2.8 Retina: Vascular disorders

Diabetic retinopathy:
Diabetes involving retina excluding macula
Diabetic maculopathy:
Macula is part of retina but considered separately. Macula involvement in diabetes is called diabetic maculopathy

Plan

Anatomy
- What is fundus and what are retinal layers

Diabetic retinopathy
- Abbreviations
- Risk factors & prevention of diabetic retinopathy
- General and ocular diabetic manifestations
- Diabetic Retinopathy Pathogenesis
- Stages / Classification
- Diabetic retinopathy & Diabetic maculopathy

Retinal venous occlusions (CRVO & BRVO)
- Types, symptoms & signs and management

Central retinal artery occlusion (CRAO)
- Etiology and pathogenesis

Hypertensive retinopathy
- Stages

Anatomy

Fundus = Retina including macula + vessels + optic disc

Retina consists of RPE & neurosensory retina

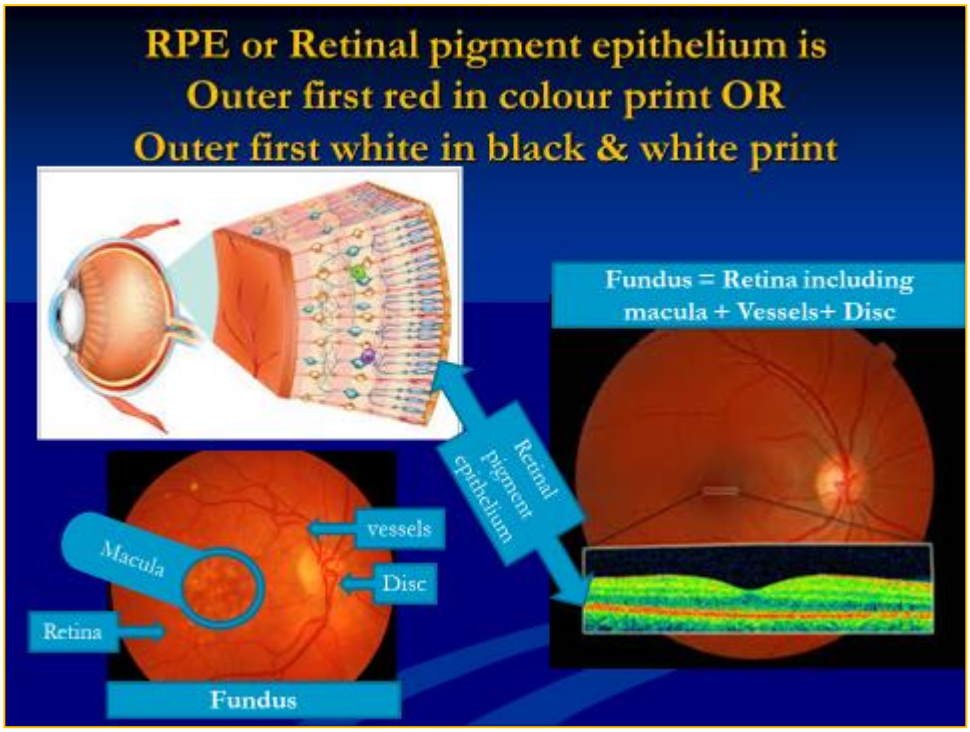
RPE = Retinal pigment epithelium is single layer attached to neurosensory retina

Neurosensory Retina = Layers 1-10 in OCT is retina or neurosensory retina.

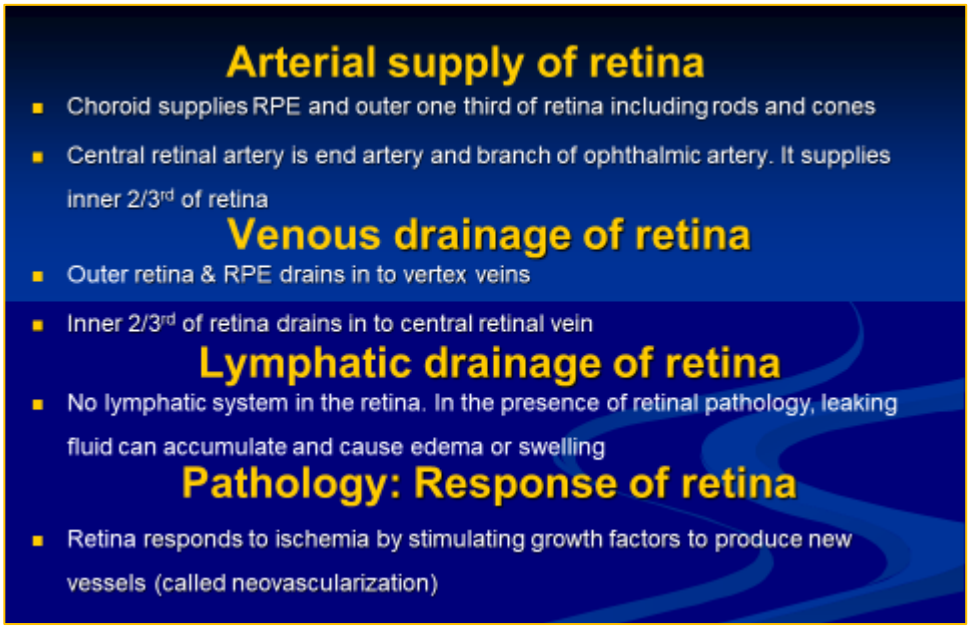
Separation of RPE and neurosensory retina is retinal detachment

First outer most layer on OCT in retinal pigment epithelium or RPE.

