DIABETIC RETINOPATHY

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Diabetic eye disease

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

All can cause severe vision loss or even blindness.

Diabetes is associated with the following ocular events :

1-Corneal abnormalities.

2-Glaucoma

3-Neovascularization.

4-Cataracts… snowflake cataracts in younger pts and greater frequency and earlier onset of age related cataract.

5-Neuropathies.

6-Diabetic Retinopathy.

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

Diabetic retinopathy - most common cause of blindness between ages 25 and 74 years.

The Retina

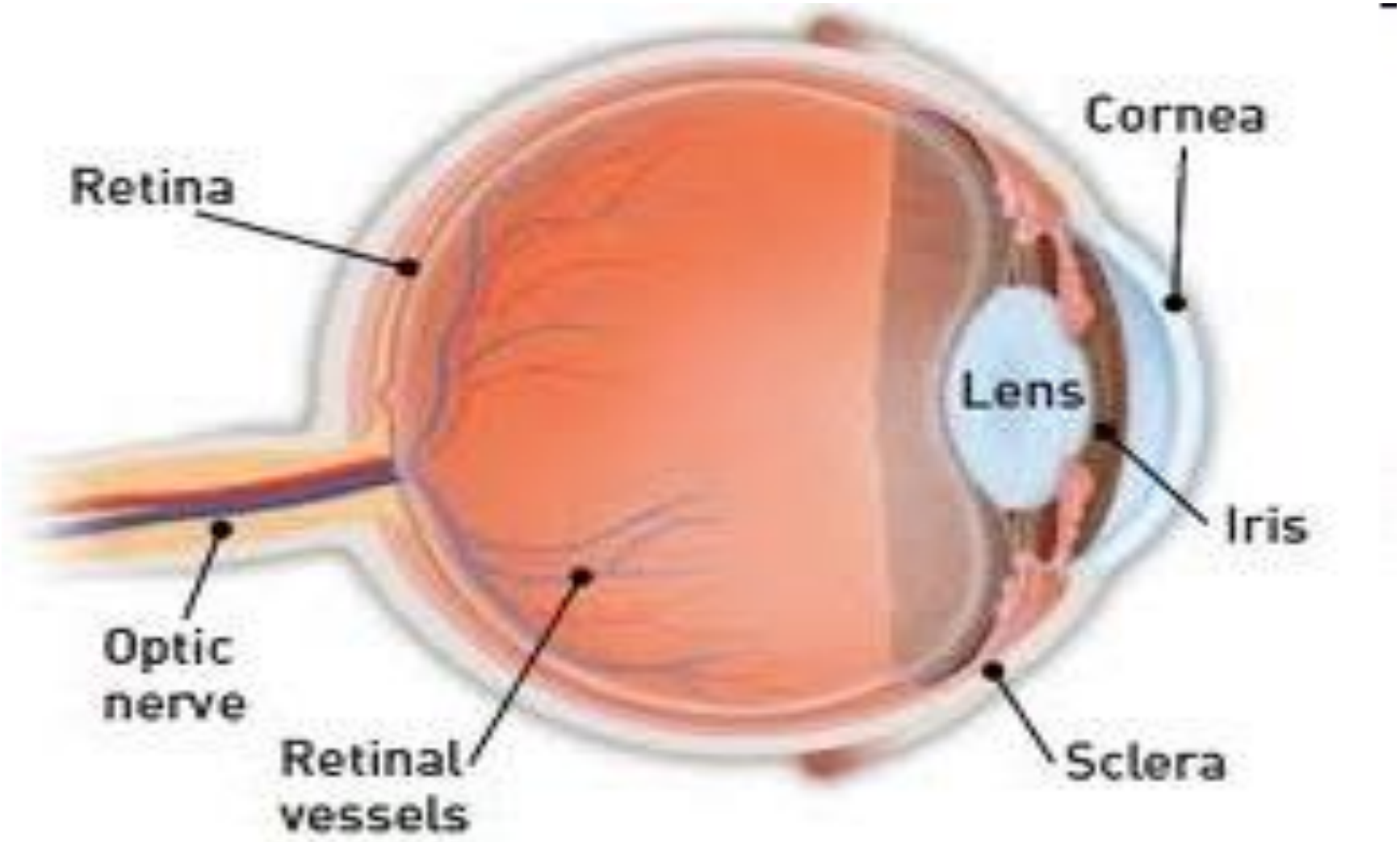
A structure that lines the inside of the globe

- **Two major layers:**

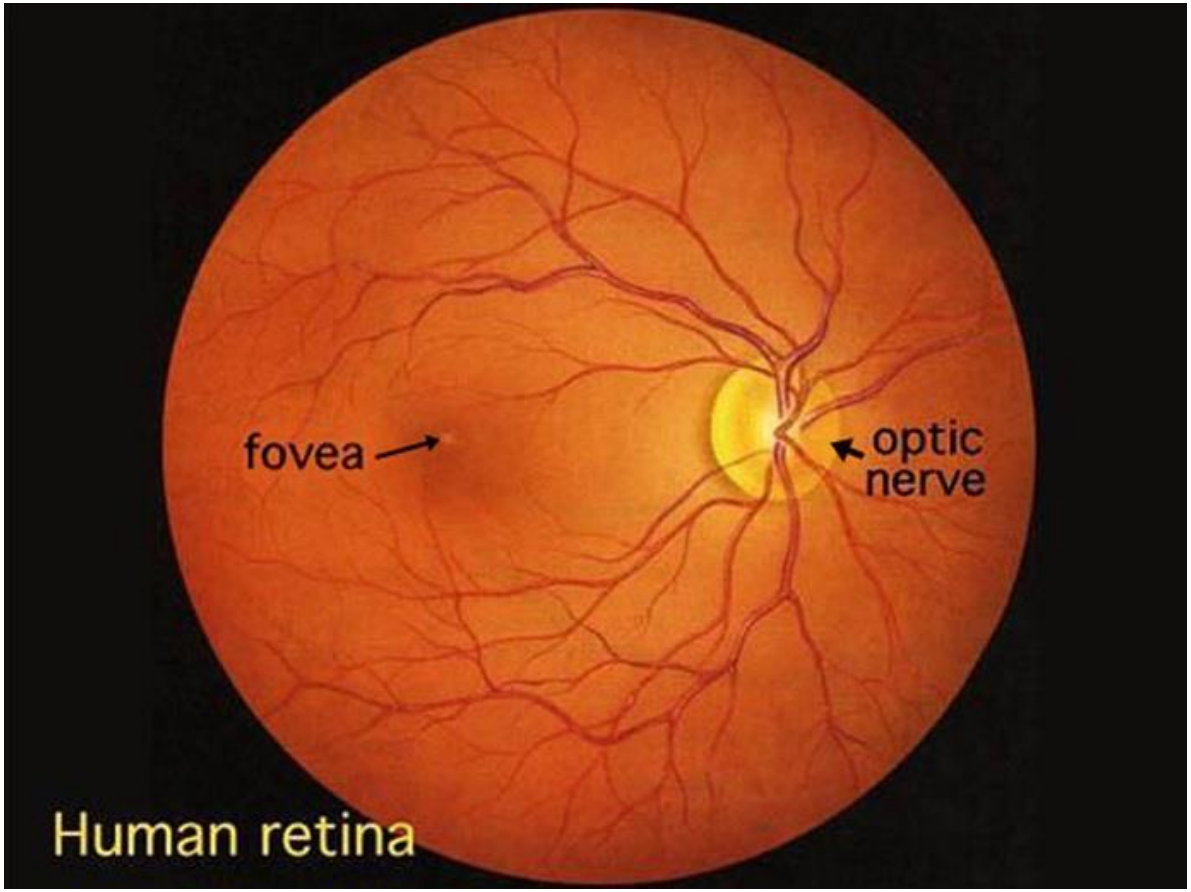
- Inner neurosensory retina (NSR): transparent, has the photoreceptors (rods and cones),light sensitive
- Outer retinal pigment epithelium (RPE).

