RETINAL VASCULAR DISEASES

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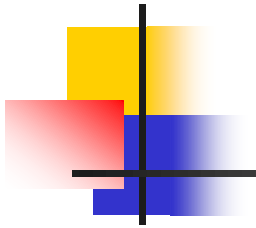
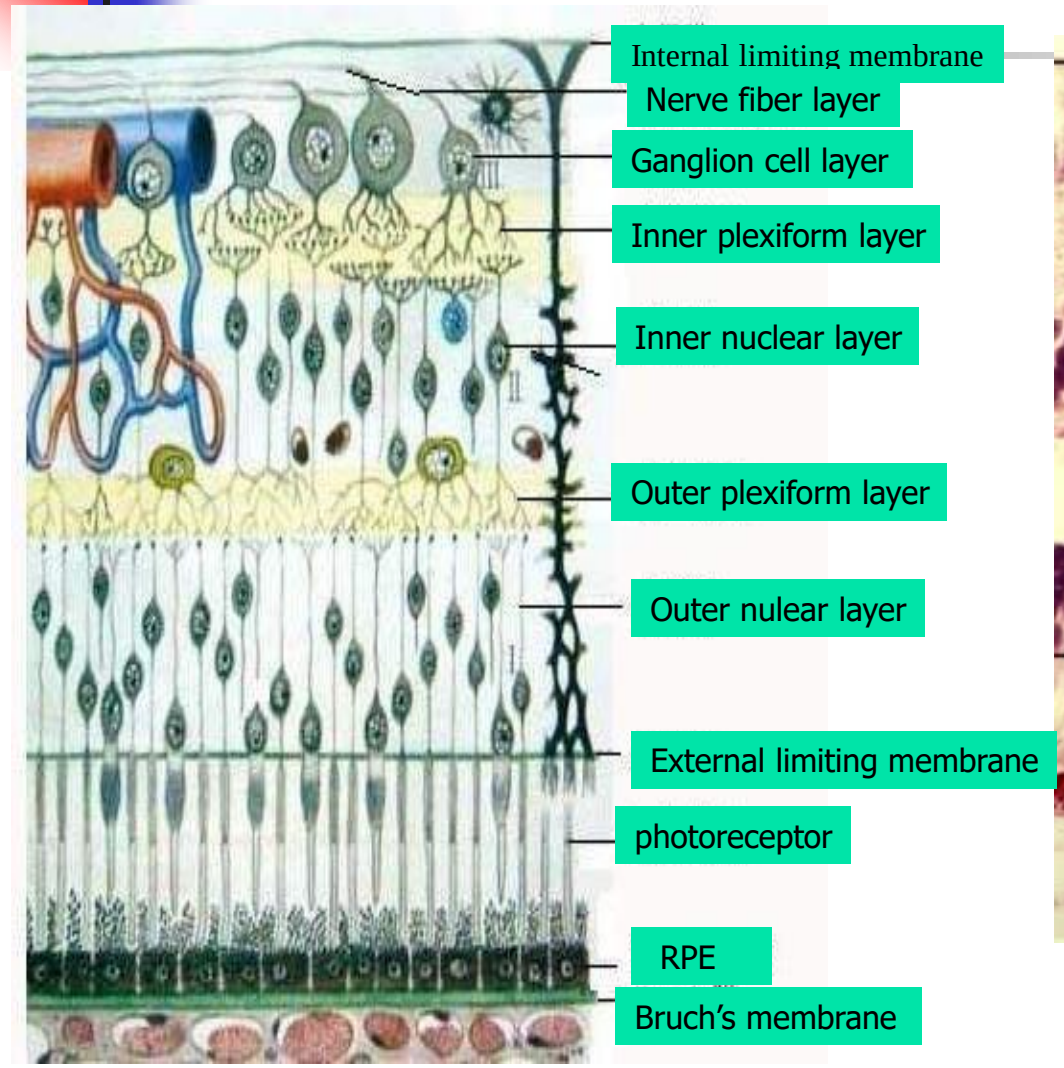
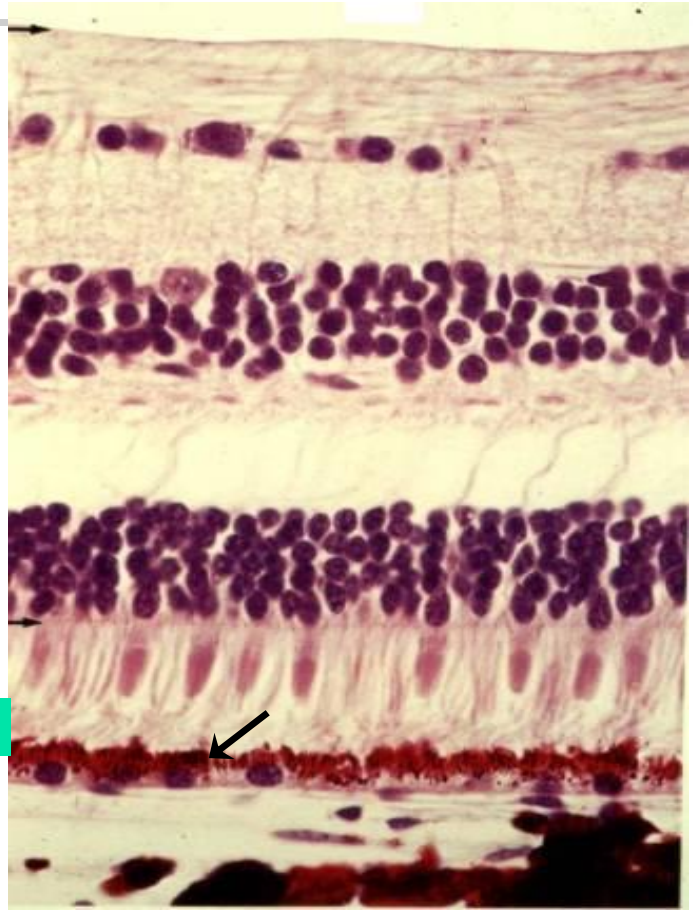
www.sengulozdek.com



- Retinal Vein Occlusions
- Retinal Artery Occlusions
- Diabetic Retinopathy
- Retinal Vasculitis (Behçet, Eales etc)
- Retinal telangiectasis (Coats diesase)
- ROP
- Age Related Macular Degeneration

Histology of retina





Retinal Vasculature

inner layer→ central retinal vascular system

outer layer→ choroid (ciliary vascular system）

macula lutea→ choriocapillaries!

Retinal Barriers

- **Inner barrier (blood–retina barrier):** retinal capillary endothelium

- **Outer barrier** (**choroid-retina barrier):** zonula occludens between the RPE, **RPE- Bruch's membrane- choriocapillaries complex**

Symptoms

- Visual impairment
- Metamorphopsia
- Macropsia / Micropsia

Signs

- Edema
- Hemorrhage
- Exudation
- Neovascularization

Signs

- **Intracellular edema**

Retinal artery occlusion:
ischemia leads to edema
of bipolar cell, ganglion and RNFL

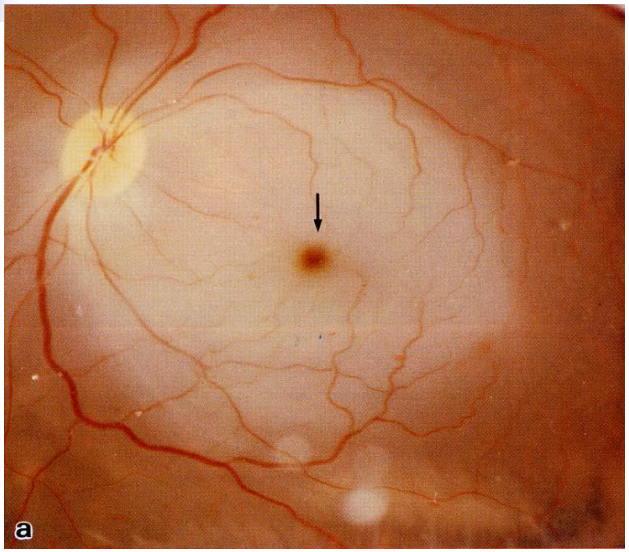
- **Extracellular edema**

Capillary endothelium injury and
exudation

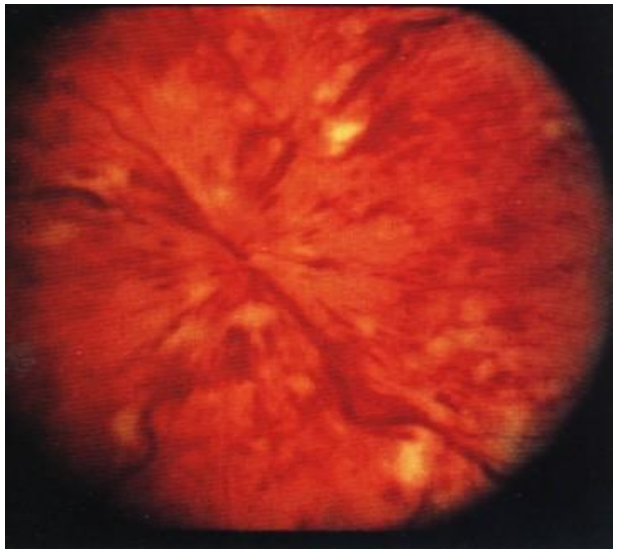
- **Cystoid macular edem**

Henle's fibers are radically located;
This pooling forms a flower-petal pattern.

Retinal Edema



Intracellular edema
CRAO



Extracellular edema
CRVO

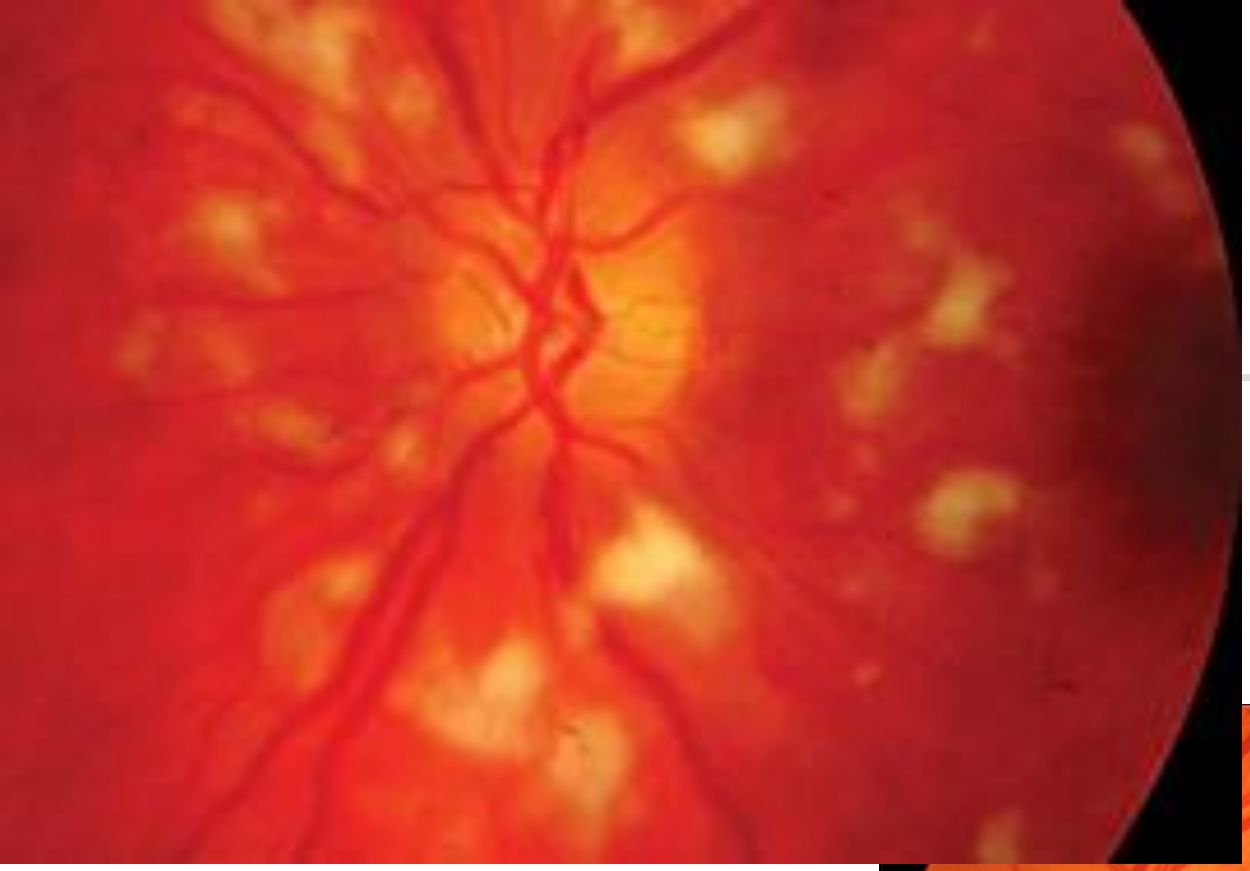
Exudates

Hard exudate

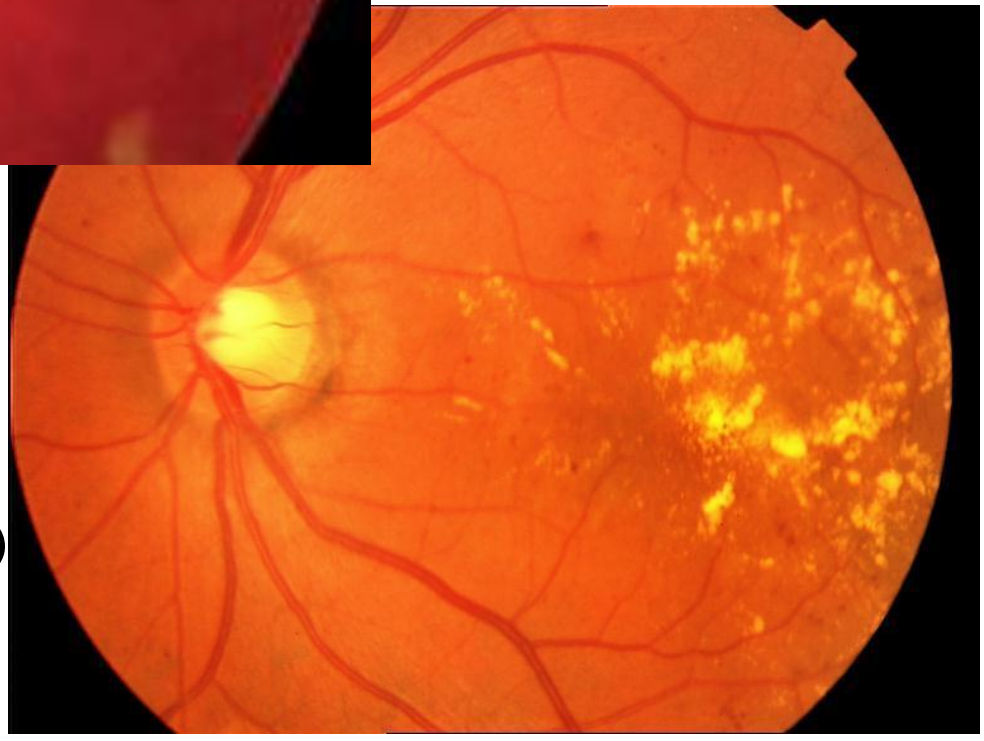
Leakage of capillary →absorb →
deposition of lipid in outer plexiform layer

Soft exudate

"Cotton-wool spot"
Precapillary arteriole occlusion→
axoplasmic transport blocked→organelles stack



Cotton-wool spot



Hard exudate (Diabetic retinopathy)

Hemorrhage

Subretinal hemorrhage

Located in under retina, mostly the source is choroid

Retinal hemorrhage

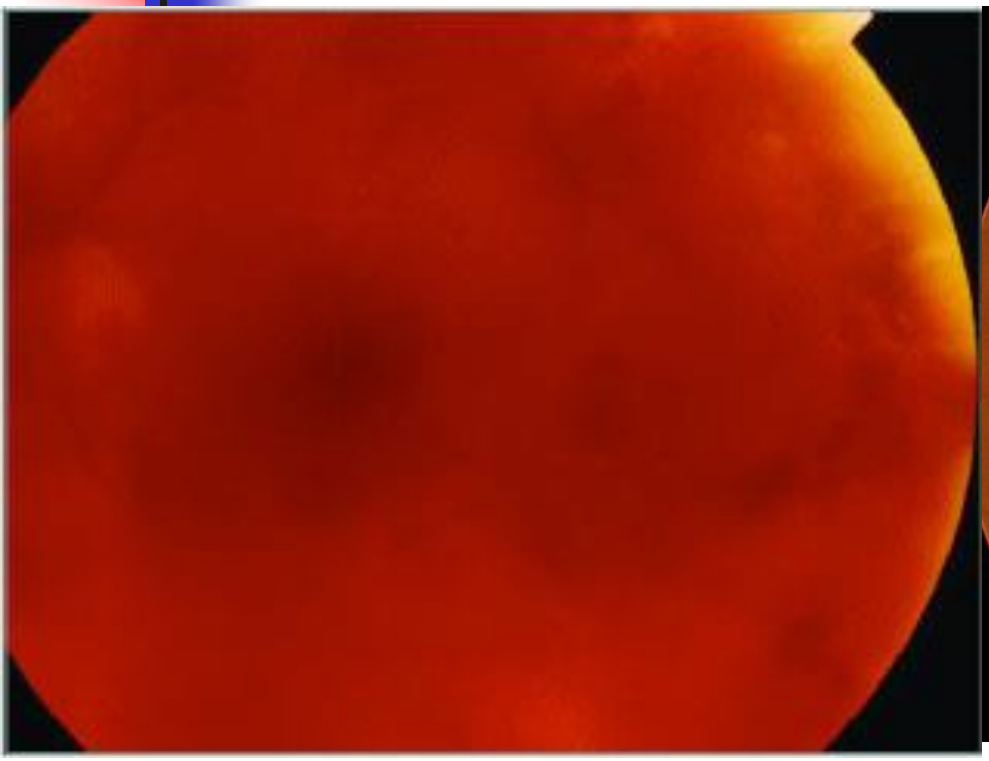
Located in nerve fiber layer
Line, strip, flame-like, bright red

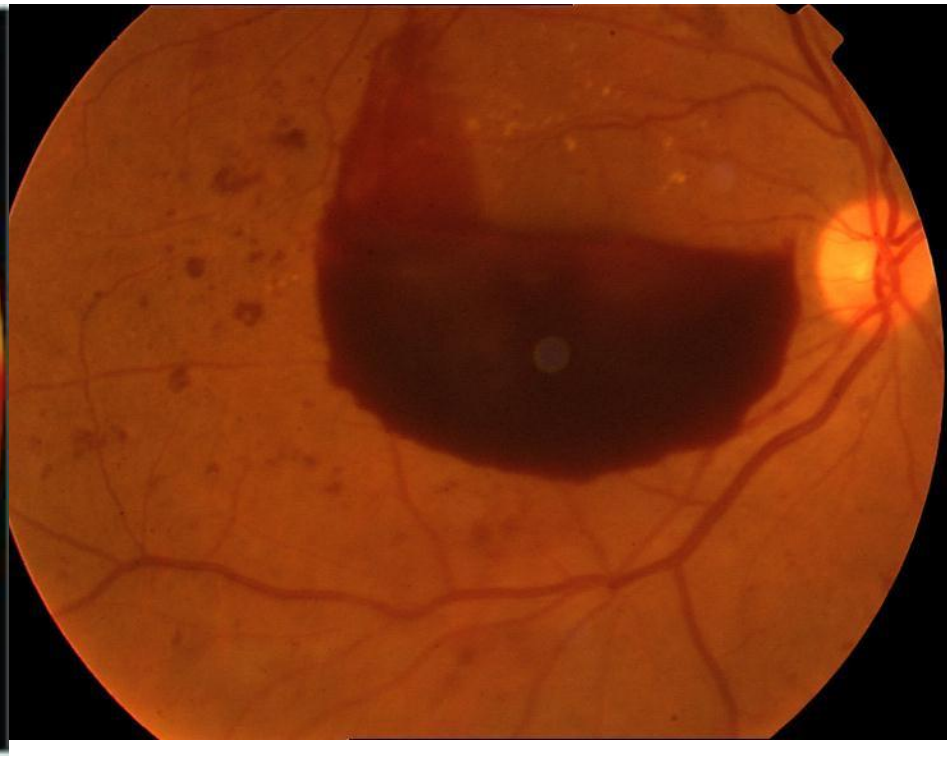
Preretinal hemorrhage

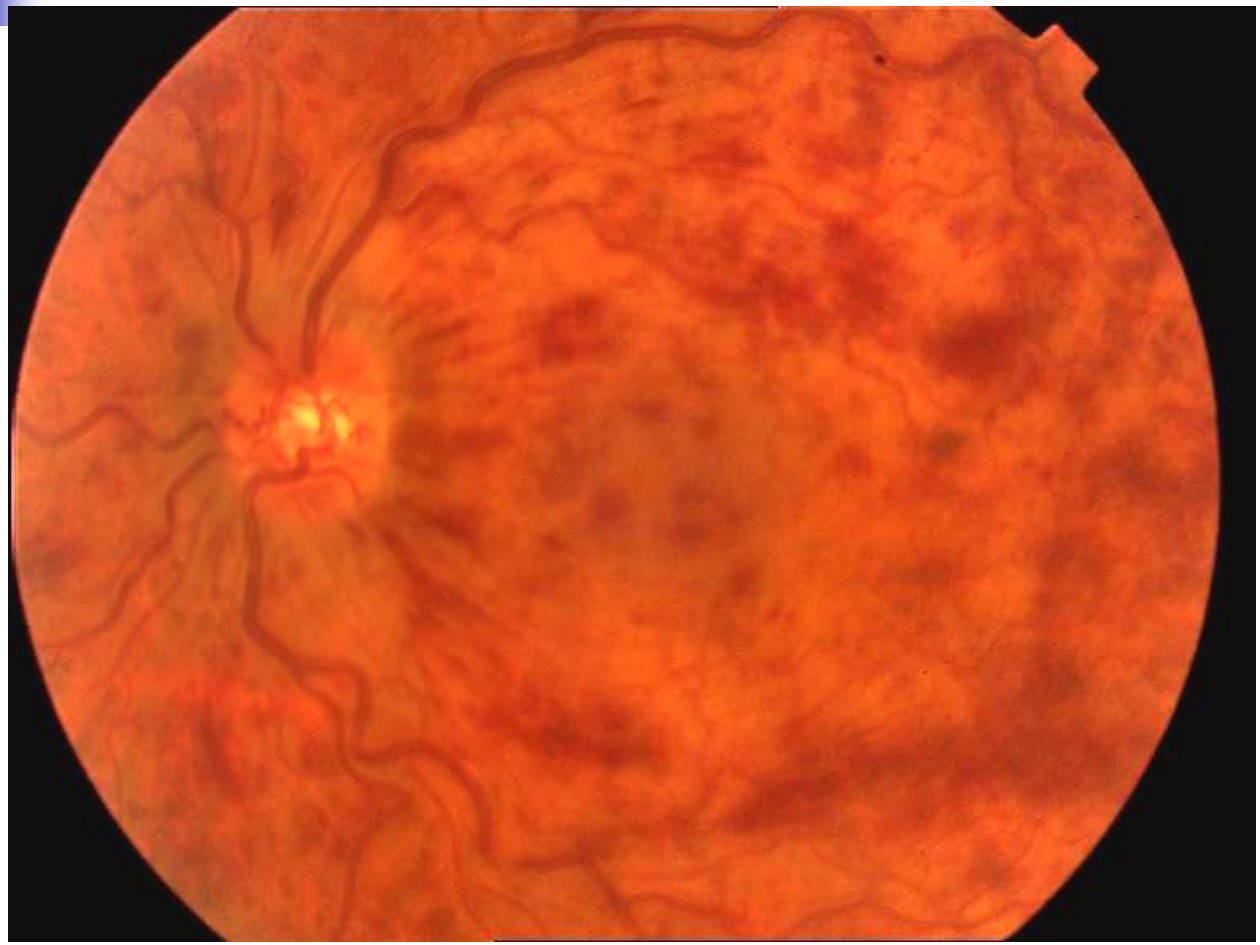
Crescent-shaped hematocele with transverse section

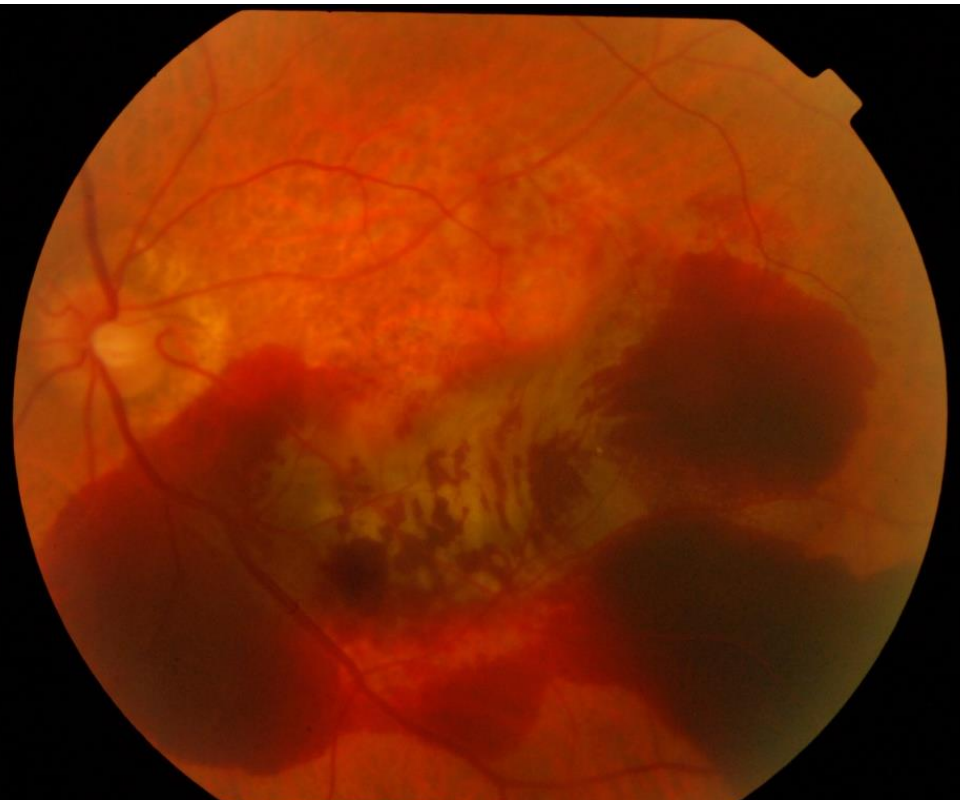
Vitreous hemorrhage

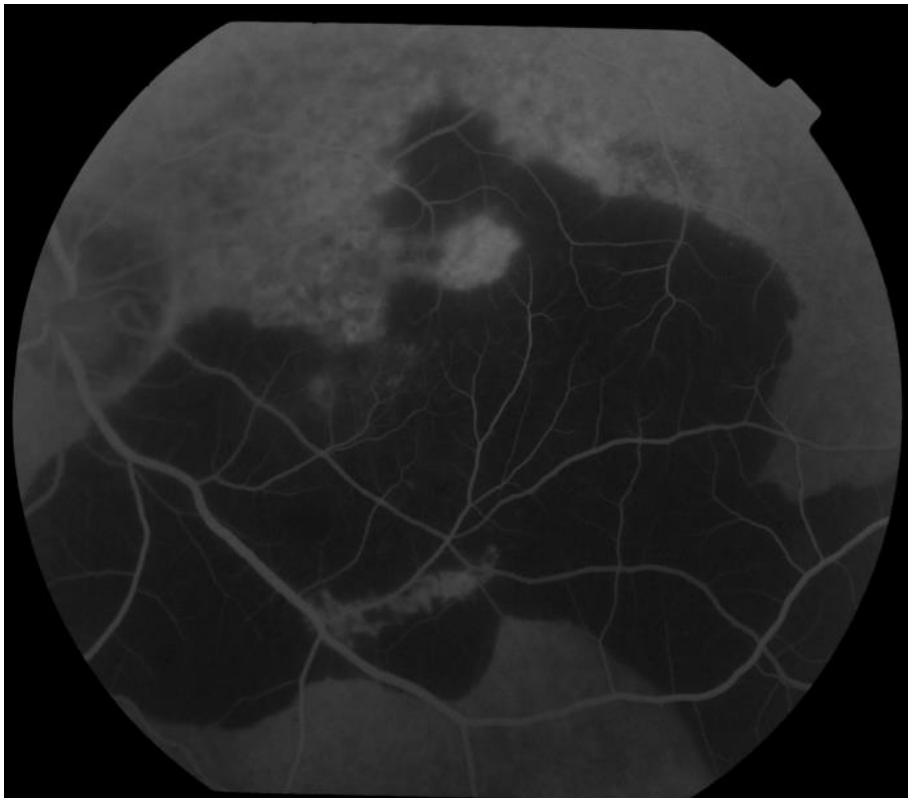
Profuse preretinal hemorrhage into the vitreous or hemorrhage of retinal neospastic vasculature



