

DIABETIC RETINOPATHY



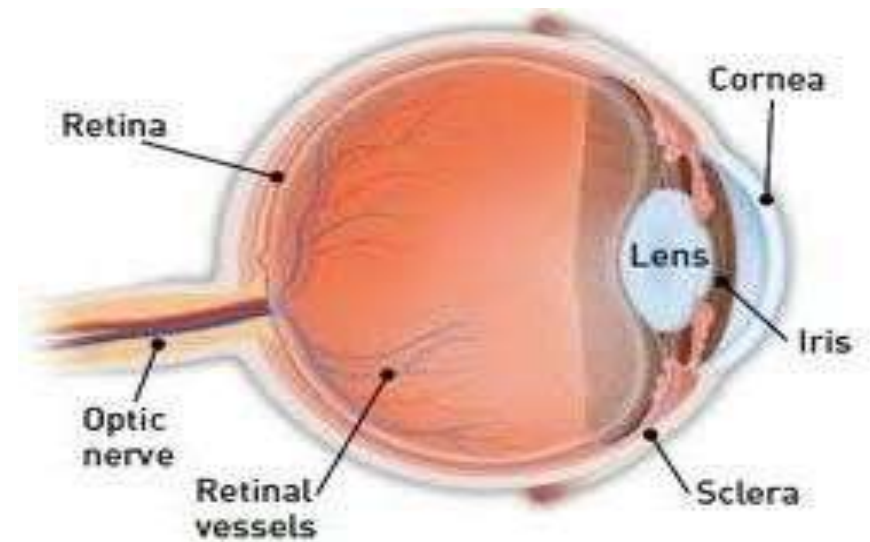
Diabetic eye disease

Refers to a group of eye problems that people with diabetes may face as a complication of diabetes.

All can cause variable degrees of vision loss or visual symptoms (pain and Diplopia)

Diabetic eye disease

- Corneal abnormalities
- Iris and angle
Neovascularization.
- Neovascular Glaucoma
- Cataracts... snowflake
cataracts in young pts
and greater frequency
and earlier onset of age
related cataract.
- Ocular Neuropathies.
- Diabetic Retinopathy.



Diabetic cataract, or “snowflake” cataract,



Diabetic retinopathy :

It is a progressive microangiopathy of the retinal blood vessels caused by chronic hyperglycemia.

Diabetic retinopathy - most common cause of moderate to severe vision loss between ages 25 and 74 years.

The Retina

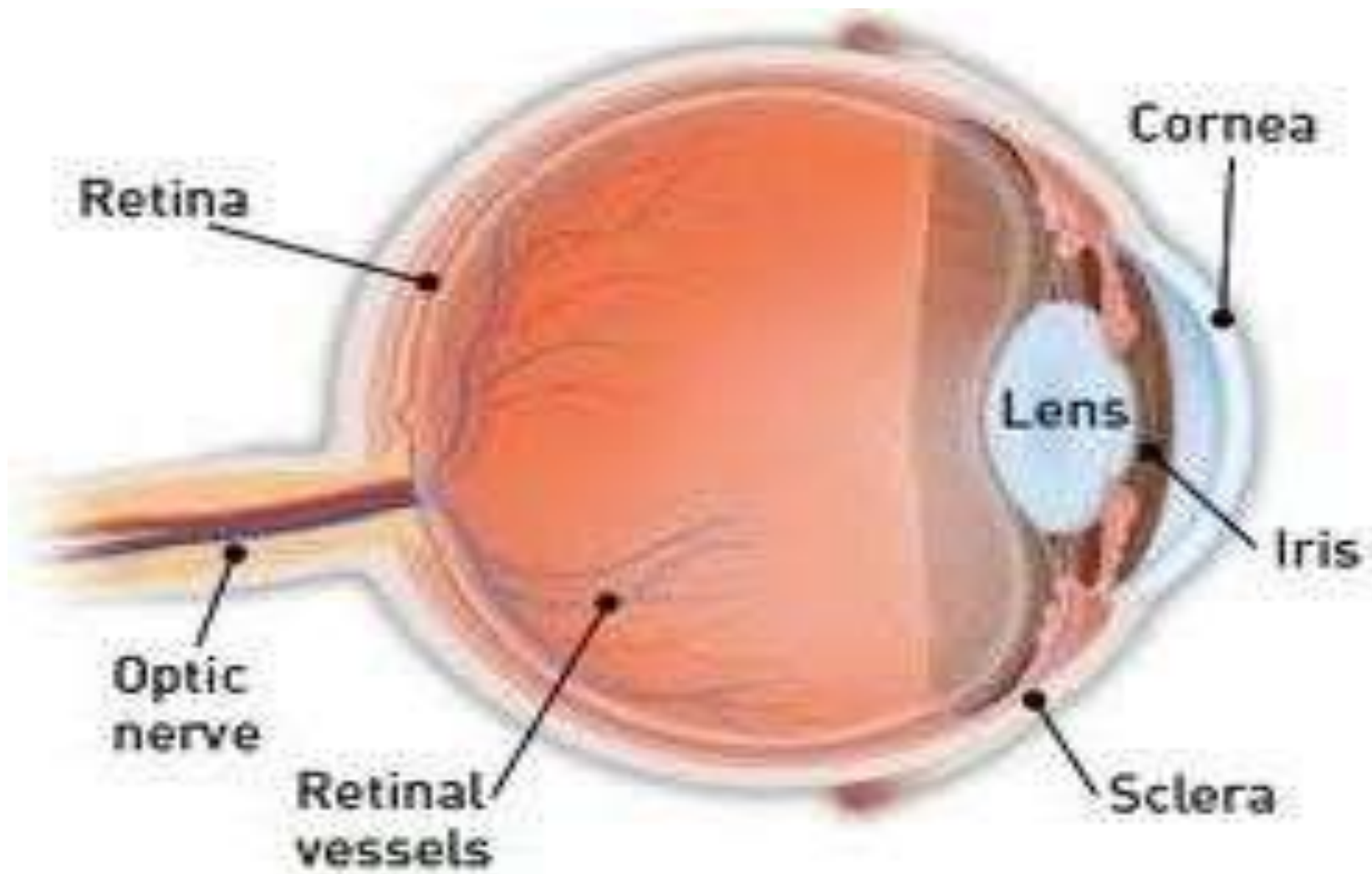
A structure that lines the inside of the globe

- **Two major layers:**

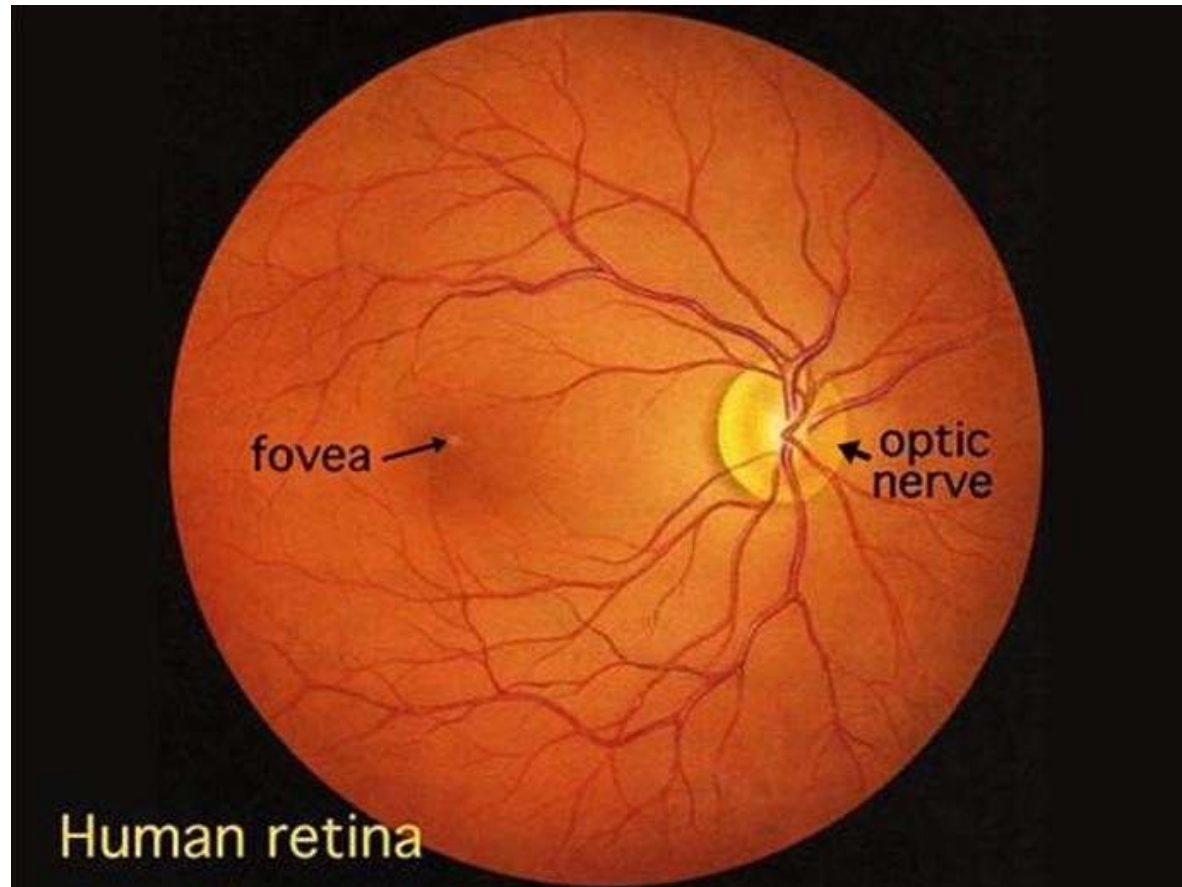
- Inner neurosensory retina (NSR): transparent, has the photoreceptors (rods and cones), light sensitive
- Outer retinal pigment epithelium (RPE).

