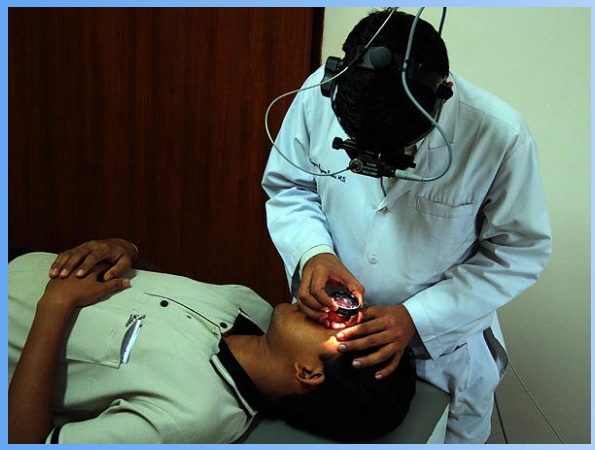
- After seeing the effects of the July 10, 1945 solar eclipse on the retina of a student, his invention of photocoagulation revolutionized the treatment of retinal disorders.

TYPES OF LASERS

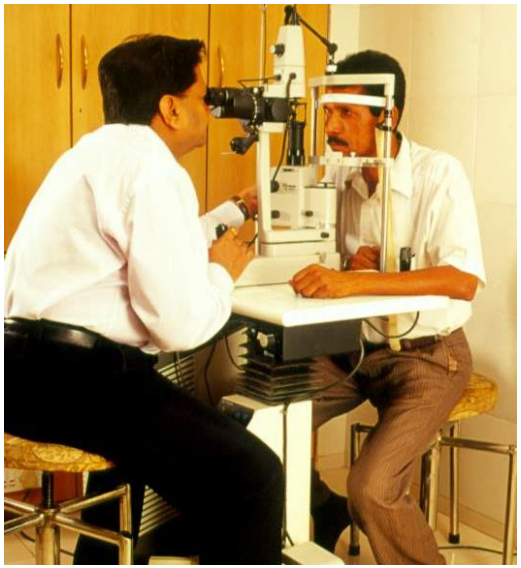


Delivery Systems

- Trans-pupillary - Slit lamp
  - Laser Indirect Ophthalmoscopy
- Trans-scleral - Contact
  - Non contact
- Endo-photocoagulation