- **Retinal blood supply:**

From central retinal artery and choroidal circulation.


Retina
Cornea
Lens
Iris
Optic nerve
Retinal vessels
Sclera

Retinal Anatomy



- **DM 1**

Loss of insulin secretion mostly in young people.. Onset is relatively acute and retinopathy begins to appear about 5 years after onset.

- **DM 2**

Patient may retain some insulin secretion but develop resistance to its action. It occurs in older age group. Because DM2 present several years prior to diagnosis, retinopathy may be found at presentation.

RISK FACTORS:

Duration of diabetes

Poor control of diabetes

Hypertension

Nephropathy

Obesity and hyperlipidemia

Smoking

Pregnancy

Pathogenesis

Microangiopathy which has features of both microvascular leakage and occlusion.

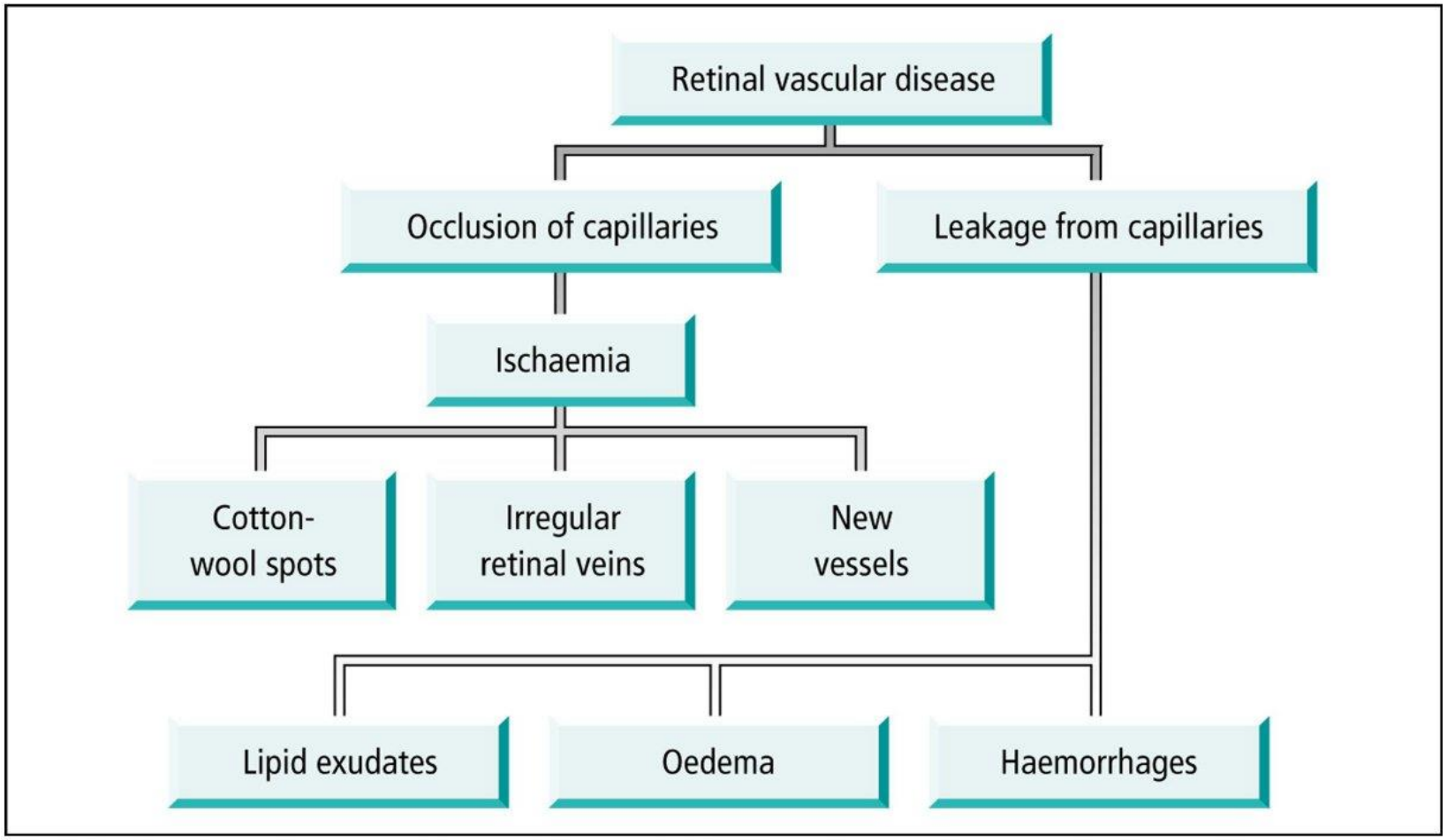


Figure 12.1 The building blocks of retinal vascular disease. Capillary leakage and occlusion often occur together.