- **Retinal blood supply:**

From central retinal artery and choroidal circulation.



Retinal Anatomy



RISK FACTORS:

Duration of diabetes

Poor control of diabetes

Hypertension

Nephropathy

hyperlipidemia

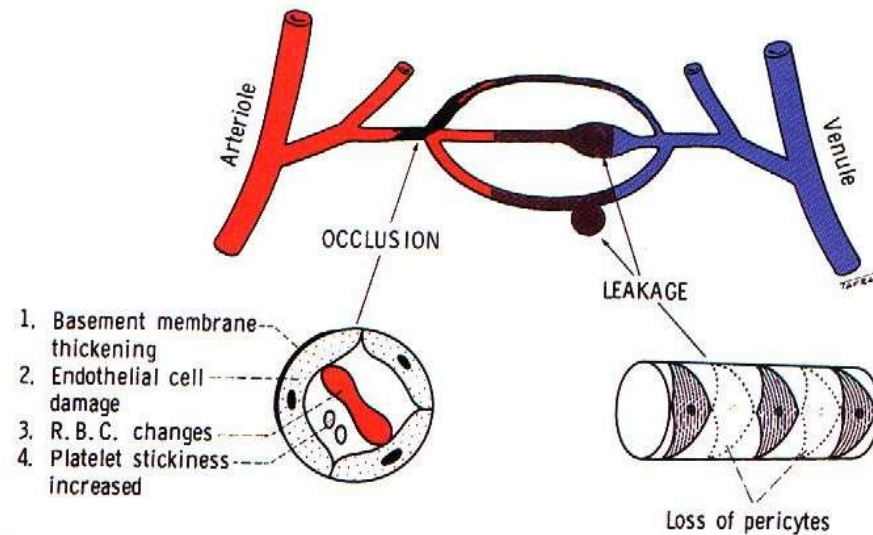
Smoking

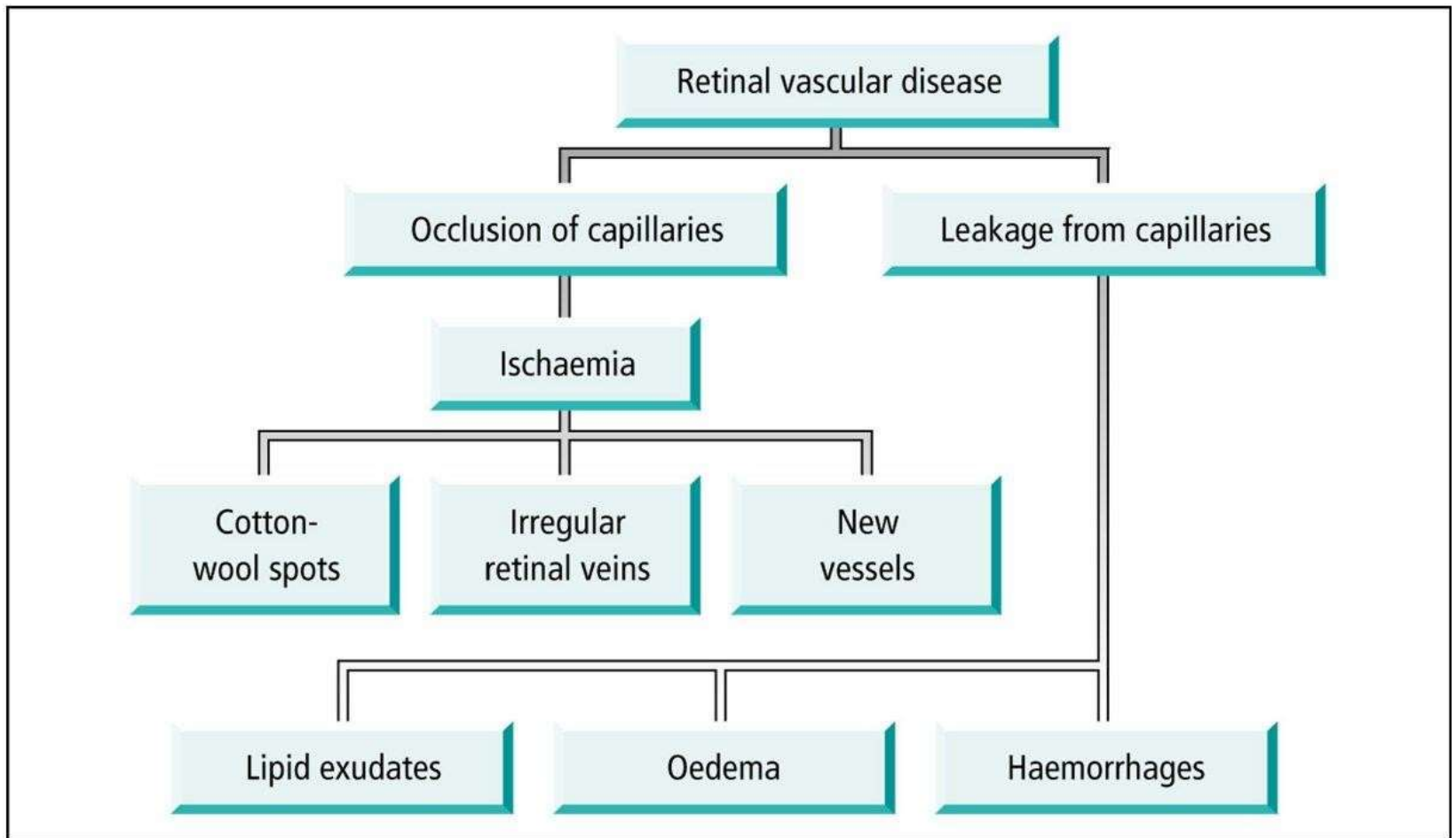
Obesity

Pregnancy

Pathogenesis

Microangiopathy which has features of both microvascular leakage and occlusion.





Ophthalmology Lecture Notes, Eleventh Edition. Bruce James, Anthony Bron.
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Figure 12.1 The building blocks of retinal vascular disease. Capillary leakage and occlusion often occur together.