Third outer most is inner segment outer segment layer (IS/OS) made of rods & cones.

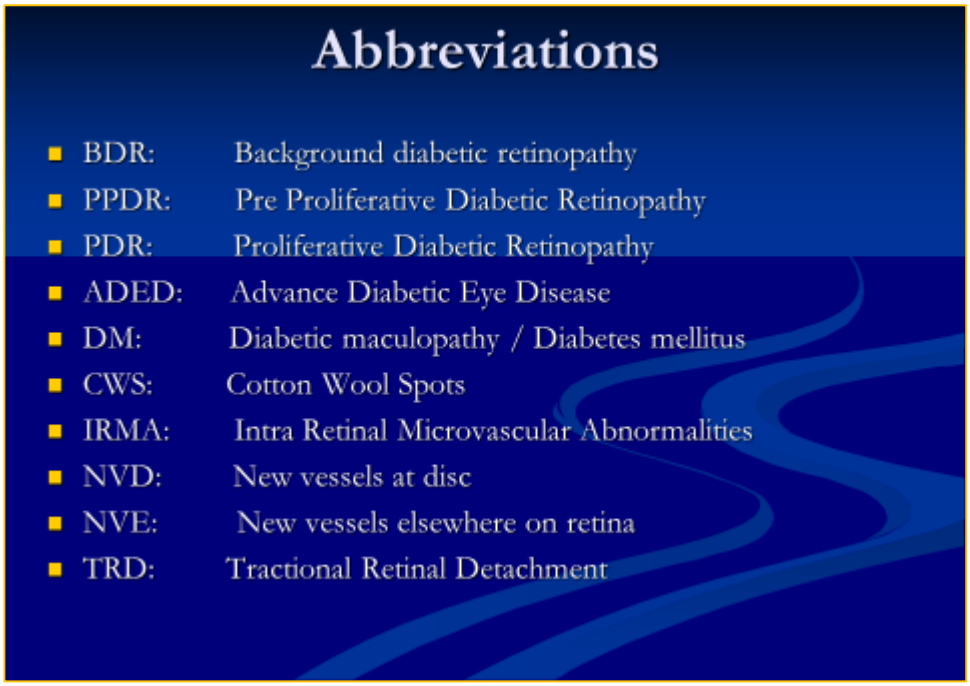


Retinal facts

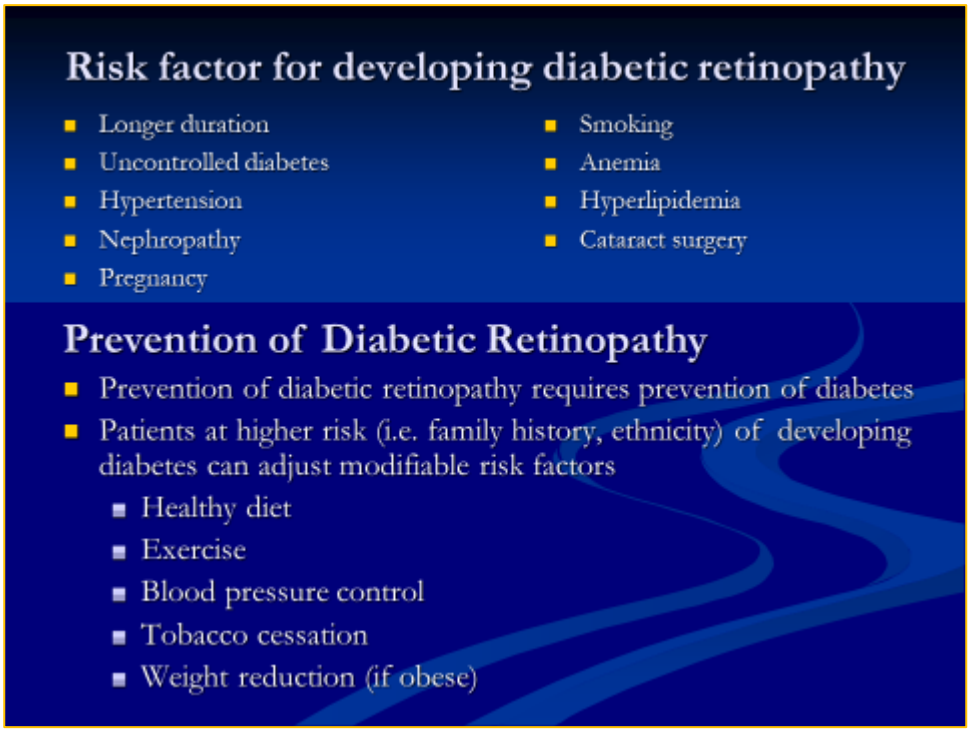


Diabetic retinopathy

Abbreviations used in diabetic retinopathy



Risk factors & prevention



Concentrate on word leakage and blockage (ischemia)