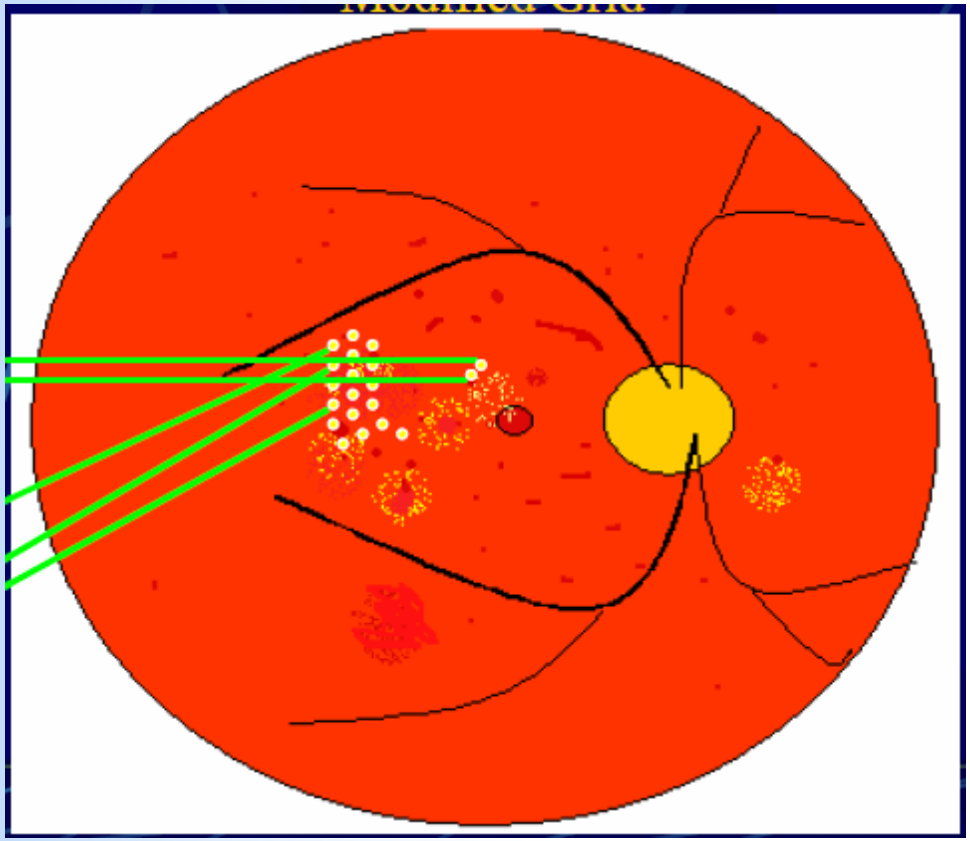

MICROSCOPE

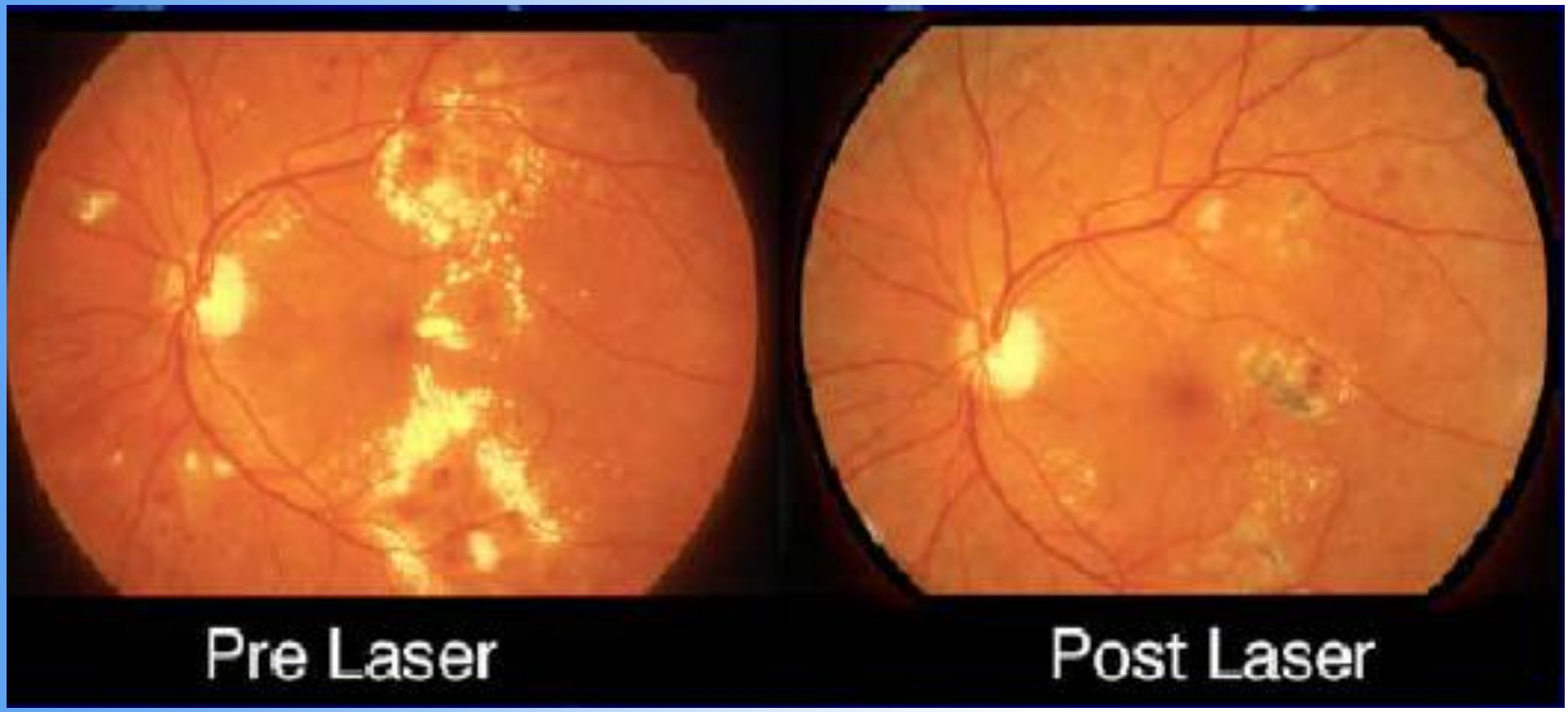


LASERS IN DIABETIC RETINOPATHY

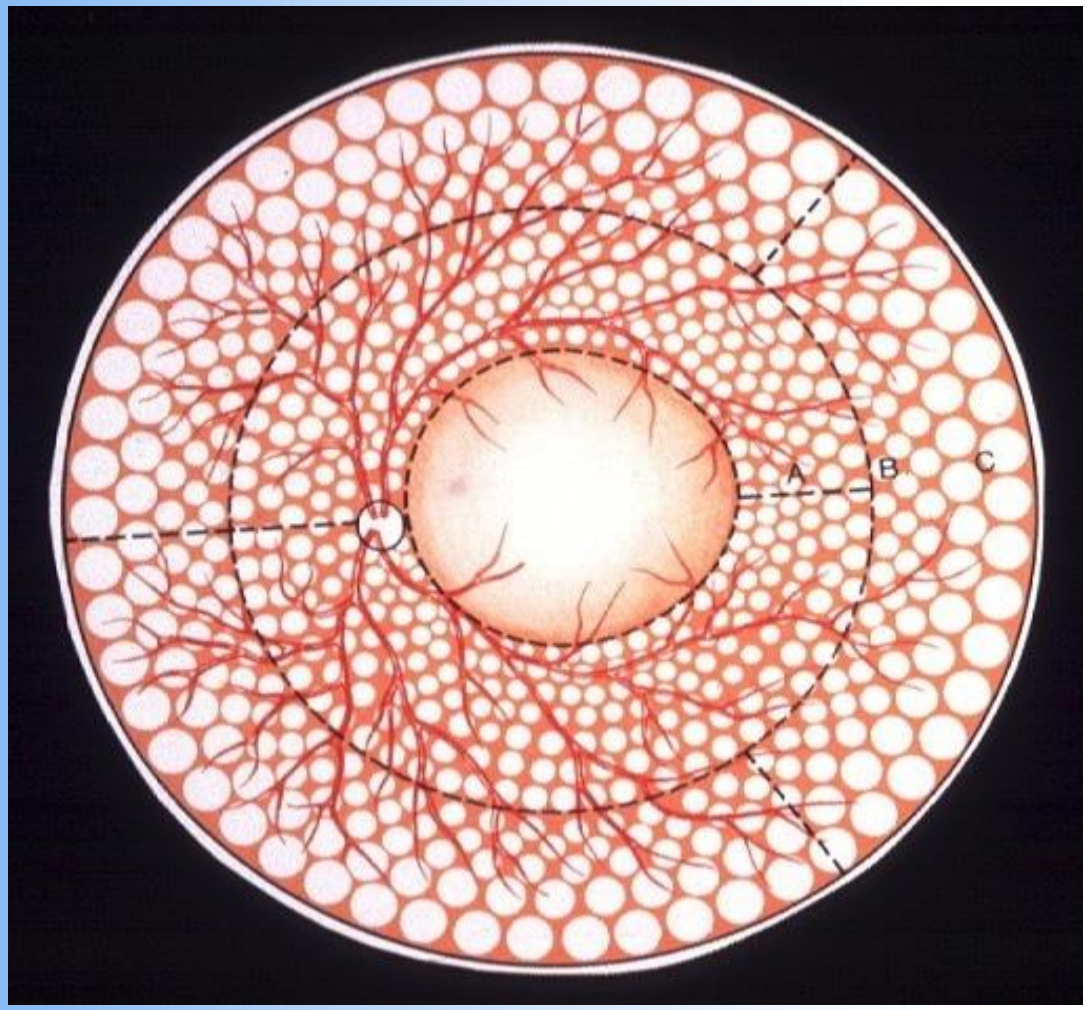
Modified Grid

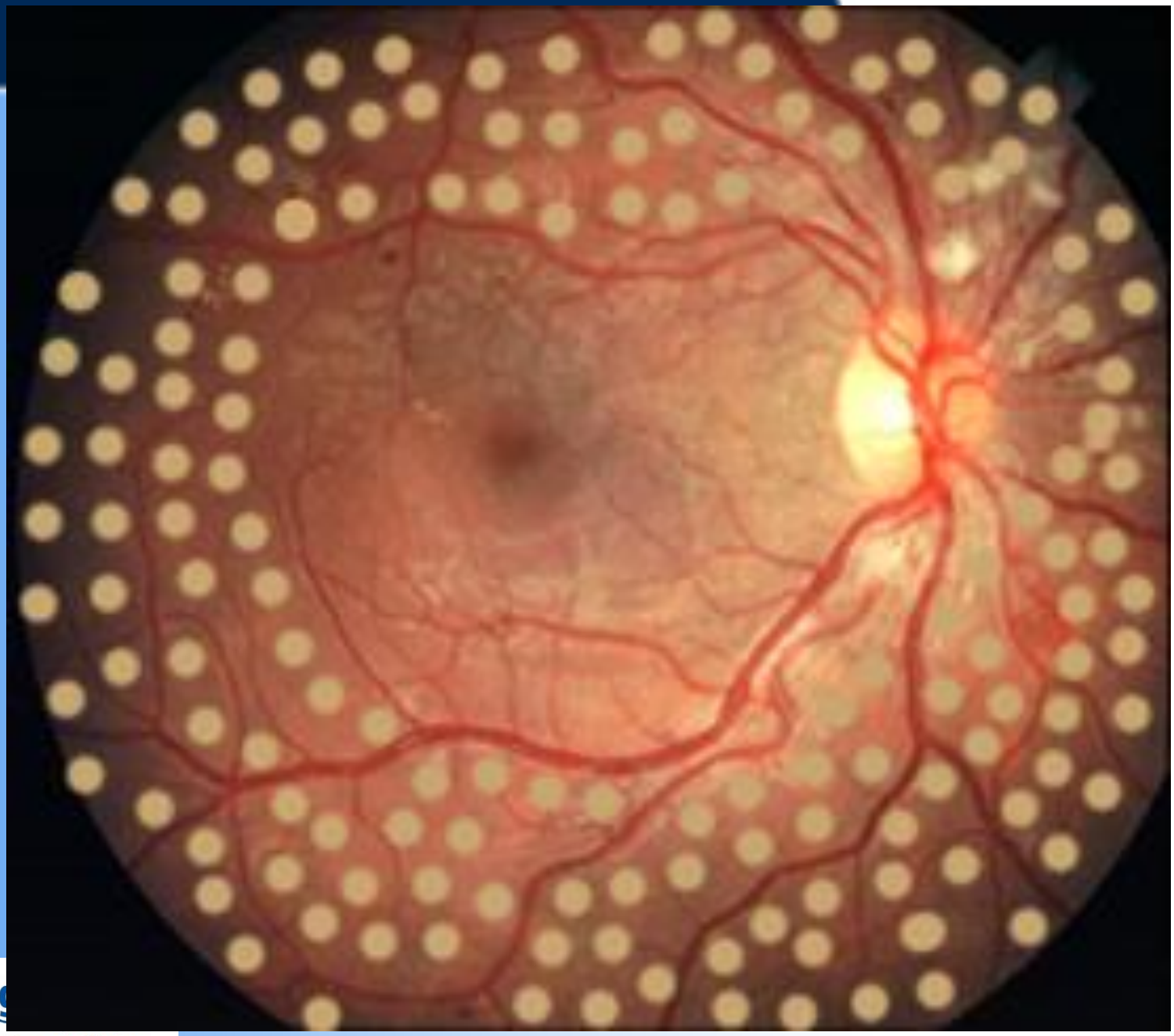
- 100 micron burns near the FAZ
- 200 microns outside these