Microvascular leakage

Loss of pericytes results into :

Distention of capillary wall producing
microaneurysms

Disruption of the inner Blood-retinal barrier p
causing plasma constituents to leak into the retina
retinal edema, hard exudates

Microvascular occlusion

Basement membrane thickening, endothelial cell damage, deformed RBCs, platelet stickiness and aggregation

Vascular Endothelial Growth Factor (VEGF) is produced by **hypoxic retina**

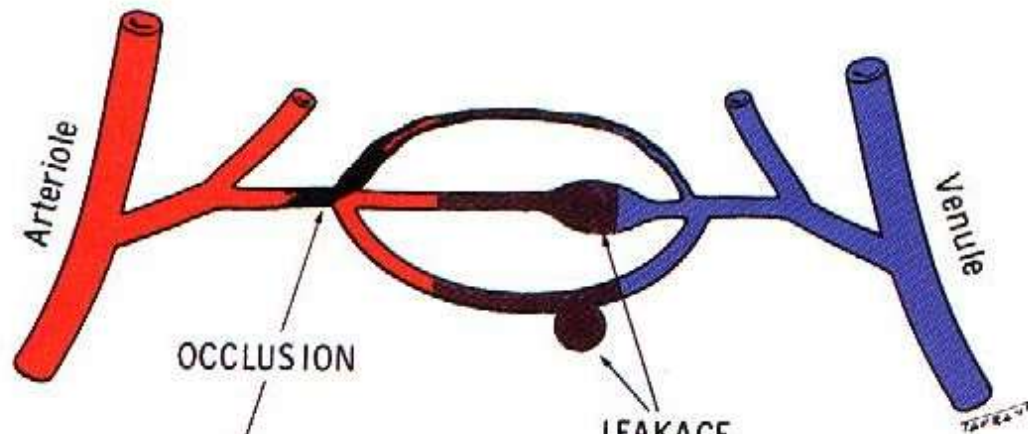
VEGF stimulates the shunt and growth of new vessels

New vessels is the hallmark of proliferative diabetic retinopathy

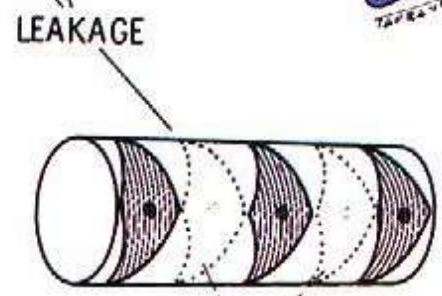
These new vessels forms at or near the optic disc (NVDs) , anywhere in the retina (NVEs) or at iris (NVI)

The new vessels break easily and leak into the vitreous gel producing vitreous hemorrhage.

With time the fibrous component of new vessels contracts and results into traction retinal detachment



1. Basement membrane thickening
2. Endothelial cell damage
3. R. B. C. changes
4. Platelet stickiness increased



Loss of pericytes

Signs of diabetic retinopathy :

Early signs (signs of non proliferative DR) :

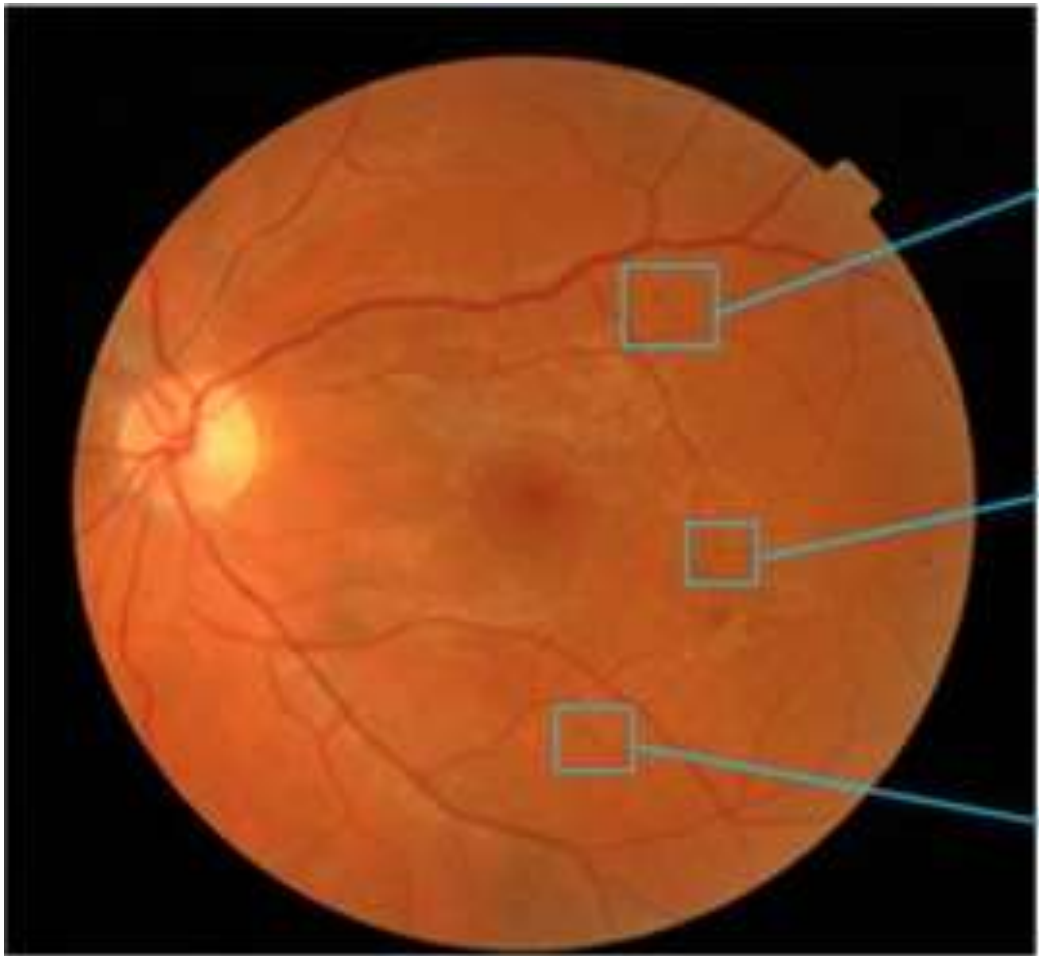
- ❖ Microaneurysms
- ❖ Dot and blot hemorrhages
- ❖ Flame-shaped hemorrhages
- ❖ Cotton-wool spots
- ❖ Hard exudates
- ❖ Edema
- ❖ Venous changes (heading and looping)
- ❖ Intraretinal microvascular abnormalities (IRMAs)

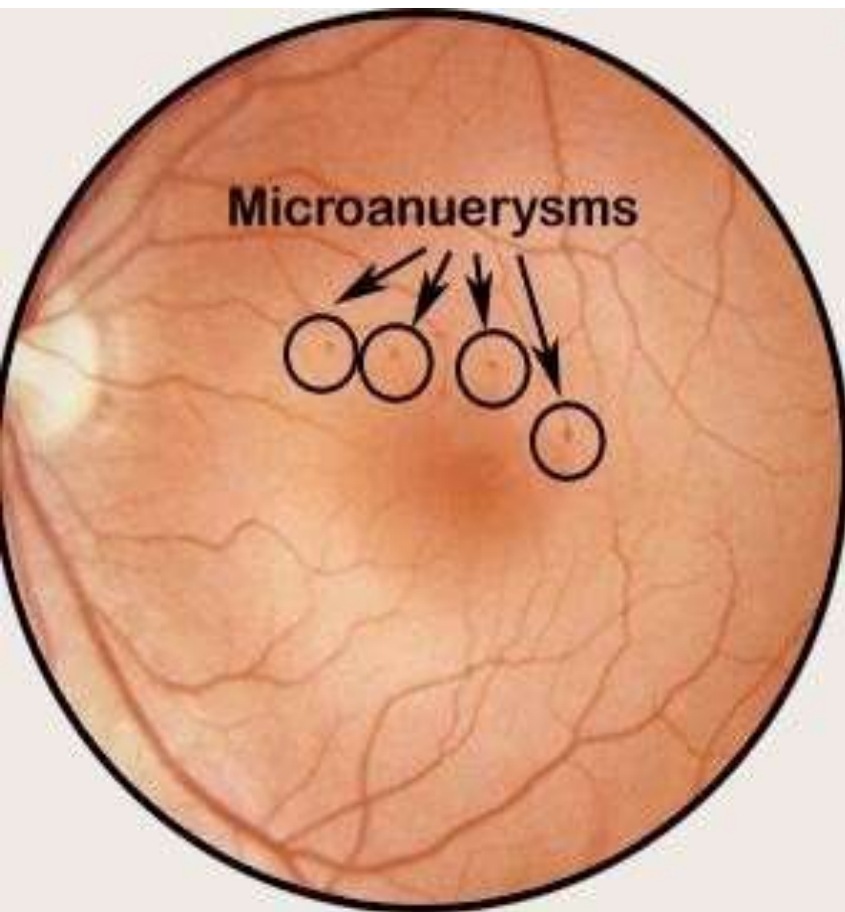
❖ Microaneurysms :

- Earliest clinical sign of diabetic retinopathy.

- Appear as small red dots in the superficial retinal layers

- Rupture produces dot, blot and flame shaped hemorrhages





❖ Dot and blot hemorrhages

Occur as microaneurysms rupture in the deeper layers of the retina (similar to microaneurysms if they are small, distinguish by fluorescein angio).