Pathogenesis: Diabetic Retinopathy

Exact cause of diabetic microvascular disease is unknown

- Prolonged exposure to hyperglycemia results in biochemical and physiologic changes that ultimately cause vascular endothelial damage. Many angiogenic stimulators and inhibitors have been identified; vascular endothelial growth factor (**VEGF**) appears to be of particular importance in the former category.
- Specific retinal vascular changes include:
- Loss of pericytes **causing leakage** (cells that control vessel flow)
- Basement membrane thickening, which compromises the capillary lumen **causing blockage and ischemia** (affecting the blood supply to the eye)
- Decompensation of the endothelial barrier function of retinal vessels

Manifestations of Diabetes Mellitus

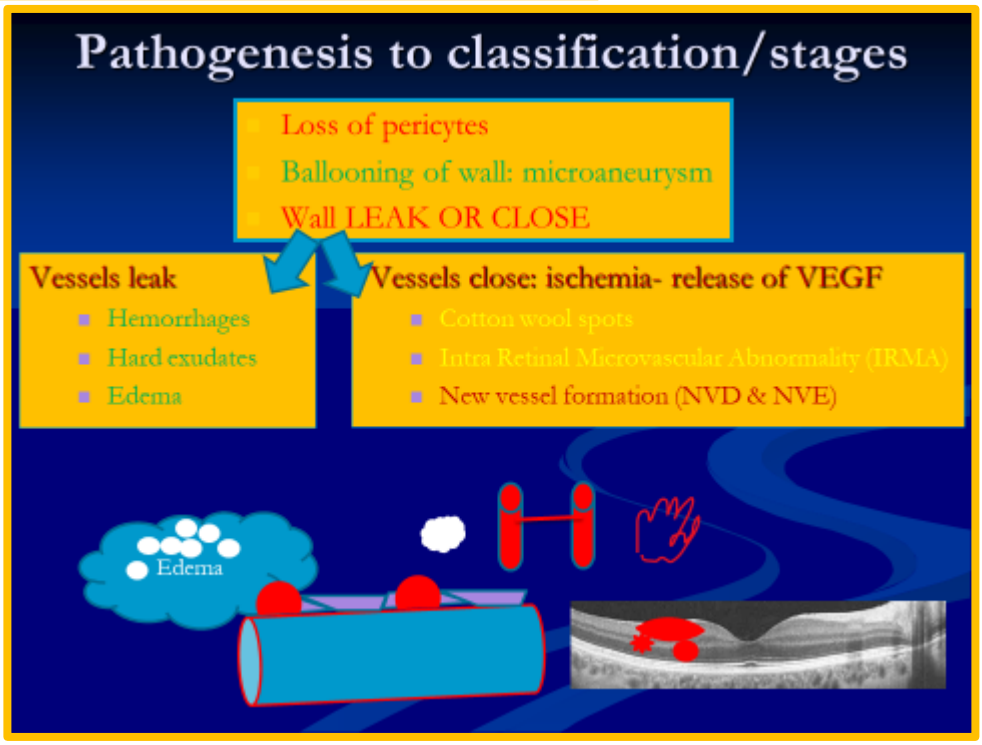
- Small vessel disease (diffuse thickening of basement membranes)
  - Retinopathy
  - Nephropathy (nodular sclerosis, proteinuria, chronic renal failure, arteriosclerosis leading to HTN)
- Large vessel disease
  - Large vessel atherosclerosis
  - Coronary artery disease
  - Peripheral vascular occlusive disease and gangrene
  - Cerebrovascular disease
- Neuropathy (motor, sensory, autonomic degeneration)

Ocular manifestations of diabetes including retinopathy

- Anterior Segment
  - Lens (accelerated cataract formation)
  - More chances of infections
- Posterior Segment
  - **Retina (retinopathy)**
  - Retinal vasculature (increased incidence of other retinal vaso-occlusive phenomenon, i.e. CRVO)
  - Vaso-occlusive disease can lead to rubeosis and neovascular glaucoma
  - Vitreous (vitreous hemorrhage, fibrosis)
- Cranial Nerves: Cranial Nerves palsies (cranial mononeuropathies)
- Orbit/Adnexia:
  - More common infections like cellulitis
  - Xanthelasma
  - Styes