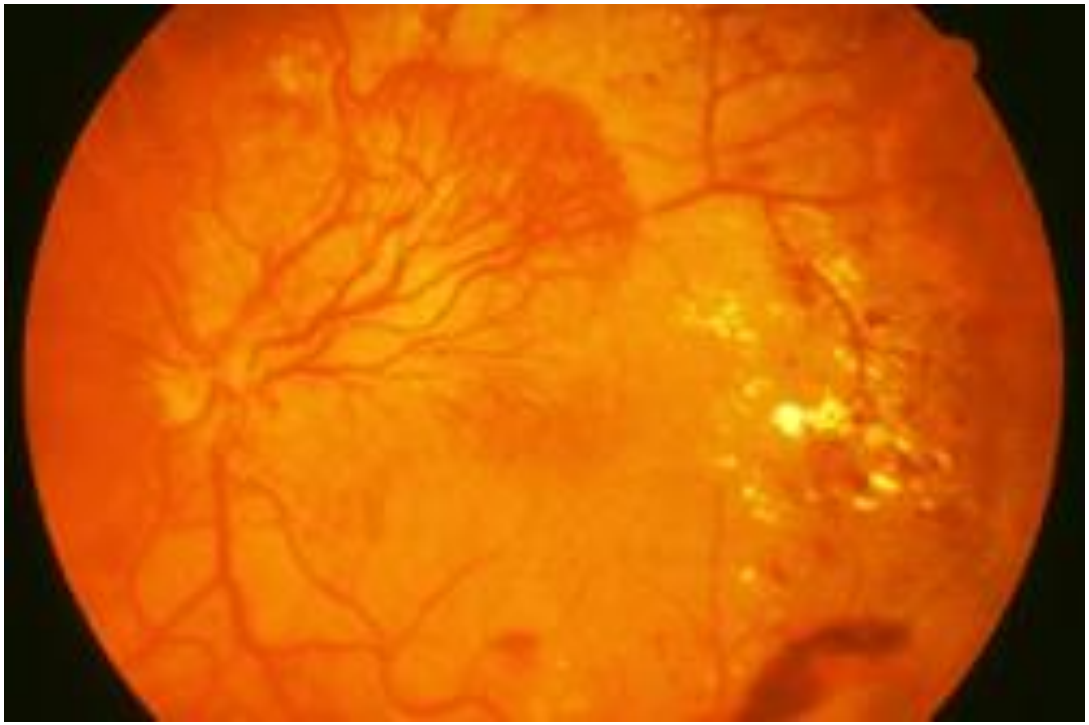








Neovascularization



Retinal ischemia

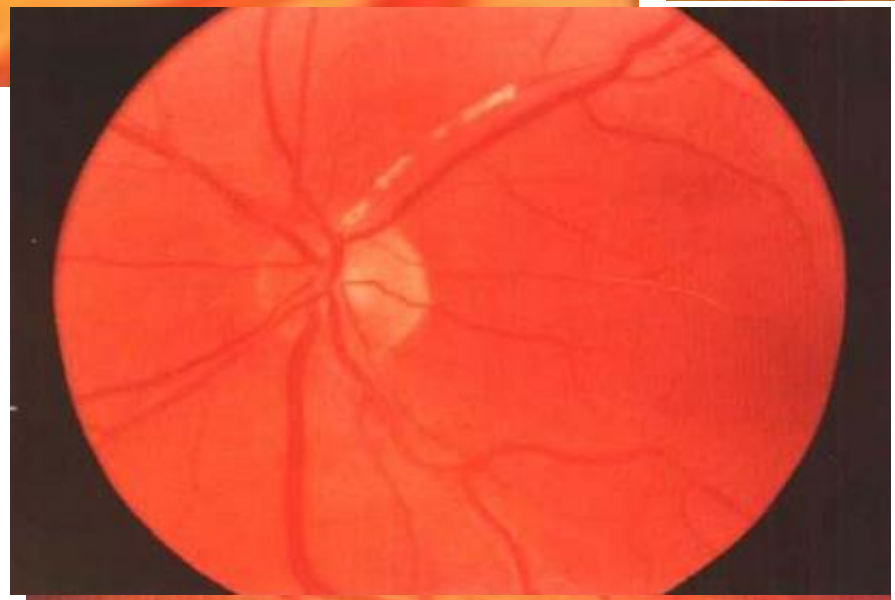
VEGF

neovascularization

Blood vessel change

- Atherosclerosis, stenosis, occlusion
- Tortuous vein, dilated vein, bead-like change

A-v cross sign



Vessel white sheath

Microaneurysm

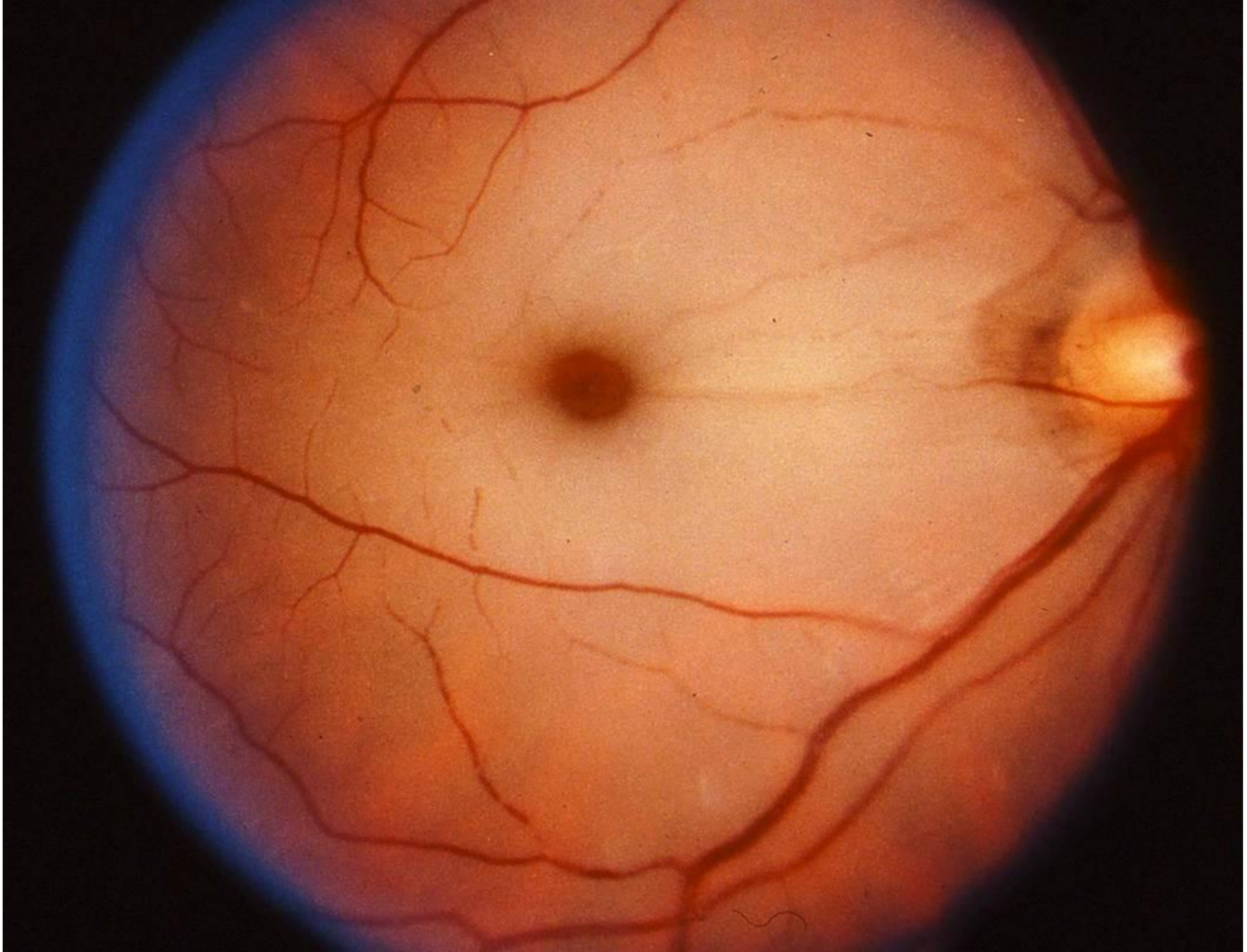
CENTRAL RETINAL ARTERY OCCLUSION

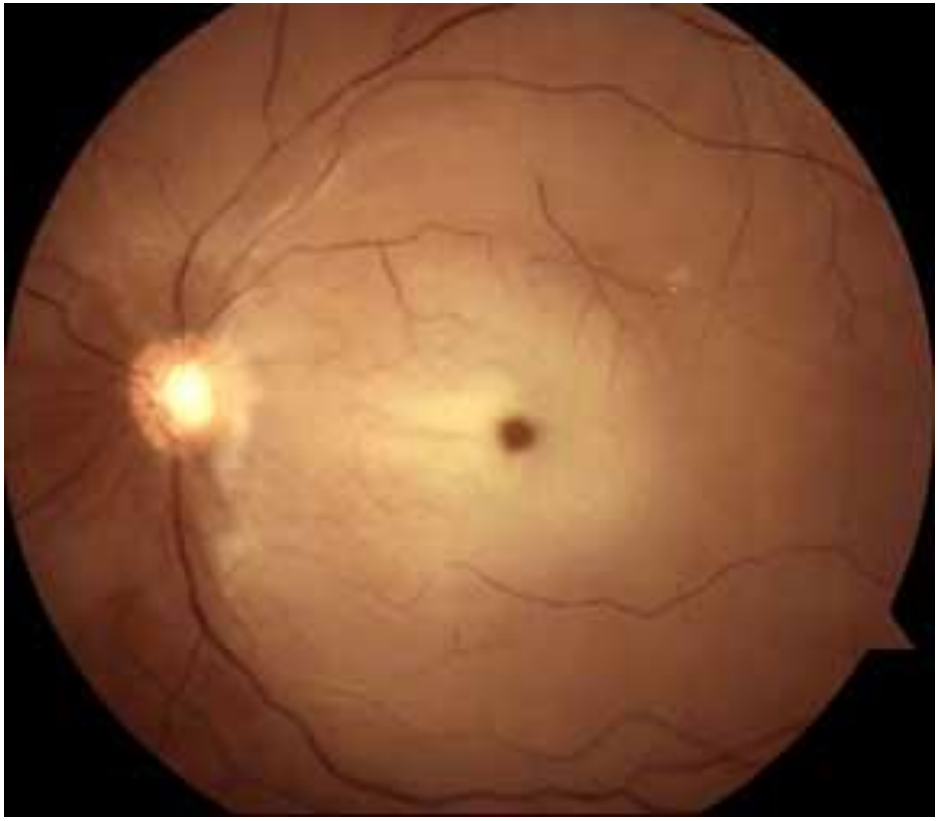
Causes

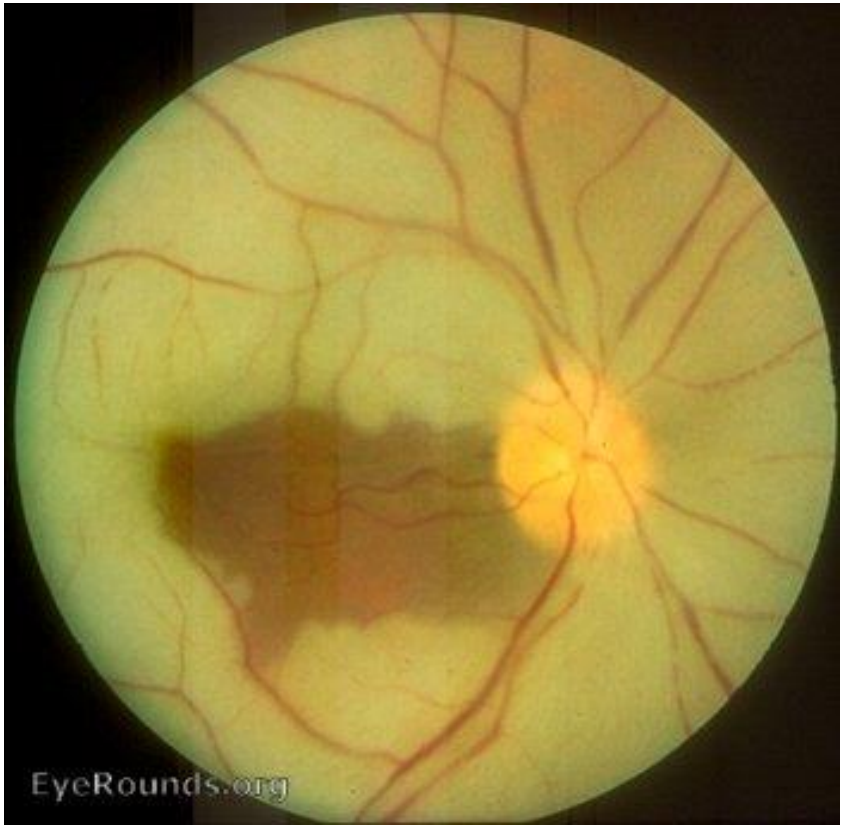
- Atherosclerosis-related thrombus
- Emboli:
  - Carotid: arheroma plaques
  - Cardiac: (calcific valvular or mural thrombosis in atrial fibrillation)
  - Aortic
- Inflammatory: Giant cell arteritis, SLE
- Trauma,
- Thrombophilic disorders:

Signs-Symptoms

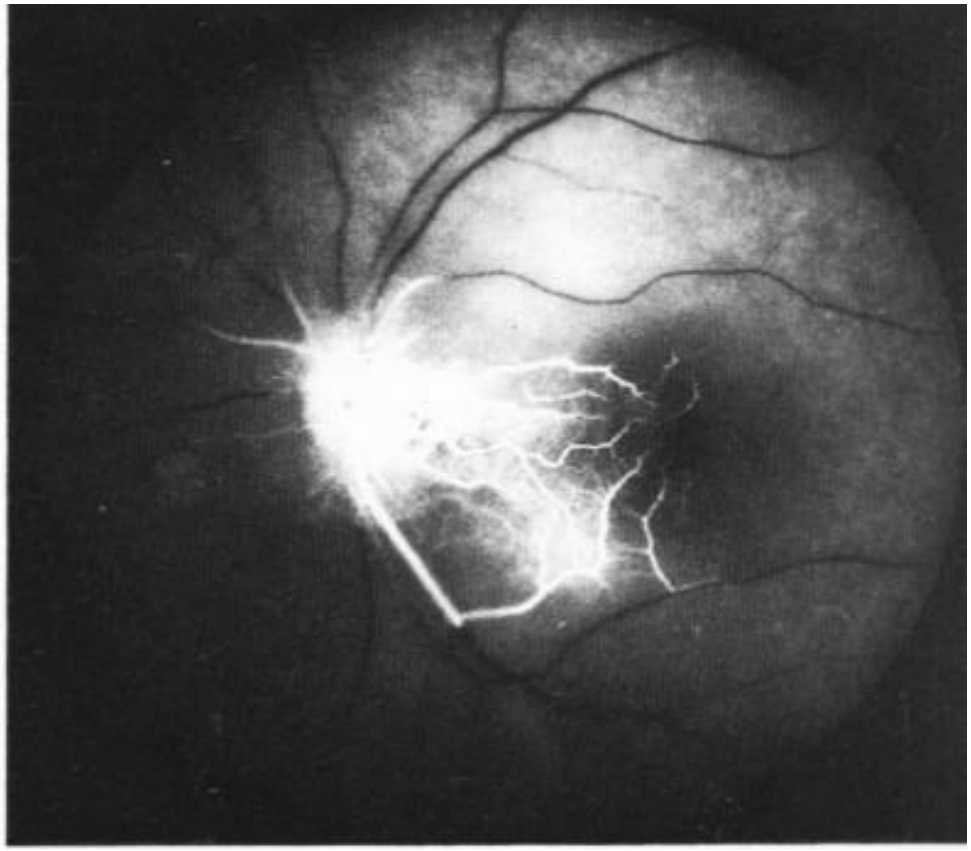
- Sudden painless visual loss
- Mostly Counting Fingers level
- Examination: RAPD!
  - (Direct pupil reflex🡻
- Fundus!

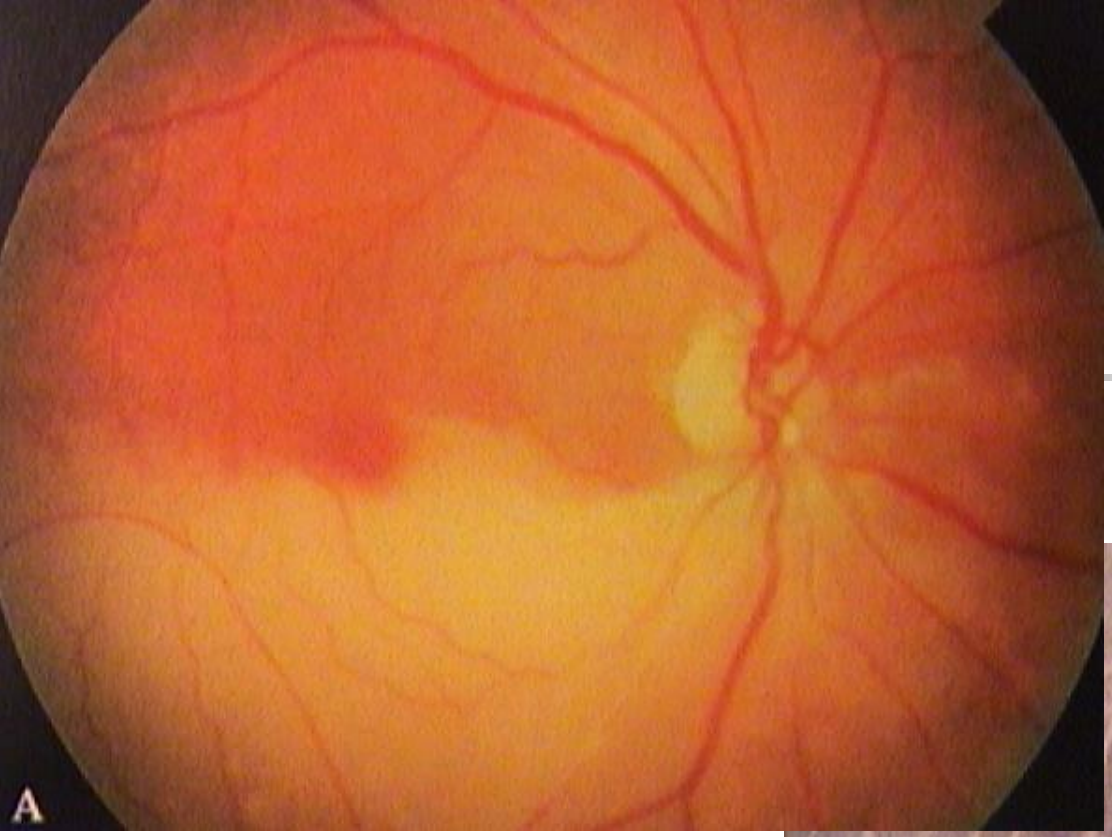





EyeRounds.org

FFA

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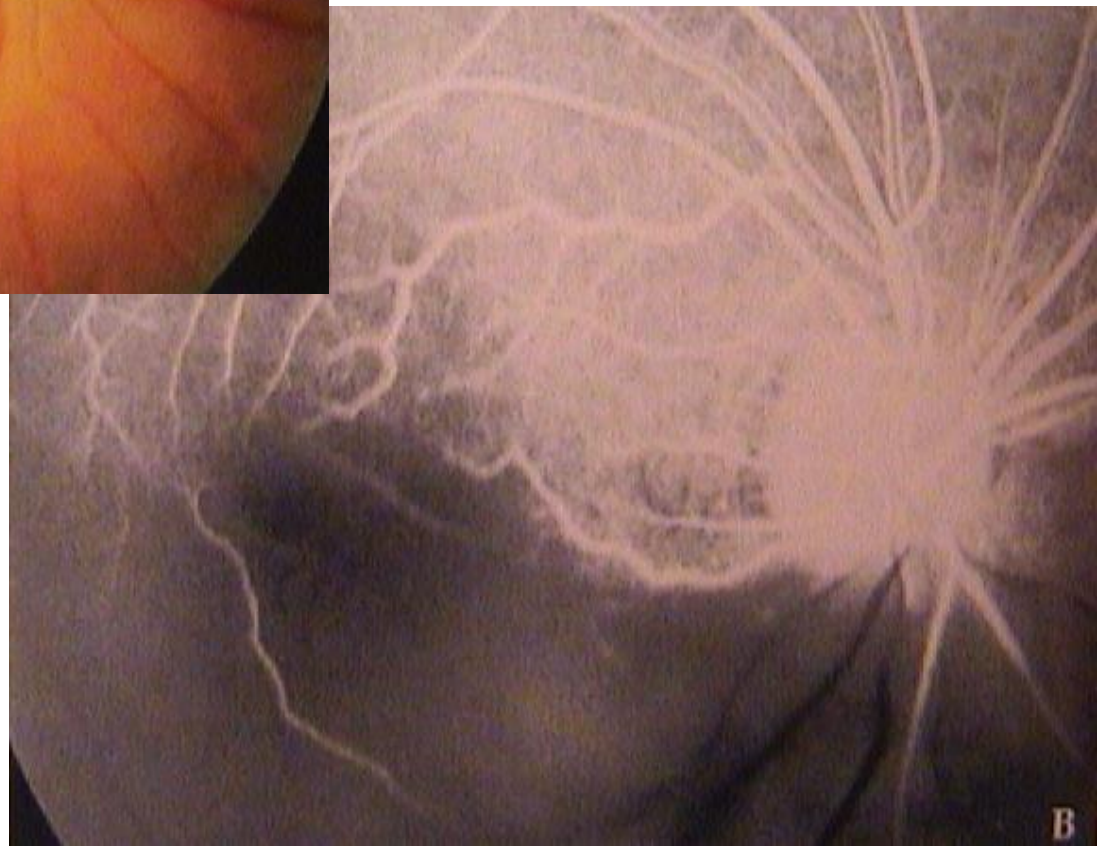
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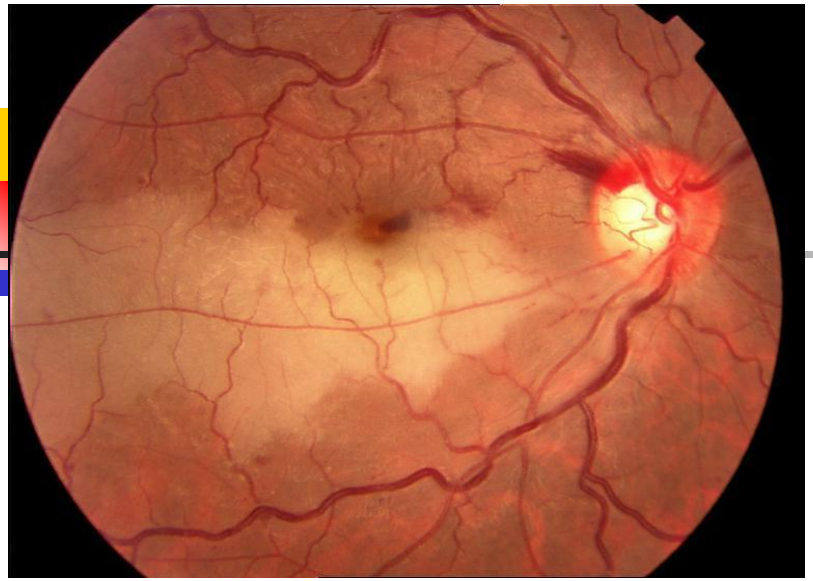

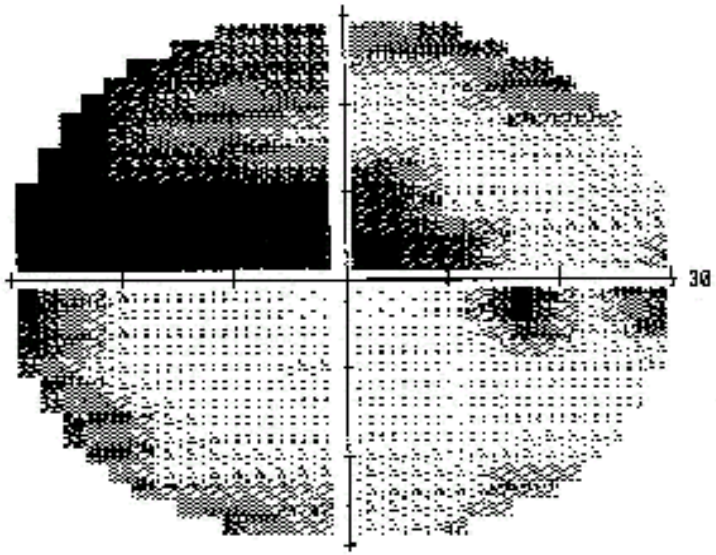
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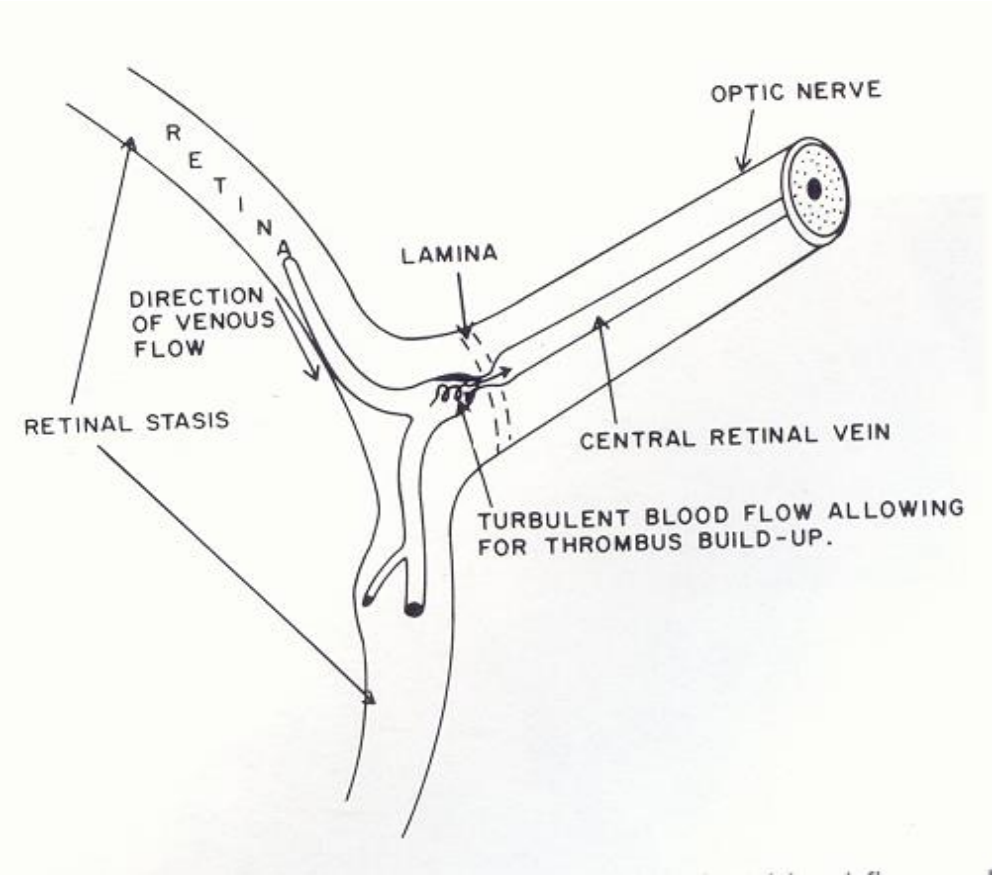
Treatment

- Vasodilator: antispasm or pushing thrombus to the smaller branch
- Reducing IOP:
  - Massage
  - anterior chamber paracentesis
  - CAI, Mannitol 20%
- O2 inhalation: mixture of 95% oxygen &5% carbon dioxide
- Fibrolytics: for patients suspect of thrombosiis: urokinase, tPA

Prognosis

- Poor
- Treatment?
  - Only within first few hours

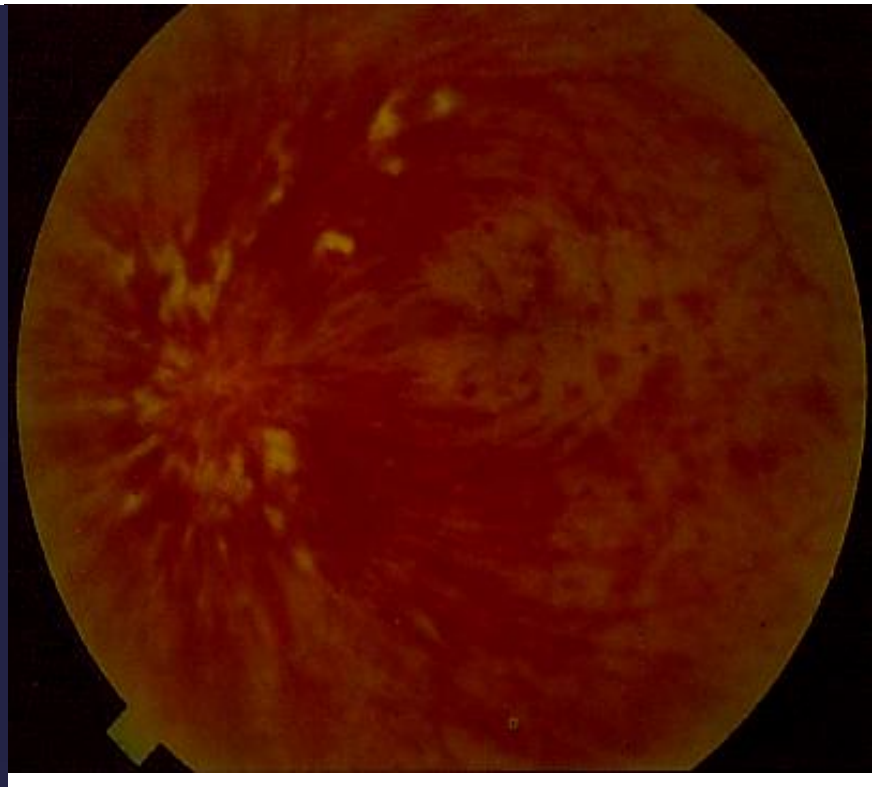
CENTRAL/BRANCH RETINAL VEIN OCCLUSIONS

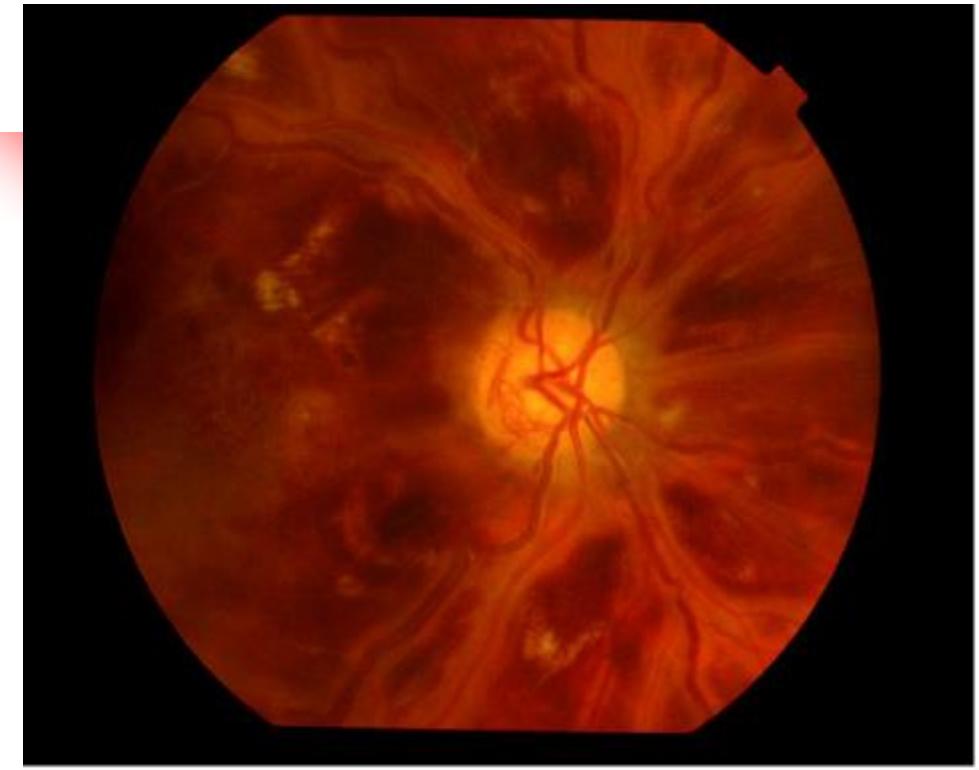

OPTIC NERVE
RETINA
LAMINA
DIRECTION OF VENOUS FLOW
RETINAL STASIS
CENTRAL RETINAL VEIN
TURBULENT BLOOD FLOW ALLOWING FOR THROMBUS BUILD-UP.