❖ - Splinter or flame shaped hemorrhages, superficial.



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❖ Hard exudates

-Caused by the breakdown of the blood-retina barrier, allowing leakage of serum proteins and lipids, from the vessels.



❖ Cotton-wool spots

Nerve fiber layer infarction from occlusion of precapillary arterioles

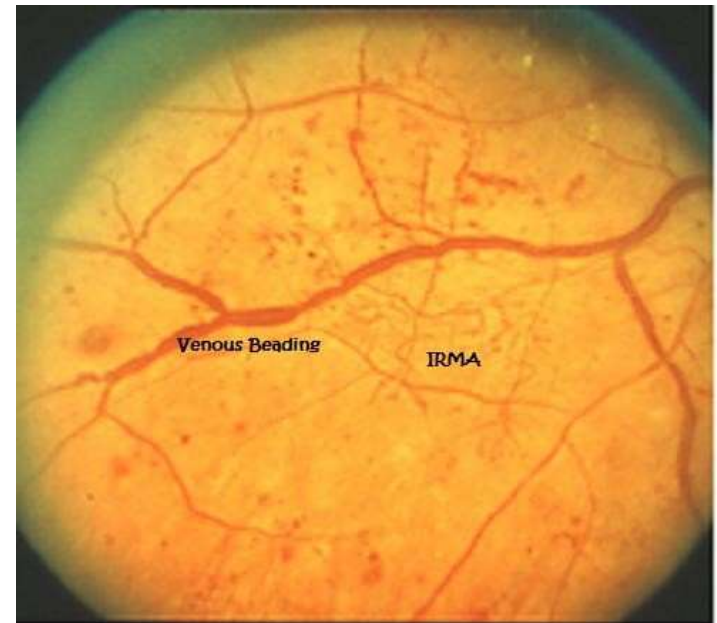
Fluorescein angiography - No capillary perfusion



❖ Intraretinal microvascular abnormalities

abnormal branching,
sinuous shunt vessels
that typically develop
adjacent to areas of capillary
non perfusion

It is a sign of sever NPDR



Diabetic Macular Edema



International Clinical Diabetic Macular Edema (DME) Disease Severity Scale:

- **DME absent:**
No retinal thickening or hard exudates (HE) present in the posterior pole.
- **DME present:**
Some retinal thickening or hard exudates (HE) present in the posterior pole.

- If DME present, it can be categorized as follows:

- **Mild DME:**

- Some retinal thickening or HE present in the posterior pole but distant from the center of macula.

- **Moderate DME:**

- Retinal thickening or HE approaching the center of the macula but not involving its center.

- **Severe DME:**

- Retinal thickening or HE involving the center of the macula.

Clinically significant macular edema

the Early Treatment Diabetic Retinopathy Study classification protocol as the presence of :

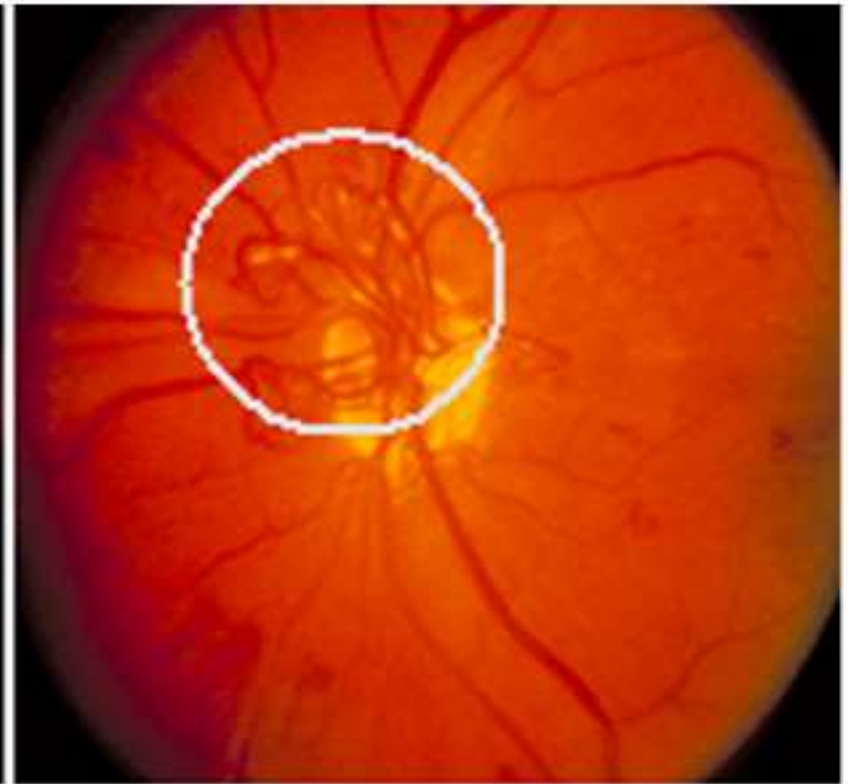
Retina thickening at or within 500 um from the center of the macula

- Retinal hard exudate at or within 500 um of the center of the macula if associated with edema.
- Zone of thickening one disc diameter, at least part of which is within one disc from the center of the macula.

Signs of diabetic retinopathy :

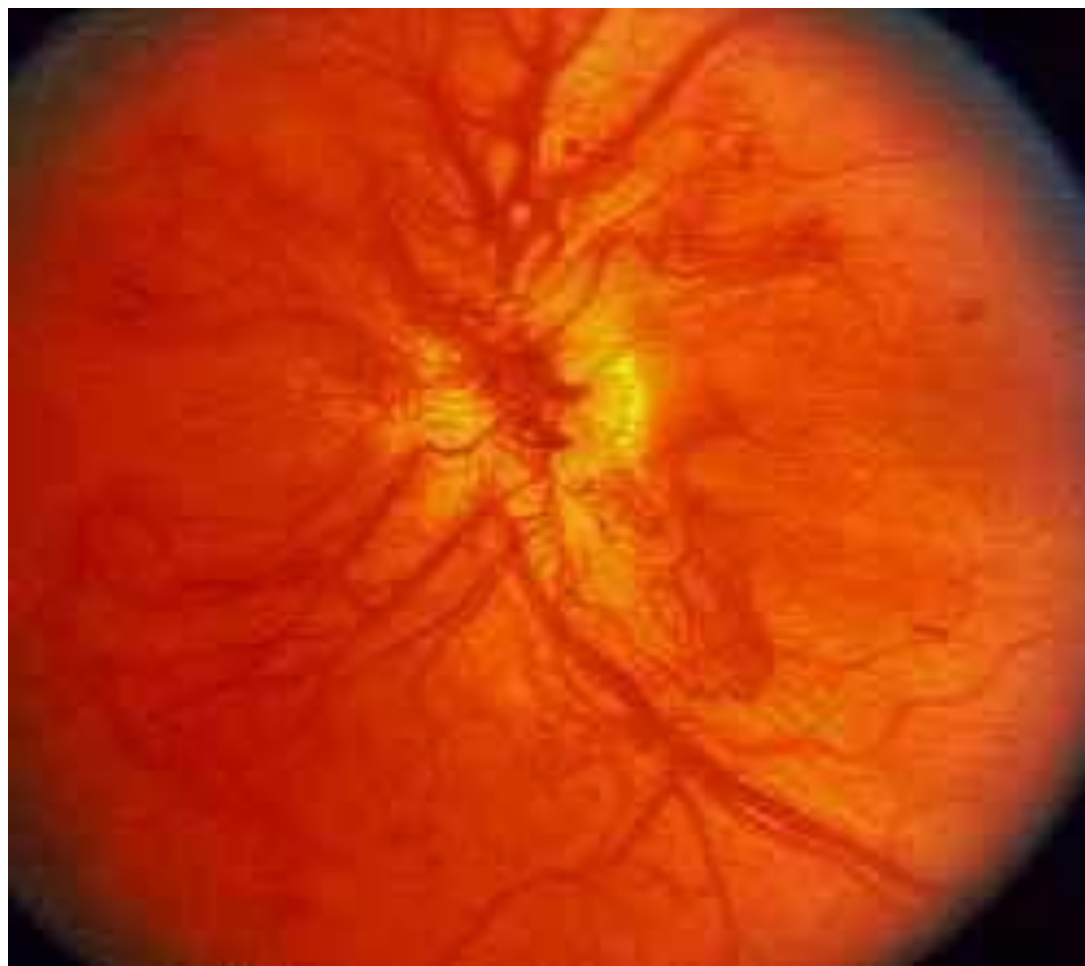
Late signs (signs of proliferative DR) :