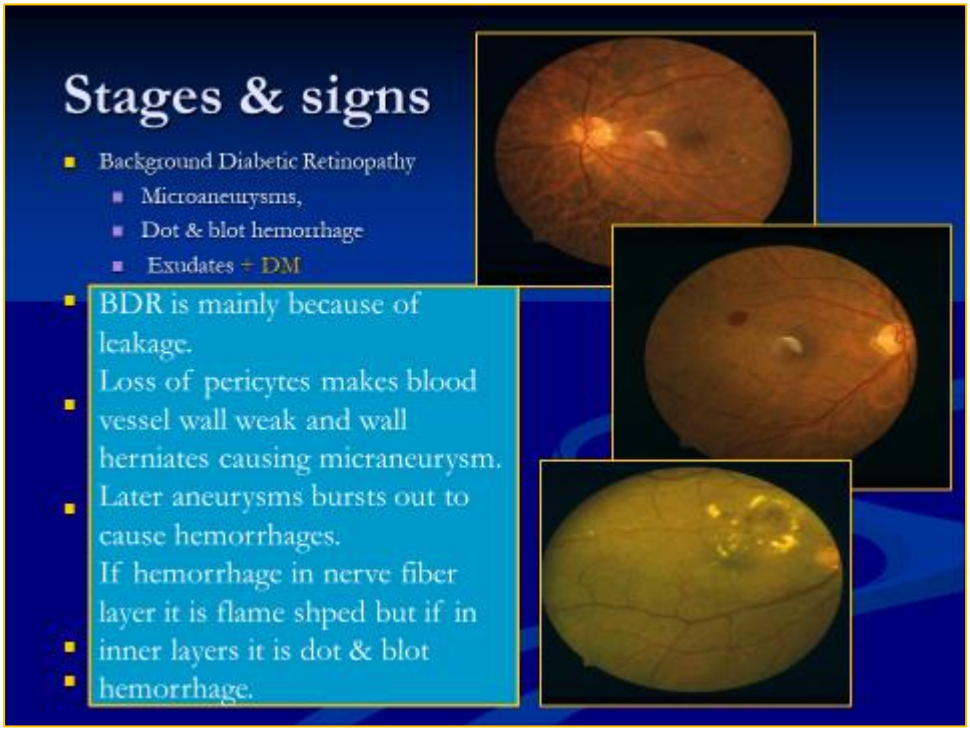
Concentrate on word leakage and blockage (ischemia)

Pathogenesis to classification/stages

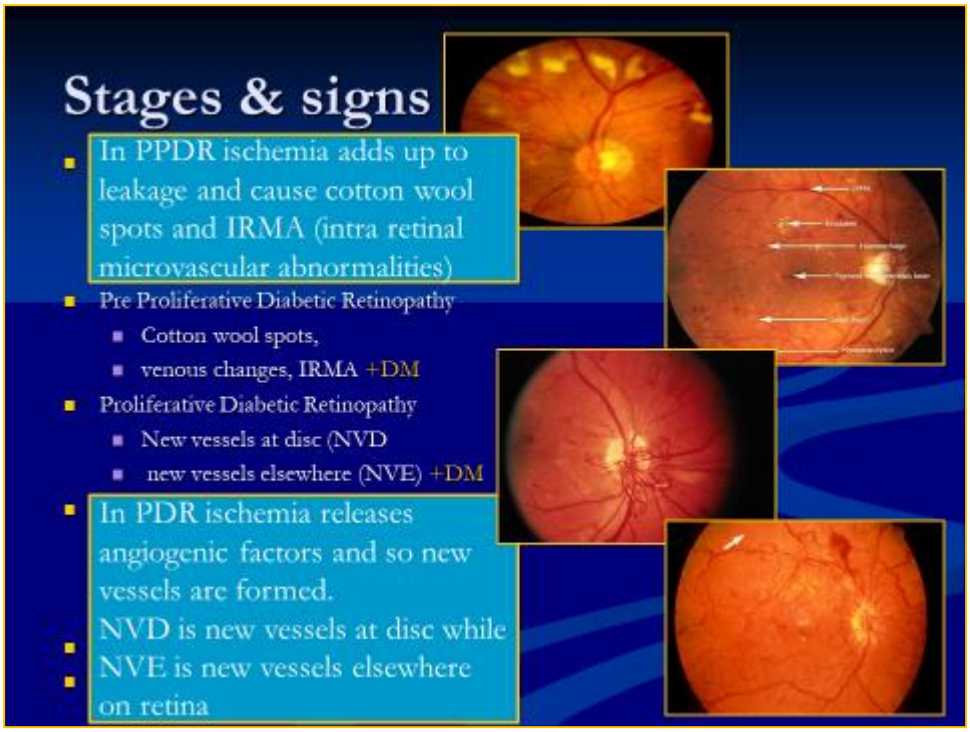


Diabetic retinopathy stages with signs		
BDR	Back Ground Diabetic Retinopathy **(leakage but no ischemia)**	Microaneurysms & hemorrhages
PPDR	Pre Proliferative Diabetic Retinopathy **(leakage + ischemia)**	**BDR PLUS** Cotton wool spots, Hard exudates, IRMA, Venous changes
PDR	Proliferative Diabetic Retinopathy **(leakage + ischemia)**	**PPDR PLUS** New vessels on retina (NVE) New vessels in disc (NVD)
ADED	Advanced Diabetic Eye Disease **(leakage + ischemia)**	**PDR PLUS** Vitreous haemorrhage, TRD, neovascular glaucoma
BODR	Burnt Out Diabetic Retinopathy	**ADED PLUS** Fibrosis