Microvascular leakage

Loss of pericytes results in distention of weak capillary wall producing *microaneurysms* which allow plasma to leak

Blood-retinal barrier breaks down 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 growth of shunt and new vessels

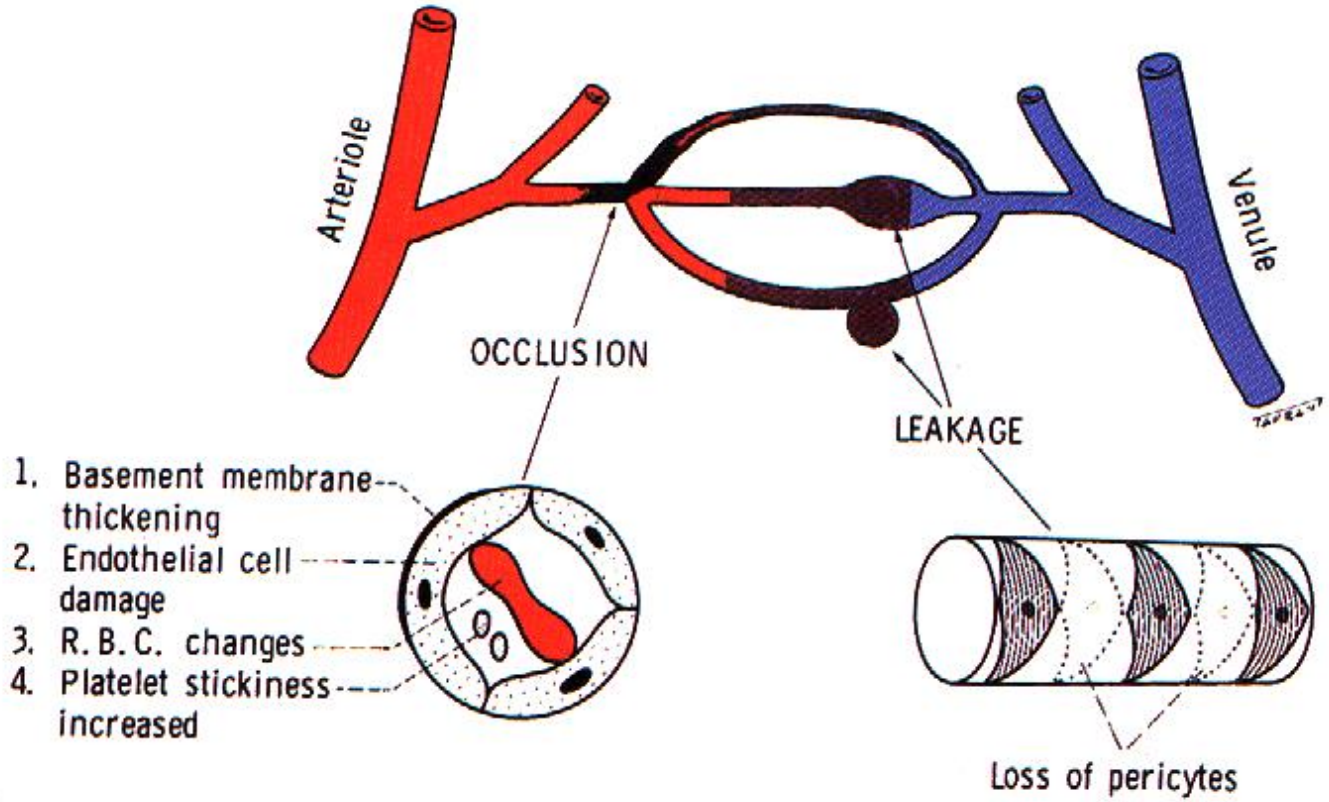
In the advanced stages of the condition, the retina produces new, less stable blood vessels.

These new vessels forms near the optic disc or anywhere in the retina

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

This bleeding, on occasion, forms scars that can separate the retina and the eye, leading to a detached retina.

As symptoms develop, a person with DR becomes increasingly likely to experience complete vision loss.


Arteriole
Venule
OCCLUSION
LEAKAGE
1. Basement membrane thickening
2. Endothelial cell damage
3. R.B.C. changes
4. Platelet stickiness increased
Loss of pericytes

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

Signs on Examination:

- **Microaneurysms** (red or yellowish dots)

-Earliest clinical sign of diabetic retinopathy.

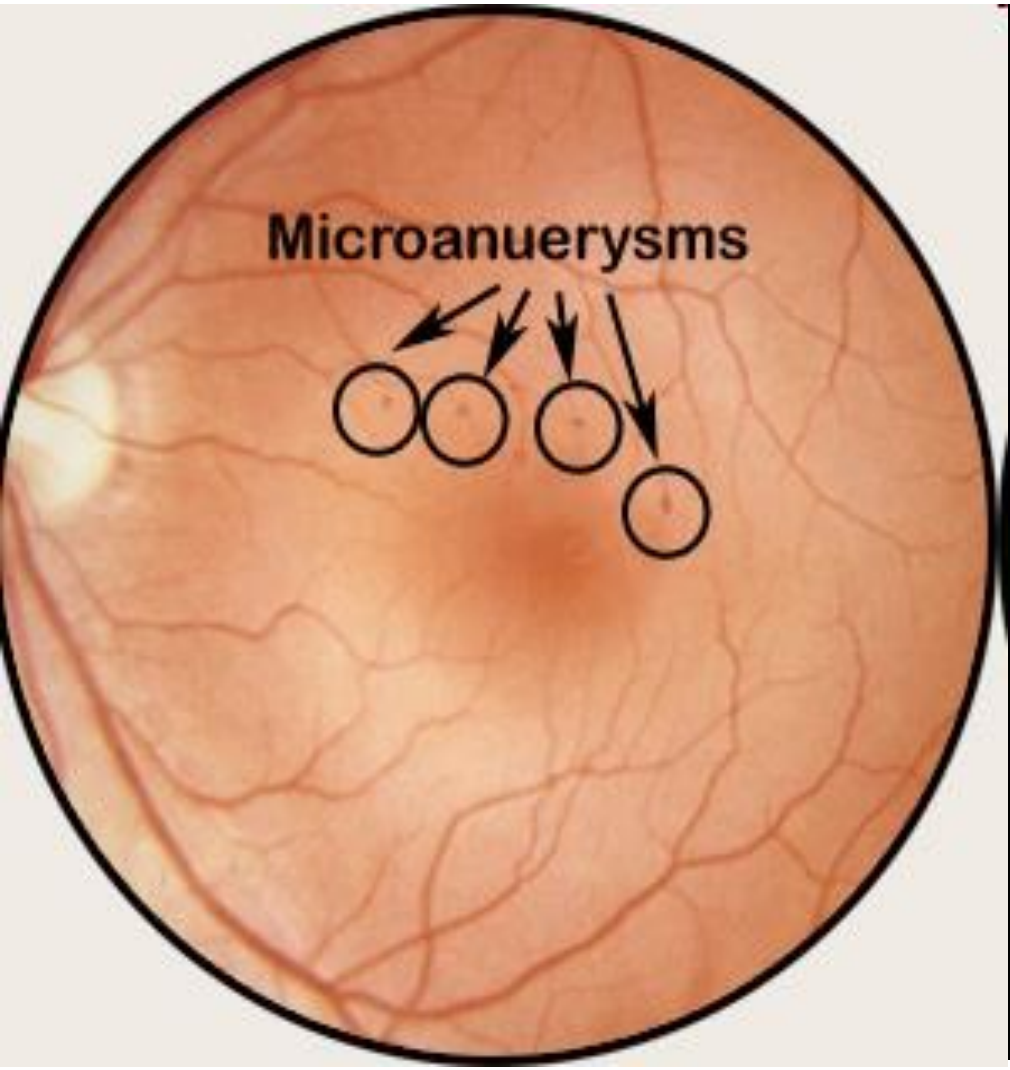
-Secondary to capillary wall outpouching due to pericyte loss

-Appear as small red dots in the superficial retinal layers

-Fibrin and RBC accumulation in the microaneurysm lumen

-Rupture produces blot/flame hemorrhages

-May appear yellowish in time as endothelial cells proliferate and produce basement membrane


Microanuerysms

❖Dot and blot hemorrhages

Occur as microaneurysms rupture in the deeper layers of the retina

(similar to microaneuryms if they are small, distinguish by fluorescein angio).