- ❖ Neovasclaiization (NVDs, NVEs and NVIs)
- ❖ Vitreous hemorrhages
- ❖ Per retinal hemorrhages
- ❖ Traction retinal detachment
- ❖ Neovascular glaucoma



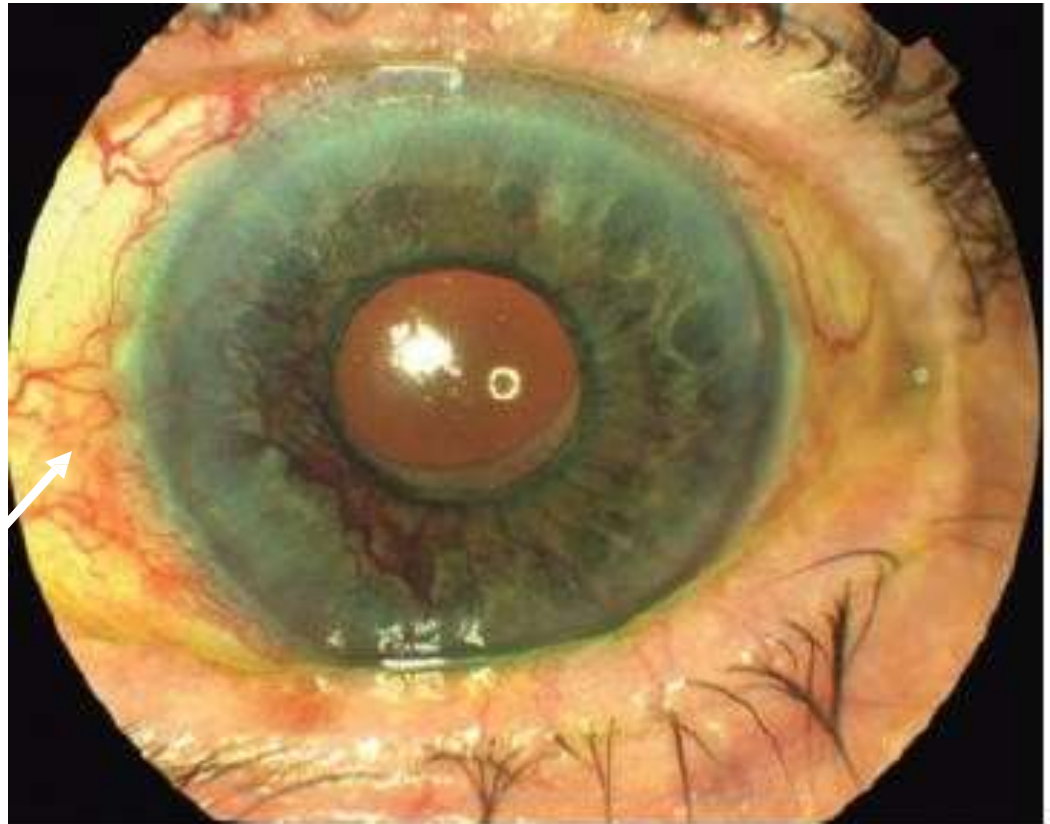
(a) New vessels elsewhere (NVE) **(b) New vessels on disc (NVD)**

NVDs



Rubeosis Iridis

Neovascularization of the iris.



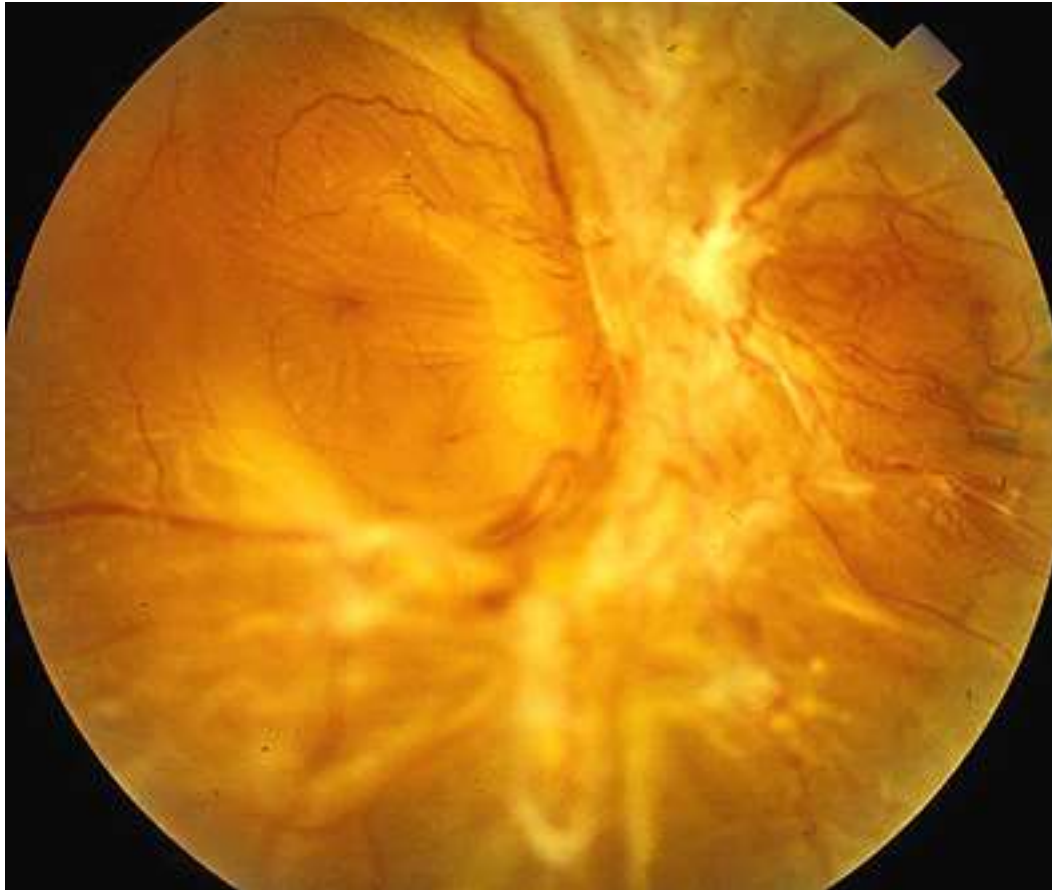
❖ Vitreous hemorrhages



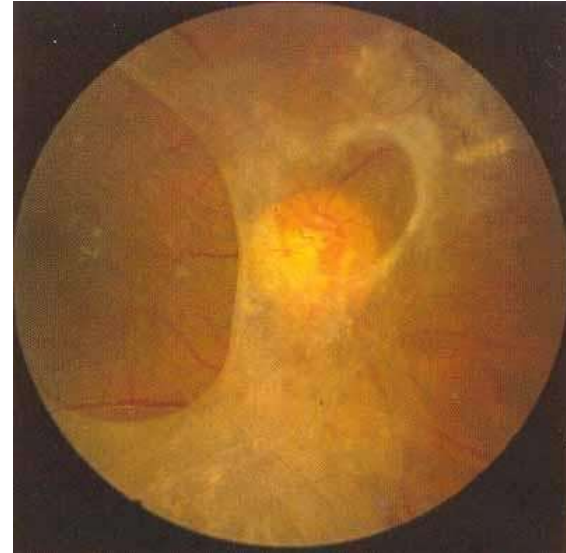
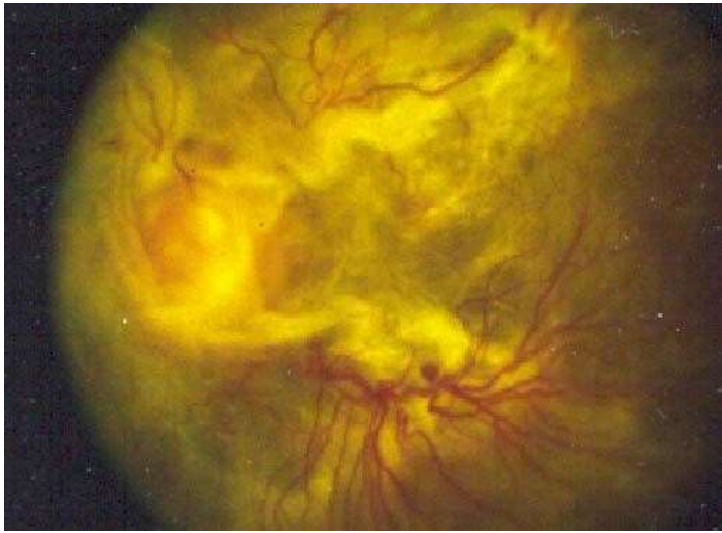
Pre-retinal or sub-hyloid Hemorrhage