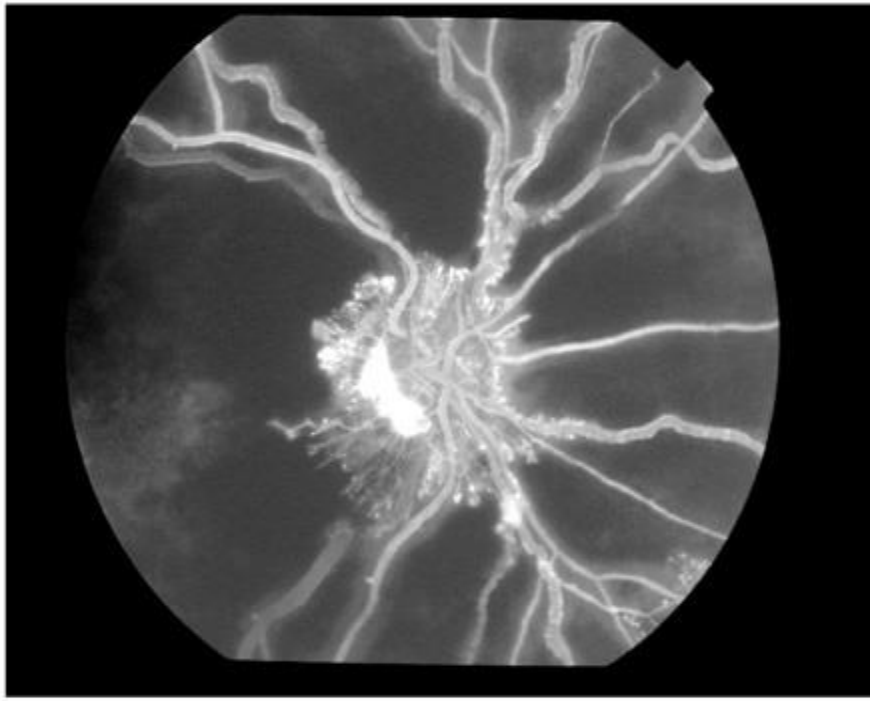
Risk Factors

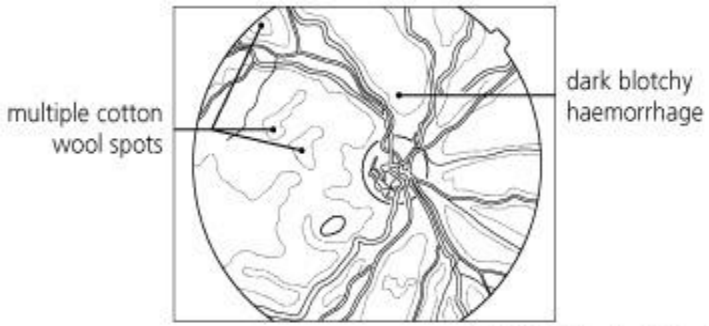
- CRVO
  - Systemic Hypertension
  - Cardiovascular Disease
  - Diabetes Mellitus
  - POAG
- BRVO
  - Systemic Hypertension
  - Cardiovascular Disease
  - Glaucoma
  - Increased Body Mass Index at 20 yrs old
  - Hypercoaguable States

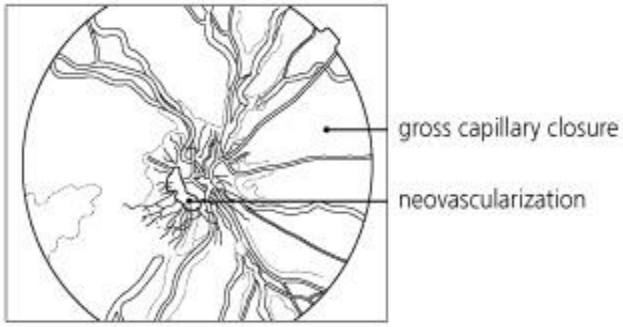
Nonischemic vs Ischemic

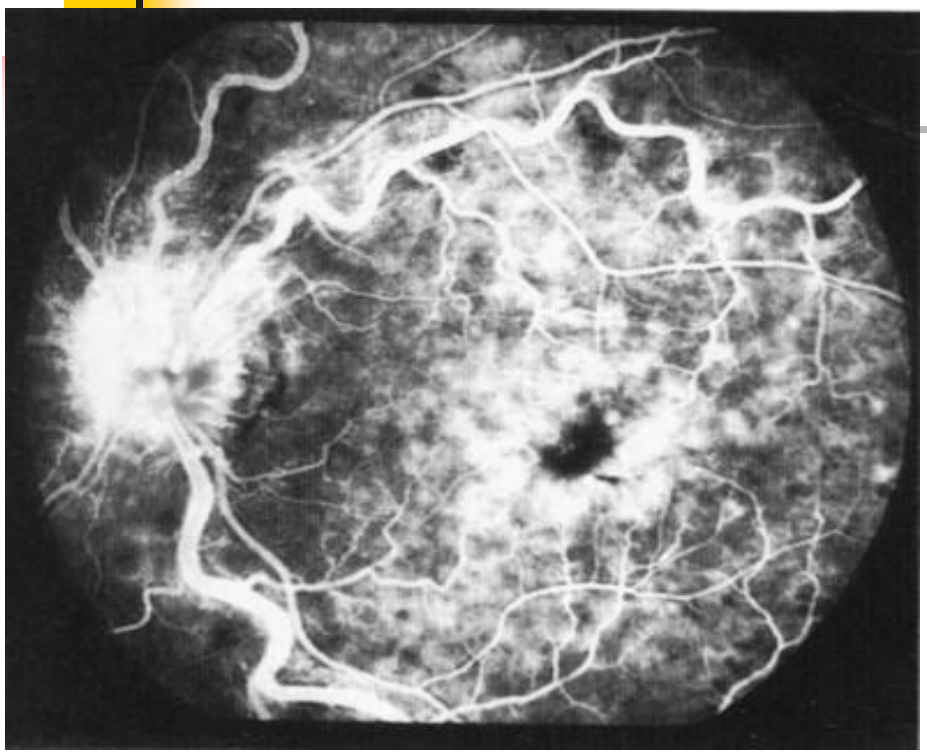




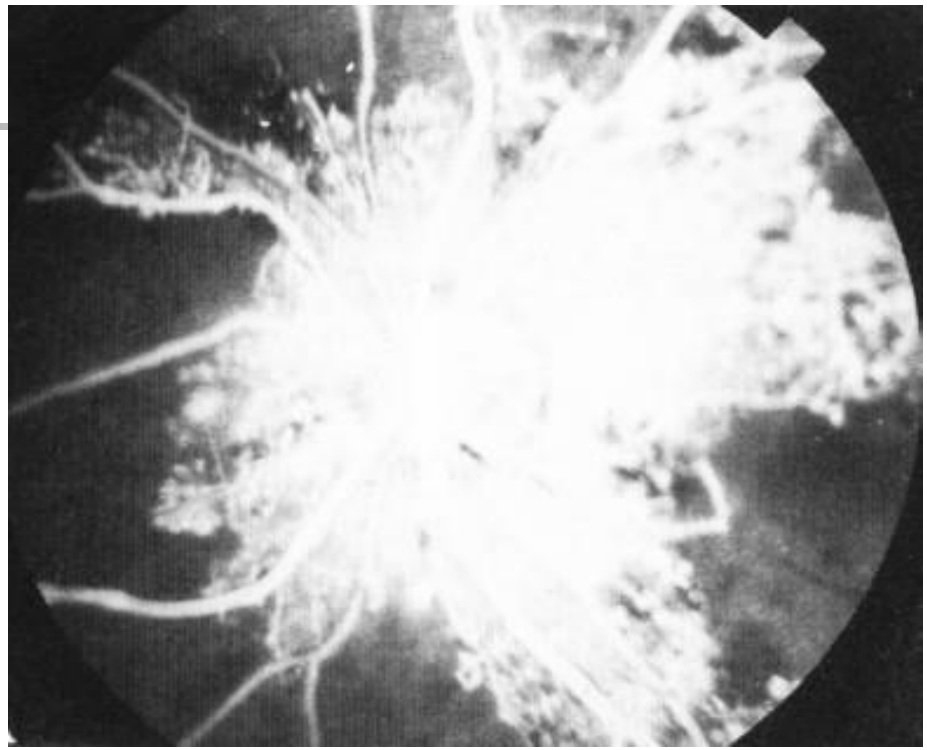








CRVO
Nonischemic



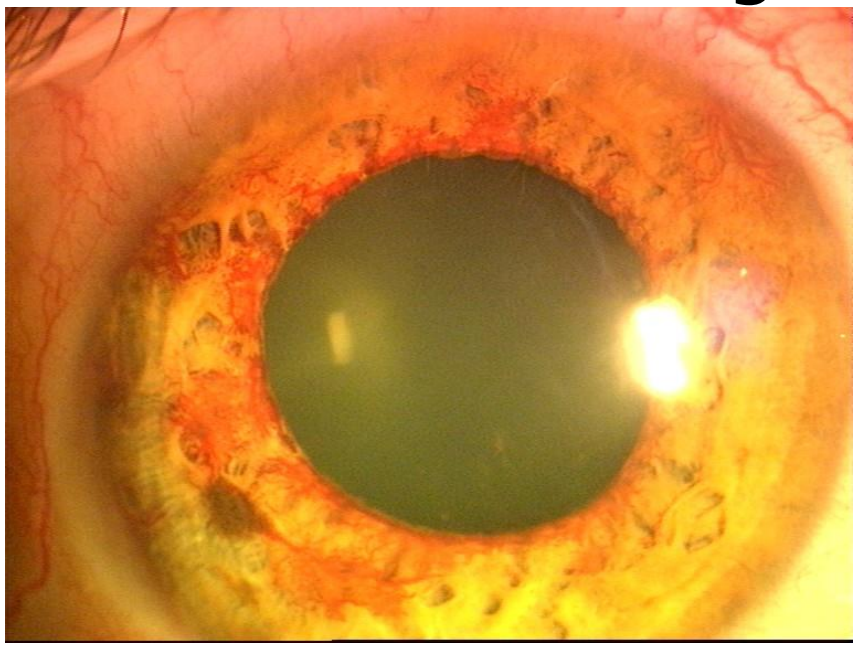
CRVO
ischemic

Treatment

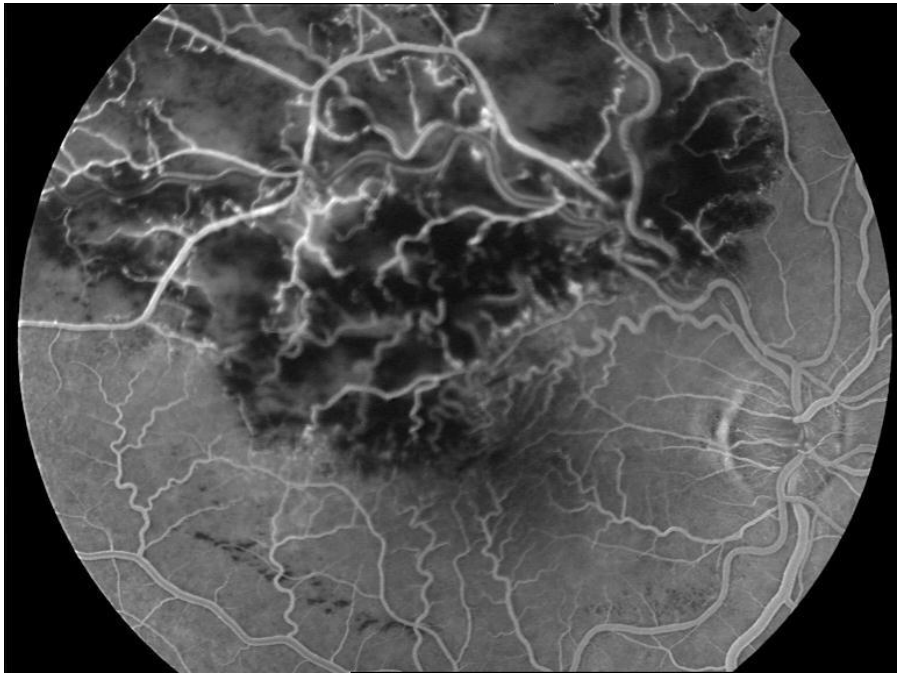
- Antitrombotic agents?
- Intravascular thrombolysis?
- IV steroids
  - Triamcinolone
  - Dexamethasone implants
- IV Anti-VEGFs
  - Bevacizumab
  - Ranibizumab

Ischemic CRVO

- Neovascularization: Iris&angle
  - Neovascular Glaucoma
- Panretinal Laser Photocoagulation: PRP

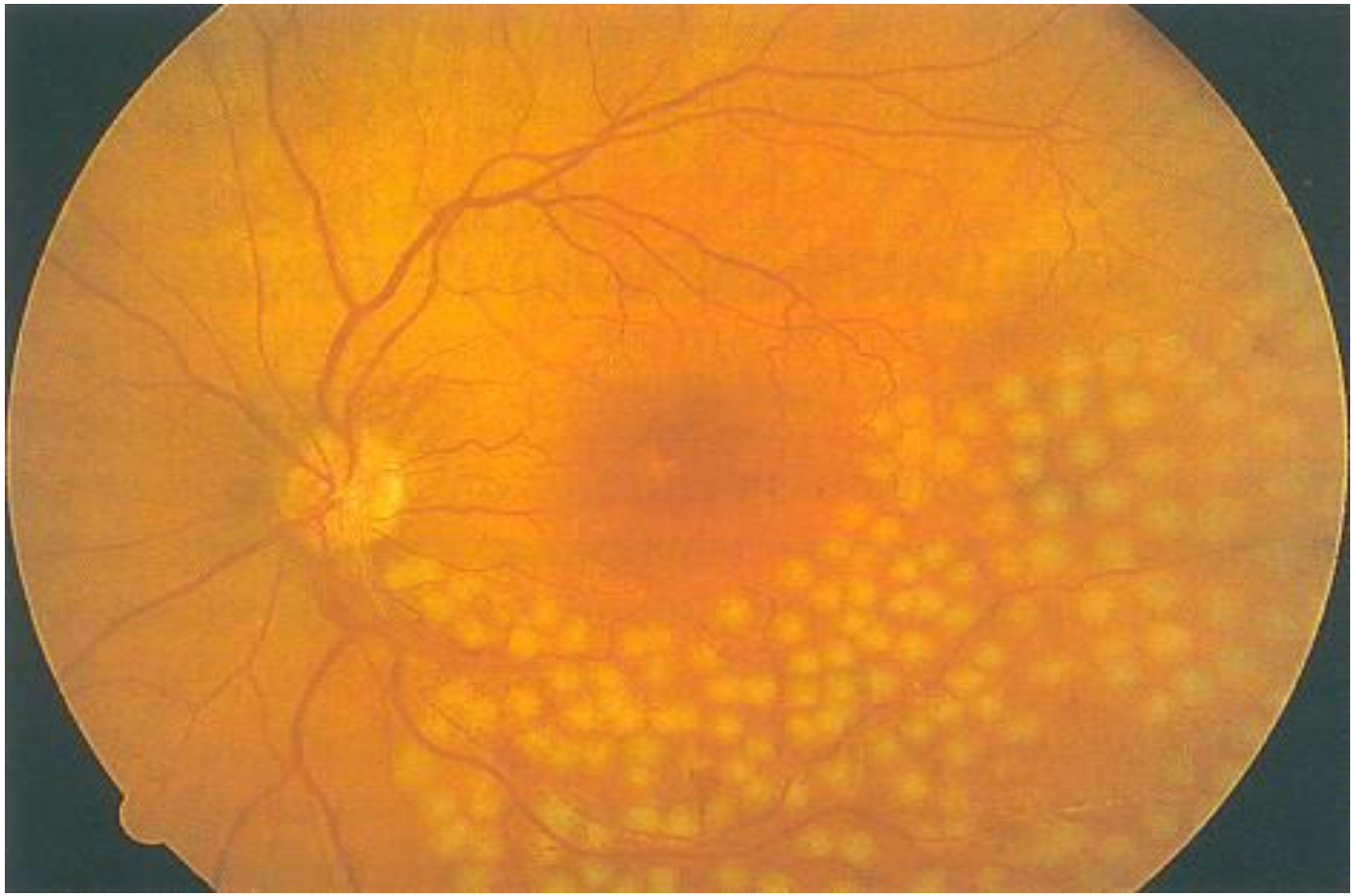


BRANCH RETINAL VEIN OCCLUSION (BRVO)



Treatment

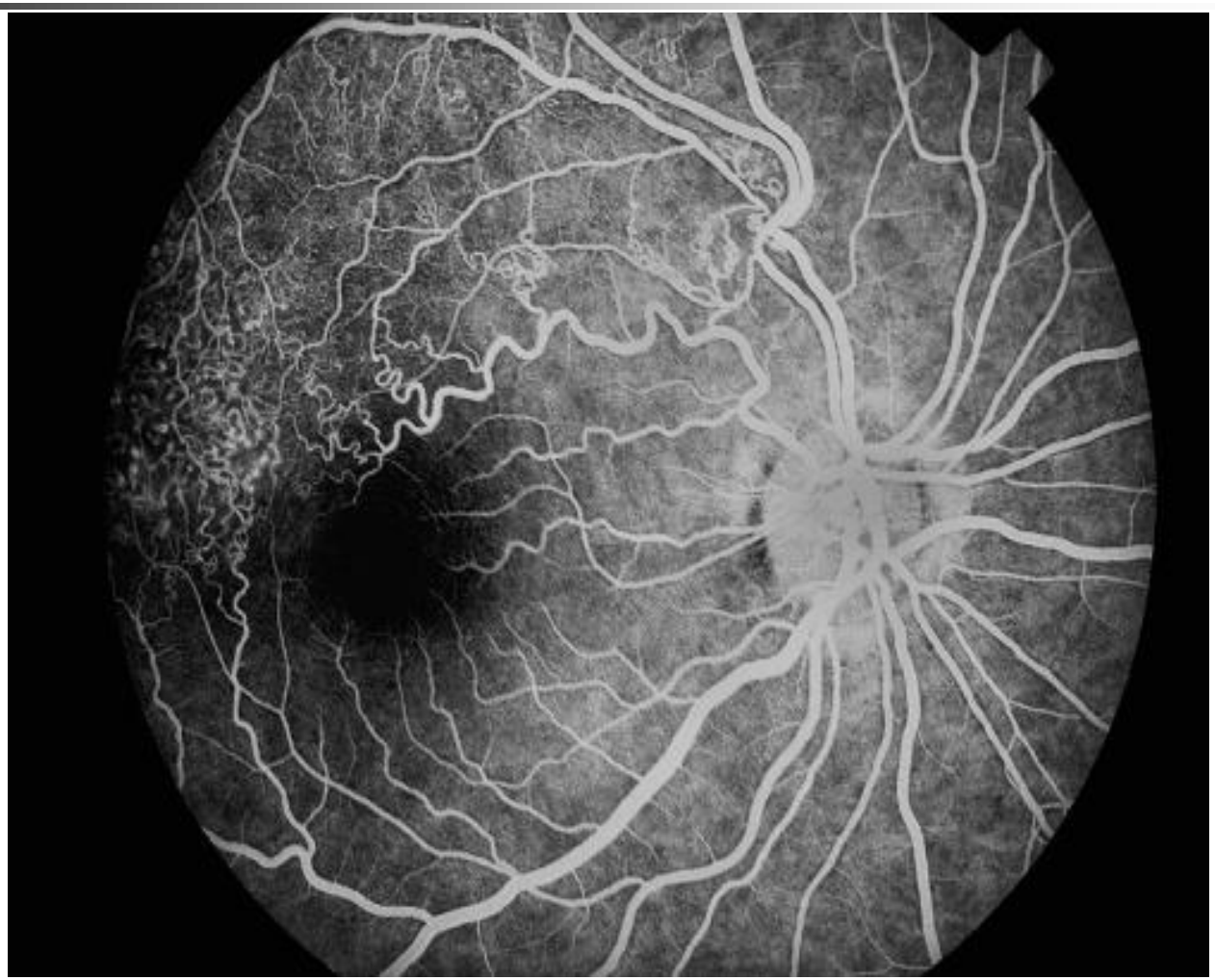
- Grid Laser
- Laser PC to ischemic areas if NVE (+)
- IV steroids
  - Triamcinolone
  - Dexamethasone implants
- IV Anti-VEGFs
  - Bevacizumab
  - Ranibizumab



Prognosis

- CRVO
  - Approximately 30% ischemic (10 DD on FA)
  - NVG 40% to 60% of these eyes vs 5% Nonischemic
  - <10% developed retinal neovascularization
  - CVOS – 83% of undetermined developed ischemia or NVI
- BRVO
  - 1/3 to 1/2 recover VA of 20/40 or better w/o therapy
  - 50% Ischemic (5 DD) of which 40% develop neovascularization; 60% of these develop VH
  - NVI Rare; 1%

BRVO-Collaterals



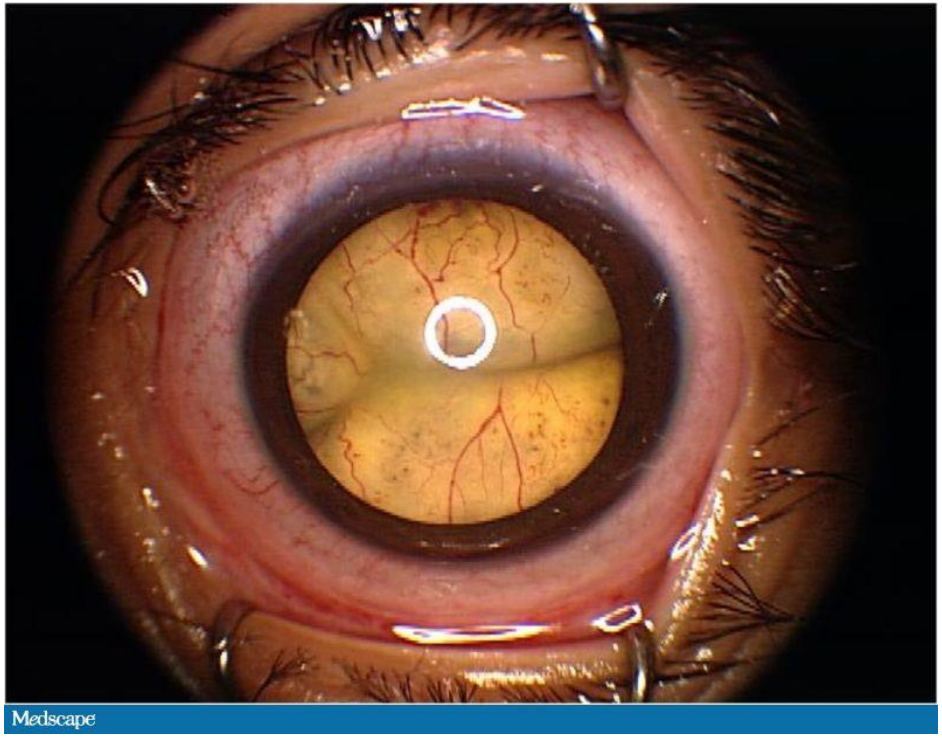
COATS DISEASE

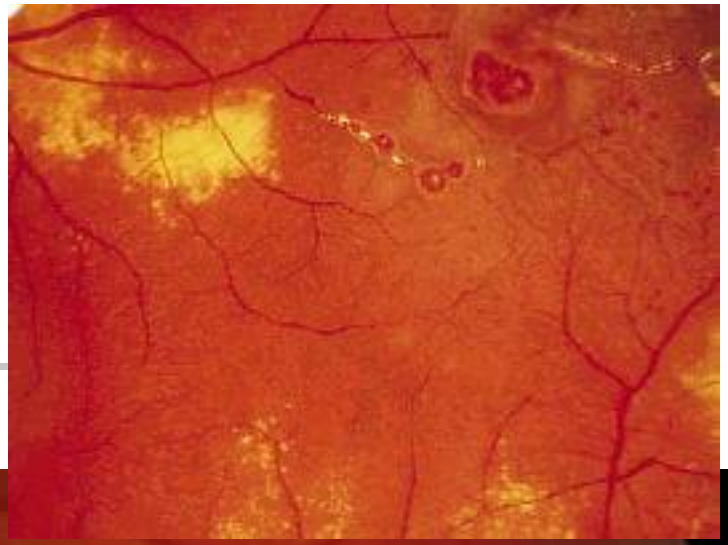
- Unilateral gradual loss of vision
- Predominantly in young males (1st decade)
- Peak age of onset: 6-8 years
- RD, NVG, Cataract, Leukocoria,
- DD: Retinoblastoma