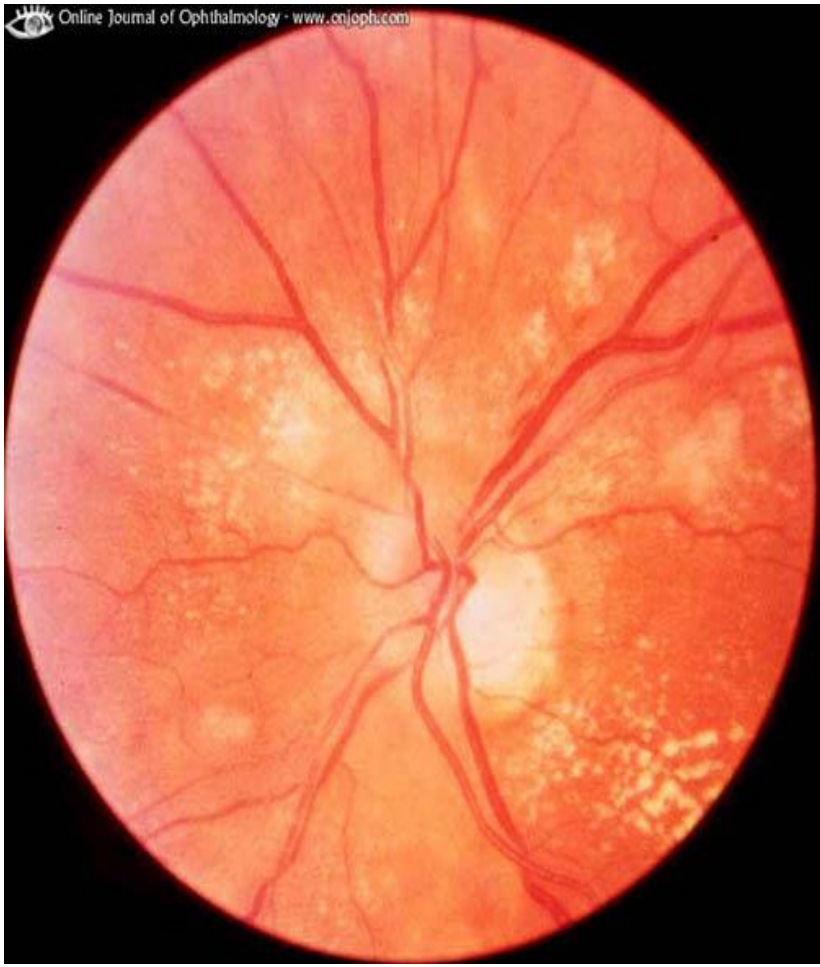
❖Flame-shaped hemorrhages - Splinter hemorrhages, superficial.

Flame-shape hemorrhage

❖Retinal edema and hard exudates

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

Hard exudate



❖Cotton-wool spots

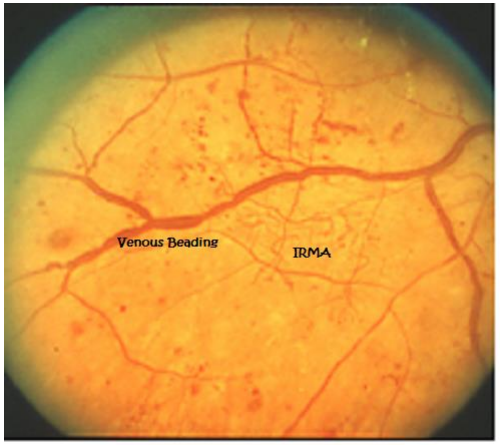
Nerve fiber layer infarction from occlusion of precapillary arterioles

Fluorescein angiography - No capillary perfusion

❖Intraretinal microvascular abnormalities

Remodeled capillary beds without proliferative changes

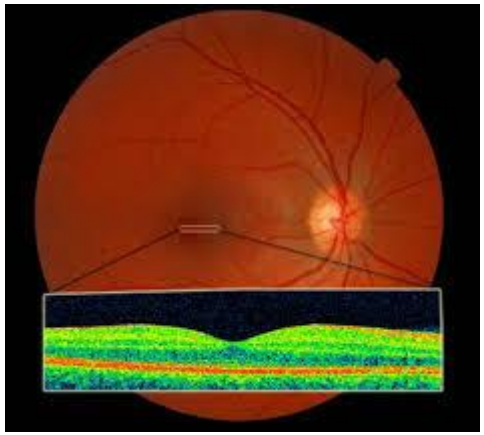
Cotton-wool spots

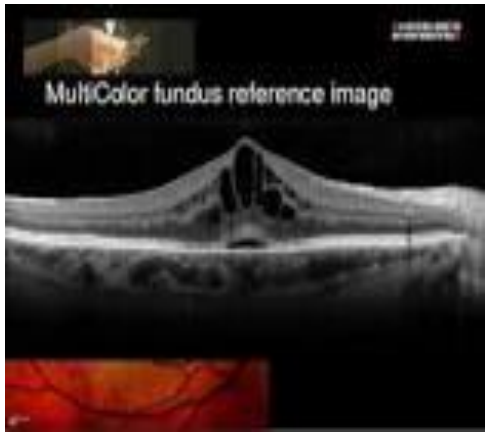


Investgations

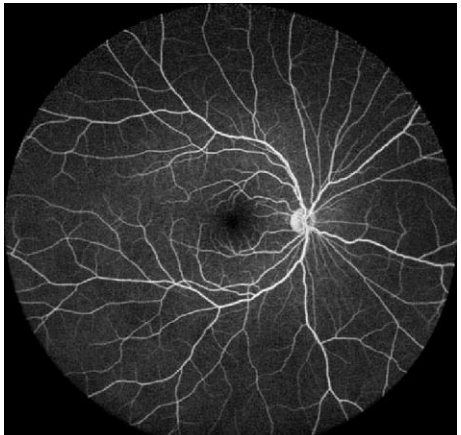
HbA1c, blood sugar

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





Fluoroscein angiography



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.

Diabetic Macular Edema

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.