Tractional retinal detachment



Tractional retinal detachment



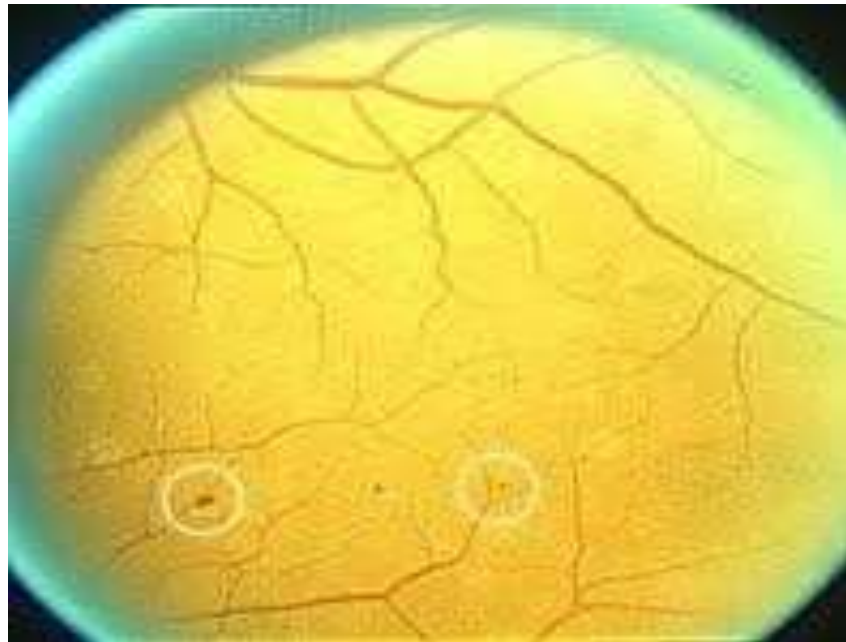
Classification of the American Academy of Ophthalmologists

Dilated Ophthalmoscopy Findings	Proposed Disease Severity Level
No abnormalities	No apparent DR
Microaneurysms only	Mild NPDR
More than “mild” but less than “severe”	Moderate NPDR
Any of the following: 20 or more microaneurysms in 4 quadrants Definite venous beading in 2 or more quadrants Prominent IRMA in 1 or more quadrants and no neovascularization	Severe NPDR
1 or more of the following: Definite neovascularization Preretinal or vitreous hemorrhage	PDR

Table 7. International Clinical Diabetic Retinopathy Disease Severity Scale.

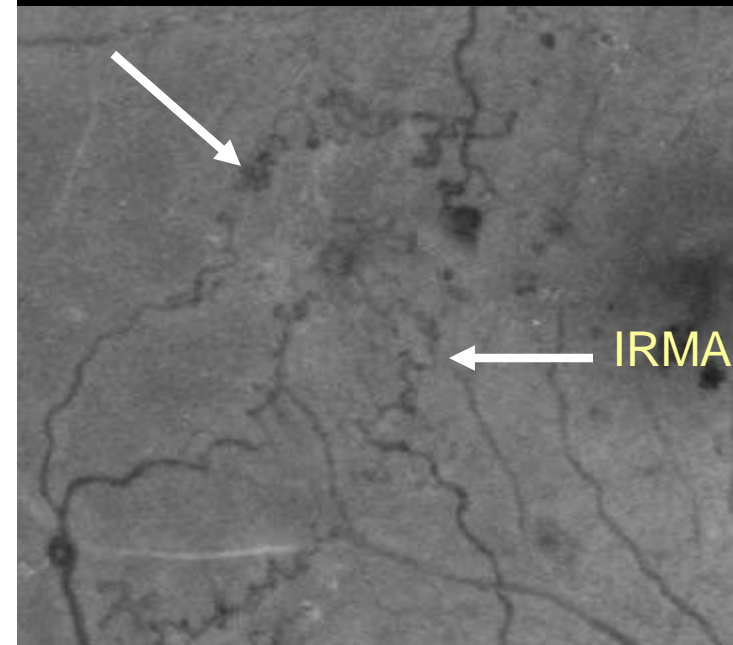
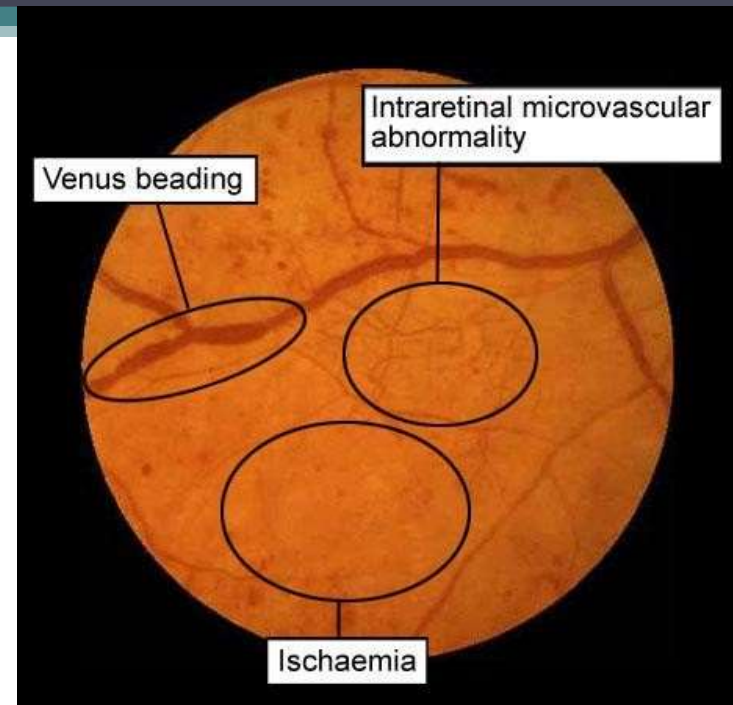
Mild NPDR