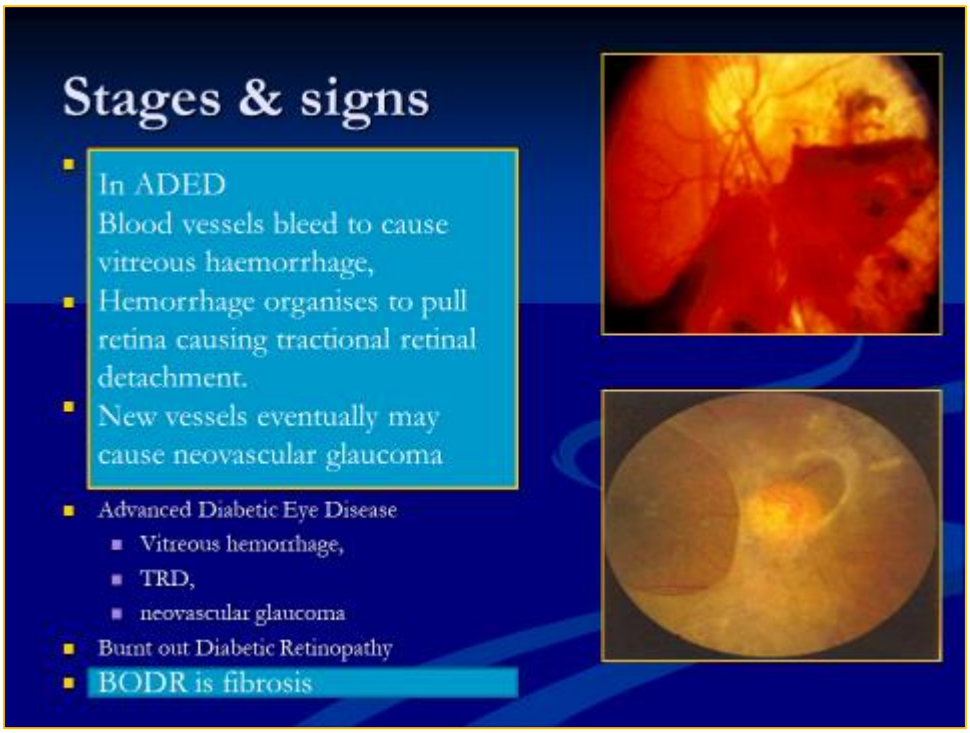
Stages & signs: Background Diabetic Retinopathy (BDR)



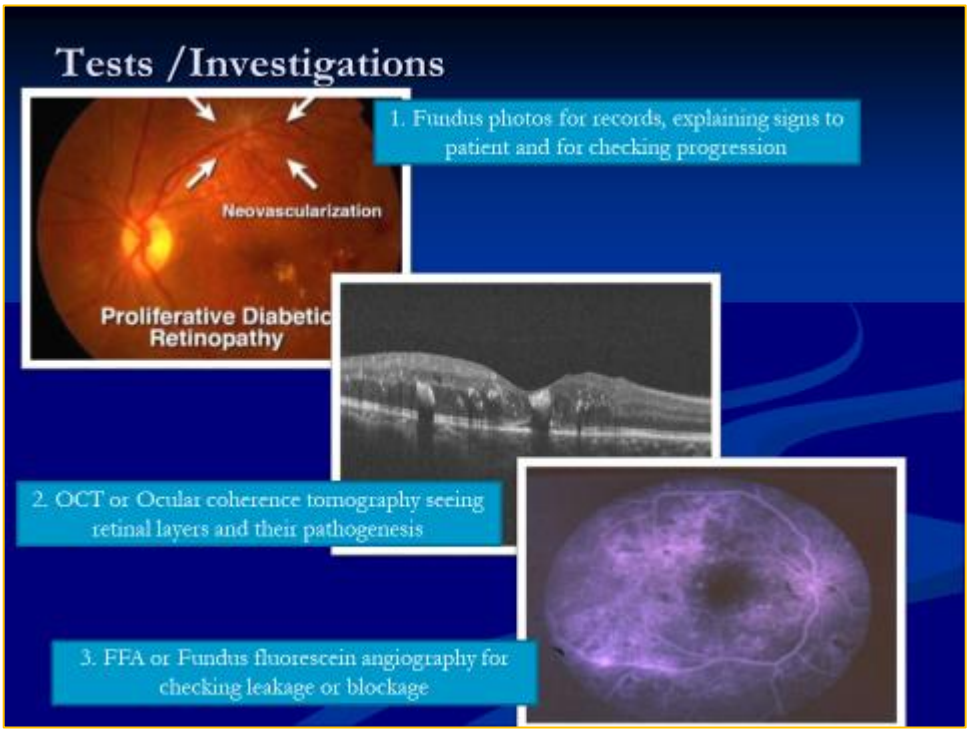
Stages & signs: Pre proliferative Diabetic Retinopathy (PPDR) Proliferative Diabetic Retinopathy (PDR)