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 microaneurysims 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

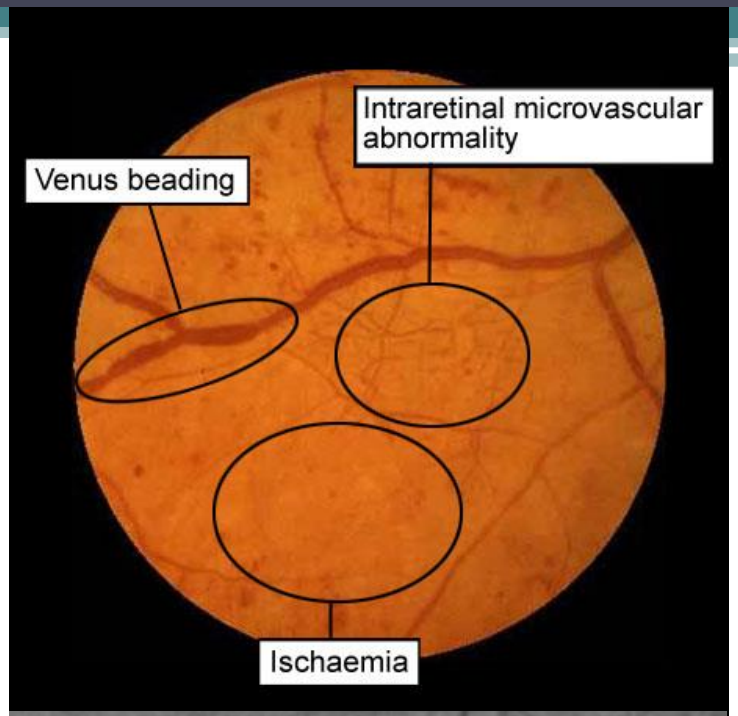
Table 7. International Clinical Diabetic Retinopathy Disease Severity Scale.

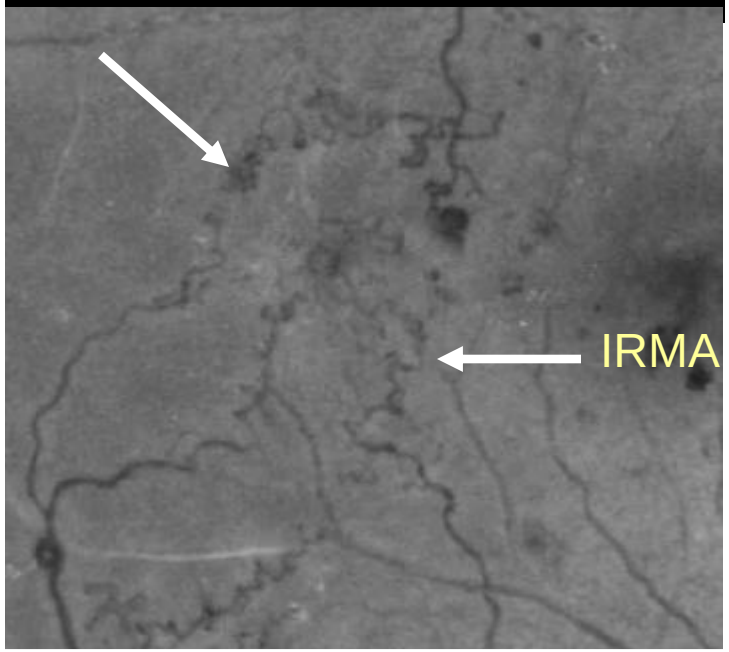
Mild NPDR

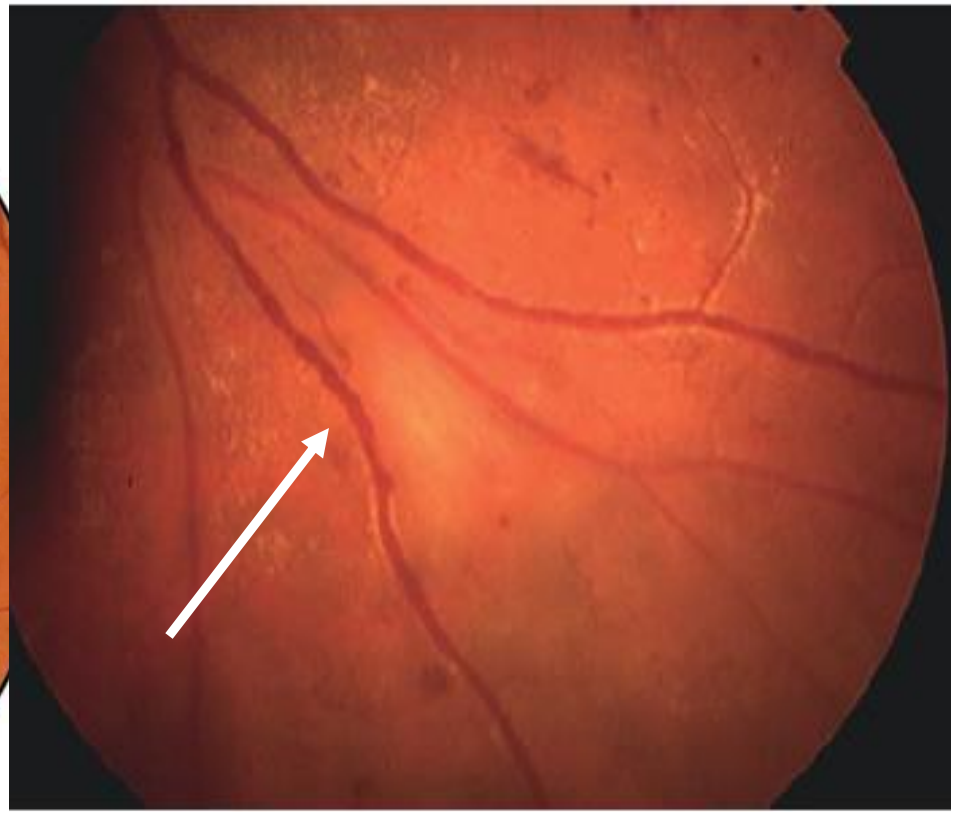
- Microaneurisms only
- Earliest clinically detectable lesion