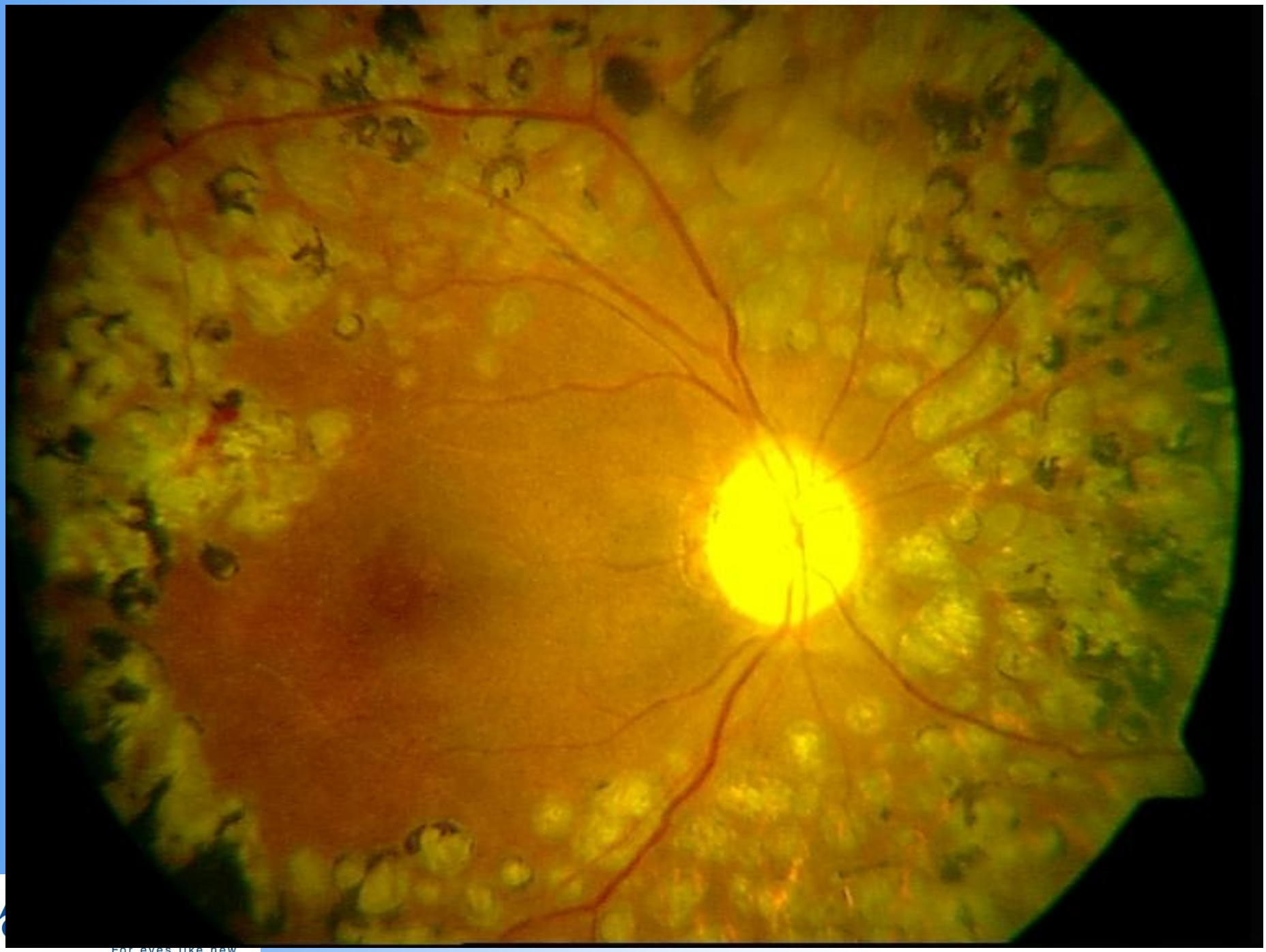




Pan Retinal Photocoagulation







Remember: *Indications for PRP*

Indications for PRP:

1. PRP should be carried out promptly in all eyes with PDR having high-risk charateristics, (HRC)

   (i) NVD more than or equal to 1/4-1/3 disc area or (ii) vitreous or preretinal haemorrhage with any amount of new vessels observed or assumed to be obscured by the haemorrhage.

Remember: *Indications for PRP*

3. Whenever iris or angle neovascularisation is seen, early PRP should be done irrespective of presence or absence of retinal HRC

Remember: *Indications for PRP*

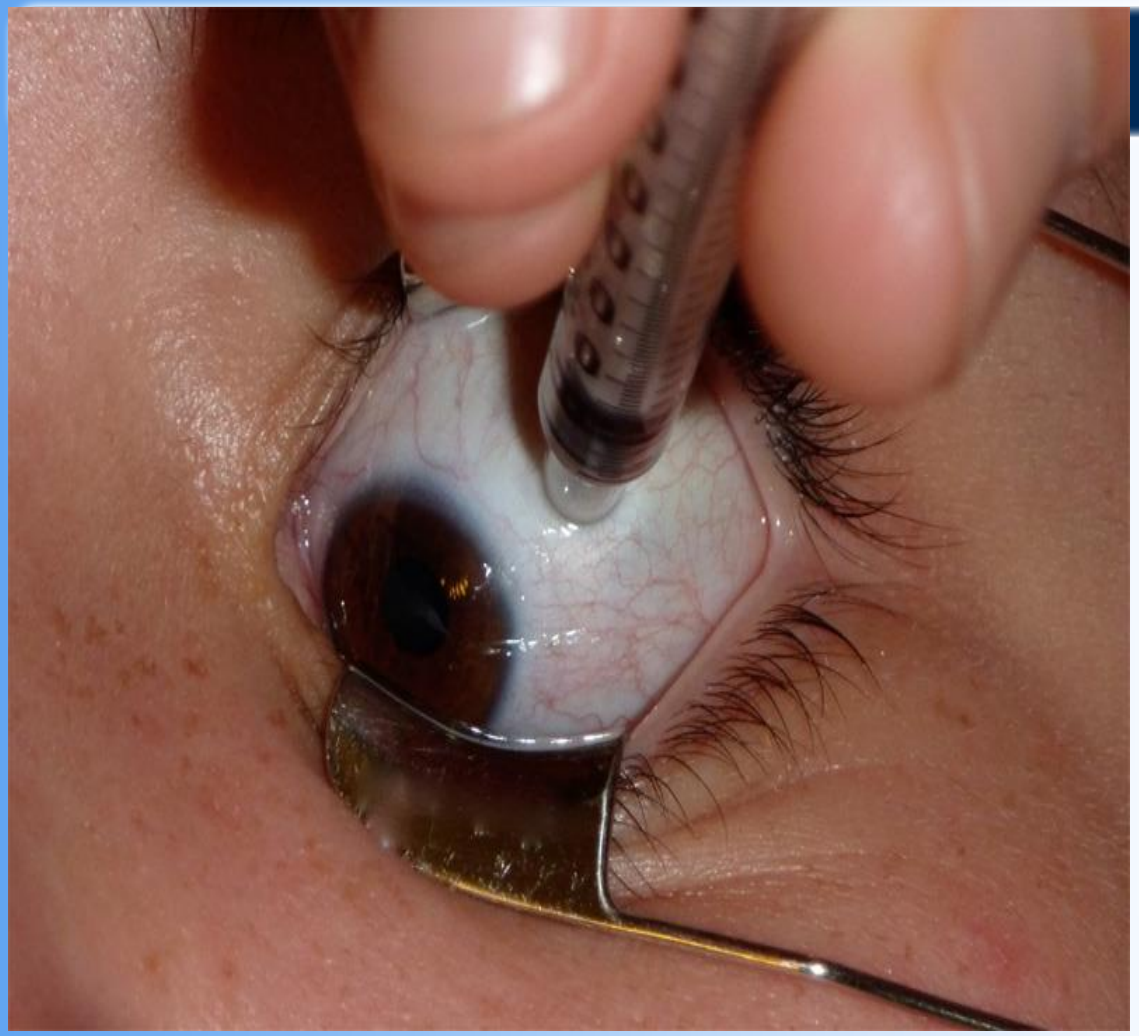
- 5. Eyes with severe ischaemia i.e. extensive retinal haemorrhages, capillary non-perfusion, multiple, prominent soft exudates have high risk of anterior segment neovascularisation and should be considered for PRP