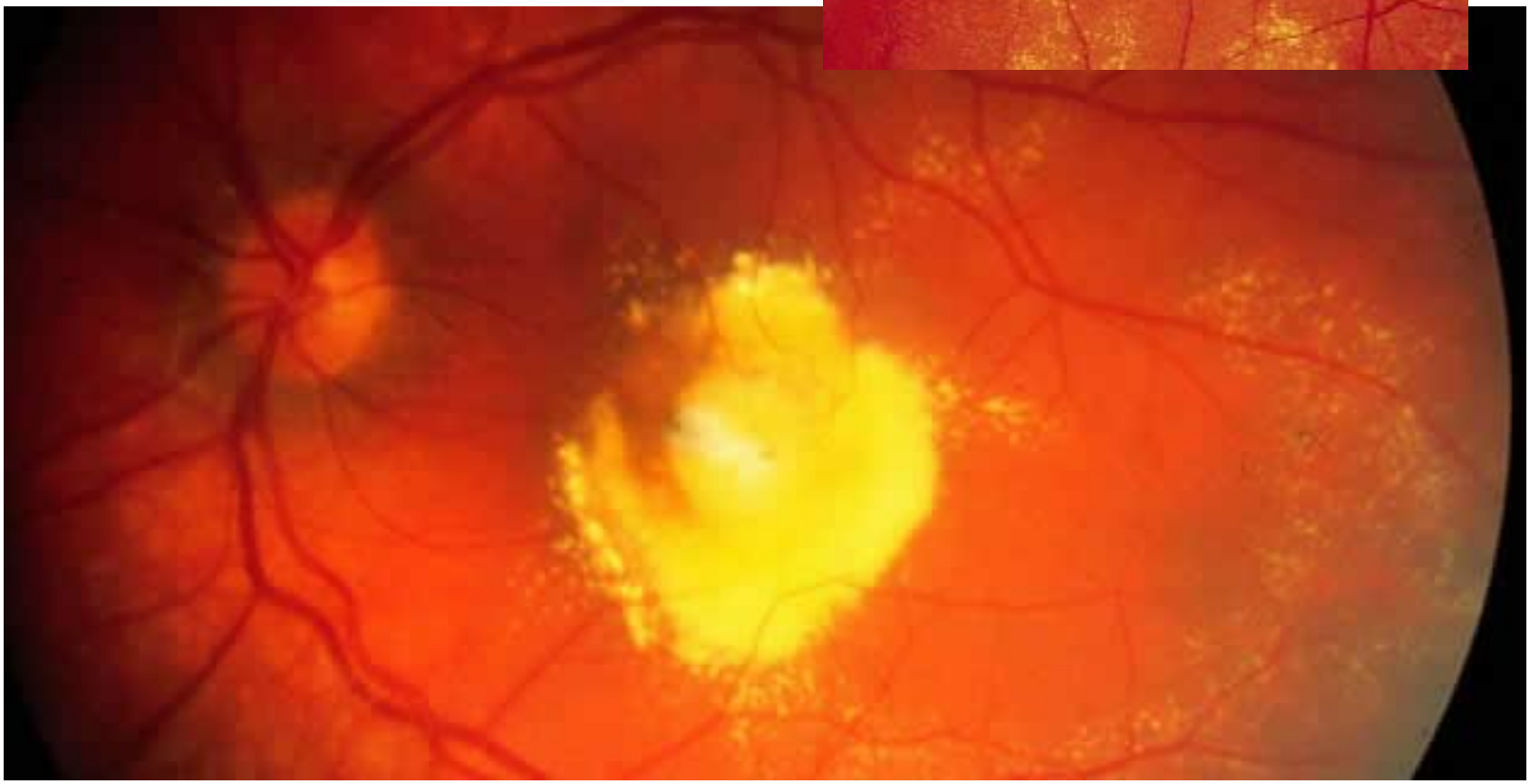
Retinal Findings

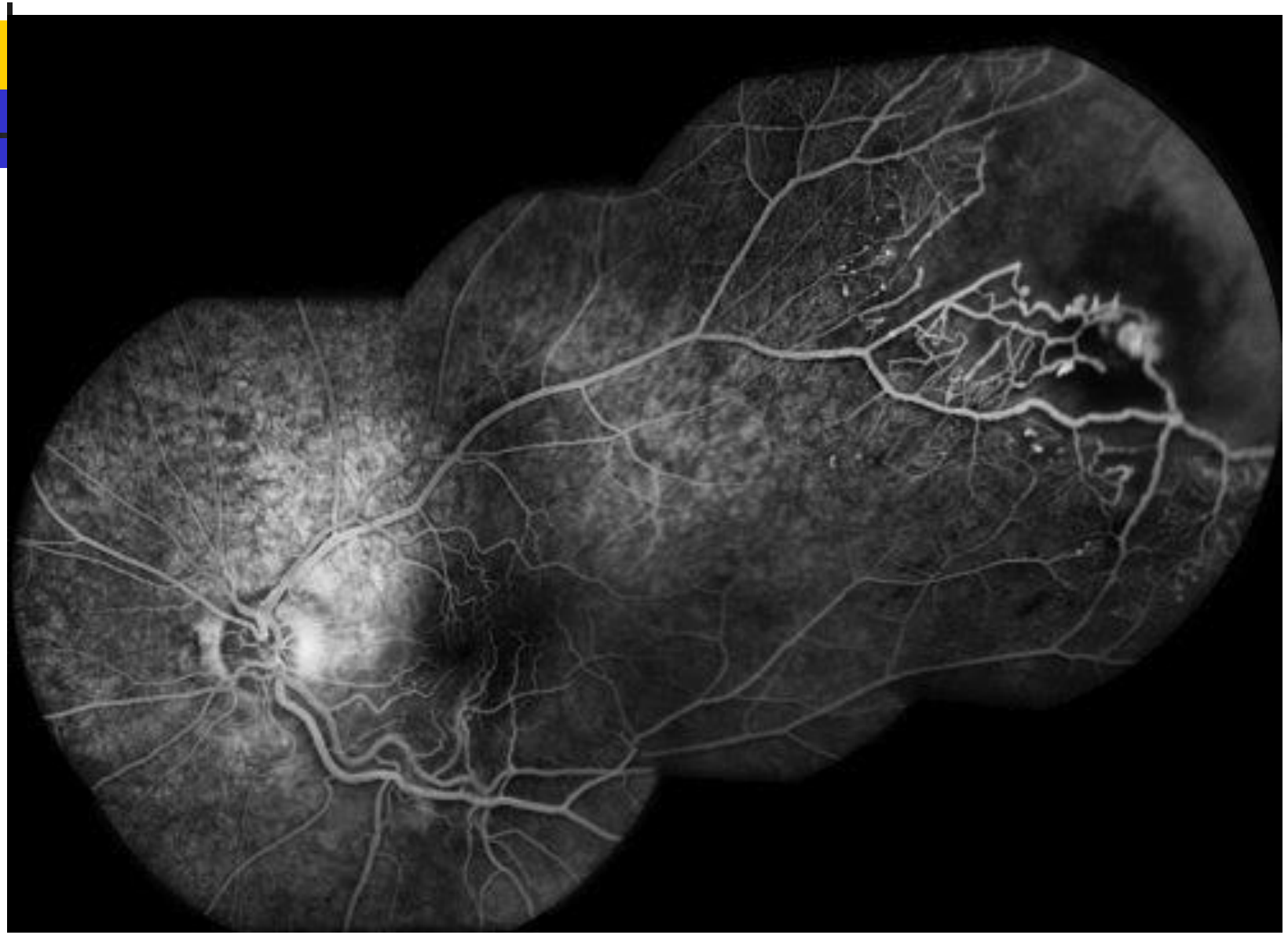
- Aneurismal and telangiectatic vessels
- Breakdown of blood retinal barrier
- Leakage of blood, serum, cholesterol to retina
- Exudative RD….Loss of retinal red reflex
- Loss of retinal capillary
- Ischemia…. NV….NVG…

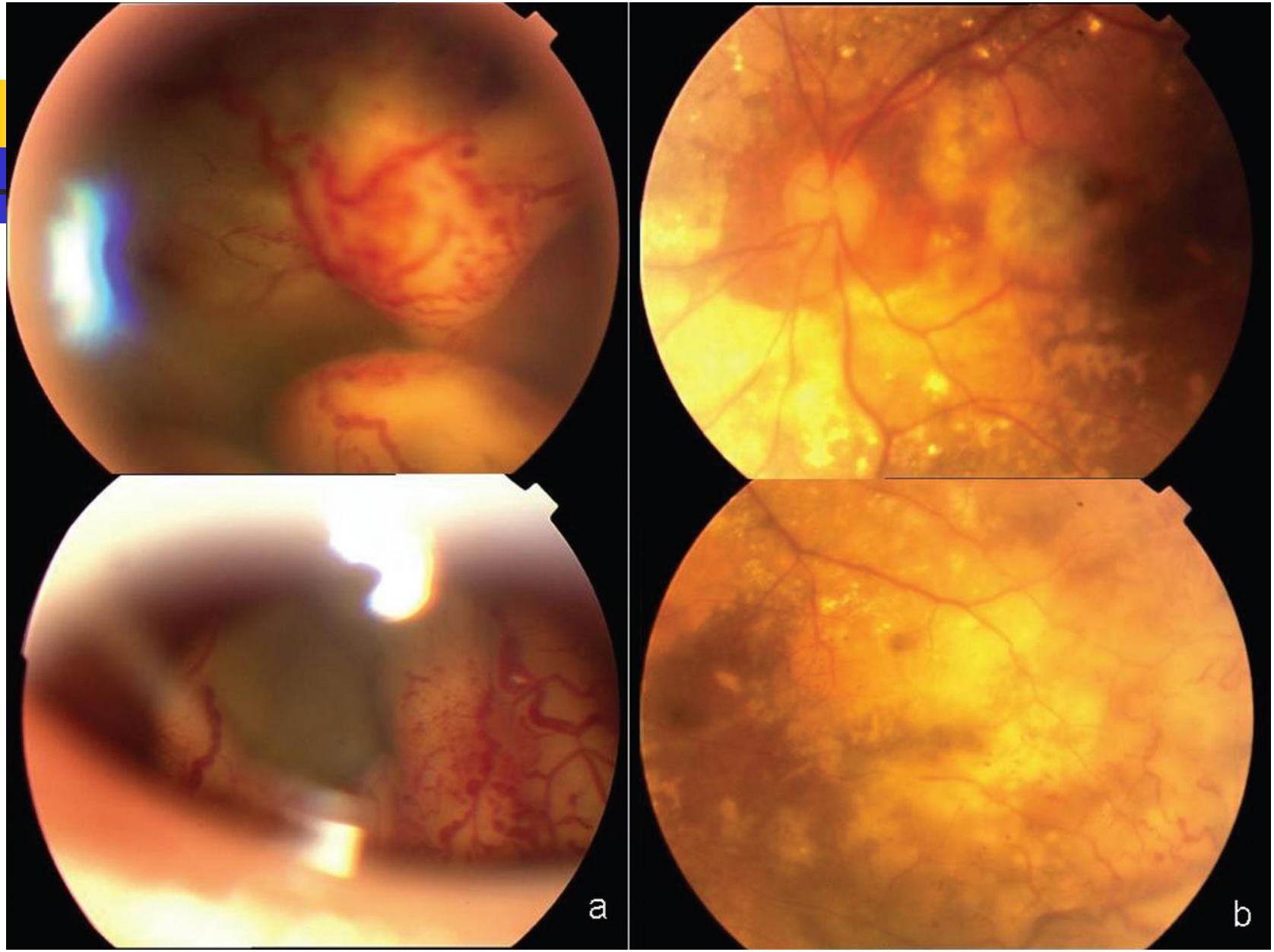
Loss of retinal red reflex










a
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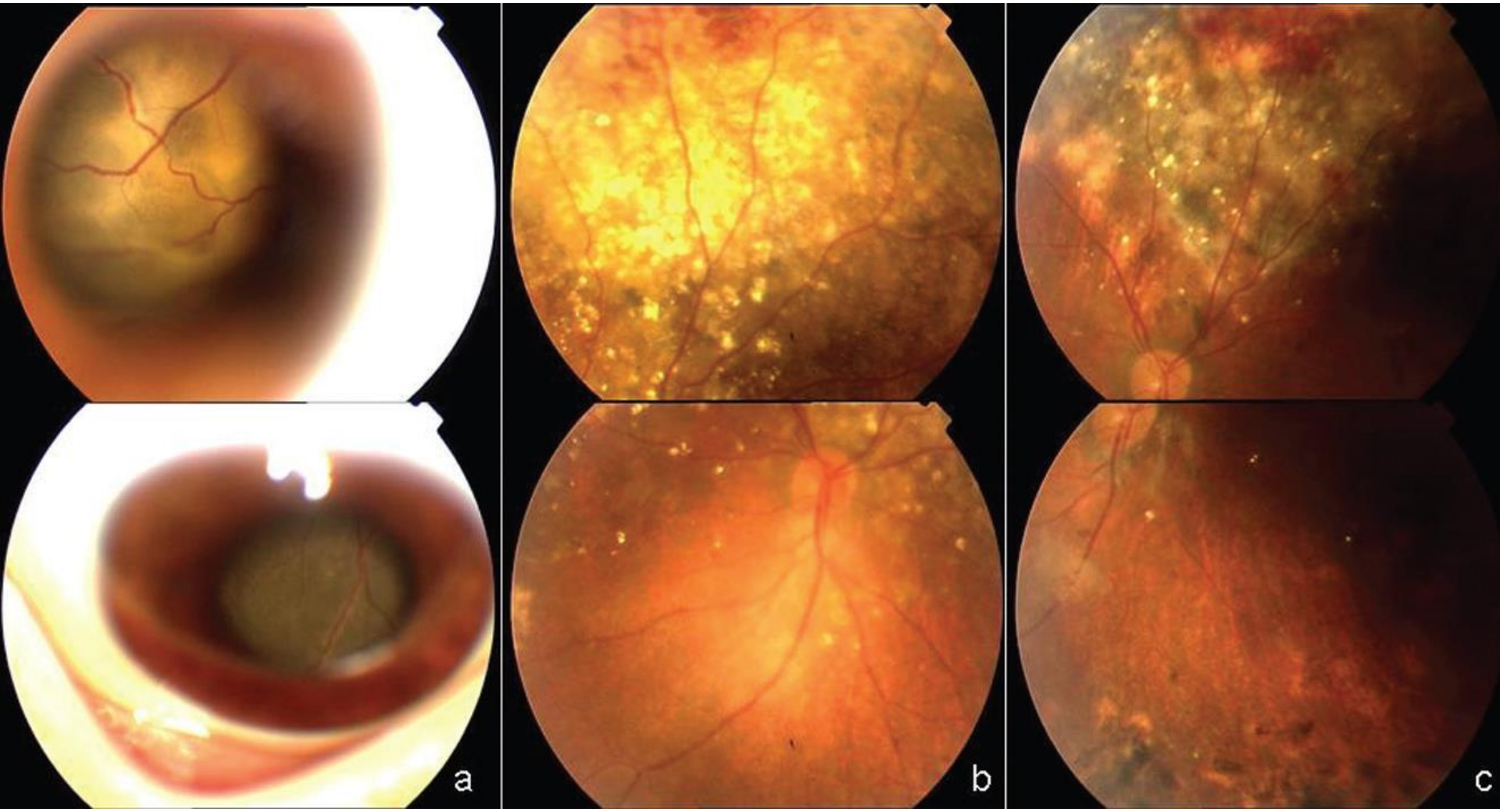

a
b
c

NOTICE!

DIFFERANTIATE FROM RETINOBLASTOMA!

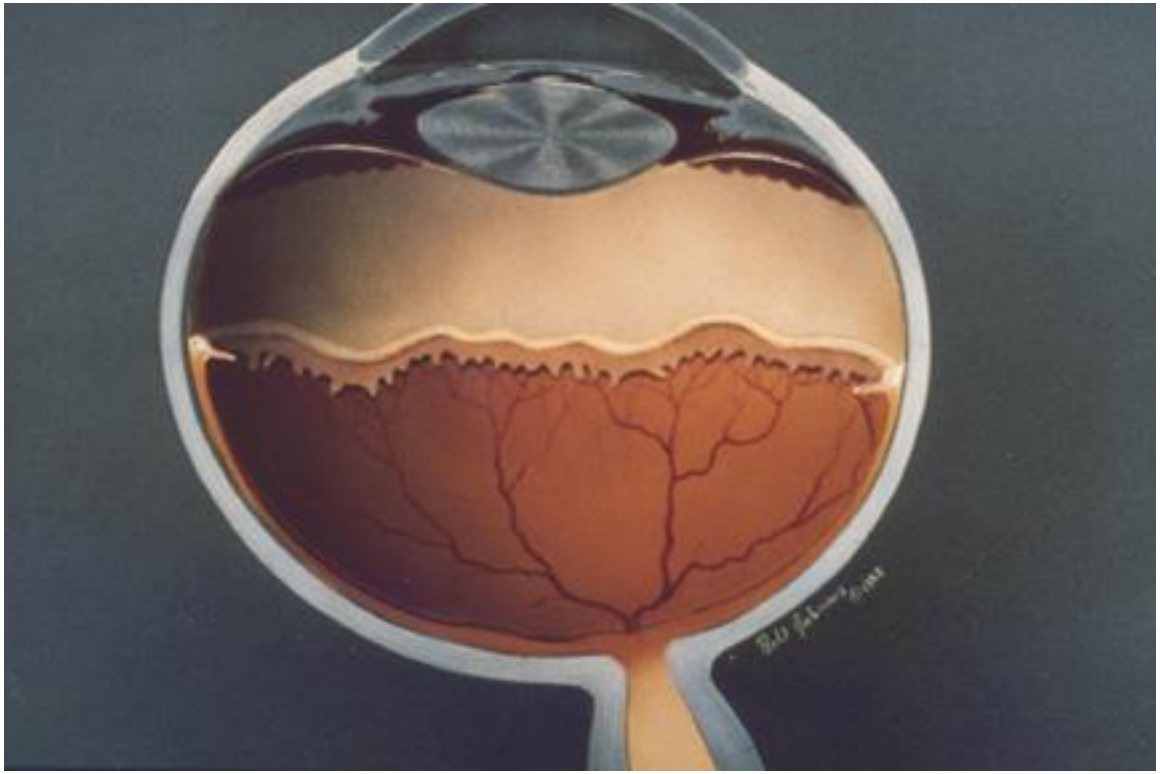
Other DD:

ROP, FEVR

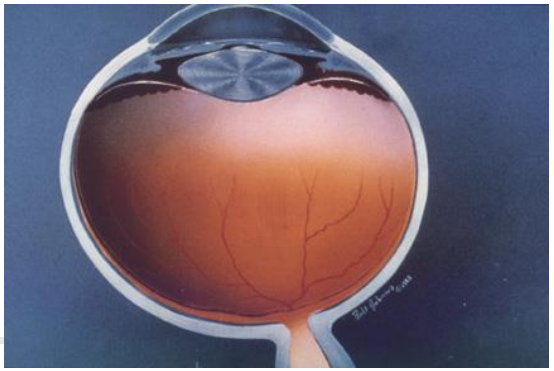
Treatment

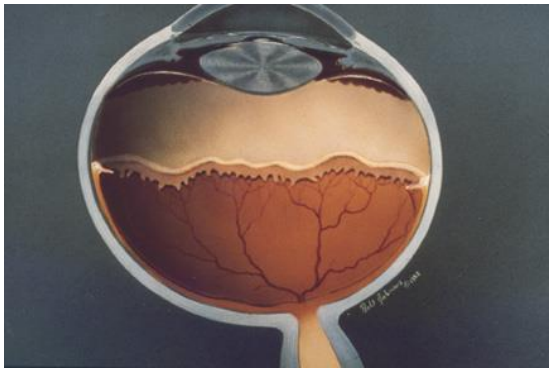
- Laser PC
- Cryotherapy
- IV-Anti-VEGF
- RD: Surgery: VRS
- Enucleation

PREMATURE RETINOPATHY

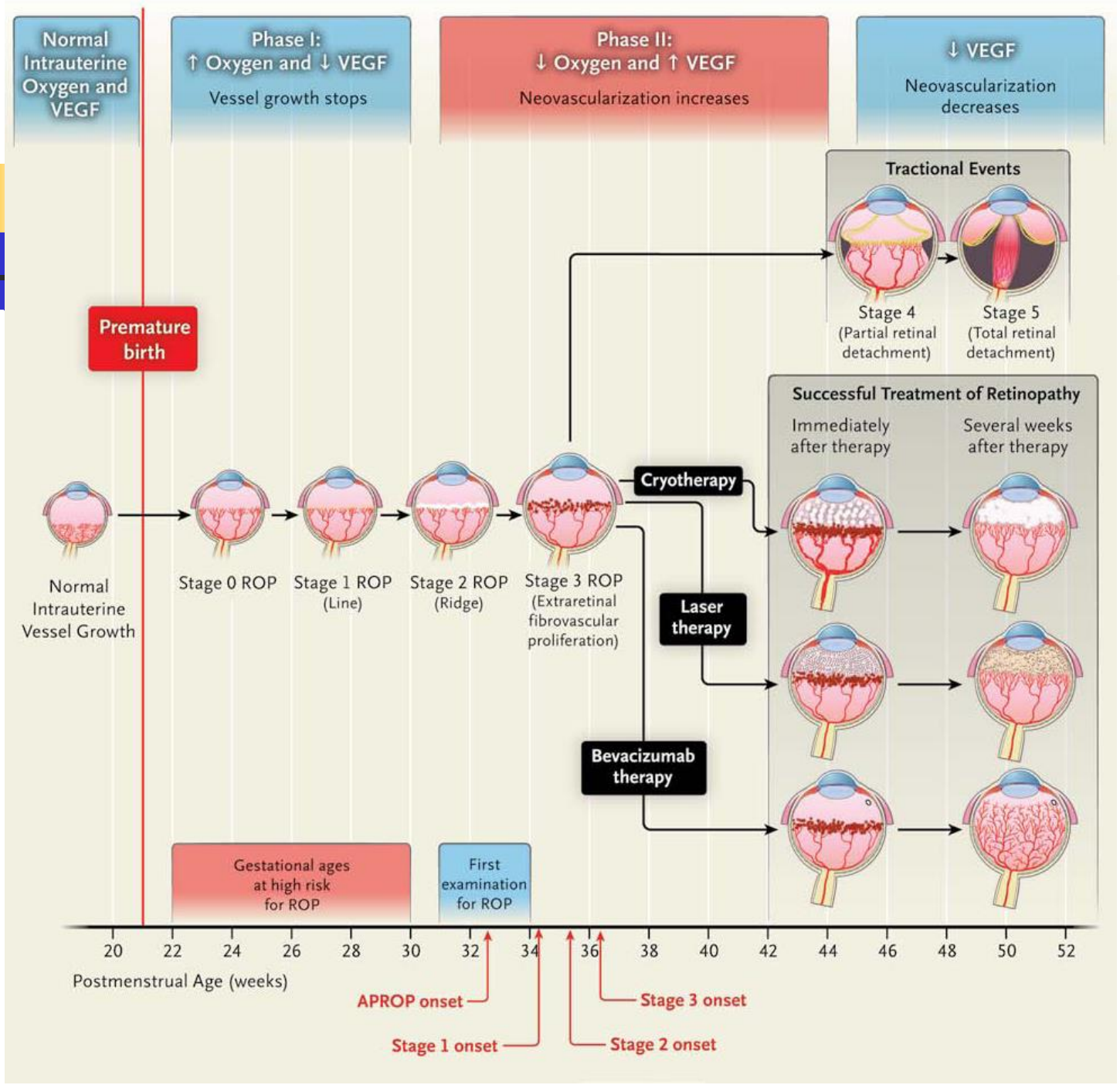


Patogenez

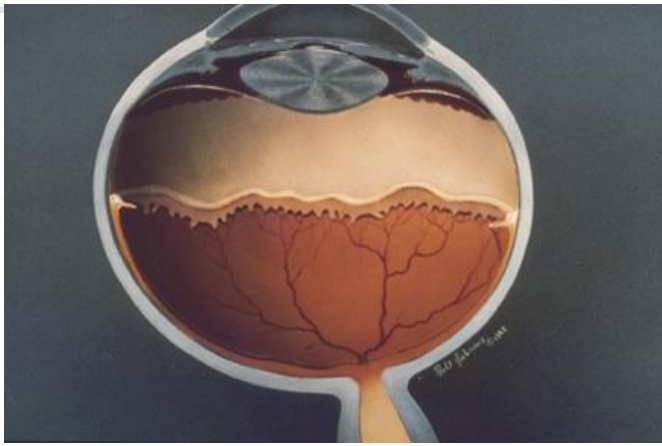




- Normal retinal vaskülerizasyon:
  - Nazal : 36 hf
  - Temporal: 40.hf.
- İntrauterin retinal vaskülerizasyon:
  rölatif hipoksik ortam
- Prematürite: avasküler retina...
- O2 ted.....VEGF down regülasyonu
- Vaskülerizasyon duraklar.... Avasküler alandan VEGF.... VEGF up regülasyonu… ROP


Normal Intrauterine Oxygen and VEGF
Phase I: ↑ Oxygen and ↓ VEGF
Vessel growth stops
Phase II: ↓ Oxygen and ↑ VEGF
Neovascularization increases
↓ VEGF
Neovascularization decreases
Tractional Events
Stage 4 (Partial retinal detachment)
Stage 5 (Total retinal detachment)
Premature birth
Successful Treatment of Retinopathy
Immediately after therapy
Several weeks after therapy
Cryotherapy
Laser therapy
Bevacizumab therapy
Normal Intrauterine Vessel Growth
Stage 0 ROP
Stage 1 ROP (Line)
Stage 2 ROP (Ridge)
Stage 3 ROP (Extraretinal fibrovascular proliferation)
Gestational ages at high risk for ROP
First examination for ROP
20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Postmenstrual Age (weeks)
APROP onset
Stage 1 onset
Stage 2 onset
Stage 3 onset

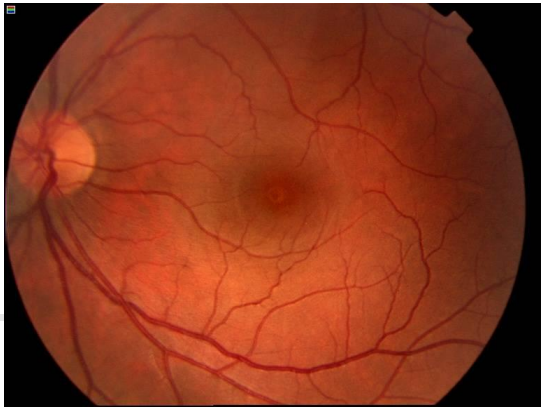
Uluslararası ROP sınıflandırması (ICROP)

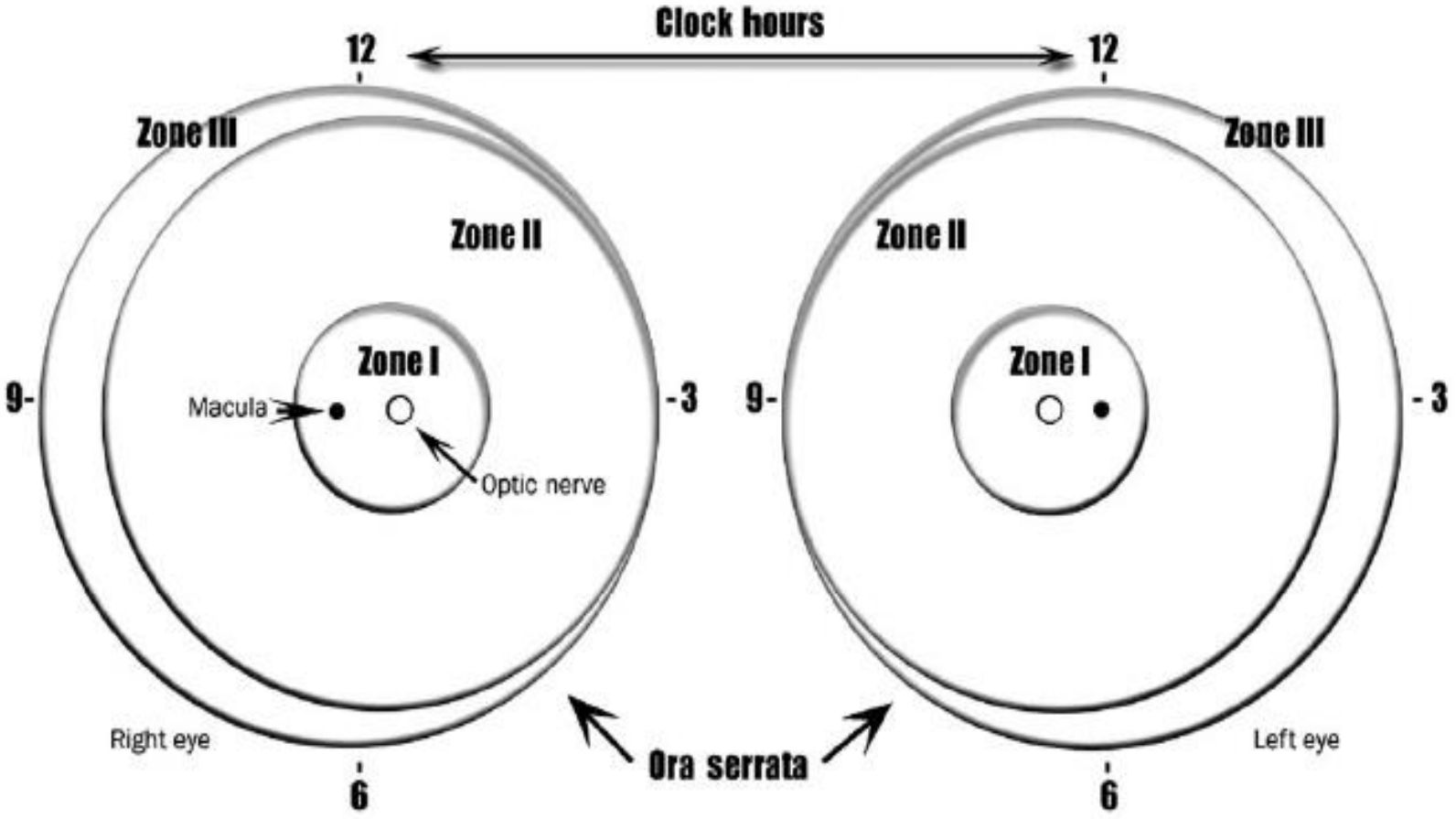


- Parametreler

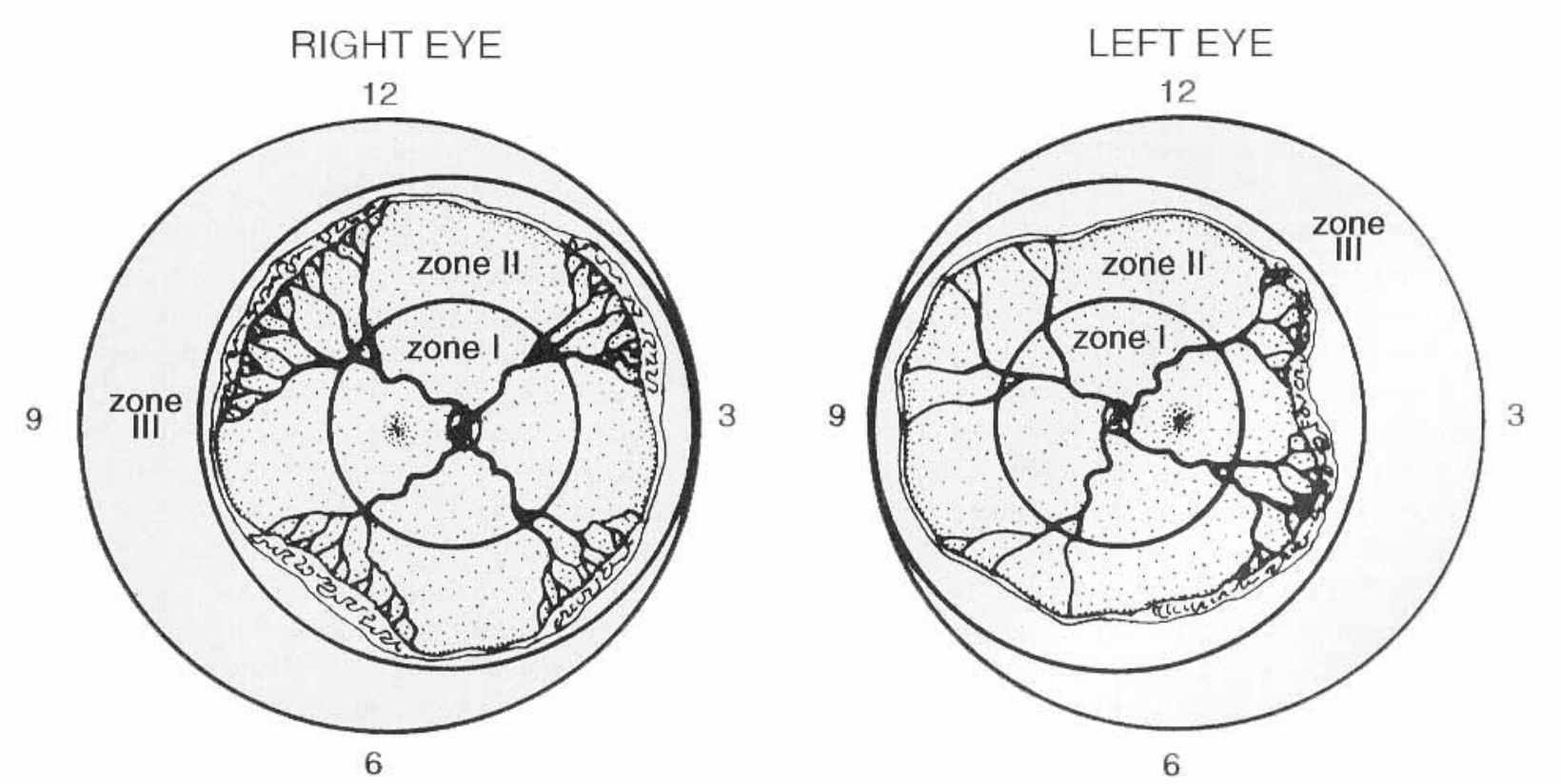
1. Zon (1,2,3)
2. Evre (1-5)
3. Yaygınlık (saat kadranı)
4. “Artı hastalık” varlığı