Moderate NPDR

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



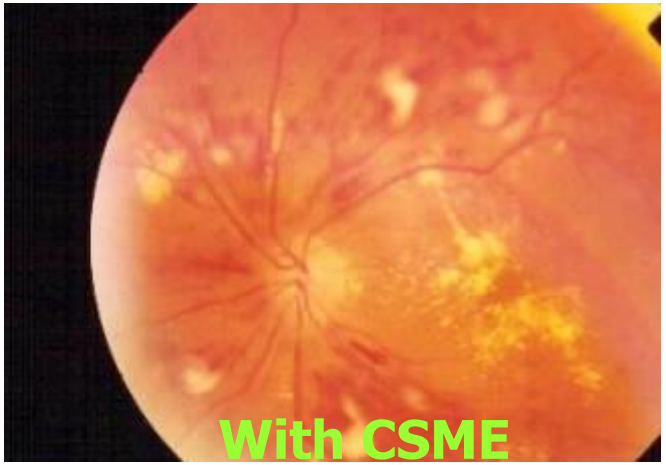


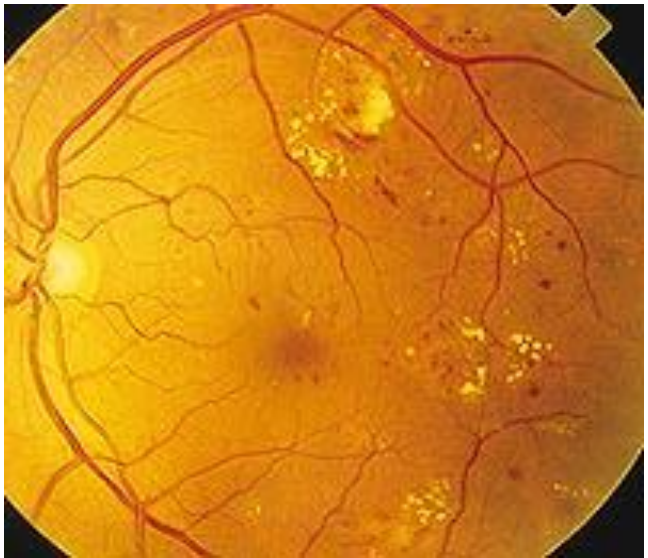


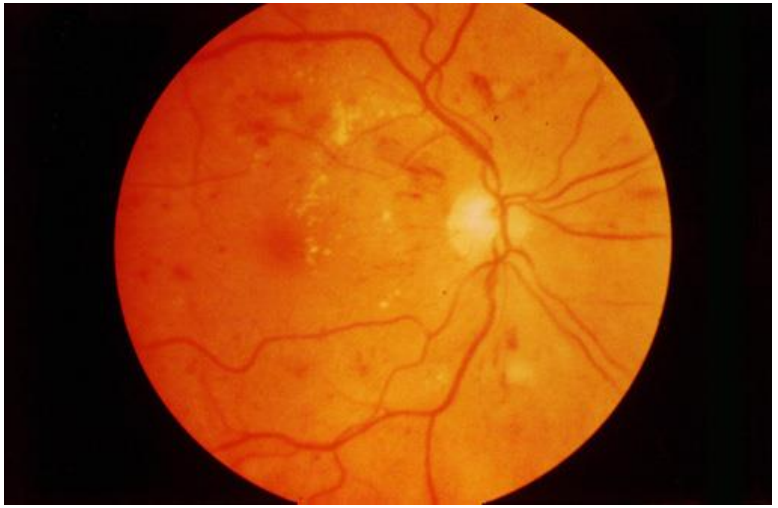
Mild vs Moderate NPDR

Severe NPDR

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



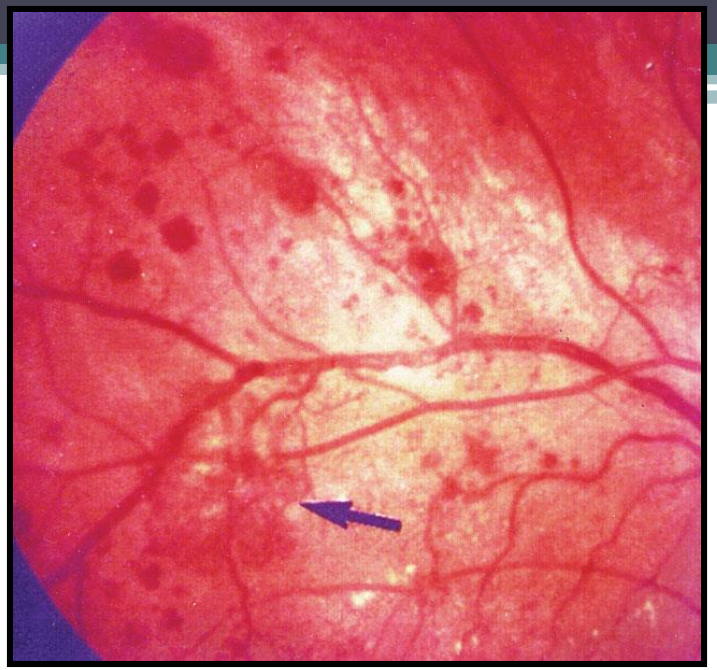




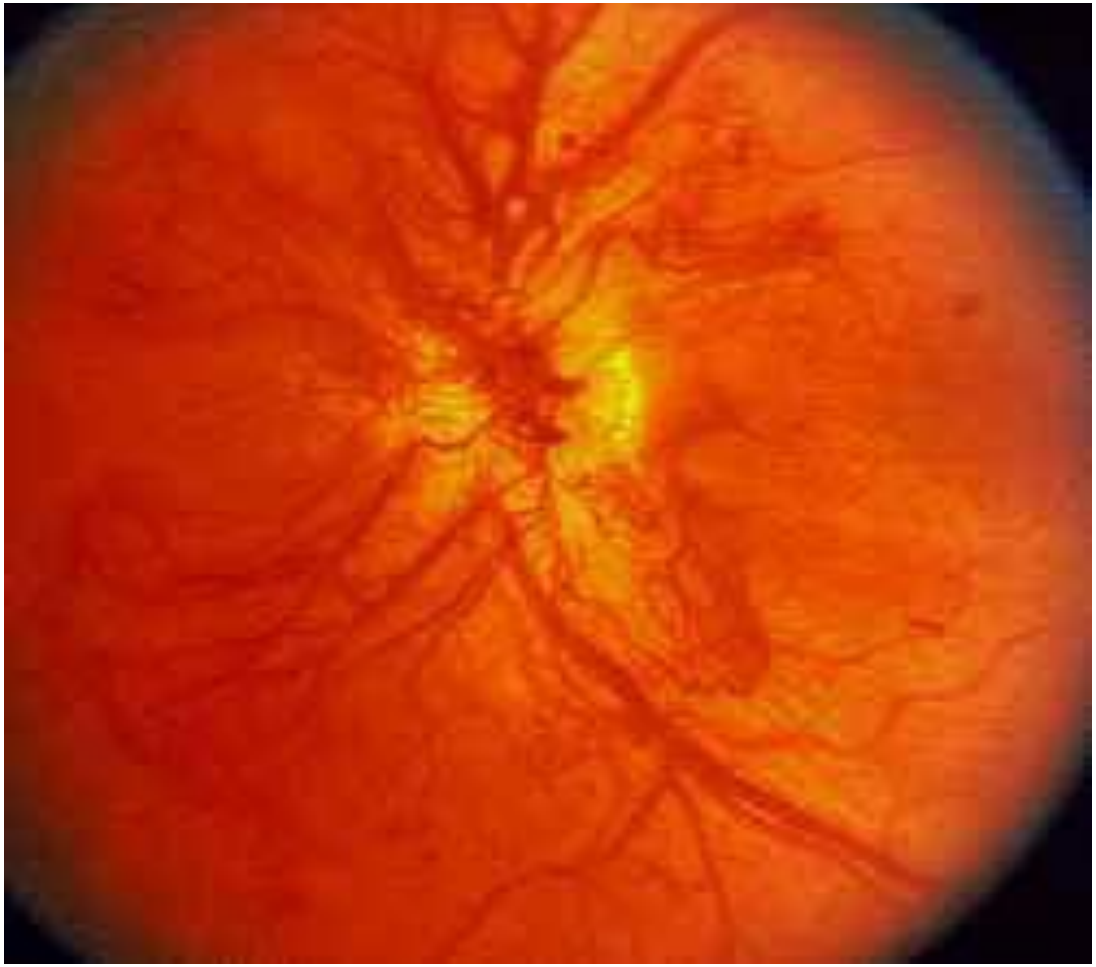
Proliferative DR

Characterized by Proliferation of new vessels from retinal veins

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



Proliferative PD