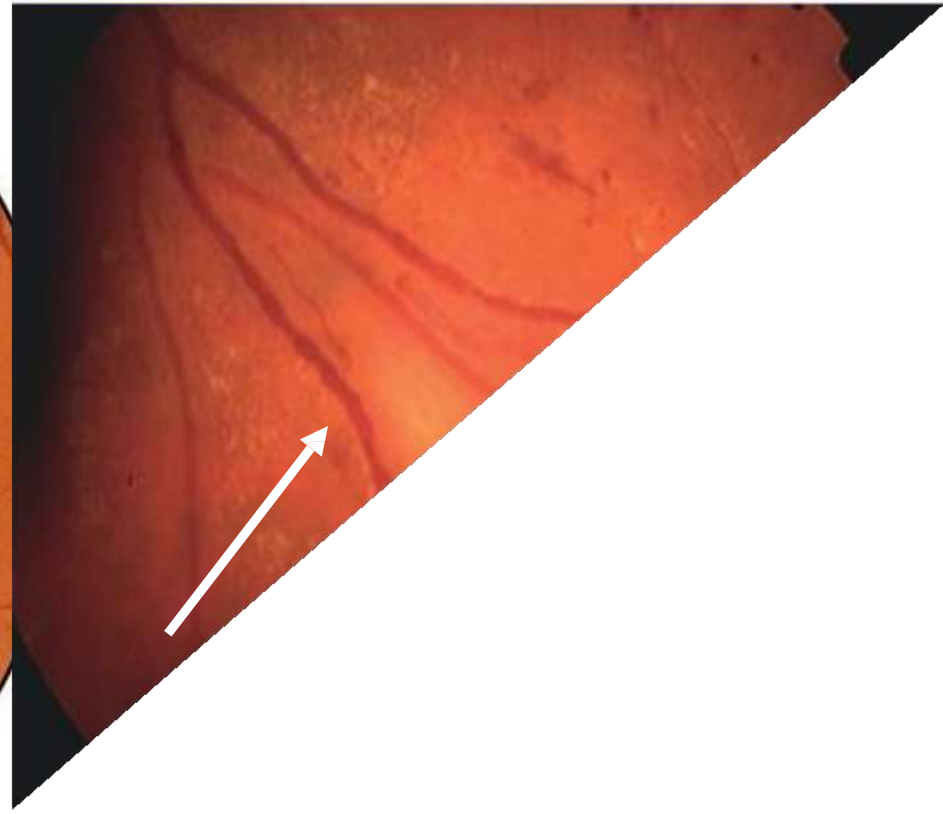
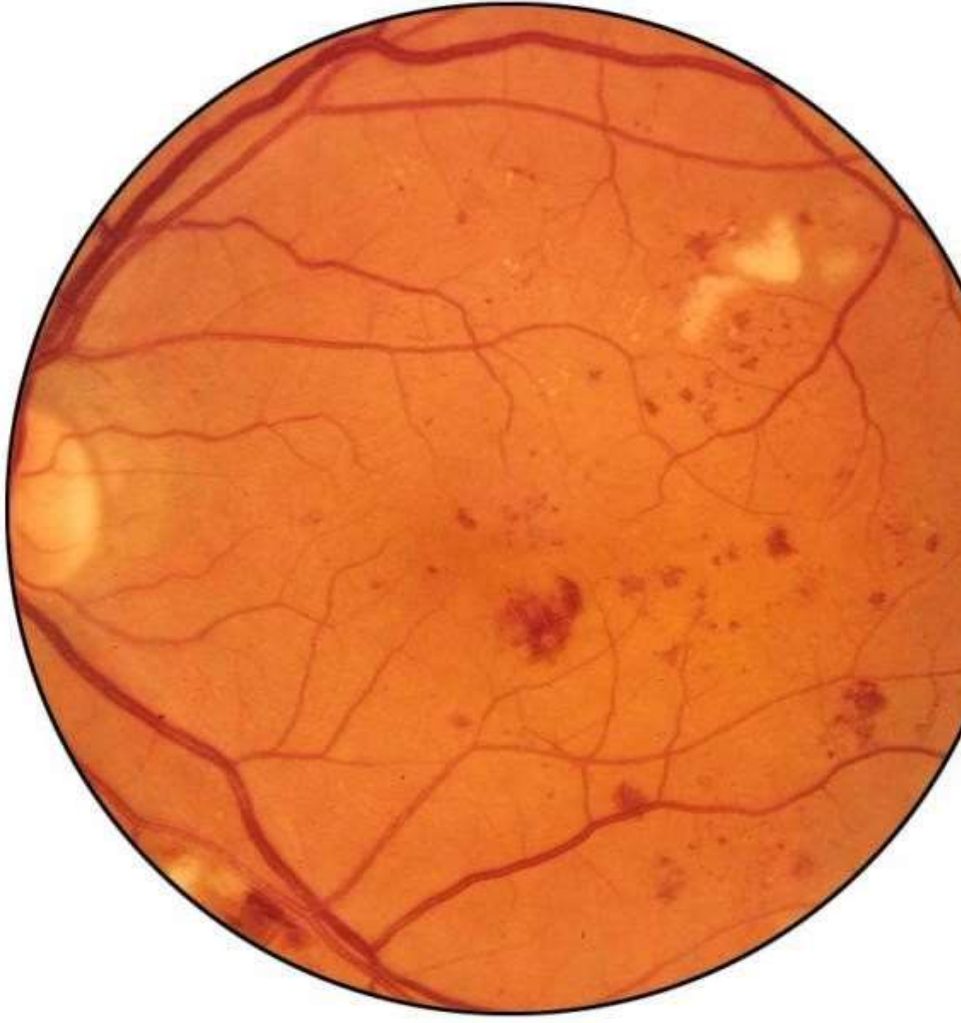
- **Microaneurisms only**
- Earliest clinically detectable lesion



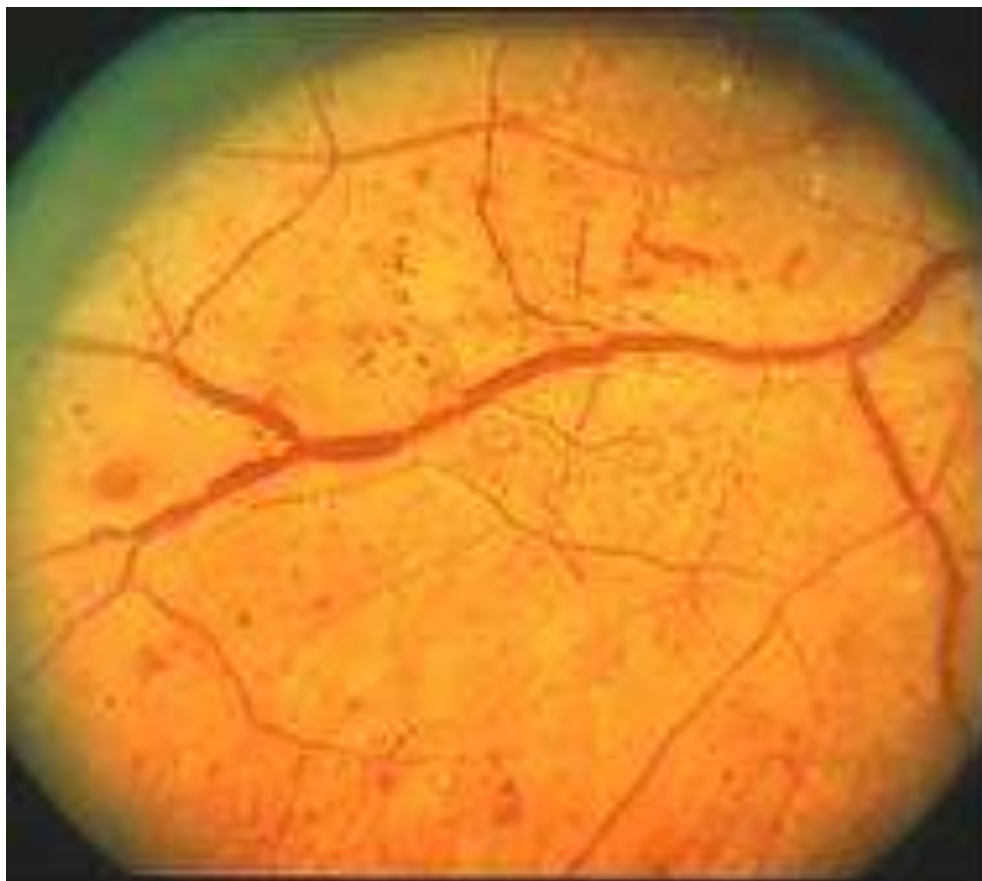
Moderate NPDR

- Microaneurysms and/or dot and blot hemorrhages in more than 1 quadrant.
- Soft exudates (Cotton wool spots).
- Venous beading in one quadrant.



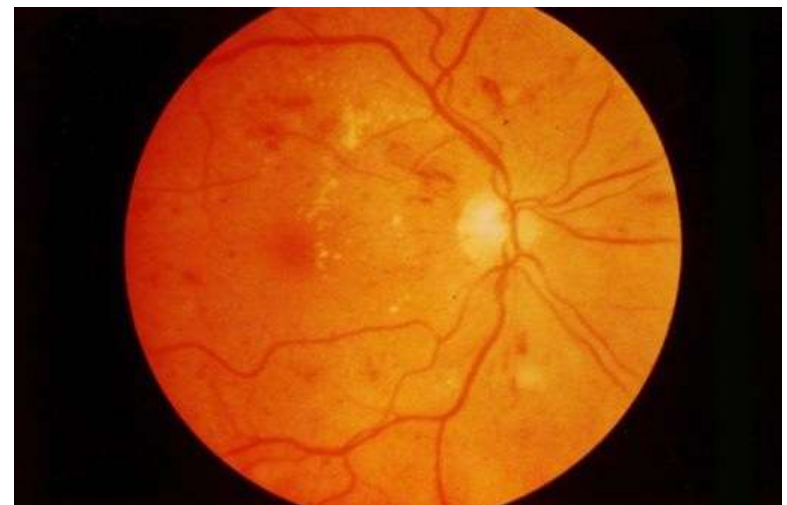
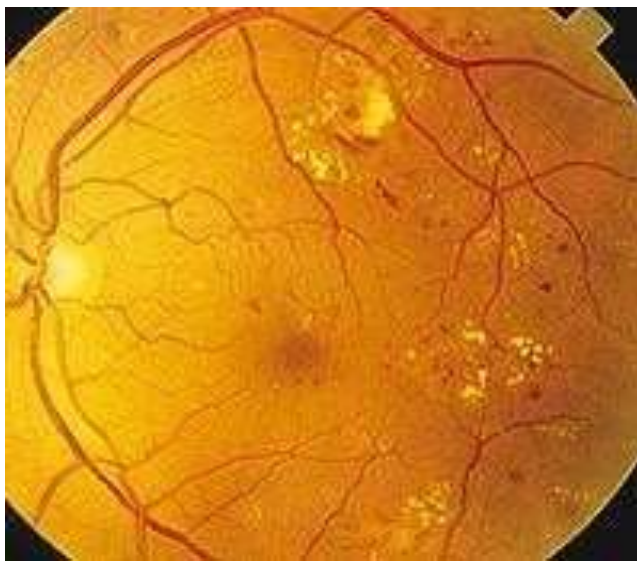
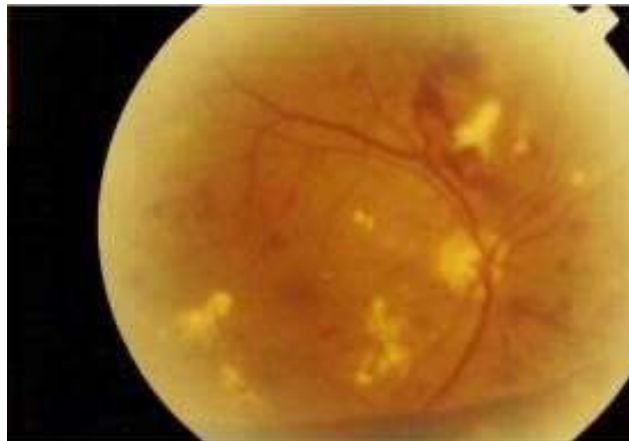