ICROP

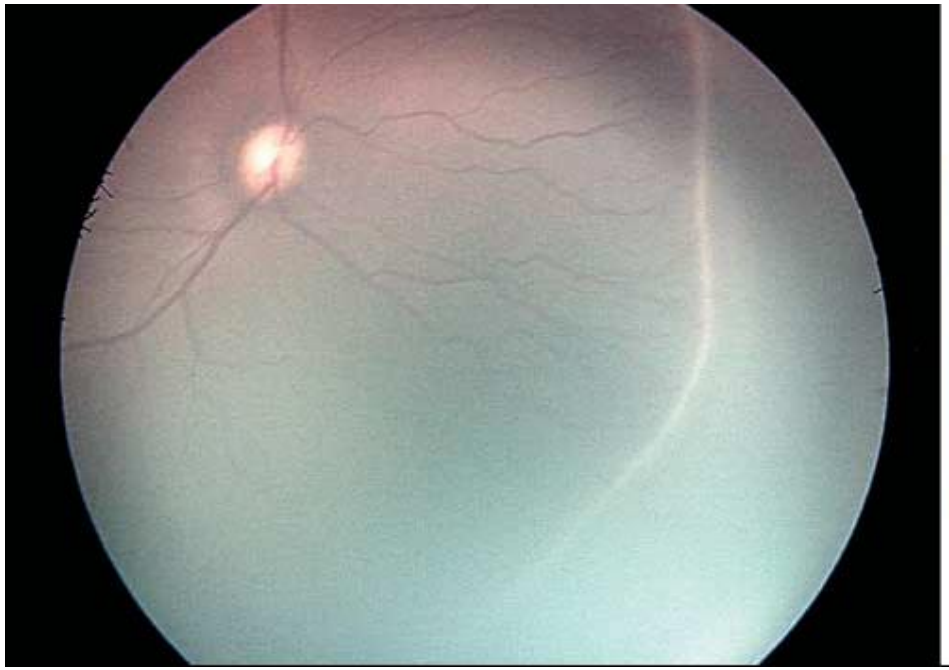


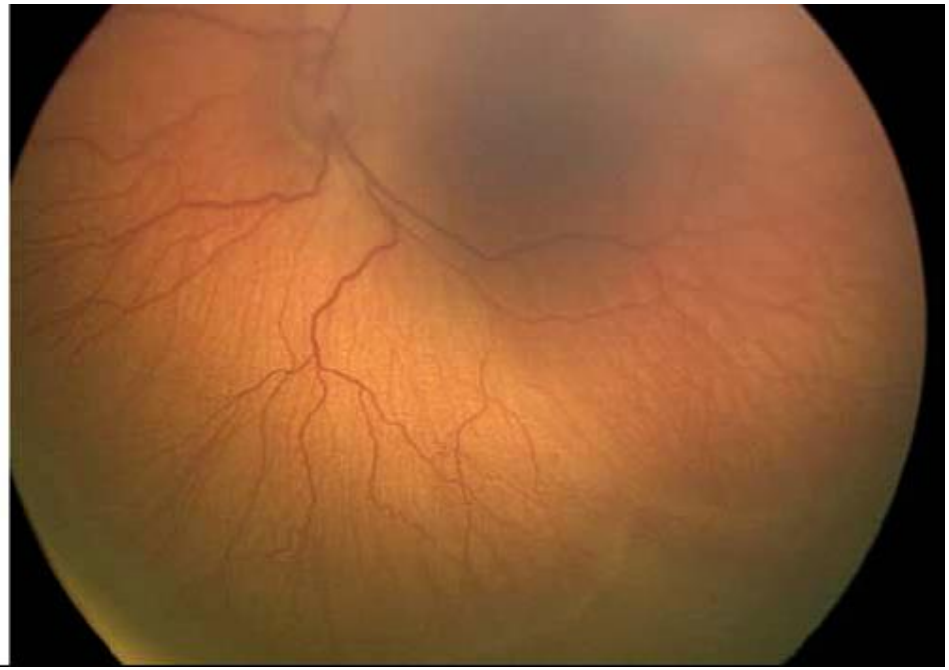

Clock hours
12
12
Zone III
Zone III
Zone II
Zone II
Zone I
Zone I
9-
-3
9-
-3
Macula
Optic nerve
Right eye
Left eye
Ora serrata
6
6

Hastalığın yaygınlığı

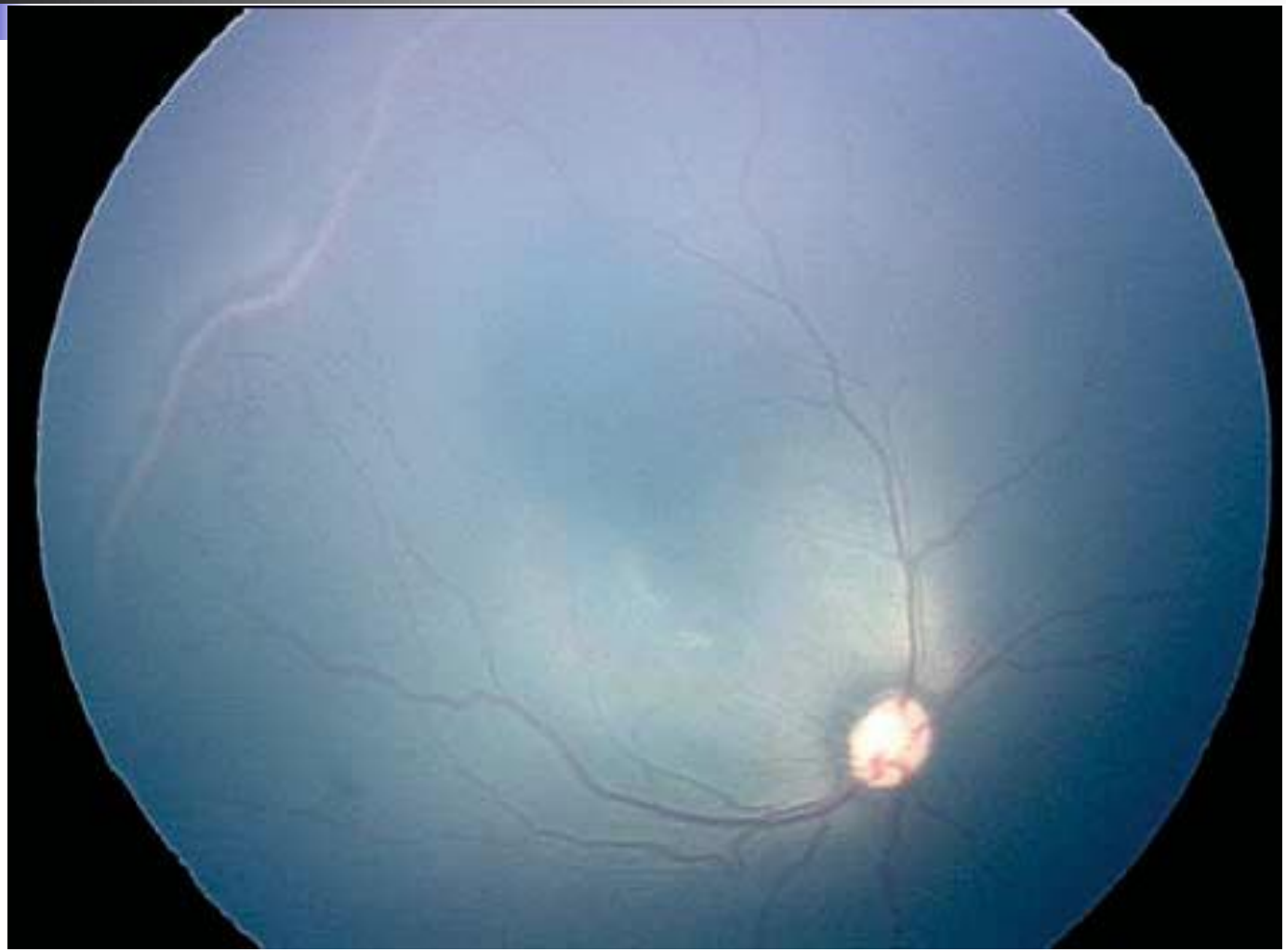


Evre 1: Demarkasyon hattı

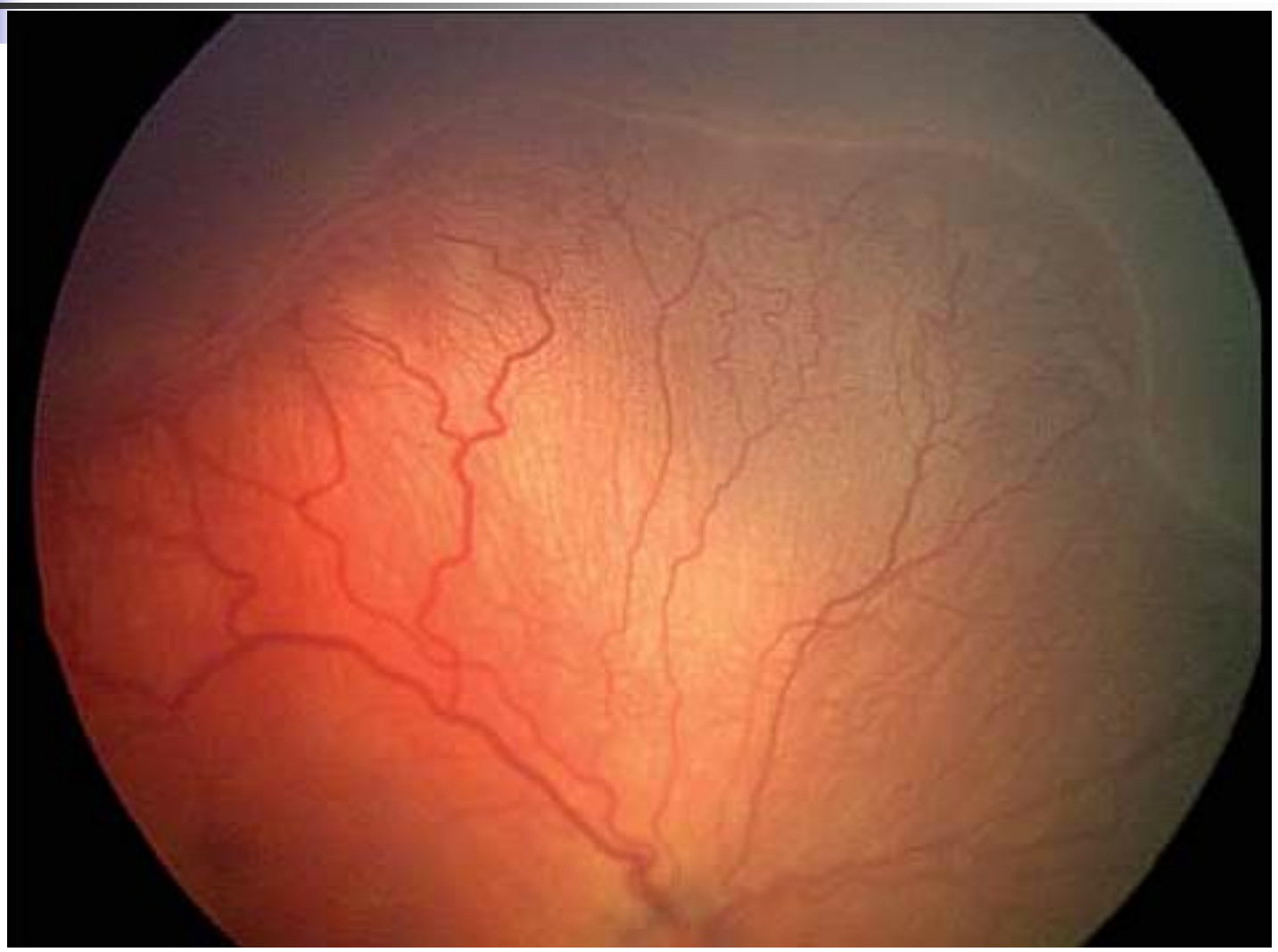


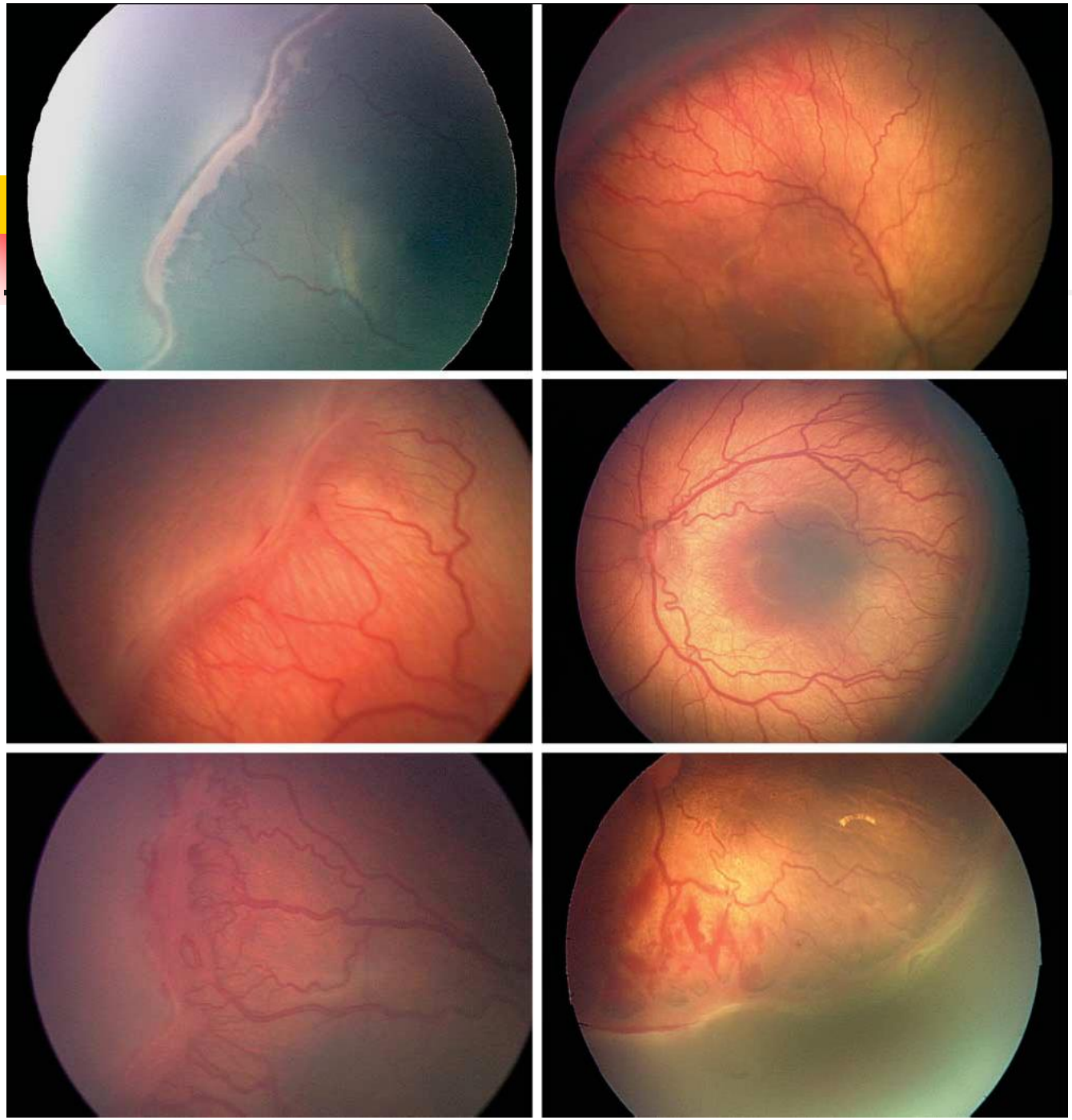


Evre 2



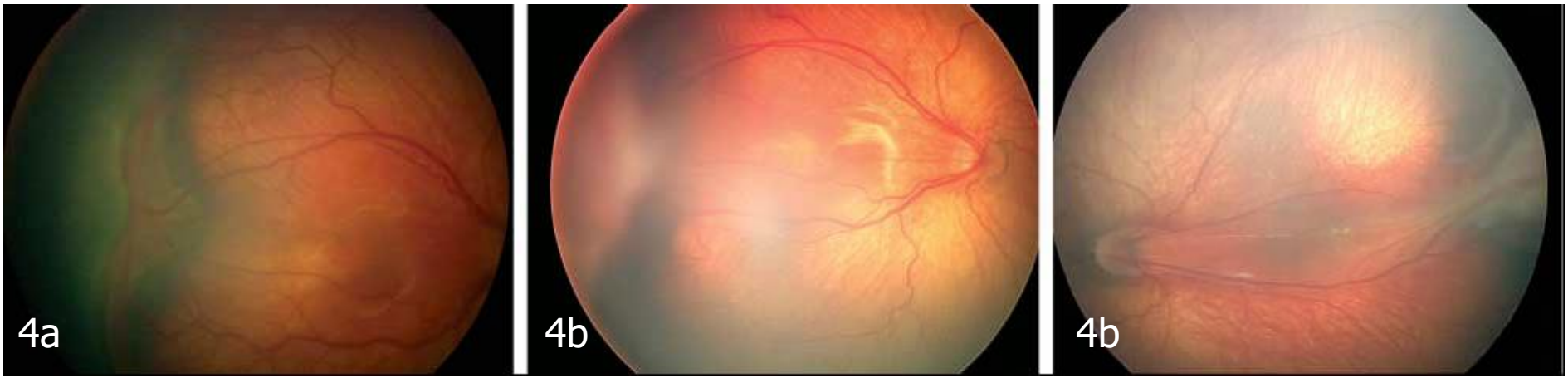
Evre 2-3



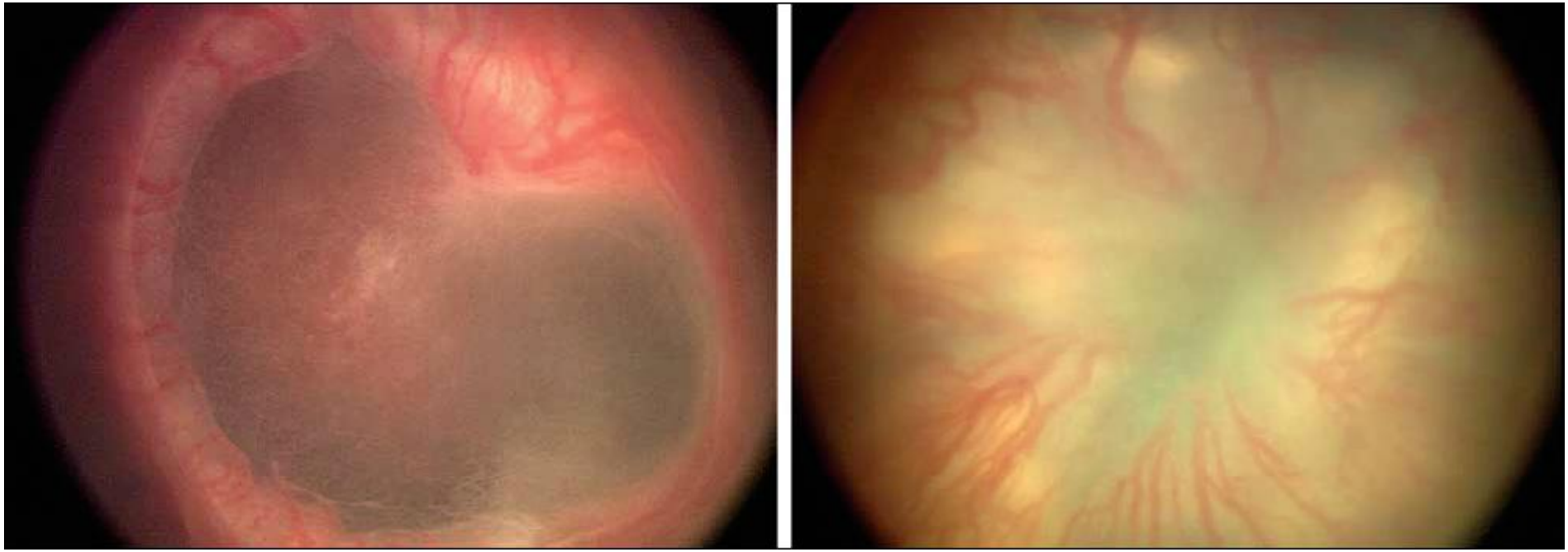


Evre III ROP Hafif-Orta-Şiddetli

Evre 4

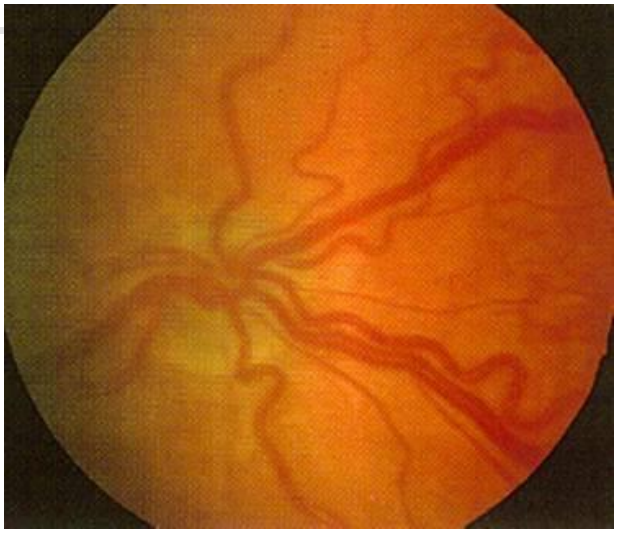


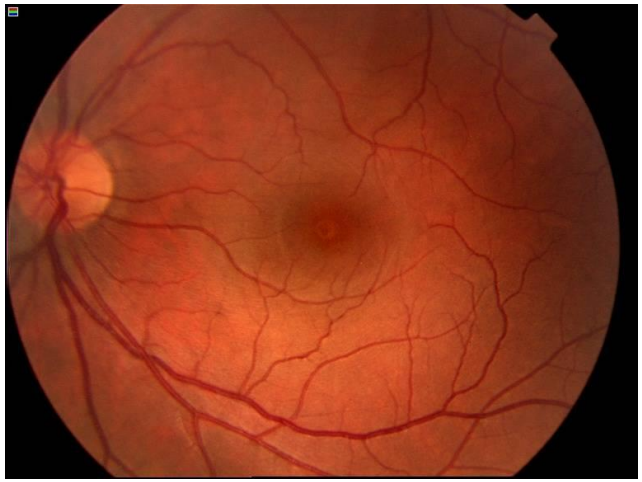
Evre 5



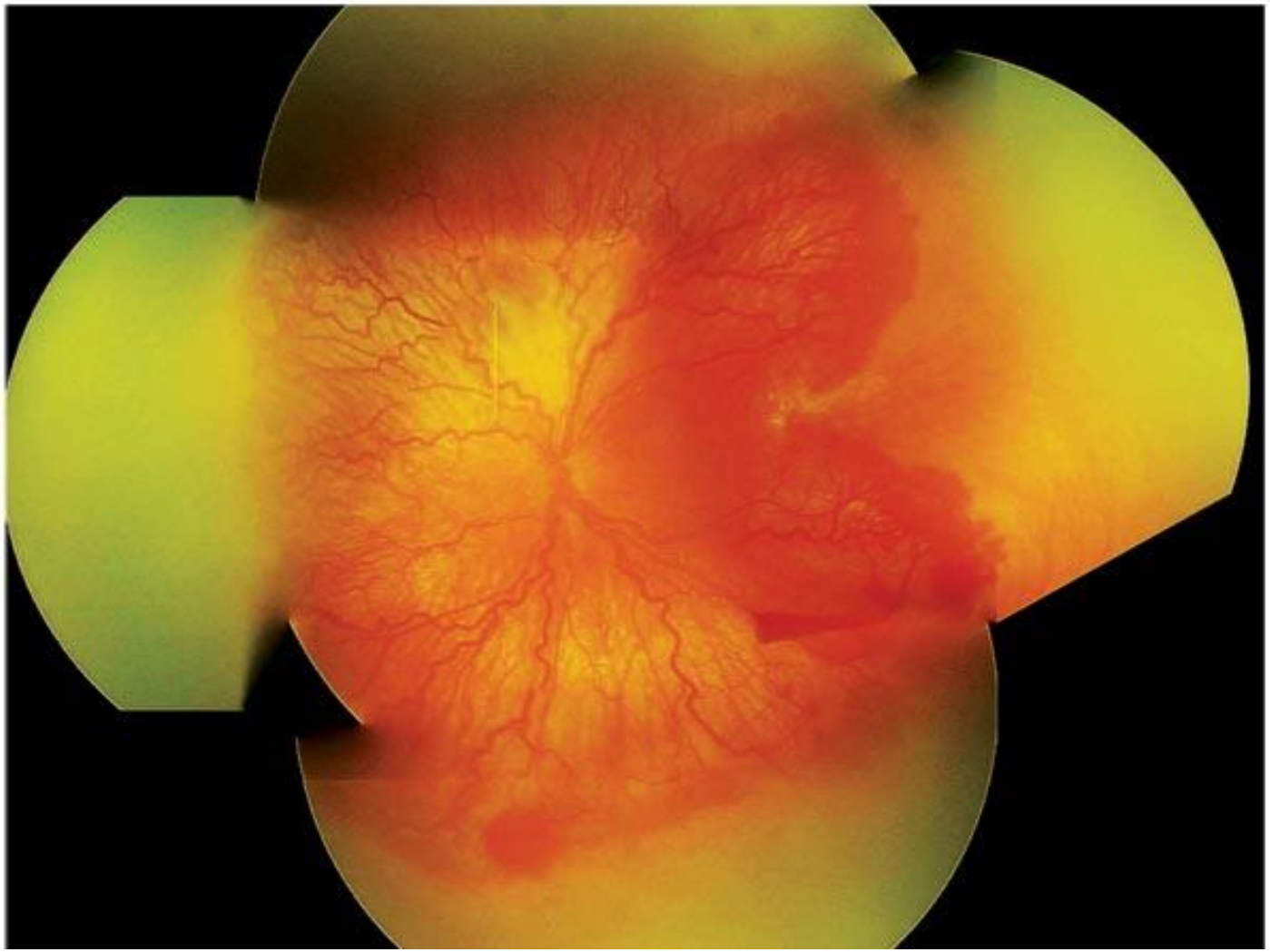
Artı (plus) hastalık

- Arka kutupta retinal vasküler dilatasyon ve tortuosite artışı
- Aktif progresyon belirtisi
- Çok hızlı ilerleme!....