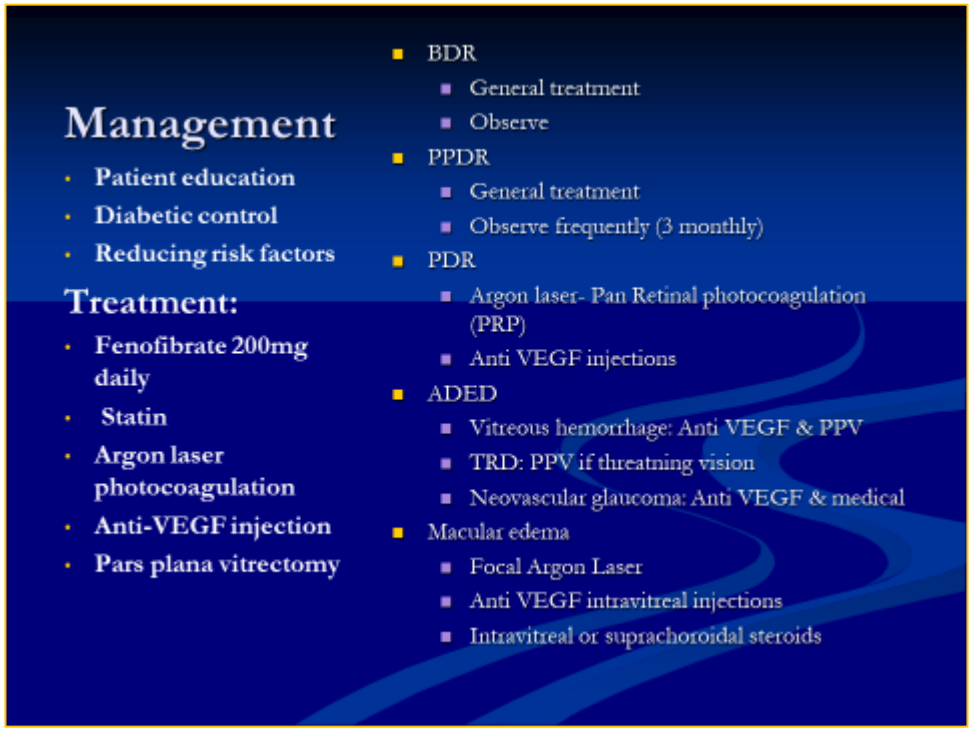
Stages & signs: Advanced Diabetic Eye Disease (ADED) Burnt Out Diabetic Retinopathy (BODR)



Investigations/Tests for Diabetic Retinopathy



Management of diabetic retinopathy & maculopathy



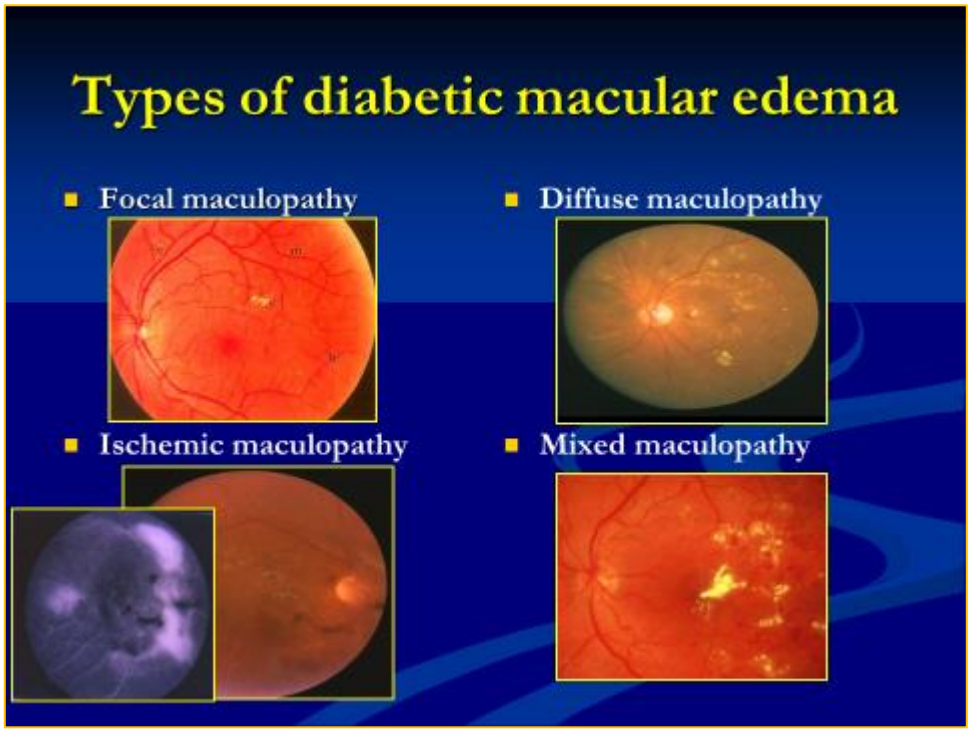
Complications of diabetic retinopathy

- Loss of vision
- Tractional retinal detachment
- Neovascular glaucoma

What is diabetic maculopathy & diabetic retinopathy

Diabetic retinopathy:
Diabetes involving retina excluding macula
Diabetic maculopathy:
Macula is part of retina but considered separately. Macula involvement in diabetes is called diabetic maculopathy