Treatment of DME

- Improve metabolic control
- Grid and focal laser photocoagulation
- Anti-VEGF injections
- Corticosteroids
- Intravitreal Steroids
- Combination Therapy

Anti-VEGF Drugs for DME

- Multiple studies have shown that vascular endothelial growth factor (VEGF) inhibitor agents are superior to laser
  - **IMPROVE VISION** & retinal thickening
- Three drugs are used by retinal specialists:
- Avastin™ (bevacizumab off-label);
- Lucentis™ (ranibizumab);
- Eylea™ (aflibercept)



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Intravitreal Steroid Implants

- Slow release
- Dexamethasone (Ozurdex™)
  - Lasts up to 6 mos
- Fluocinolone (Iluvien™)
  - Lasts up to 3 years

Grain of rice compared to Ozurdex™ implant

- Some recent investigations such as the DRCR.net Protocol I have supported the use of combination therapy in the treatment of DME, including anti-VEGFs, laser & steroids with greater improvements in visual acuity noted*

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* *Ophthalmology.* 2010;117:1064-1077.

Ozurdex®

Applicator and NOVADUR™ implant

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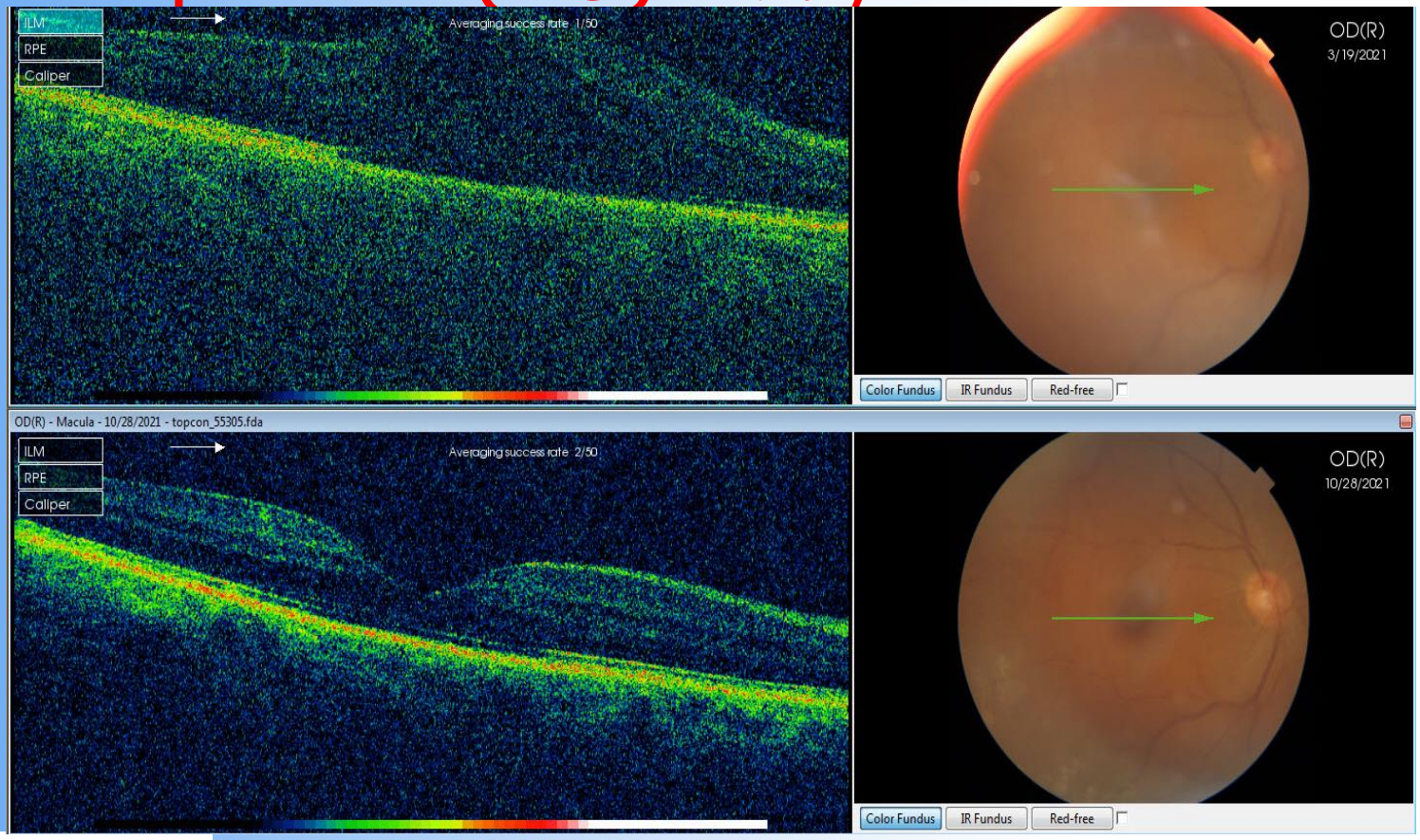
Case 1: 65yrs/F - OZURDEX