Mild vs Moderate NPDR



Severe NPDR

Micro anueysms in 4 quadrants, venous changes in 2 quadrants or IRMA in one quadrant



Proliferative DR

Characterized by
Proliferation of new
vessels from retinal
veins

- New vessels on the optic disc
- New vessels elsewhere on the retina

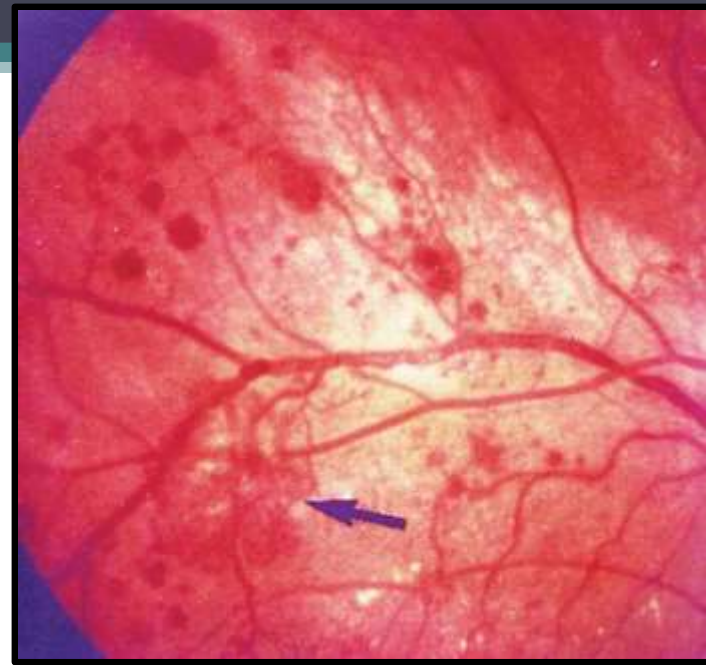


TABLE. RECOMMENDED FOLLOW-UP SCHEDULE FOR DIABETIC PATIENTS

Severity of Retinopathy	Examination Criteria	Follow-up (month)
Normal	No retinopathy	12
Mild NPDR	Microaneurysms only	9
Moderate NPDR	More than microaneurysms but less than severe	6
Severe NPDR	Any of the following (4-2-1 rule)	
• Intraretinal hemorrhages in all four quadrants		4
• Venous beading in two or more quadrants		4
• IRMA in one or more quadrants		4
Proliferative DR	Neovascularization of disc or elsewhere	Refer to retina specialist
Macular edema	Macular thickening and/or cystic edema	Refer to retina specialist

Abbreviations: NPDR, nonproliferative diabetic retinopathy; IRMA, intraretinal microvascular abnormalities; DR, diabetic retinopathy.

Treatment

❖ Mild & Moderate NPDR

- No specific treatment for retinopathy
- Good diabetic control to delay progression
- Control of associated Hypertension, Anemia and Renal failure

❖ Severe NPDR

- Close follow up by Ophthalmologist

❖ Clinically Significant Macular Edema

- Intra-vitreous anti-VEGF.
- **Laser photocoagulation** to minimize risk of visual loss.

We aim the laser at the points of leakage, the exudate is often seen as to be in a circular or circinate pattern, with the focus of leakage or microaneurysm in the middle. If the treatment is effective, the retinal edema and exudate will resorb, although this may take some months.

Circinate retinopathy - Hard exudates in a ring around leaking aneurysms



❖ Proliferative DR

—Retinal **laser photocoagulation** as per the judgment of ophthalmologist (in high risk eyes) , it improves retinal circulation and decreases production of vasoproliferative factors (by ablating areas of ischemic retina).

Our aim here is scattered laser burns to the entire retina (pan-retinal laser pr PRP), leaving an untreated area around the optic disc and around the central region of the macula, to preserve vision.

—**Anti-VEGF** , shrinks neovascularization and decrease leakage, given as intravitreal injection, like avastin.



Leaking
blood vessel

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Diabetic retinopathy typically presents no symptoms during the early stages.

The condition is often at an advanced stage when symptoms become noticeable. On occasion, the only detectable symptom is a sudden and complete loss of vision.

DR usually affects both eyes.

The only way people with diabetes can prevent DR is to attend every eye examination scheduled by their doctor.

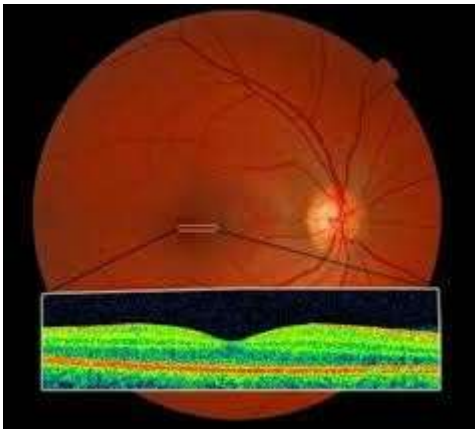
Symptoms of diabetic retinopathy may include:

- Blurred vision
- The impairment of color vision
- Floaters, or transparent and colorless spots and dark strings that float in the patient's field of vision
- Patches or streaks that block the person's vision
- Poor night vision
- Sudden and total loss of vision

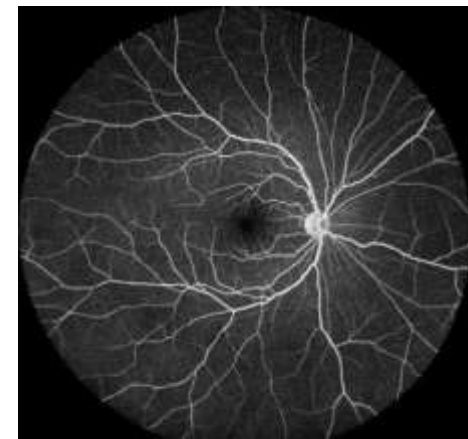
Investgations

HbA1c, blood sugar

OCT, to determine the thickness, presence of swelling, to diagnose macular edema or CSME



Fluorescein angiography



Complications of Diabetic Retinopathy

- Vitreous hemorrhage
- Tractional retinal detachment
- Rubeosis Iridis
- Glaucoma
- Blindness

Neovascular Glaucoma

- Complication of rubeosis iridis
- New vessels cause angle closure
- Mechanical obstruction to aqueous outflow
- Intra ocular pressure rises
- Pupil gets distorted as iris gets pulled.
- Eye becomes painful and red
- Loss of vision

Blindness

- Non-clearing vitreous hemorrhage
- Neovascular glaucoma
- Tractional retinal detachment
- Macular ischemia

Prevention of Complications

- 1- By early institution of appropriate treatment
- 2- Early detection of DR in its asymptomatic treatable condition
3. Routine fundus examination of all diabetics (at least yearly)
4. Appropriate referral to ophthalmologist