Zon 1, Artı hastalık (APROP)

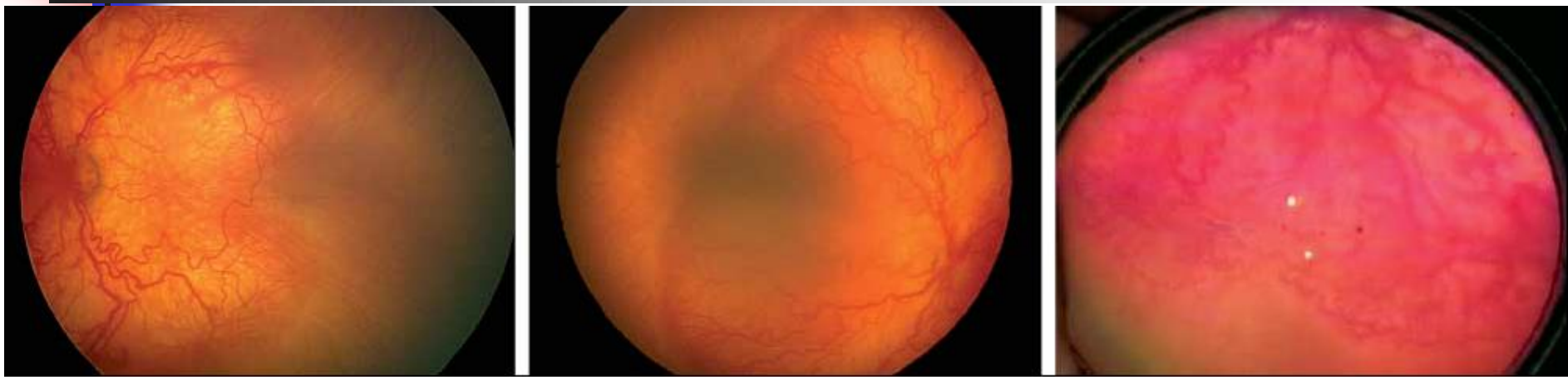


Tedavi endikasyonu (ICROP-revisited-2005)

- zon I ROP: artı hastalık
  - (evre, yaygınlık önemsiz)
- zon I ROP: evre 3 / artı hastalık (-)
- zon II: evre 2 veya 3 / artı hastalık

International Committee for the Classification of Retinopathy of Prematurity. The International Classification of Retinopathy of Prematurity revisited. *Arch Ophthalmol.* 2005;123:991–999

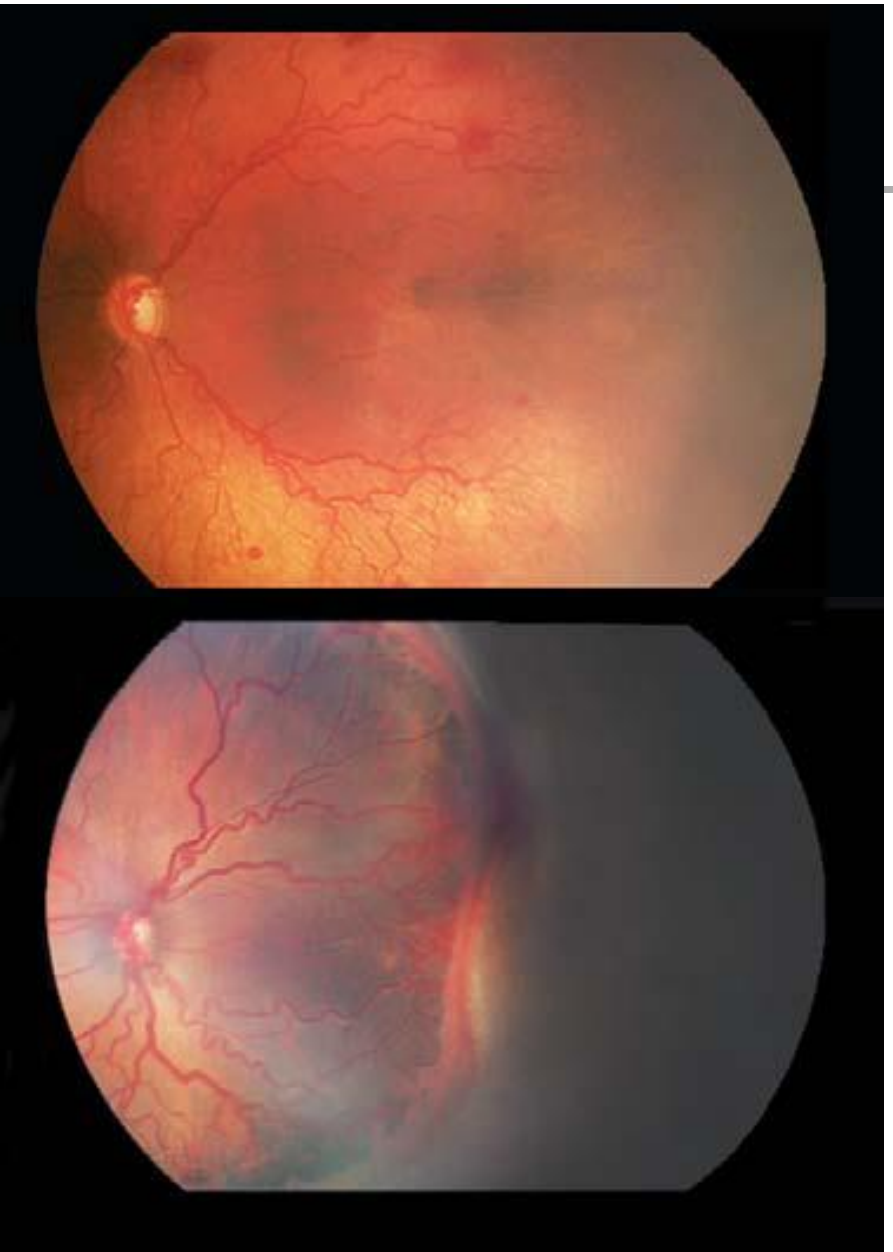
AP-ROP: Aggressive Posterior ROP (AP-ROP): ÇDDAP daha sık

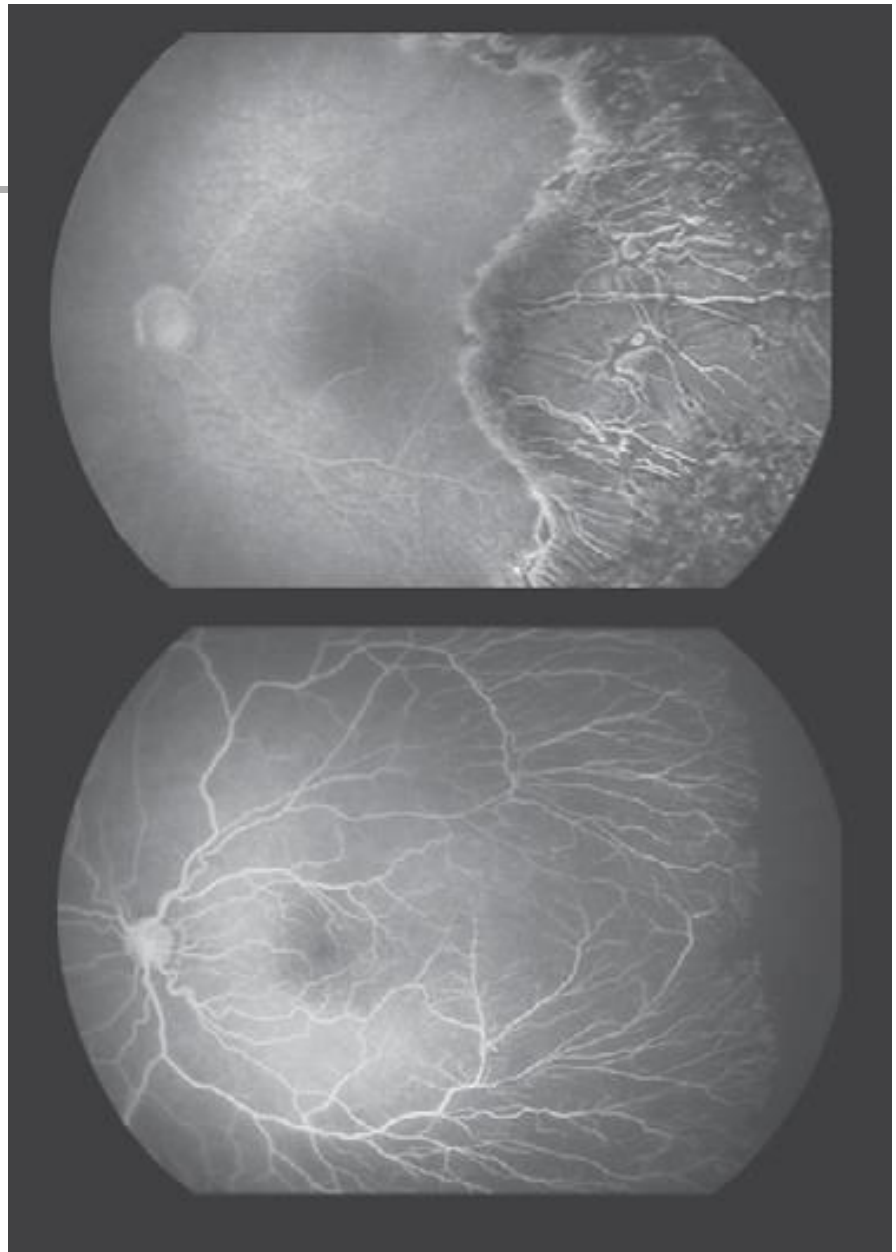


- Posterior yerleşim (Zone 1)
- (+) hastalık
- Evre önemsiz ve sınır genellikle belirsiz

72 saatte tedavi!...

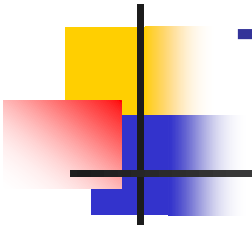
Tedavi öncesi ve sonrası





lazer

Anti-VEGF



TARAMA

Tarama
AAP-AAO (2006 ROP Politikası)

- ≤32hf ve <1500gr: Rutin tarama

- 1500-2000gr
- >32 hf
  - Klinik gidiş stabil değilse
  - Kardiopulmoner destek ihtiyacı (+)

Retina muayenesi

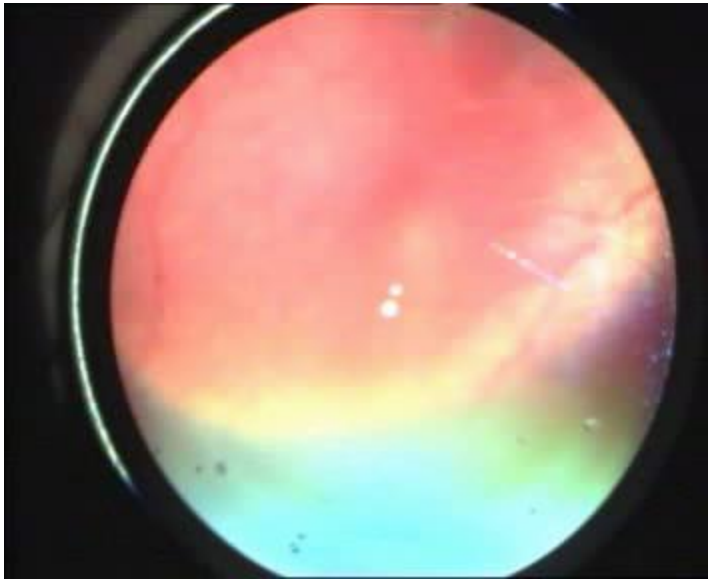
İlk muayene: Optimal zaman

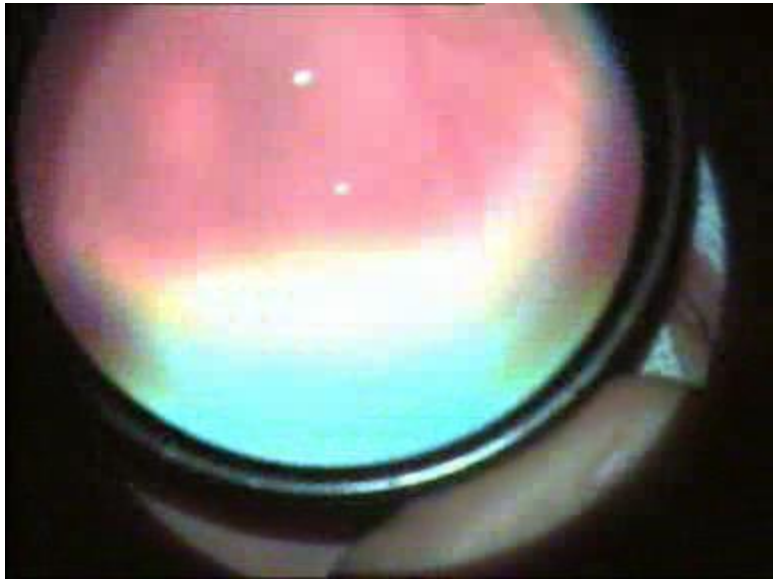
**PP 4. hf veya PM 31. hf (hangisi daha geç ise)

Eşik veya eşik öncesi yüksek risk: 35-37hf

TEDAVİ

Krio - Lazer





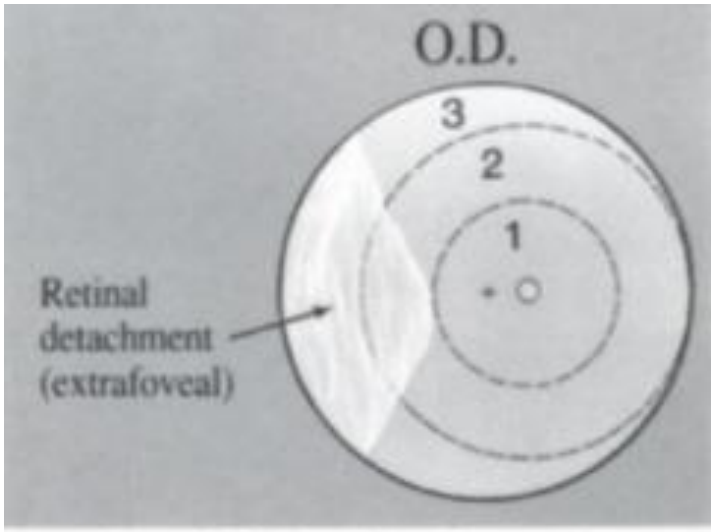

E.T. (108132)
DOB: 6/14/2005
Imaged on: 7/26/2005
Eye: OD
ROP
evre 3 plus

Zon 1 prematürite retinopatisinde tedavi sonuçları ve prognoz

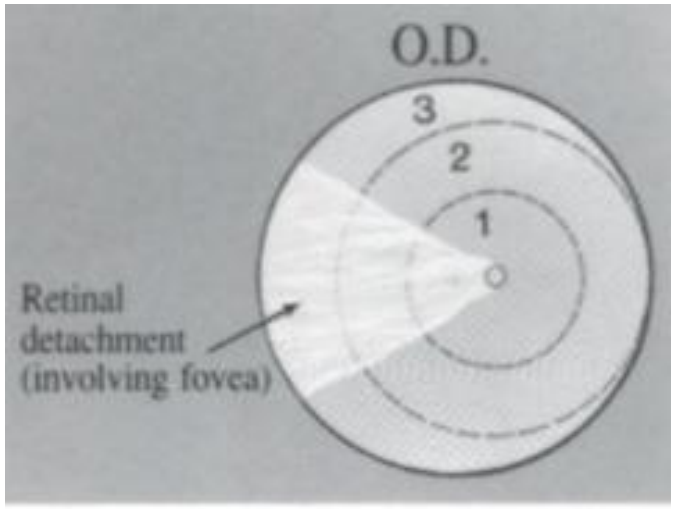
- Lazer tedavisi: Anatomik başarı >%90
- Cerrahi tedavi: Anatomik başarı <%50

- Tök L, Urgancıoğlu B, Özdek Ş, ve ark. Zon 1 prematürite retinopatisinde tedavi sonuçları ve prognoz. MN Oftalmoloji, 2008; 15(2): 101-105.

Evre 4: Subtotal Retina dekolmanı
a) extrafoveal b) foveayı da içine alan RD



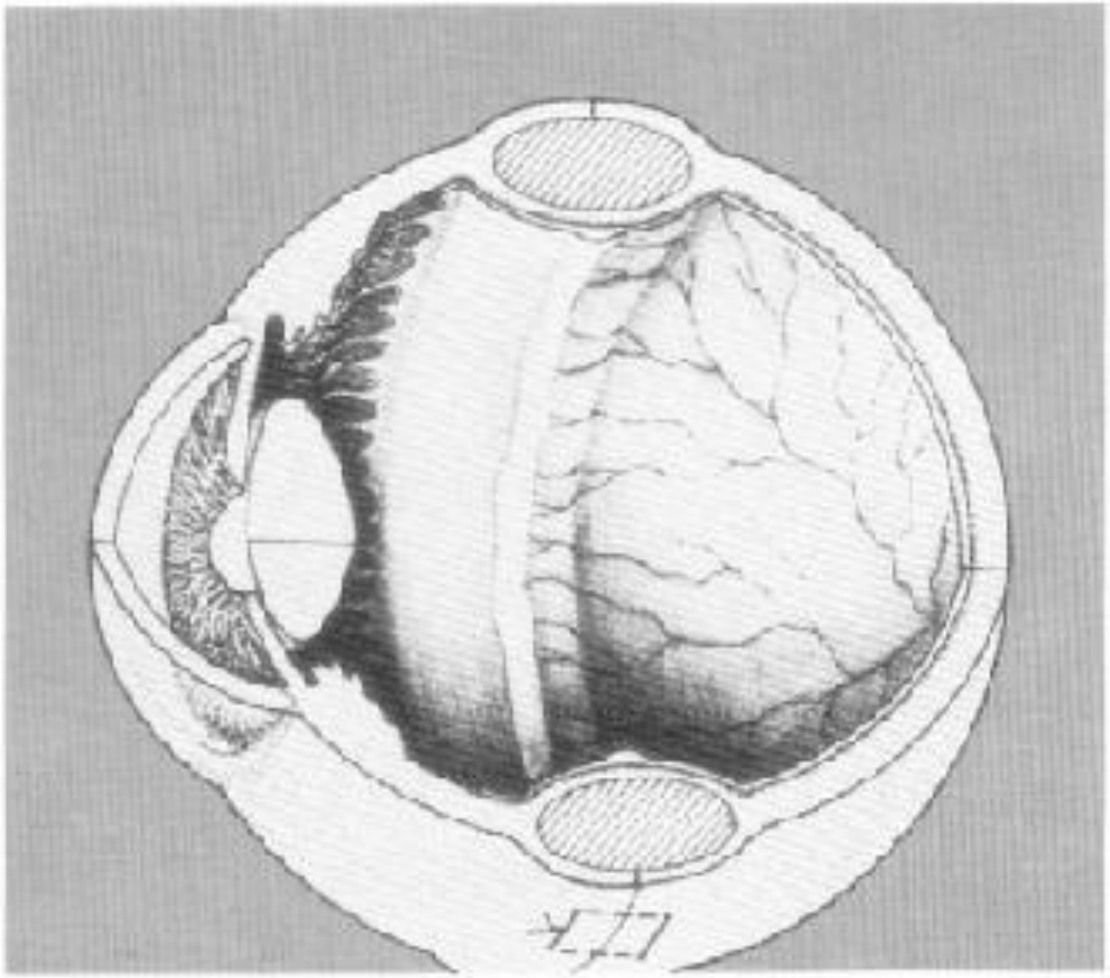
Stage 4A Retinopathy of Prematurity



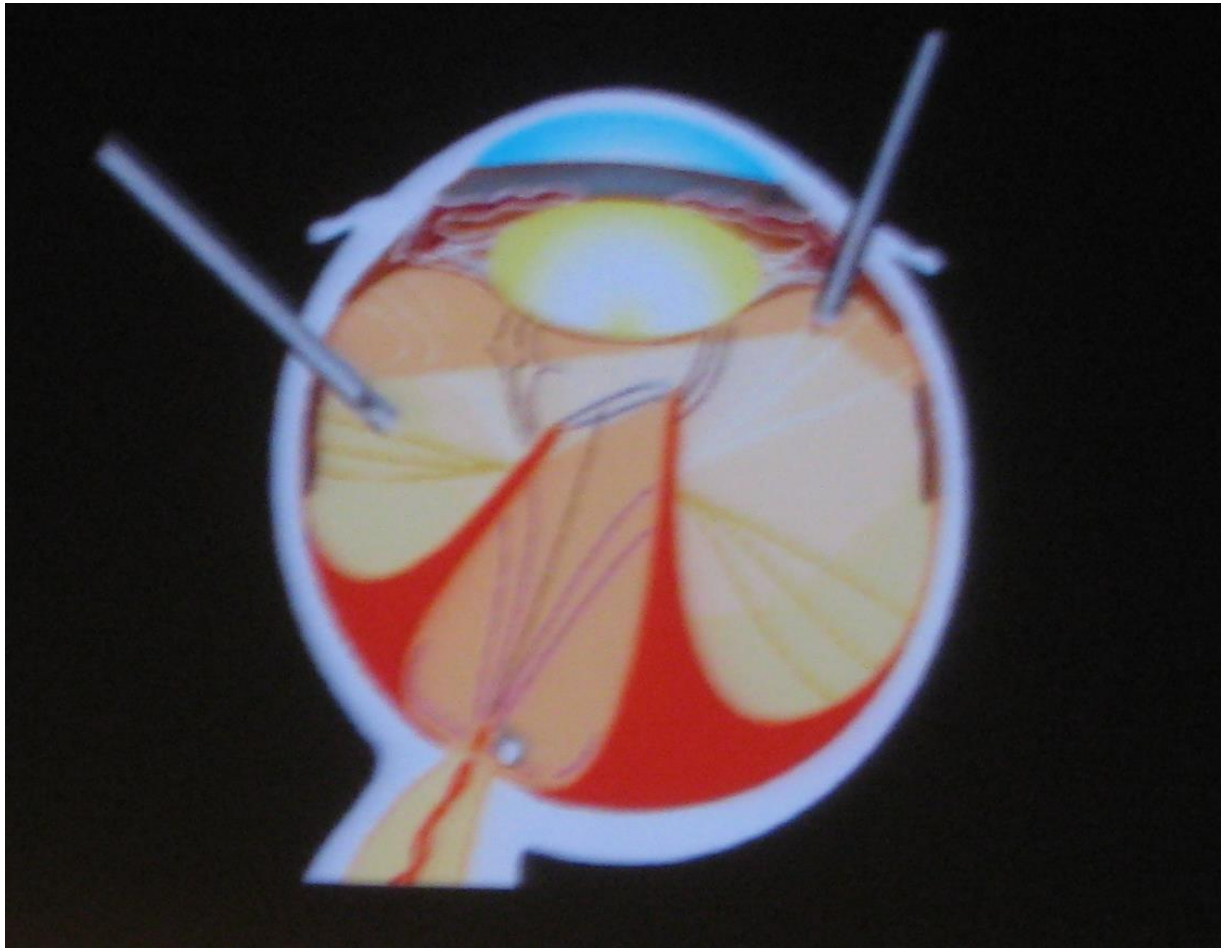
Stage 4B Retinopathy of Prematurity

TEDAVİ: CERRAHİ

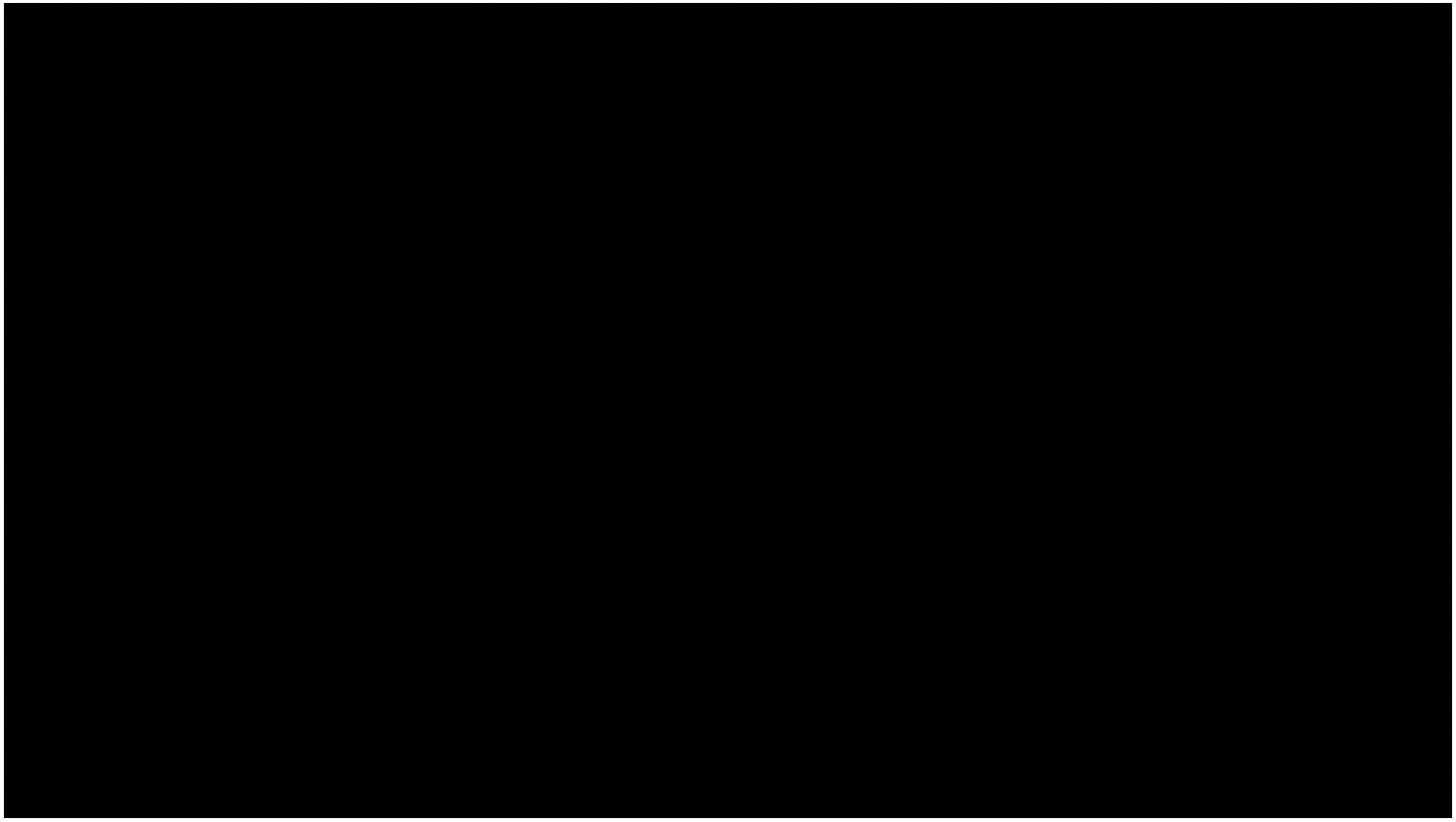
Çevresel Skleral Çökertme



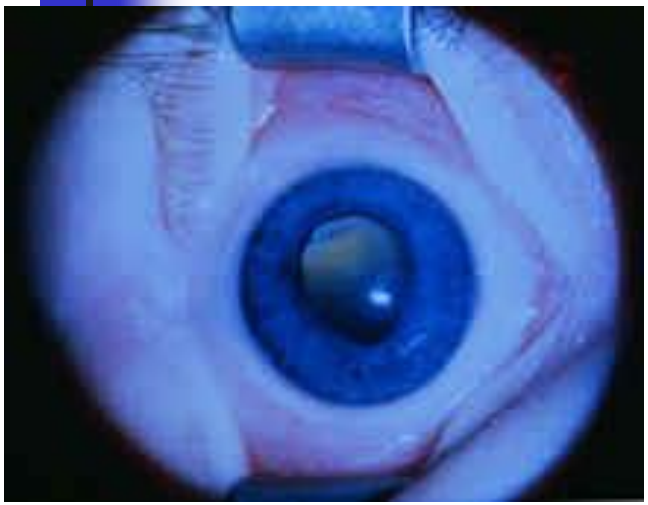
Vitrektomi

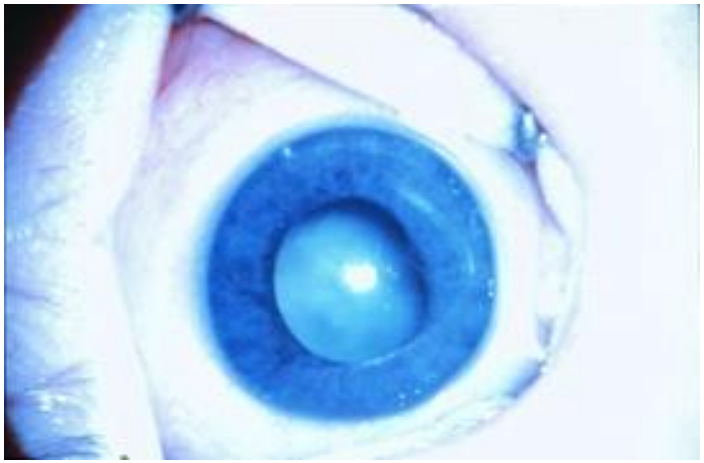


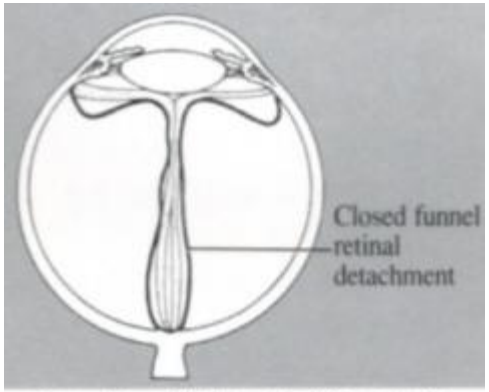
Lens koruyucu vitrektomi



Evre 5: Total retina dekolmanı: Lökokori







Severe Stage 5 Retinopathy of Prematurity

Yeni tedaviler

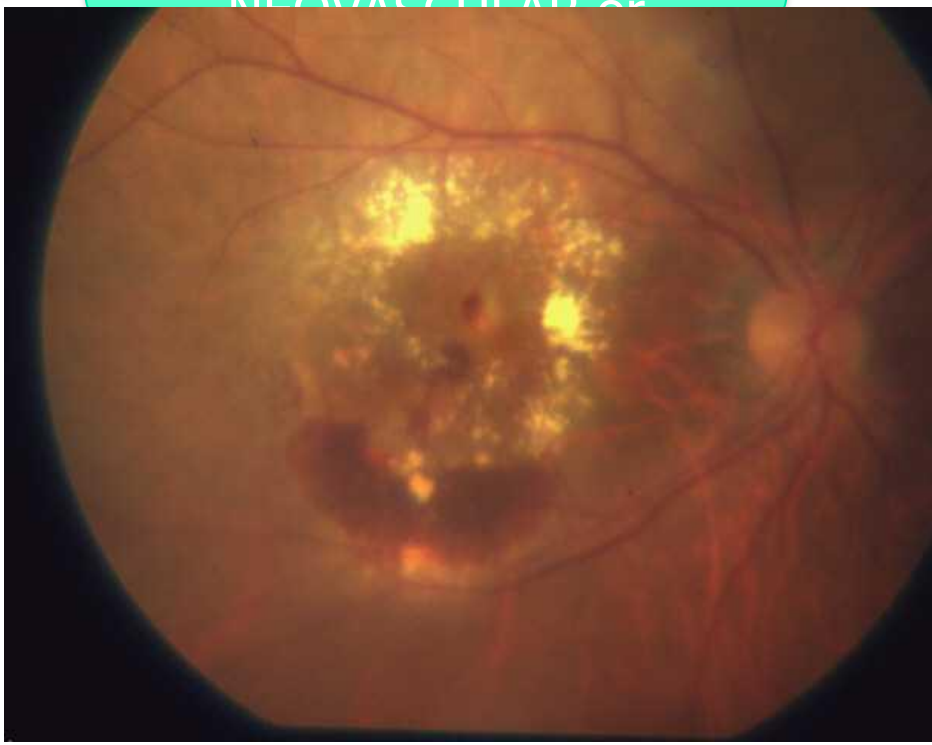
- Anti VEGF ajanlar (intravitreal)
  - Bevacizumab (Avastin/Altuzan)
  - Ranibizumab? (Lucentis)