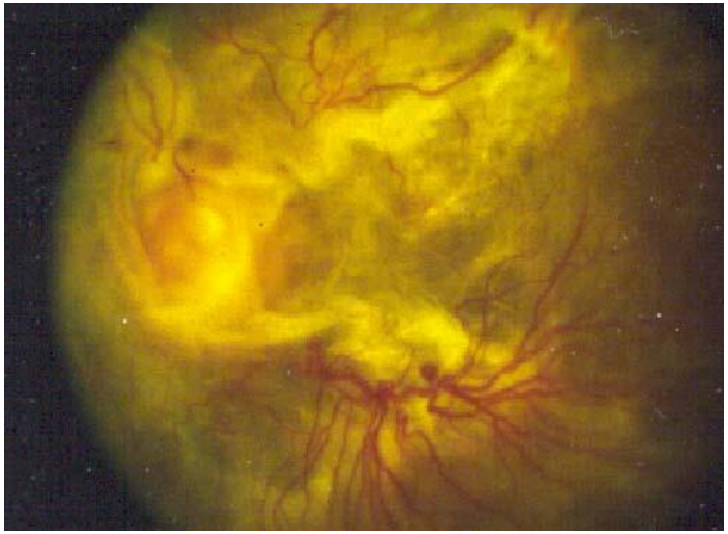
Complications of Diabetic Retinopathy

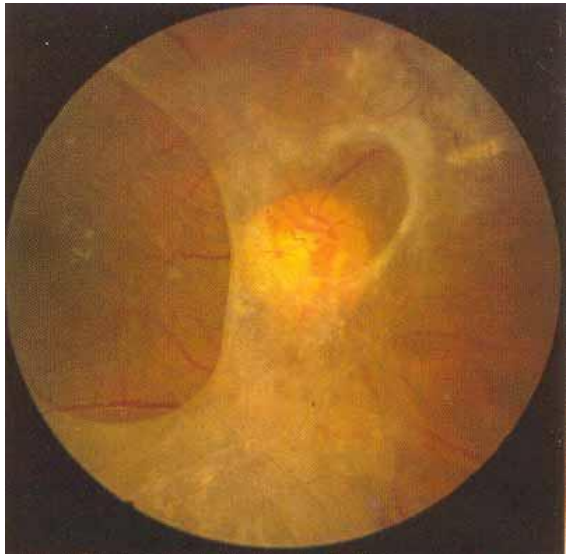
- Vitreous hemorrhage
- Tractional retinal detachment
- Rubeosis Iridis
- Glaucoma
- Blindness

Vitreous Hemorrhage

Tractional retinal detachment

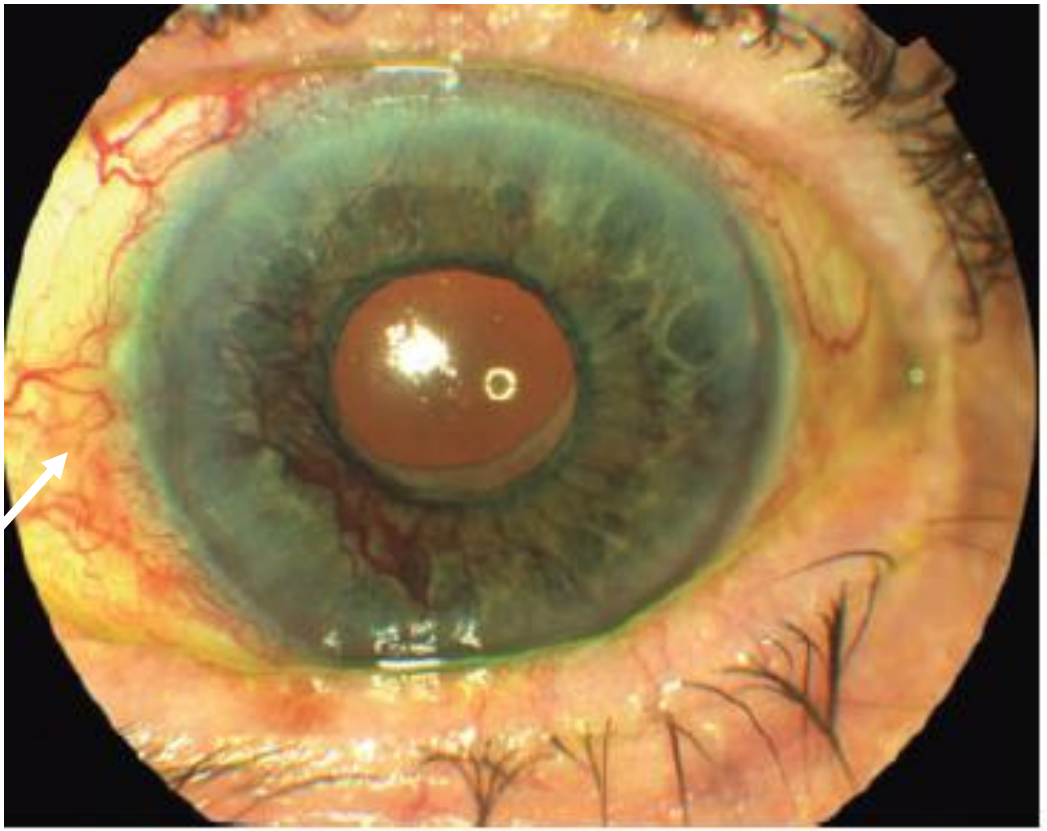
Occurs when scar tissue on the retina's surface contracts and causes your retina to pull away from the layer underneath. This requires surgical treatment by vitrectomy and removal of the vitreous gel and blood and repair any of the detached retina.