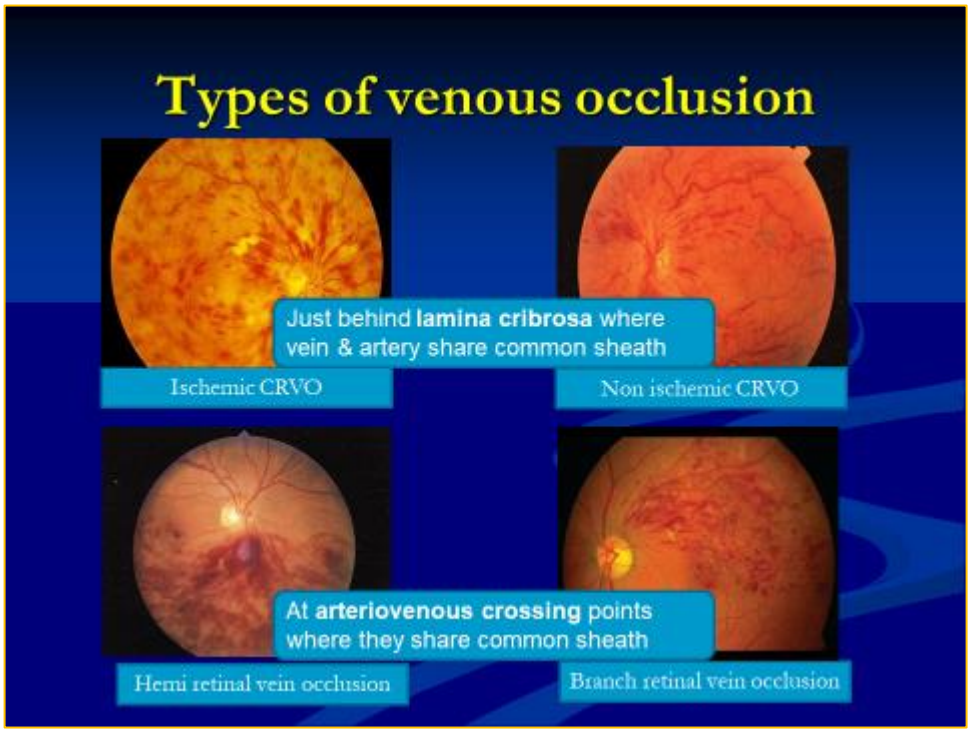
Diabetic retinopathy:
Retinopathy involving all retina except macula
Diabetic maculopathy:
(other names: Diabetic macular edema, Clinically significant macular edema)
Macula is part of retina but so important that it is considered separately and called diabetic maculopathy.
It is most common of losing vision because of diabetes
Diabetic maculopathy may be present alone without diabetic retinopathy or may be present with any stage of diabetic retinopathy like BDR or PPDR or PDR like
BDR with maculopathy
PPDR with maculopathy
PDR with maculopathy
<u>Types of macular edema:</u>
Focal maculopathy- when leakage in only one spot
Diffuse maculopathy- when leakage over larger area
Ischemic maculopathy- when no leakage but vascular closure causing ischemia
Mixed maculopathy- when both leakage and ischemia involved



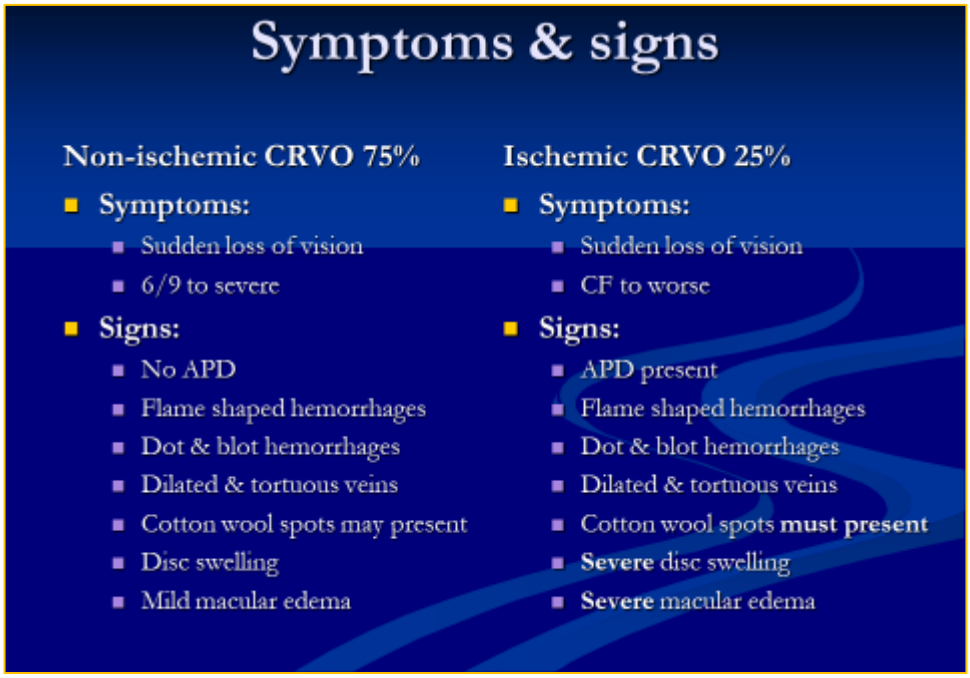
Retinal venous occlusions

Types of retinal vein occlusion

CRVO- Central retinal vein occlusion behind lamina cribrosa
BRVO- Branch retinal vein occlusion. One of four branches or smaller branch
Hemi retinal vein occlusion- Upper or lower division of central vein