AGE RELATED MACULAR DEGENERATION

ARMD

DRY

WET



EARLY VS ADVANCED DISEASE

Risk Factors

- Age >55y
- Genetic predisposition: Family history
- Cigarettes smoking
- HT

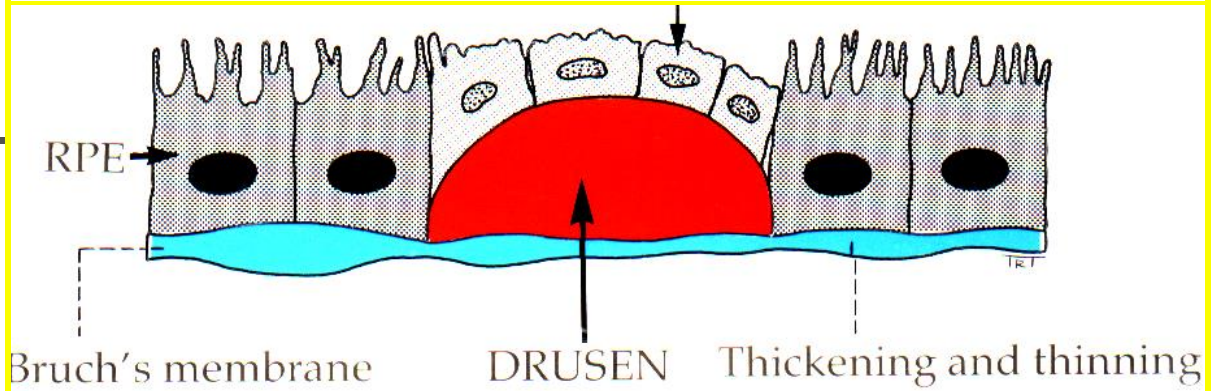
Signs&Symptoms

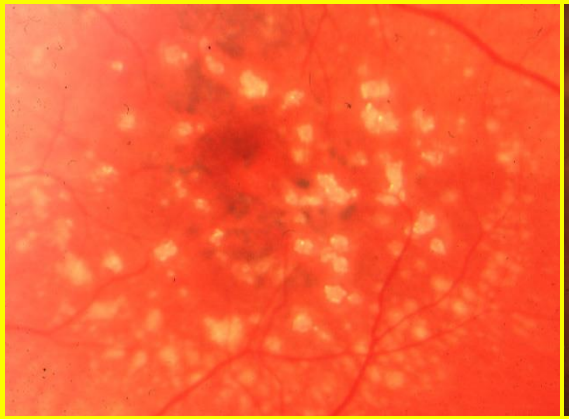
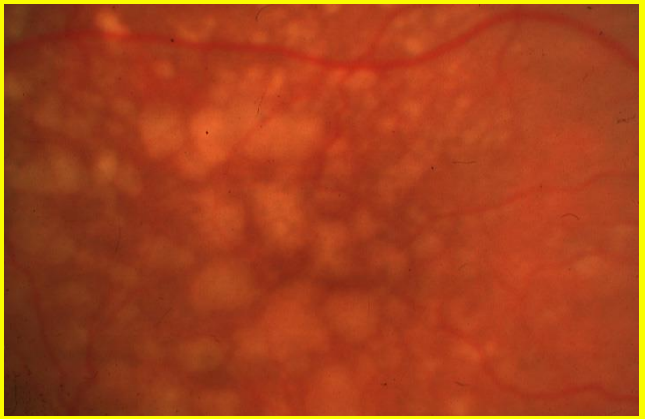
- Metamorphopsia
- Central scotoma
- Visual loss

- FUNDUS: Drusen, RPE atrophy

Drusen

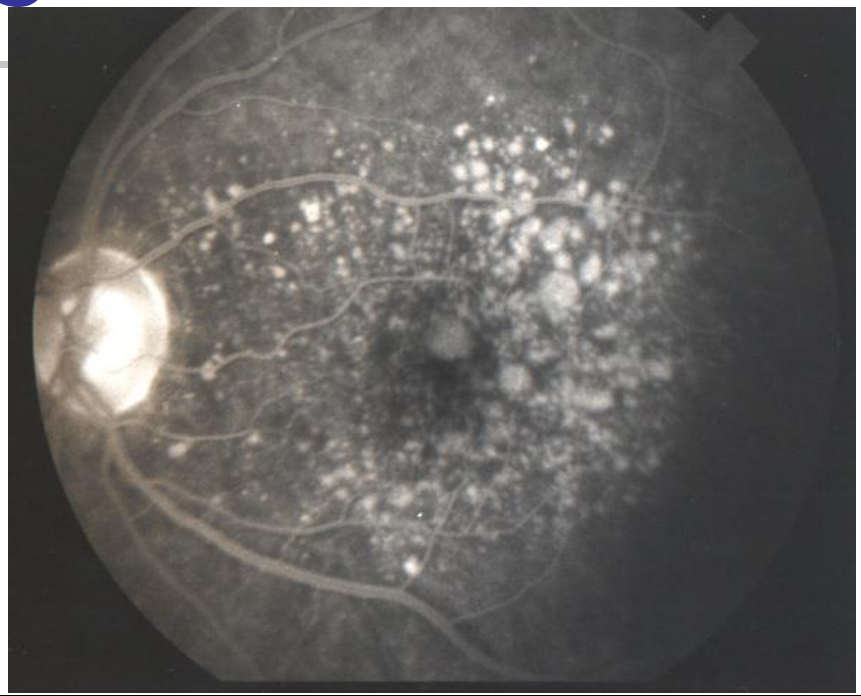
Histopathology

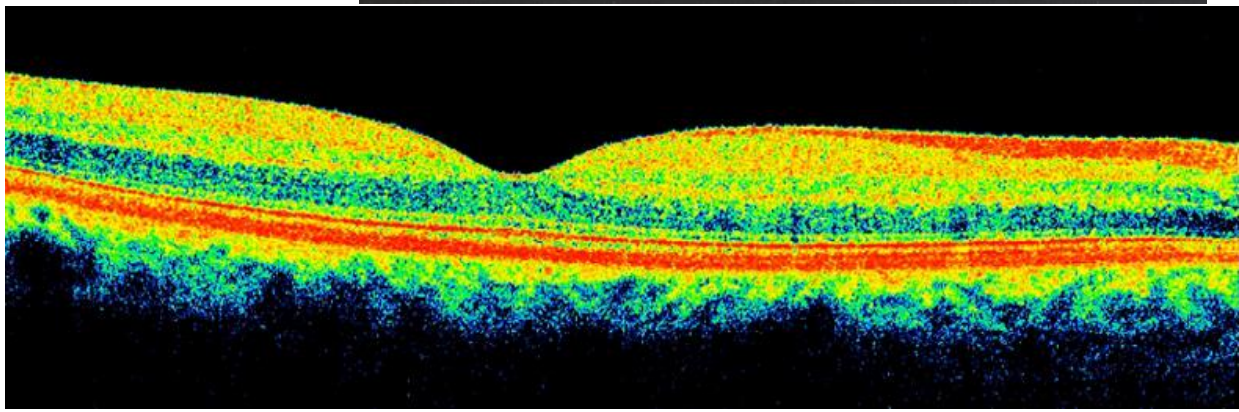


Hard	Soft
	
• Small well-defined spots • Usually innocuous	• Larger, ill-defined spots • May enlarge and coalesce • Increased risk of AMD

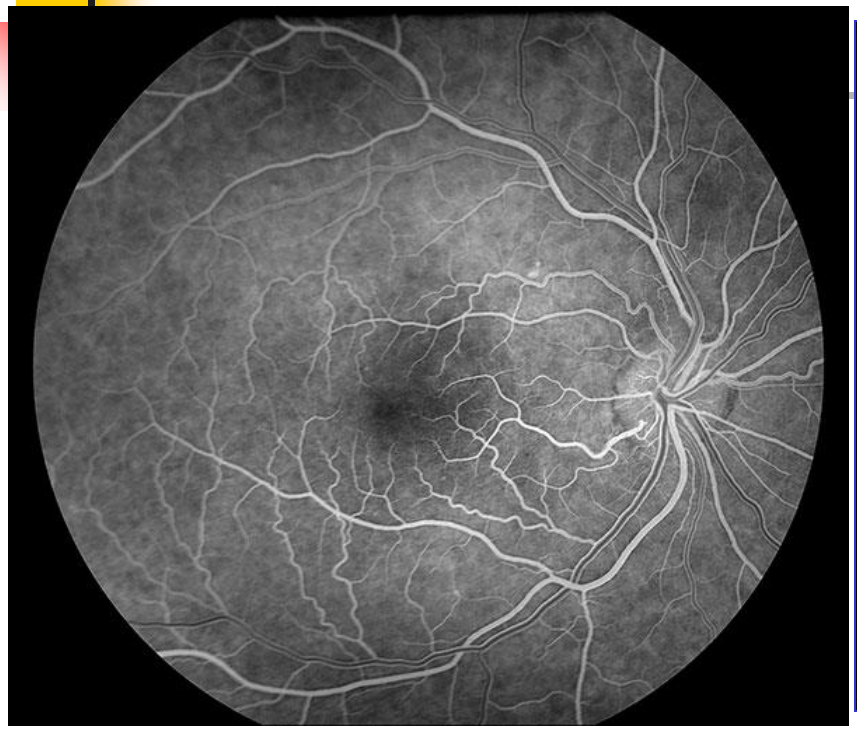
Diagnostic tests

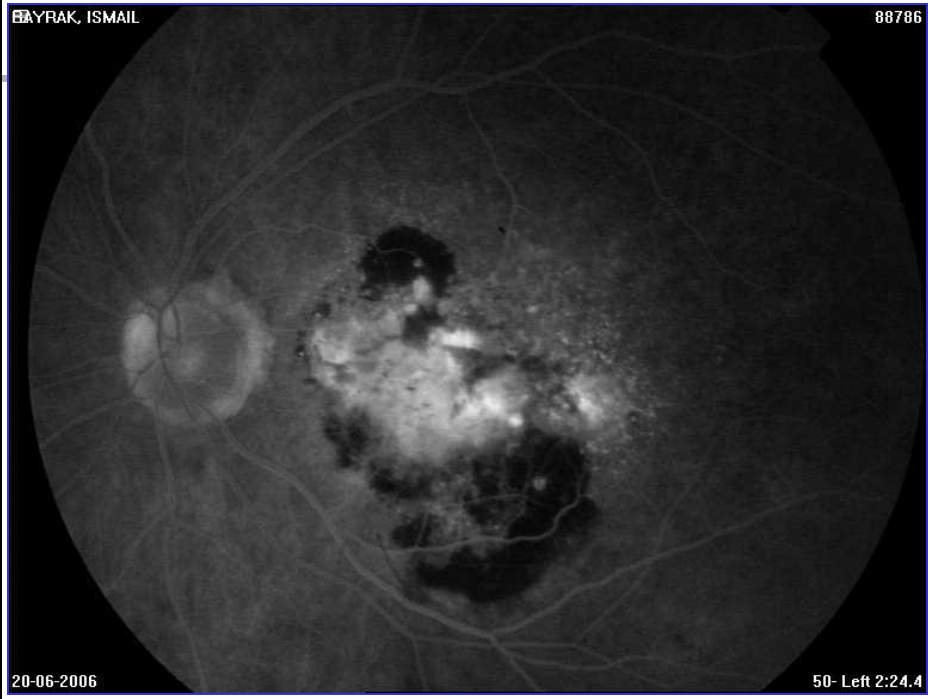
- Fundus Fluorescein Angiography (FFA)
- Optic Coherence Tomography (OCT)



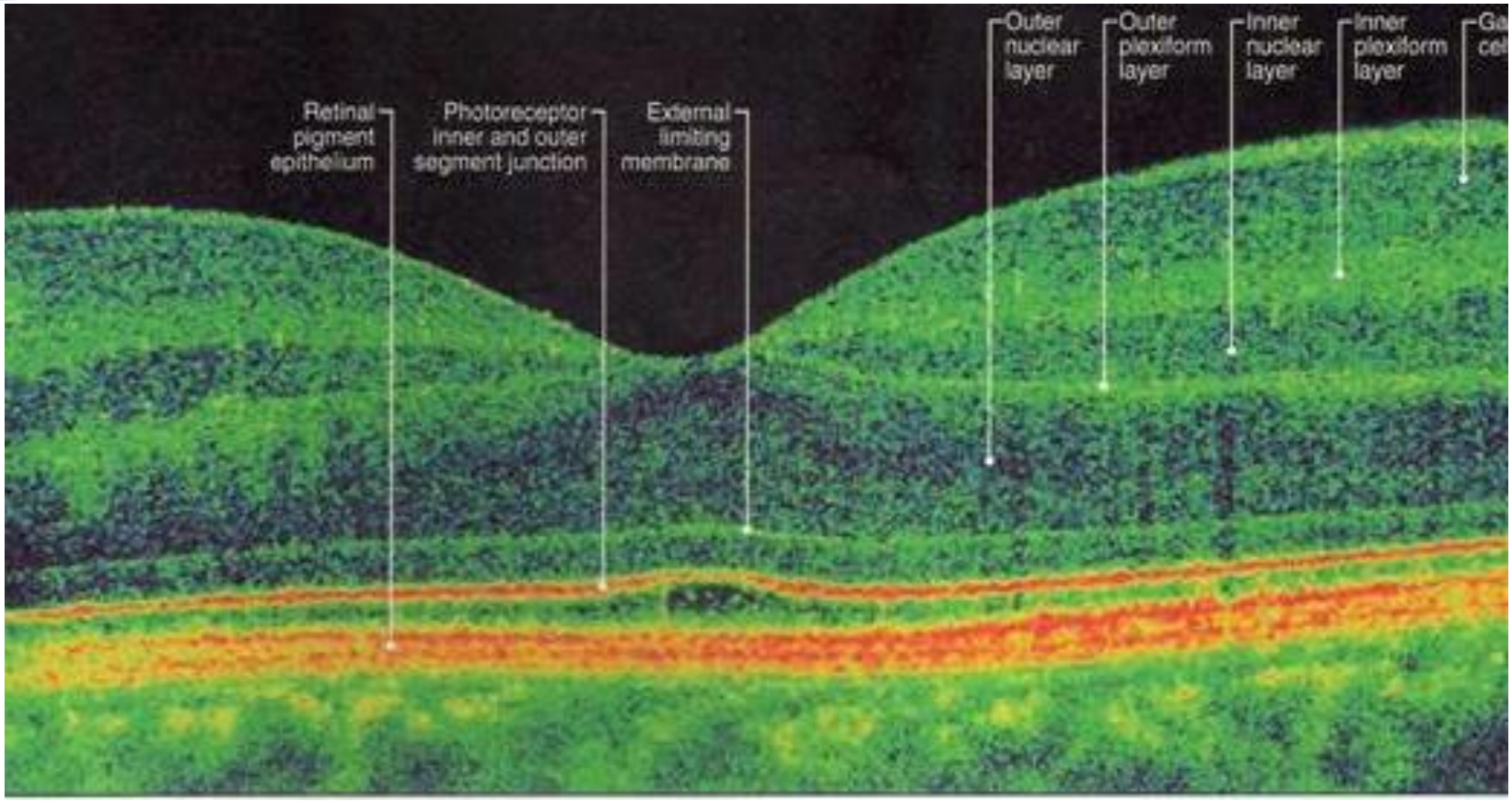


FFA

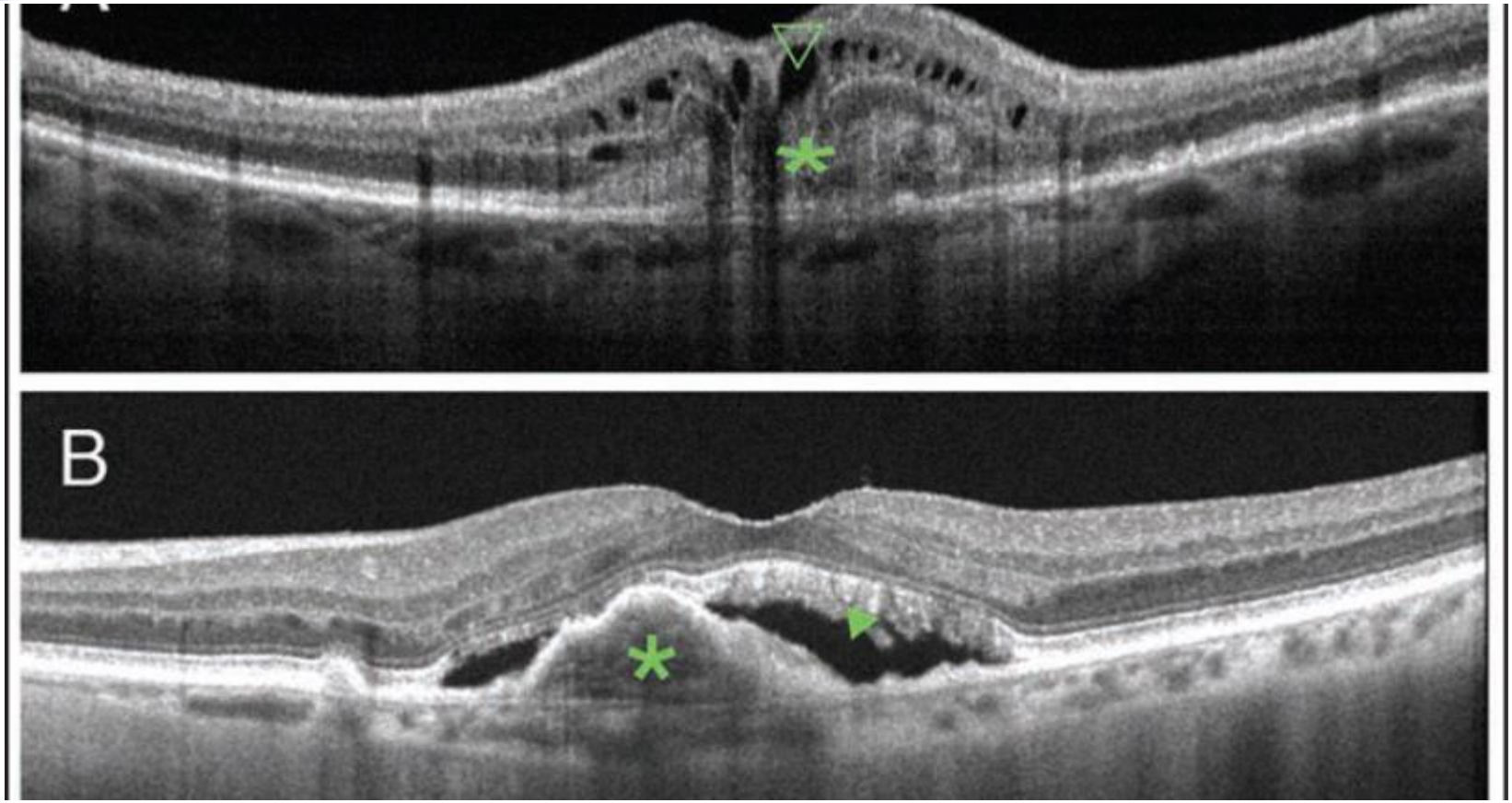




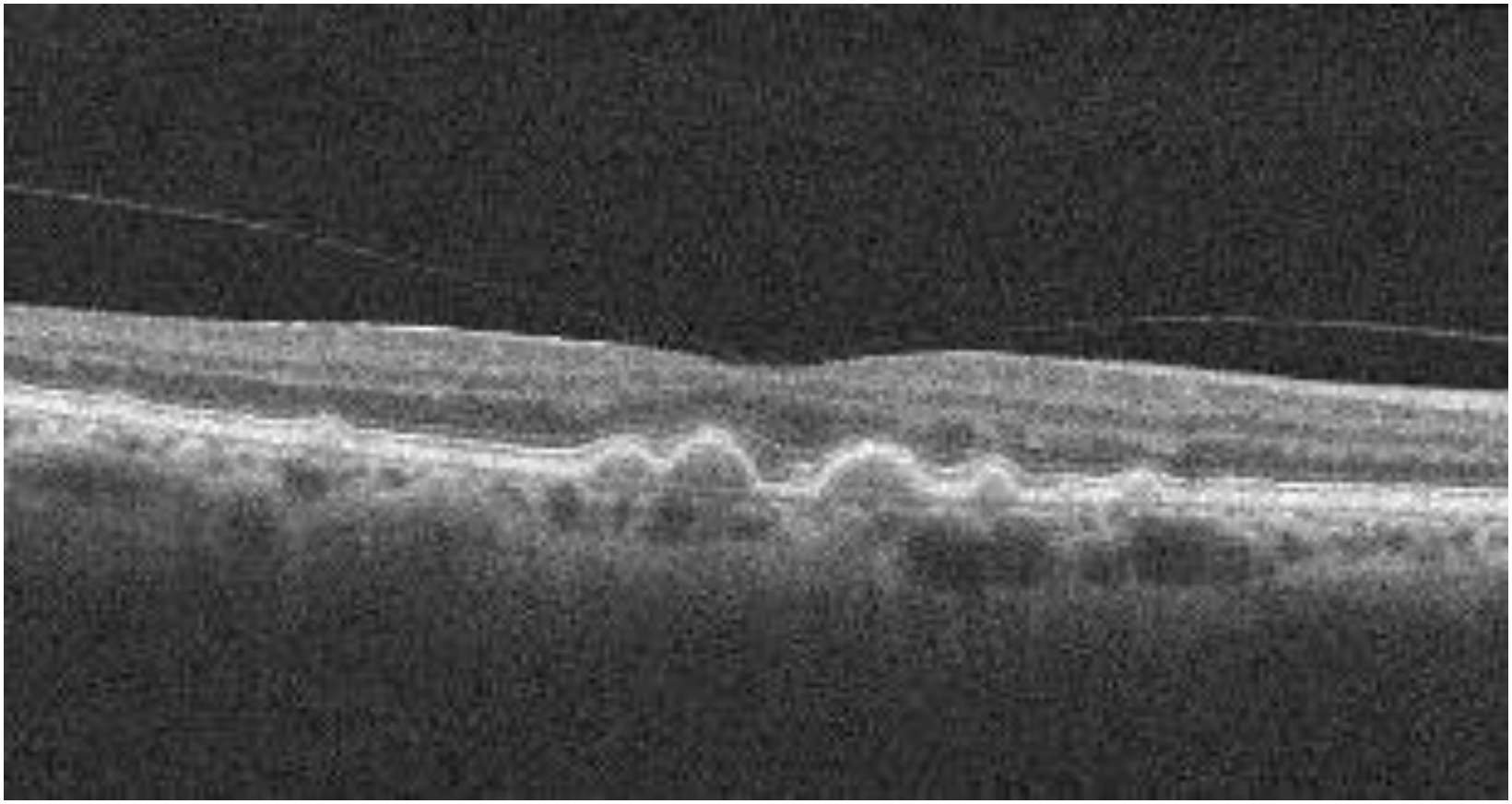
OCT


Retinal pigment epithelium
Photoreceptor inner and outer segment junction
External limiting membrane
Outer nuclear layer
Outer plexiform layer
Inner nuclear layer
Inner plexiform layer

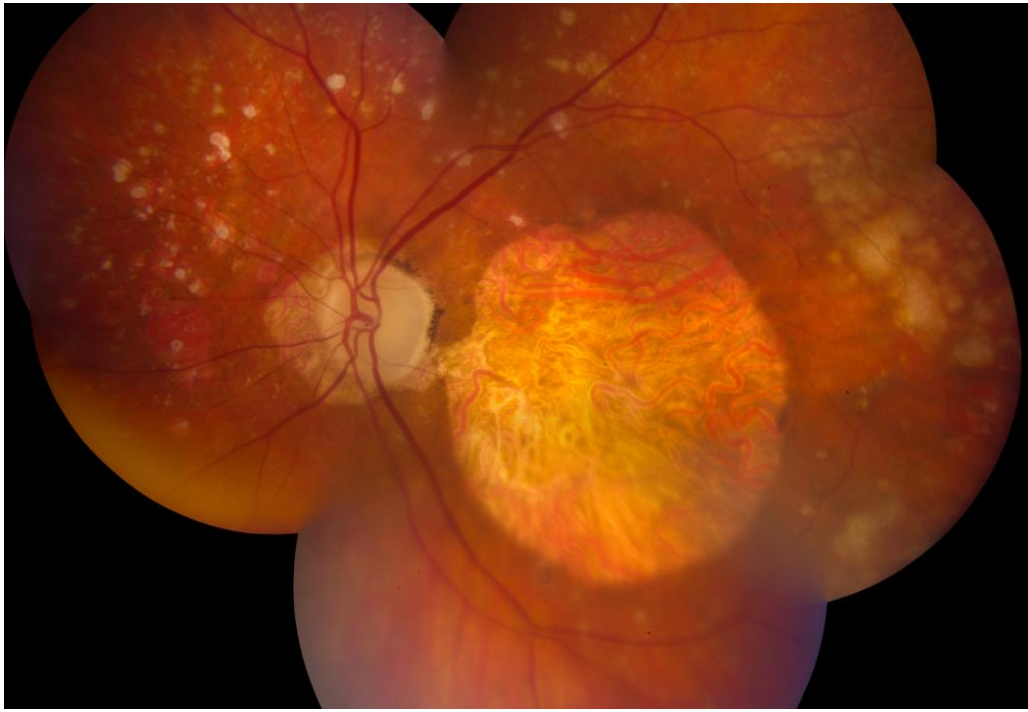
OCT in wet ARMD



OCT in Dry ARMD



Advanced atrophic ARMD

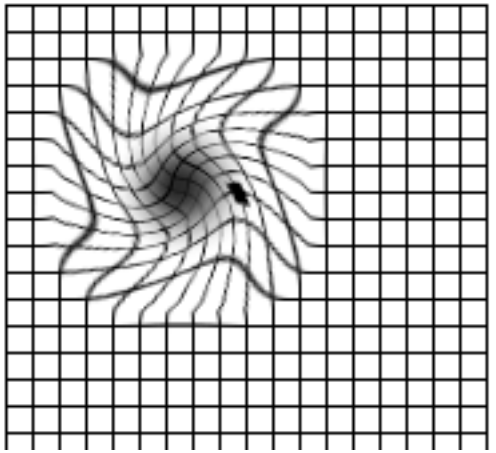


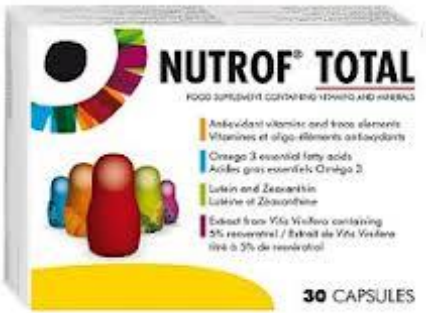
Management of Dry ARMD

- Regular follow-up
- Early visit if metamorphopsia develops
- Anti-oxidant Vitamin-Fish oil intake to decrease the risk for neovascular ARMD

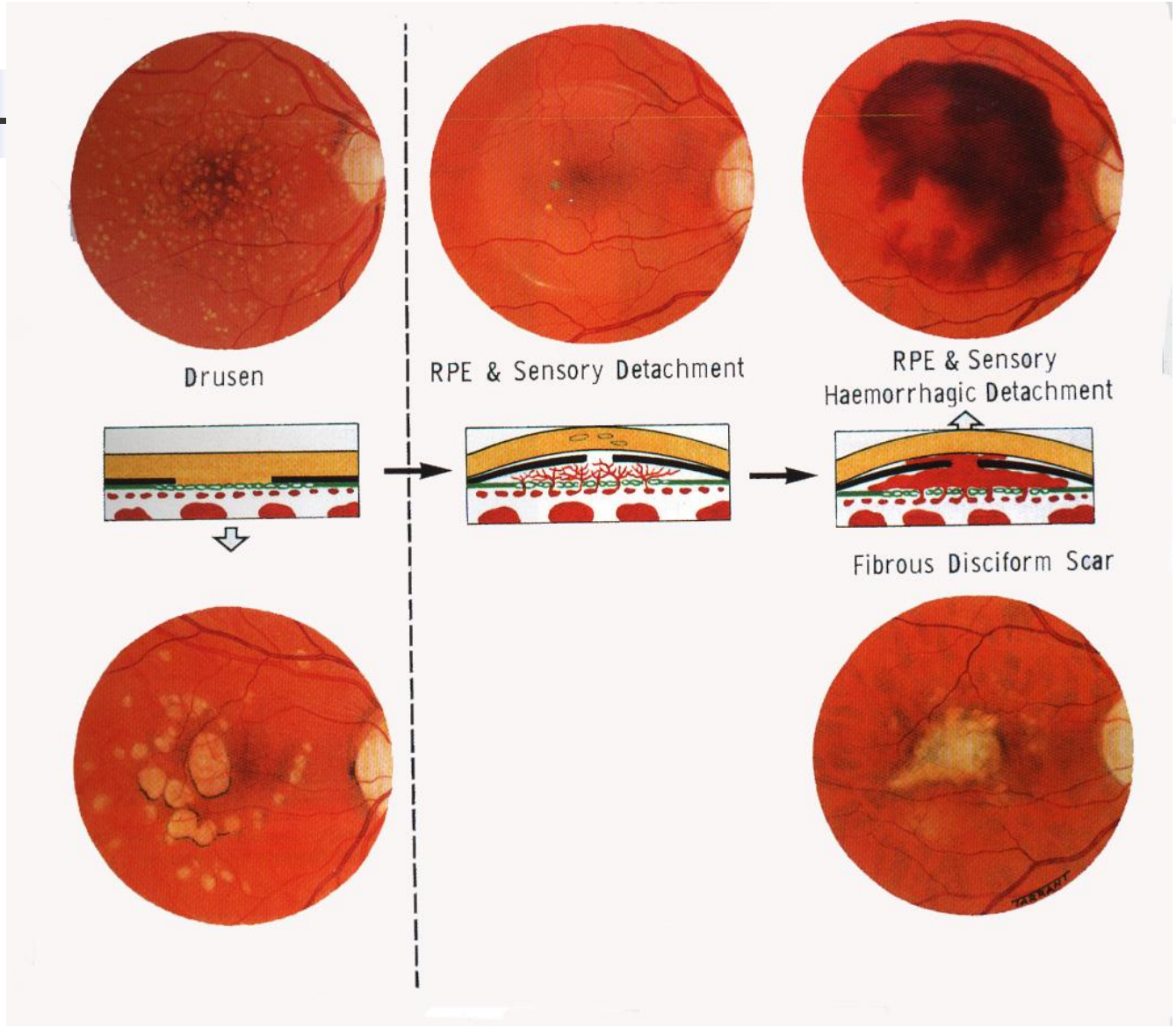
Amsler Grid

As it might appear to some-one with age-related macular degeneration.