- Pre-Op BCVA OD: 6/36, N10, OS:6/6, N6
- Post-Op BCVA (OD): 6/9, N8



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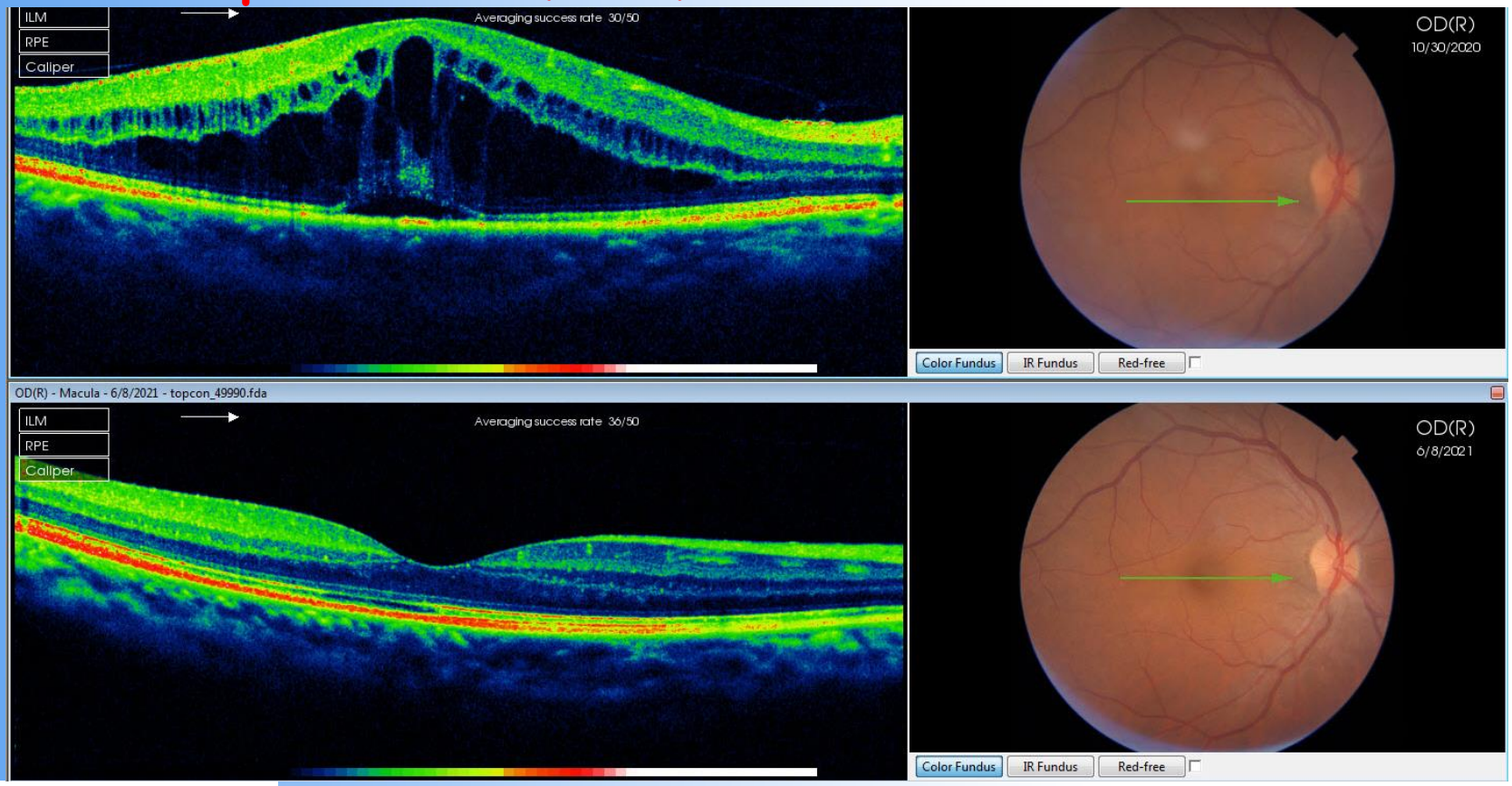
Case 2: 63yrs/F – Inj. AVASTIN

- Pre-Op BCVA OD: 6/60, N12, OS:6/6, N6
- Post-Op BCVA (OD): 6/9, N8



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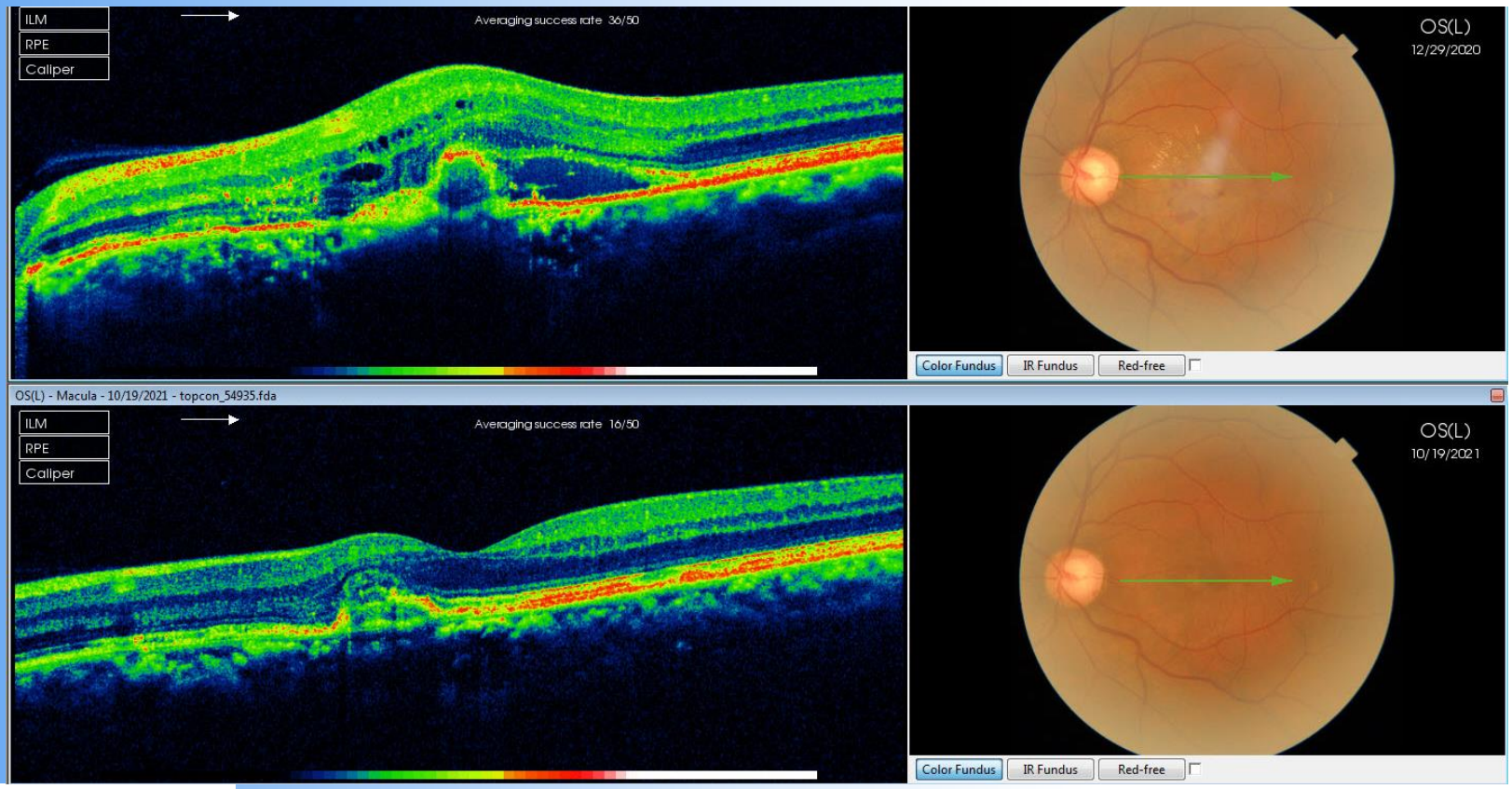
Case 3: 55yrs/M – Inj. EYLEA