Symptoms & signs



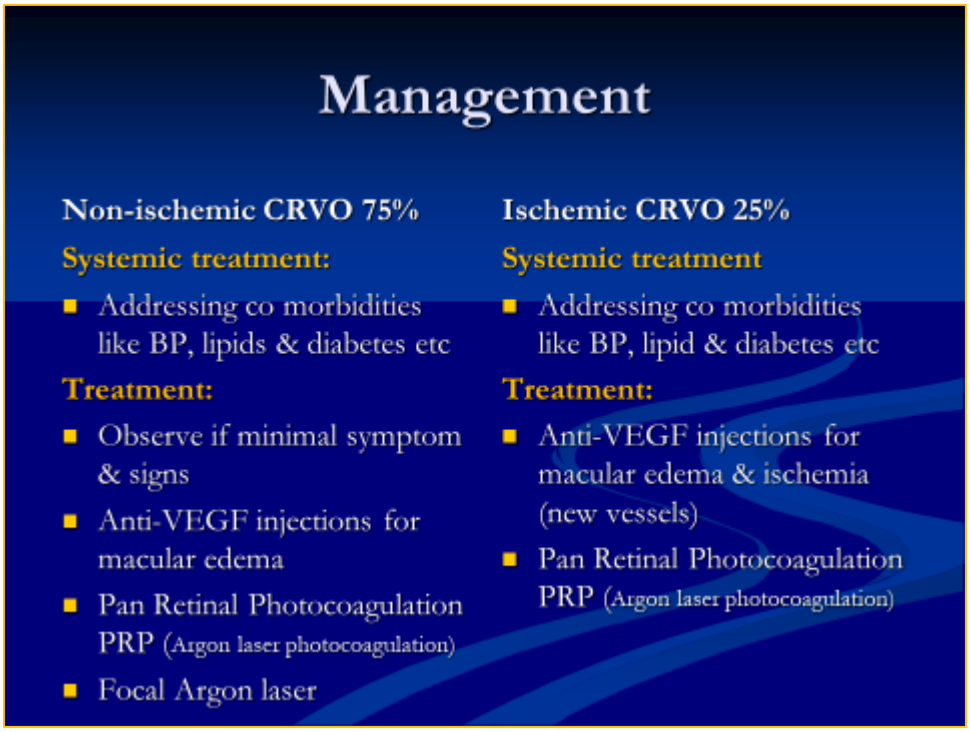
Predisposing conditions

- Age
- Increased IOP
- Systemic hypertension
- Diabetes
- Smoking
- Contraceptive pills

Complications of CRVO / BRVO

- Macular edema
- Retinal new vessels leading to
    - Retinal haemorrhage
    - Vitreous haemorrhage
- Anterior chamber new vessels leading to
    - neovascular glaucoma

Management of CRVO / BRVO



Central retinal artery occlusion

Definition

Total blockage of central artery is called central retinal artery occlusion (CRAO) while blockage of branch is branch retinal artery occlusion (BRAO)

Etiology

It is usually due to embolus or thrombosis along with spasm.

Pathogenesis

Arterial ischemia causes infarction of inner retina.

Symptoms

Sudden loss of vision usually minimal recovery if artery reopens in 72 hours.

Signs

In complete block:

- Arteries very thin and hardly visible
- Veins look normal
- Retina becomes white because of edema
- Macula looks red called cherry red spot

In incomplete block:

- Column of venous blood broken in bead like fashion

Treatment

- Reducing intraocular pressure to help artery reopen
- Paracentesis to reduce pressure so artery can reopen
- Breathing in bag to increase CO2 concentration to dilate vessels

Complications

- Permanent loss of vision
- Ischemia can cause release of angiogenic factors causing neovascular glaucoma

Hypertensive retinopathy

Definition

These are retinal changes because of longstanding or acute systemic hypertension.

Pathogenesis

Pathogenesis	Clinical sign
Arteriole wall thickening due to ??????? atherosclerosis causing	arteriolar narrowing and A-V changes Copper wiring
Necrosis of smooth muscle and endothelium causing leakage	Hemorrhages Hard exudates Cotton wool spots edema

Clinical retinal changes are expressed as grades

Grades	Changes of hypertensive retinopathy
Grade 0	No changes
Grade 1	Mild generalised arteriolar narrowing
Grade 2	Focal narrowing of arterioles, Copper wire reflex, A-V changes
Grade 3	Grade 2, Silver wire reflex, Flame shaped hemorrhages Leakage (exudates & edema) and Cotton wool spots
Grade 4	Grade 3 changes, Exudates forming macular star, Disc swelling