Rubeosis Iridis

Neovascularization of the iris.



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

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

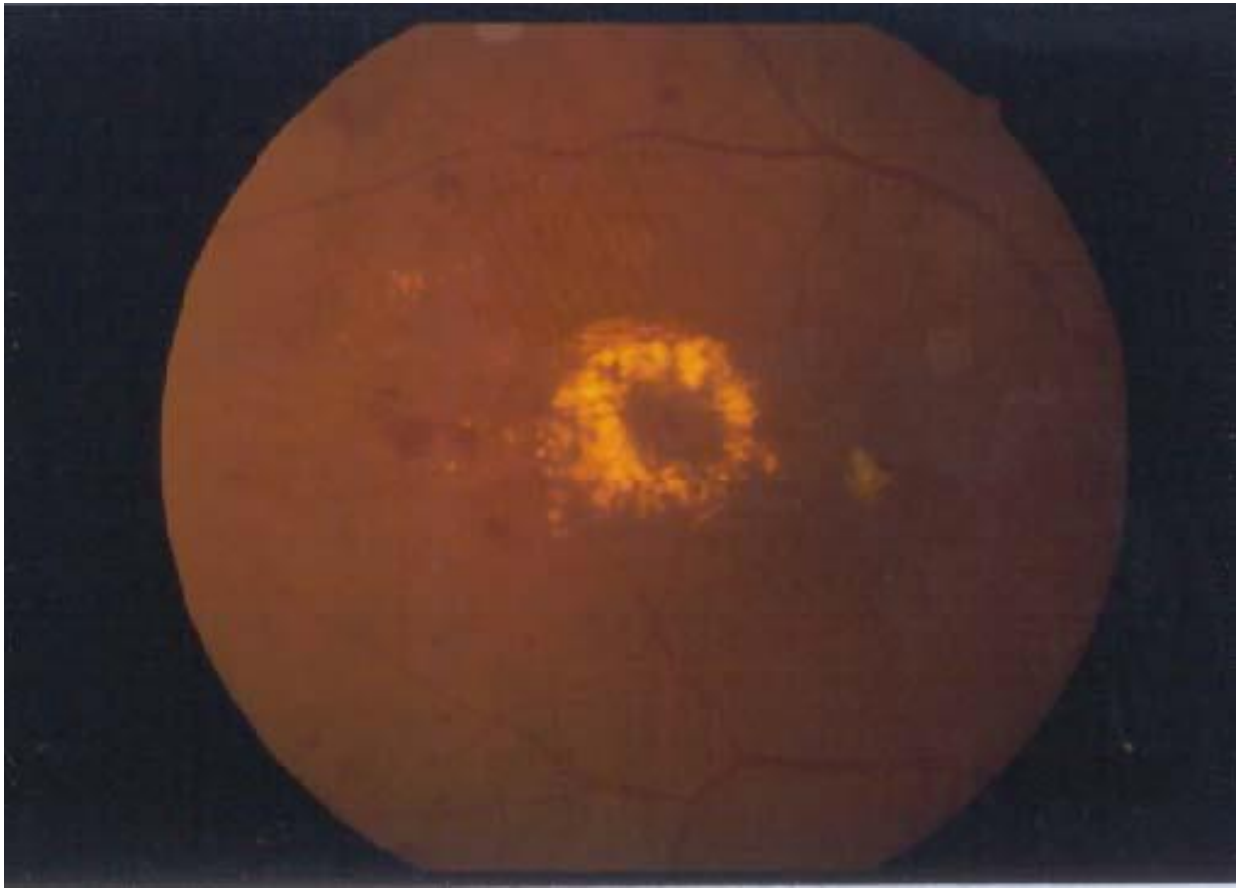
❖Clinically Significant Macular Edema

- Intra-vitreal 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

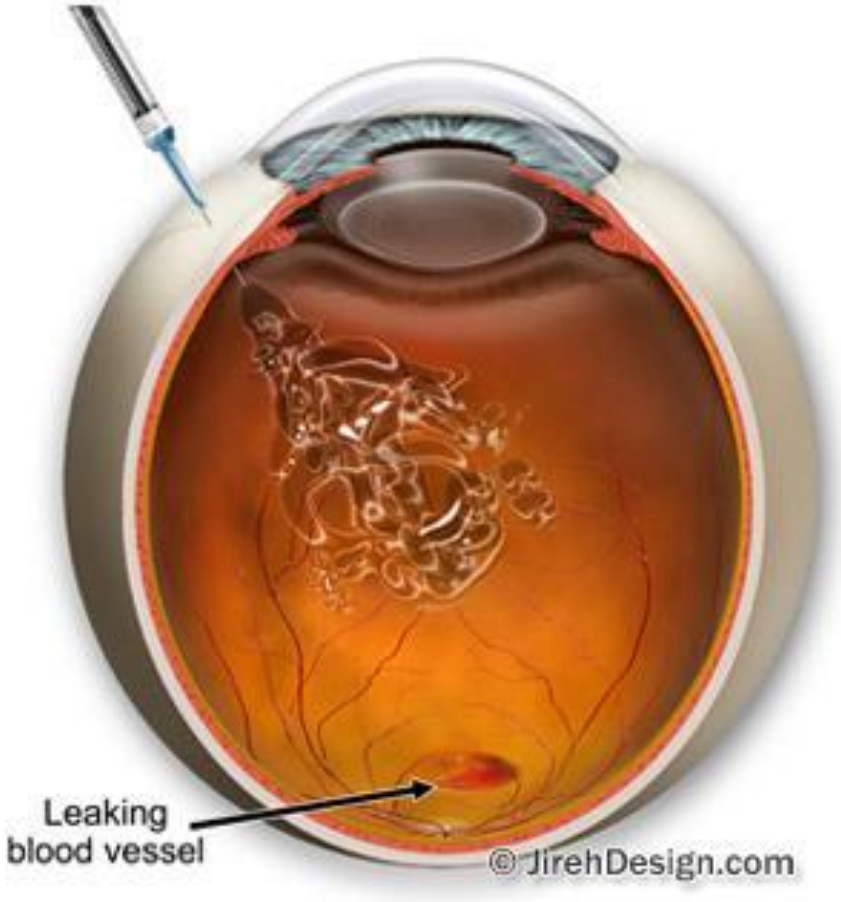


❖Proliferative DR

— Retinal laser photocoagulation as per the judgment of ophthalmologist (in high risk eyes) , it improves retinal circulation and decreases production of vasoprolifrative 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 neovasculazation and decrease leakage, given as intravitreal injection, like avastin.


Leaking
blood vessel
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Good luck