- Pre-Op BCVA OS: 6/36, N12, OS:6/6, N6
- Post-Op BCVA (OS): 6/9, N8



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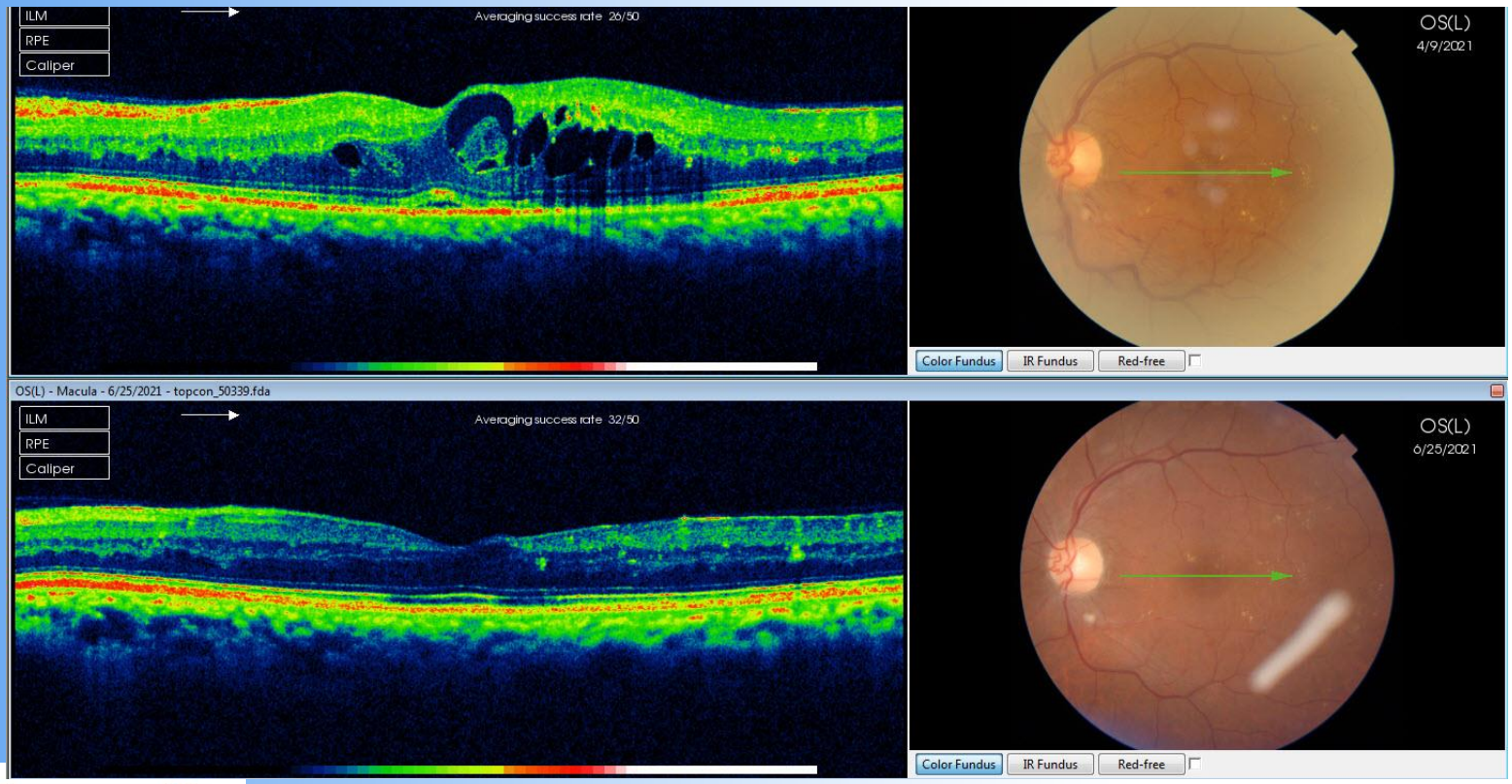
Case 4: 58yrs/M – Inj. LUCENTIS

- Pre-Op BCVA OS: 6/60, N12
- Post-Op BCVA (OS): 6/6, N6



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25G Vitrectomy System

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The Alcon CONSTELLATION® Vision System

- Superior standard of surgical control
- Combining ULTRAVIT® High Speed Vitrectomy Probes with Duty Cycle Control,
- Integrated Pressurized Infusion & IOP Compensation
- Advanced Xenon Illumination
- V-LOCITY® Efficiency Components to deliver an exceptional level of performance.

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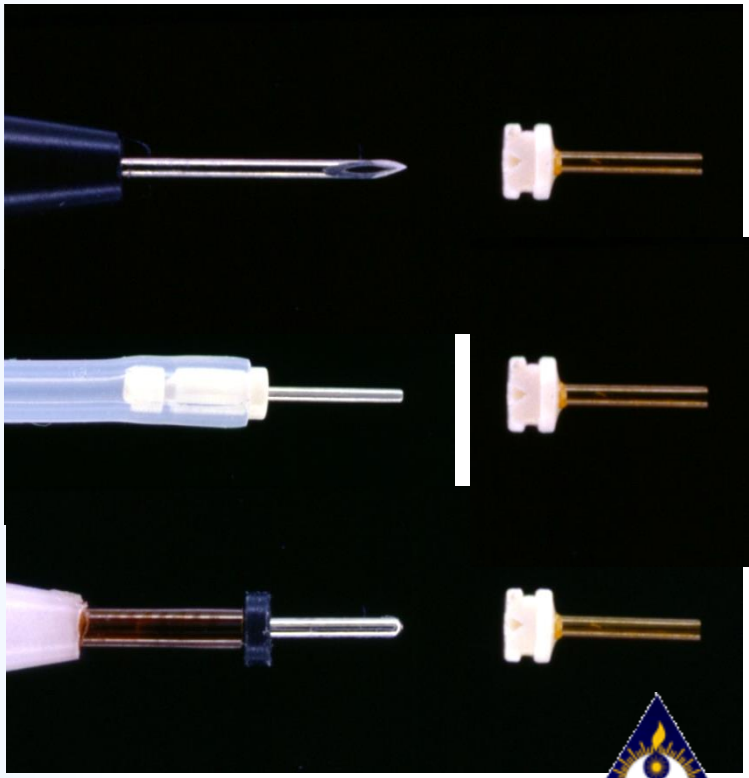
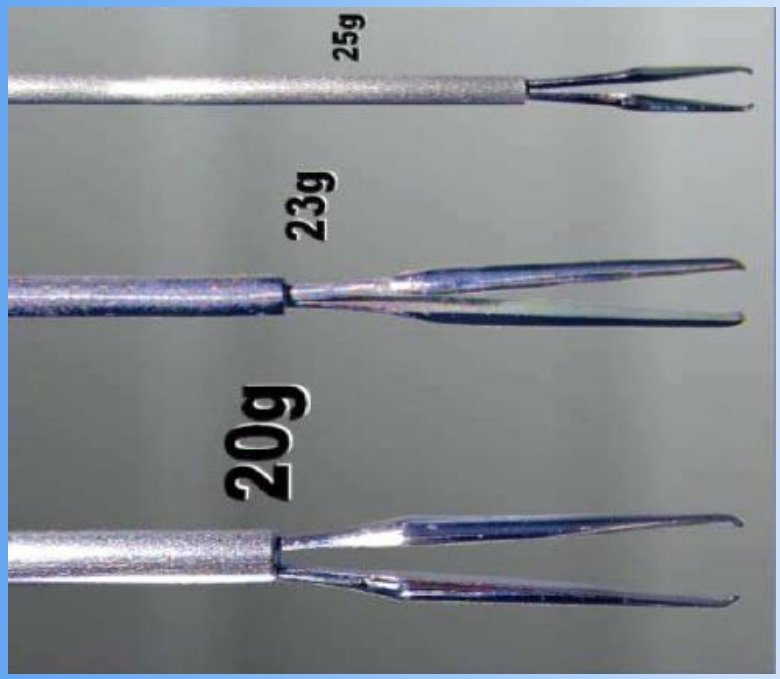
Instrumentation

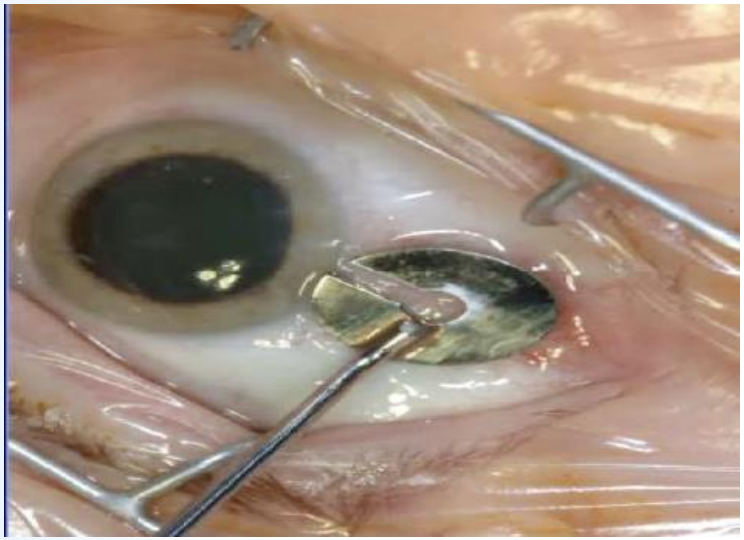
- **25-Gauge Microcannula System**
- Microcannula
- Insertion trocar
- Infusion cannula
- Plug forceps
- Cannula plug

- **Transconjunctival** (eliminates conjunctival dissection)
- **Integrated cannula system**
  - Trocar insertion tool
  - Cannula based infusion





- Non flexible instruments: feels like standard 20 G
- Able to rotate eye



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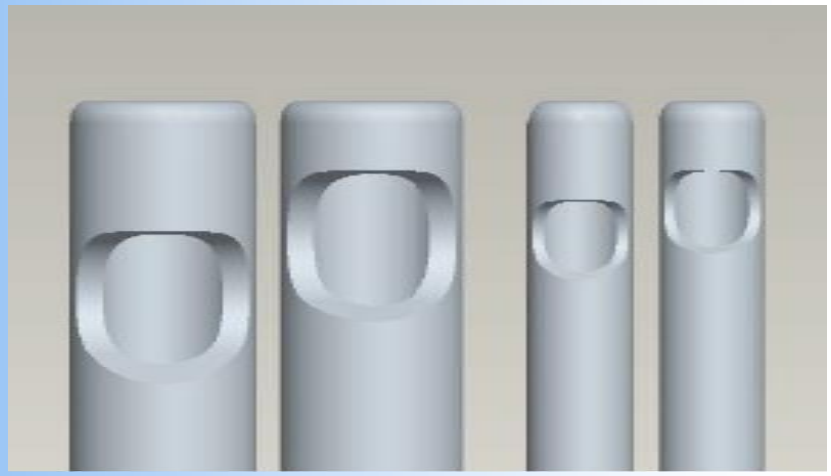
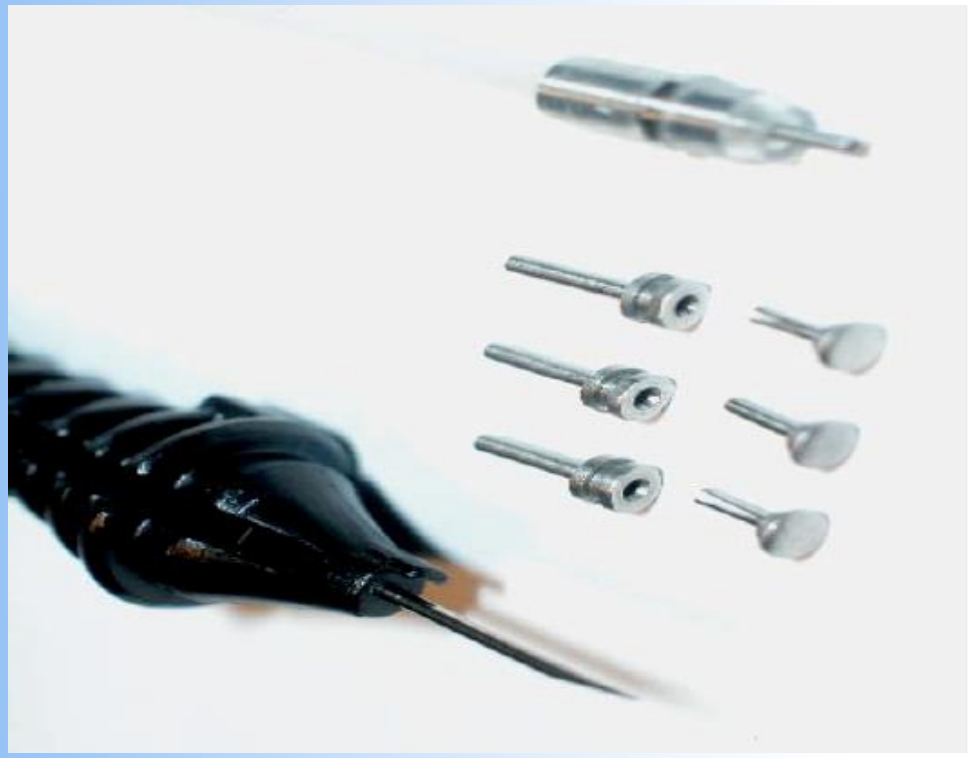
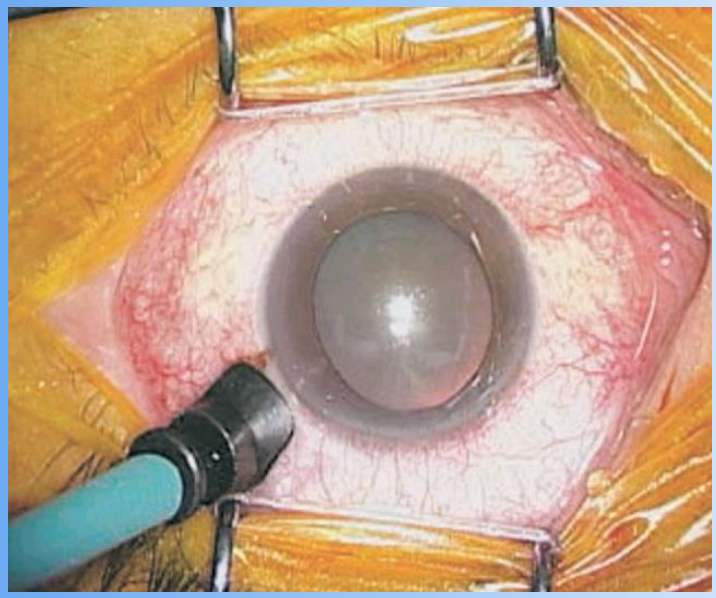
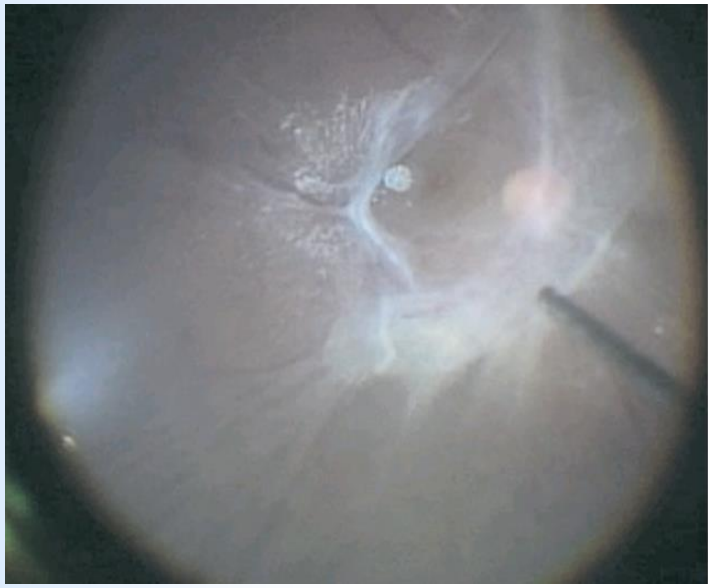
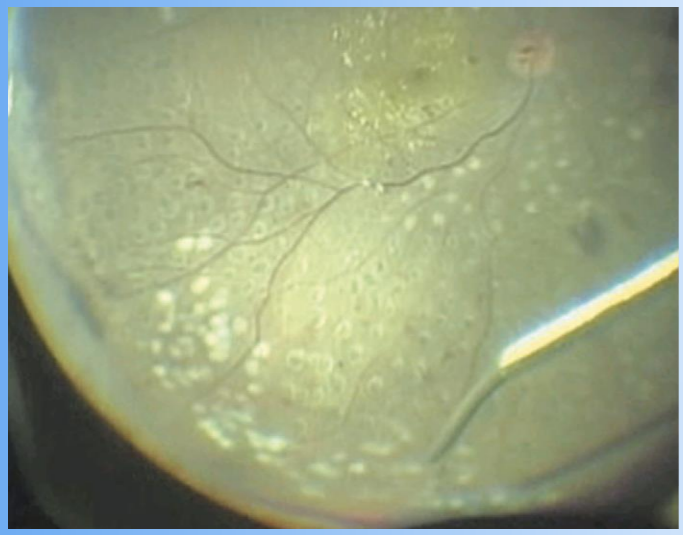


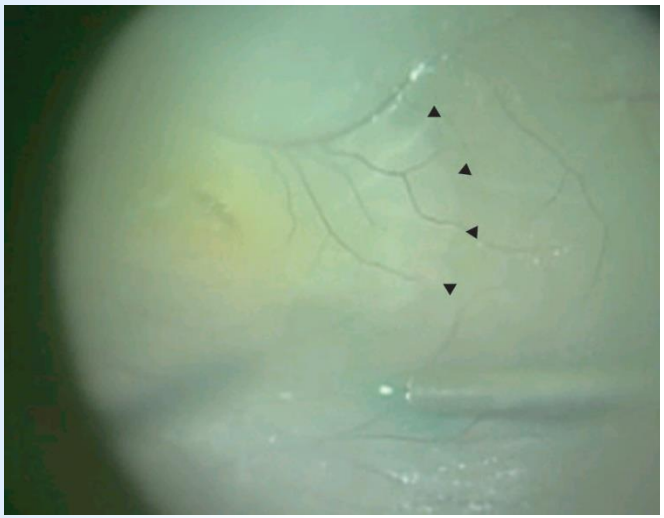






- Panoramic fundus view under 27-gauge chandelier endoillumination
- Sufficient illumination and wide-angle view of the fundus are obtained without reflecting glare into the surgeon's eyes

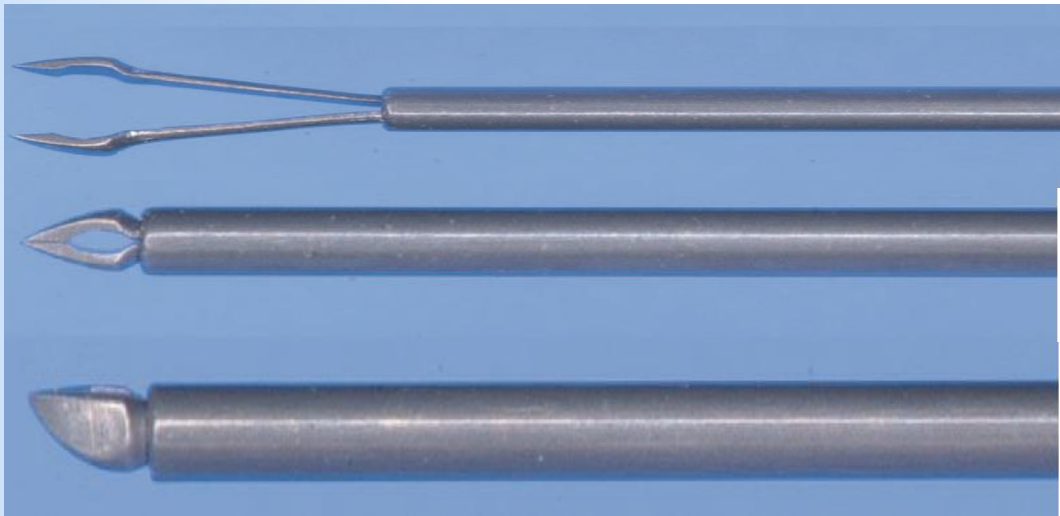




- Intraoperative view of the mercury vapor illuminator combined with a 27/29-gauge light fiber in a variety of vitreoretinal disorders

27-gauge transconjunctival instruments for epiretinal membrane removal

- The size of the shaft - 0.40 mm in diameter
- The shaft of the microforceps is rigid and thin enough for intraocular manipulation
- The shape of the grasping end is asymmetric
- The distance between the two tips of the grasping end is 750 microns when opened and is wide enough to grasp tough and thick proliferative epiretinal tissue



RECOMMENDED EYE EXAMINATION SCHEDULE

Diabetes Type	Recommended Time of First Examination	Recommended Follow-up*
Type 1	3-5 years after diagnosis	Yearly
Type 2	At time of diagnosis	Yearly
Prior to pregnancy (type 1 or type 2)	Prior to conception and early in the first trimester	No retinopathy to mild moderate NPDR every 3-12 months Severe NPDR or worse every 1-3 months.

*Abnormal findings may dictate more frequent follow-up examinations

h ttp://one.aao.org/CE/PracticeGuidelines/PPP_Content.aspx?cid=d0c853d3-219f-487b-a524-326ab3cecd9a

A protocol for diabetic screening and Monitoring

- Type 2 DM patients without retinopathy should be assessed at the time of diagnosis and **bi-annually** thereafter.
- Patients with mild NPDR, should be assessed **every 12 months** by a suitably experienced practitioner.
- Screening doctors should always look, for the onset of CSME
- Type 1 diabetics **rarely develop retinopathy until after eight years of diabetic life**.
- Screening is unnecessary for at least the first 5 years of the disease and that **patients without retinopathy should be screened annually** after the onset of puberty until the onset of NPDR
- For children with type 1 diabetes, screening can be delayed until age 10, or until five years after diagnosis, whichever occurs first

Pregnancy

- Diabetic retinopathy may worsen during pregnancy. Screening should therefore be undertaken
  - at confirmation of pregnancy
  - every two months during pregnancy if no retinopathy is present
  - monthly, if retinopathy is present.

PREVENTION

90 percent of diabetic eye disease can be prevented simply by proper regular eye examinations, treatment and by controlling blood sugar.

http://www.aao.org/newsroom/release/20091030.cfm

Dr.Agarwal's
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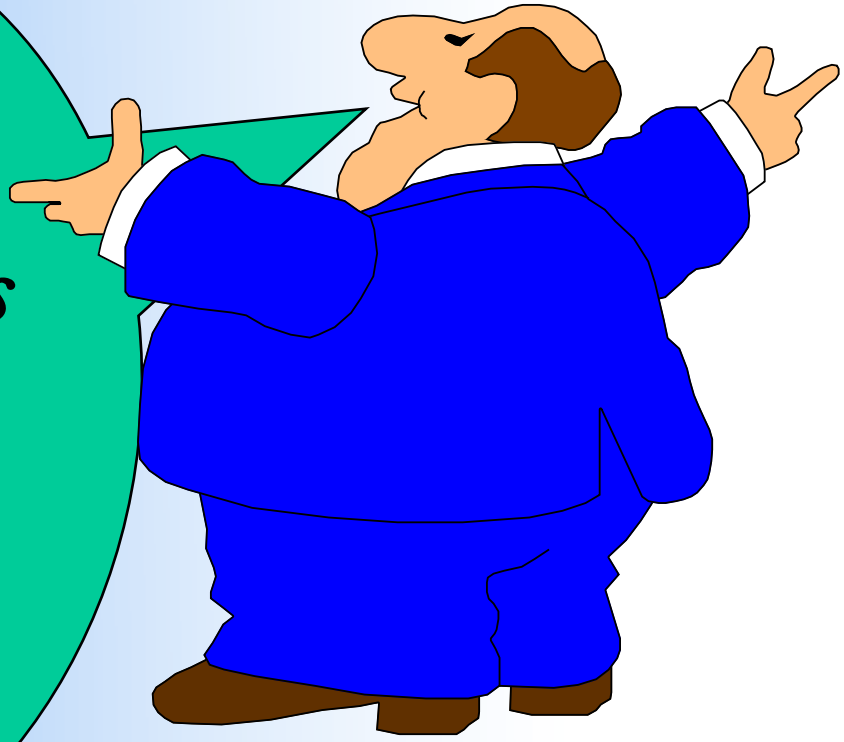
Kampala



THANK YOU

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