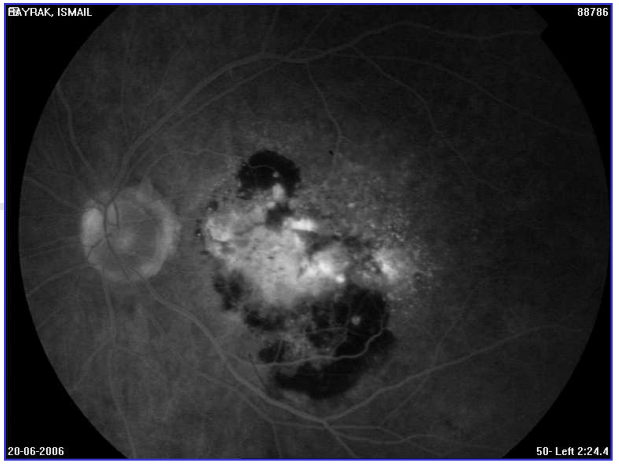


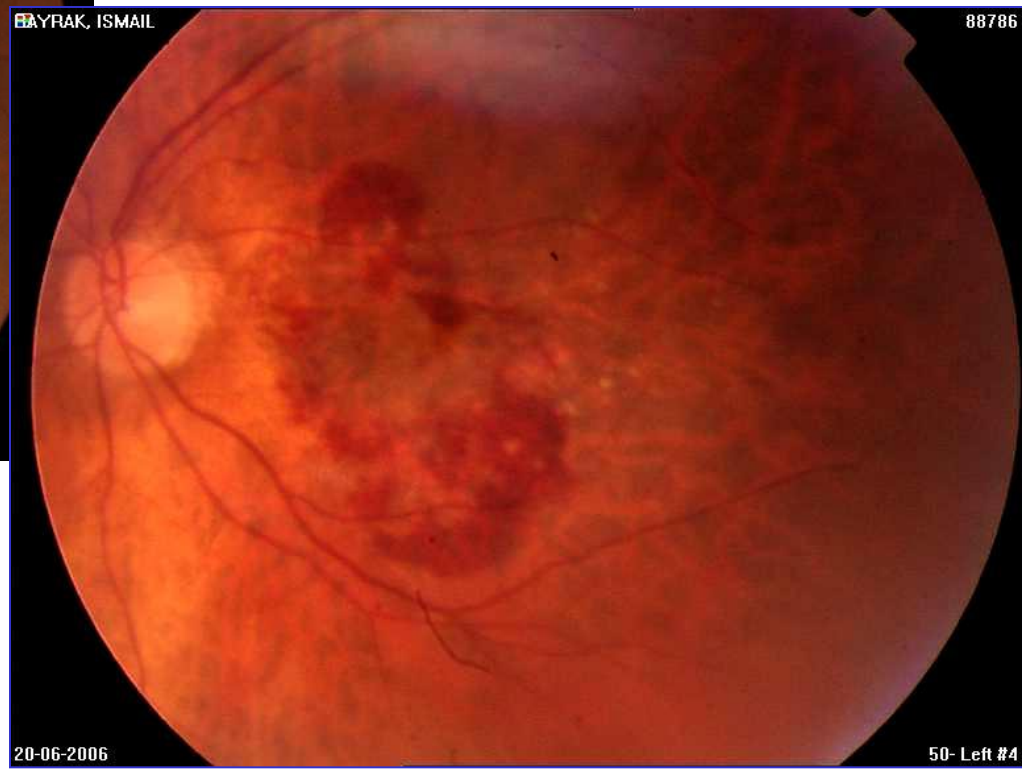
Progression to wet type



Neovascular ARMD

- Rapidly progressive visual loss
- Progressing central scotoma if untreated
- Treatment:
  - IV-Anti-VEGF injections
  - PDT: rarely
  - Laser Photocoagulation?


BAYRAK, ISMAIL
88786
20-06-2006
50- Left 2:24.4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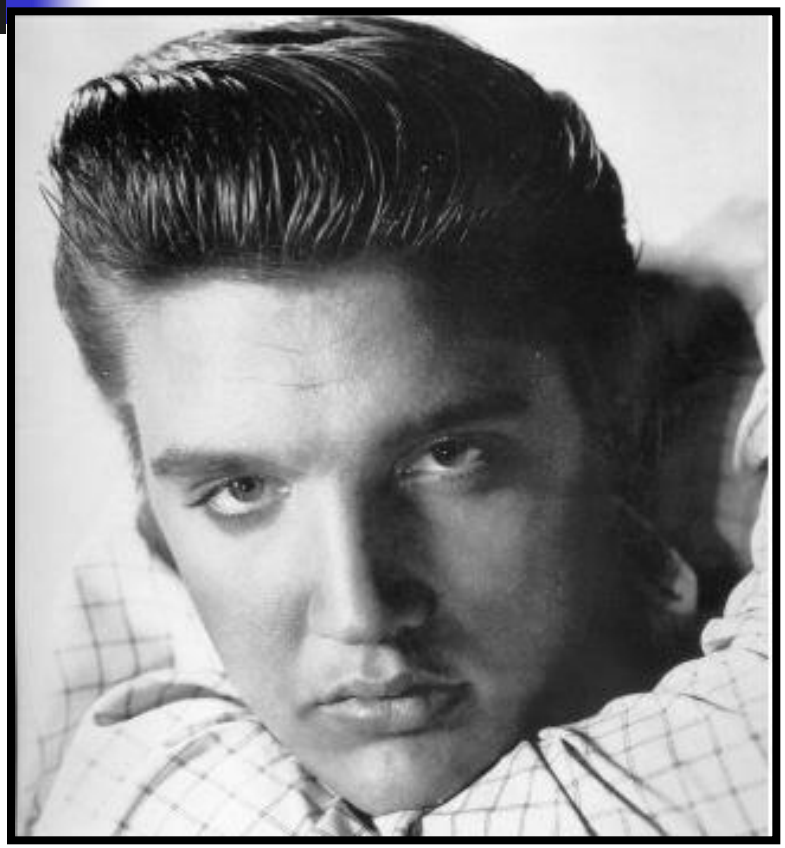
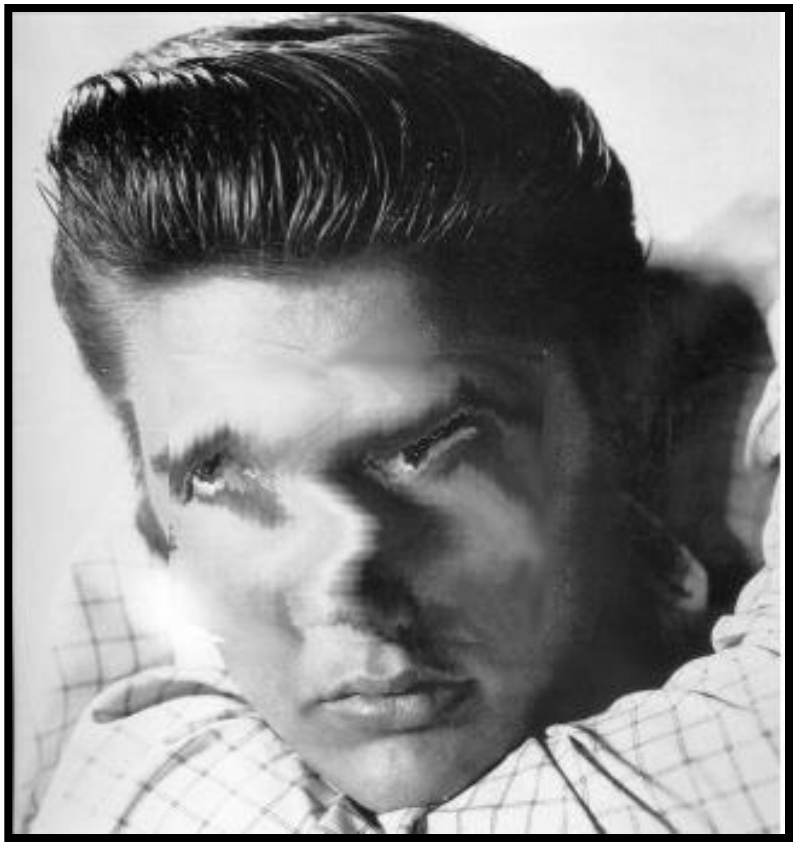
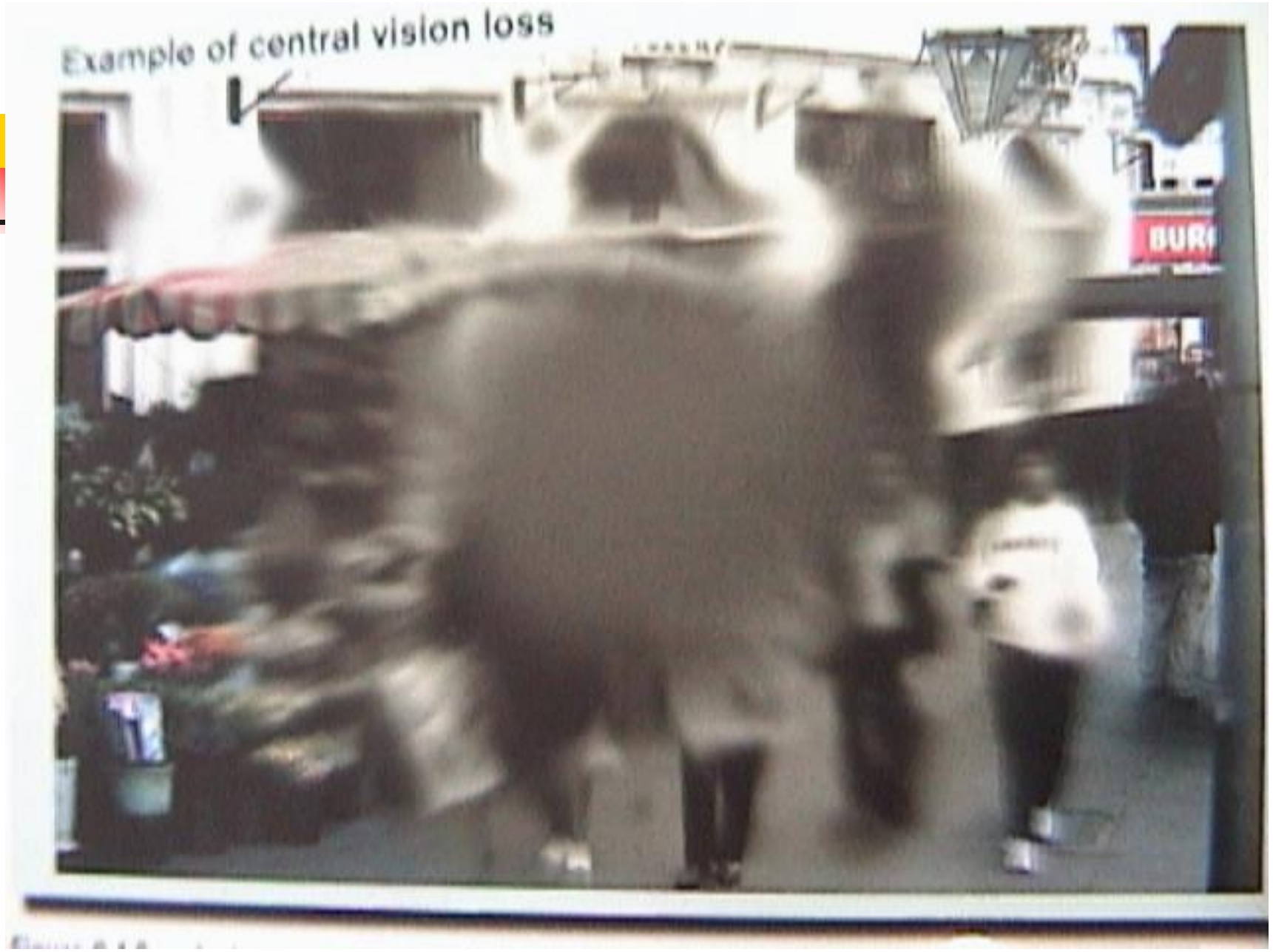
88786
20-06-2006
50- Left #4

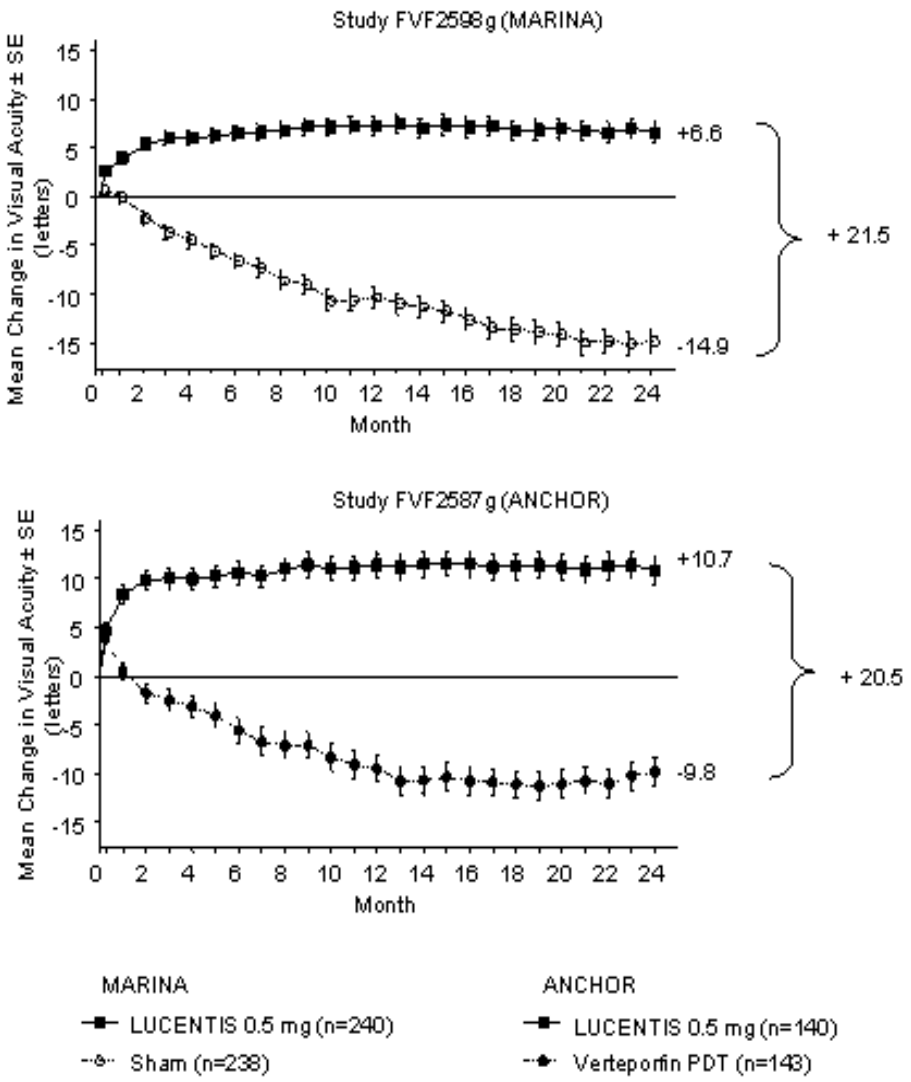




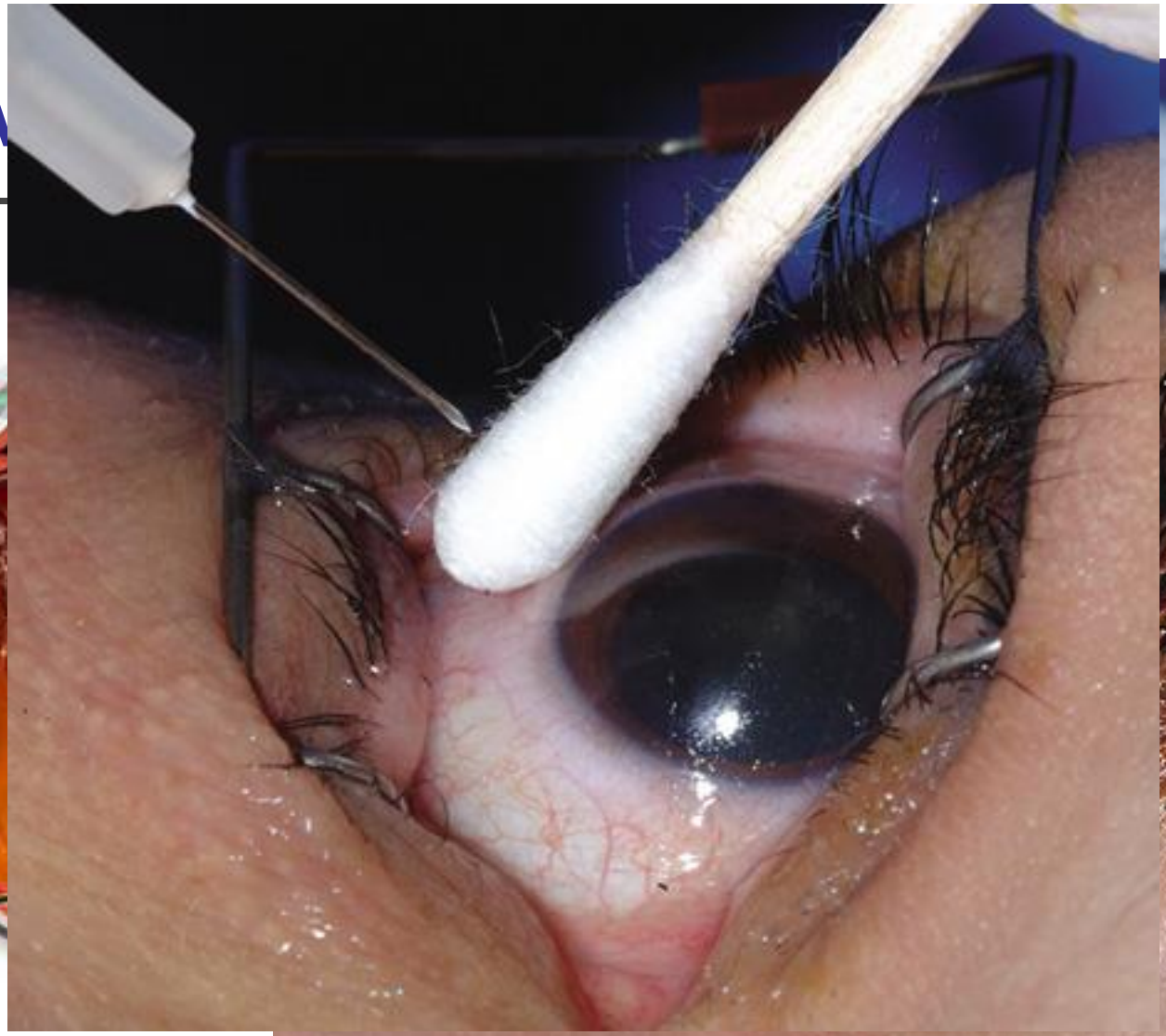

Example of central vision loss

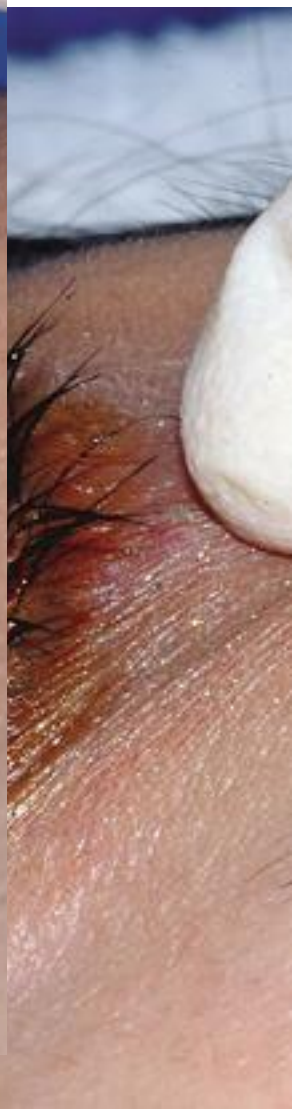
Treatment

- IV Pharmacotherapy
  - IV Anti-VEGF:
  - Ranibizumab
  - Bevacizumab
  - Aflibercept (VEGF trap eye)
- PDT: Rarely
- Laser Photocoagulation??



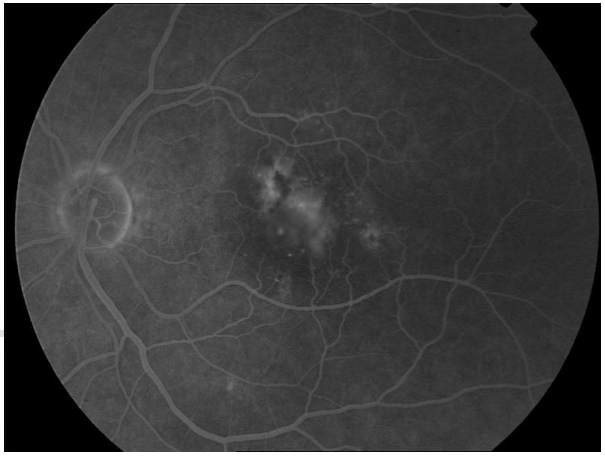
IV

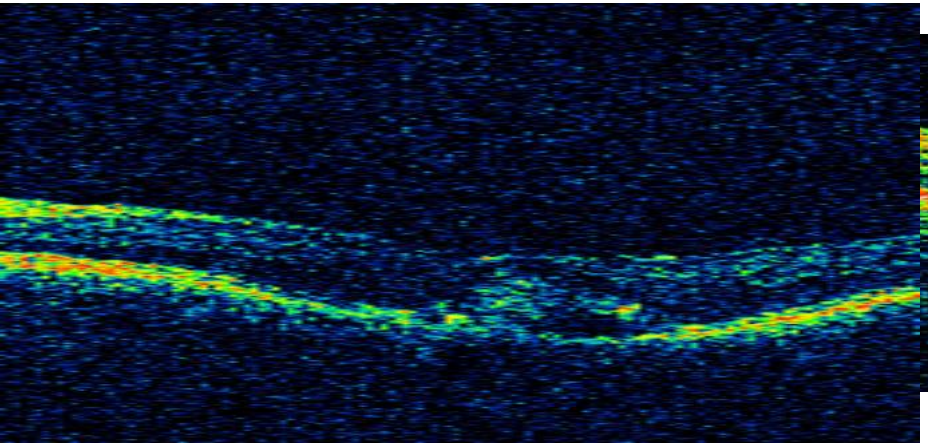


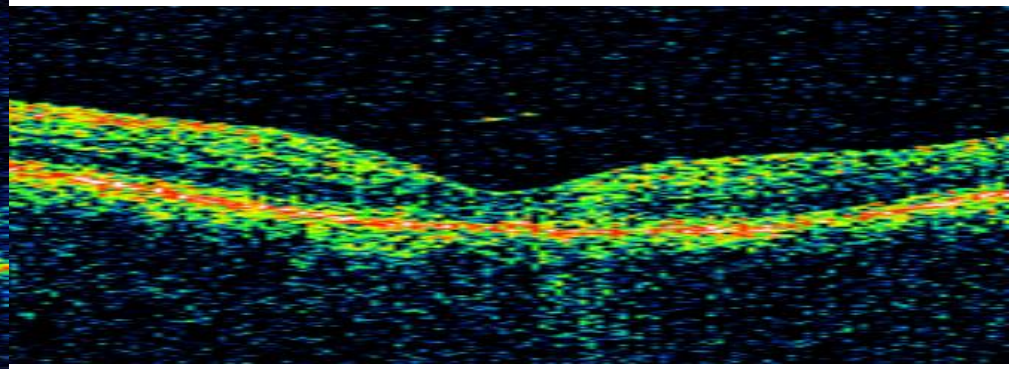


Response to Anti-VEGF

- %25-30: VEGF Responder: ilk 3 doz yeterli
- %65: VEGF Bağımlı
- %5-10: VEGF Cevapsız

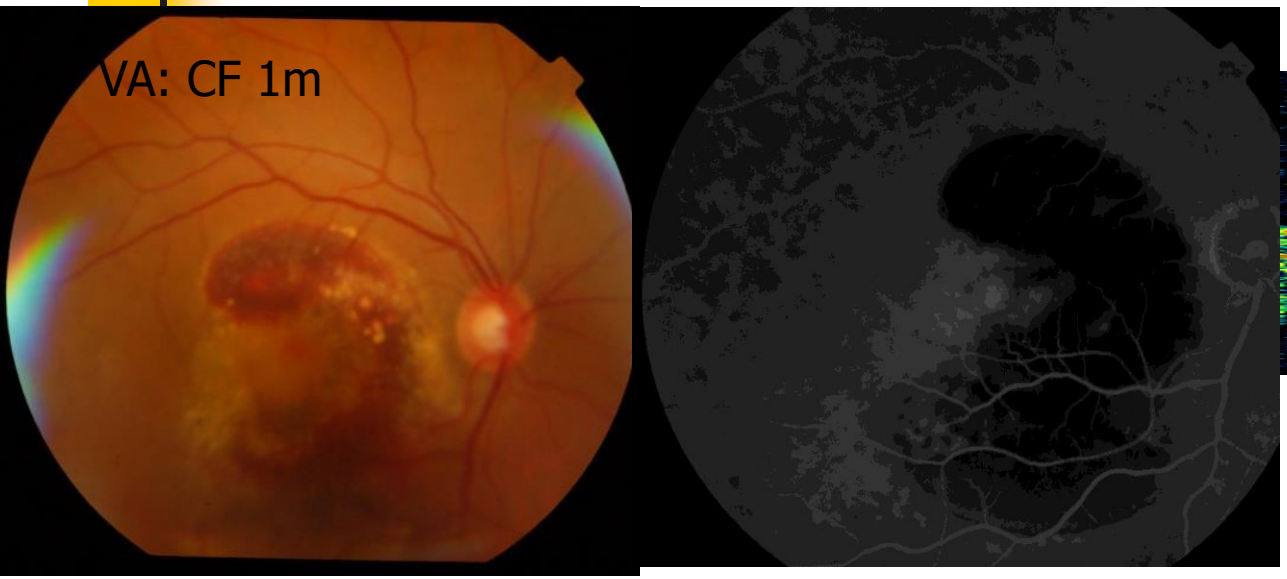


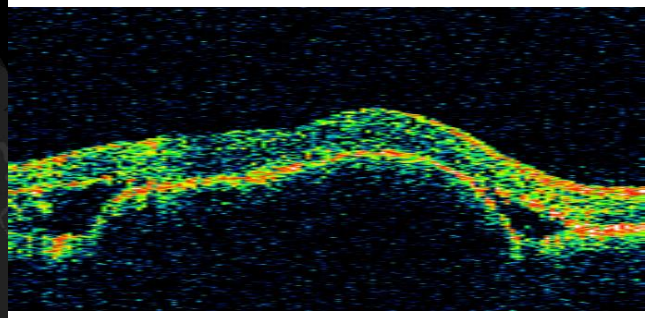




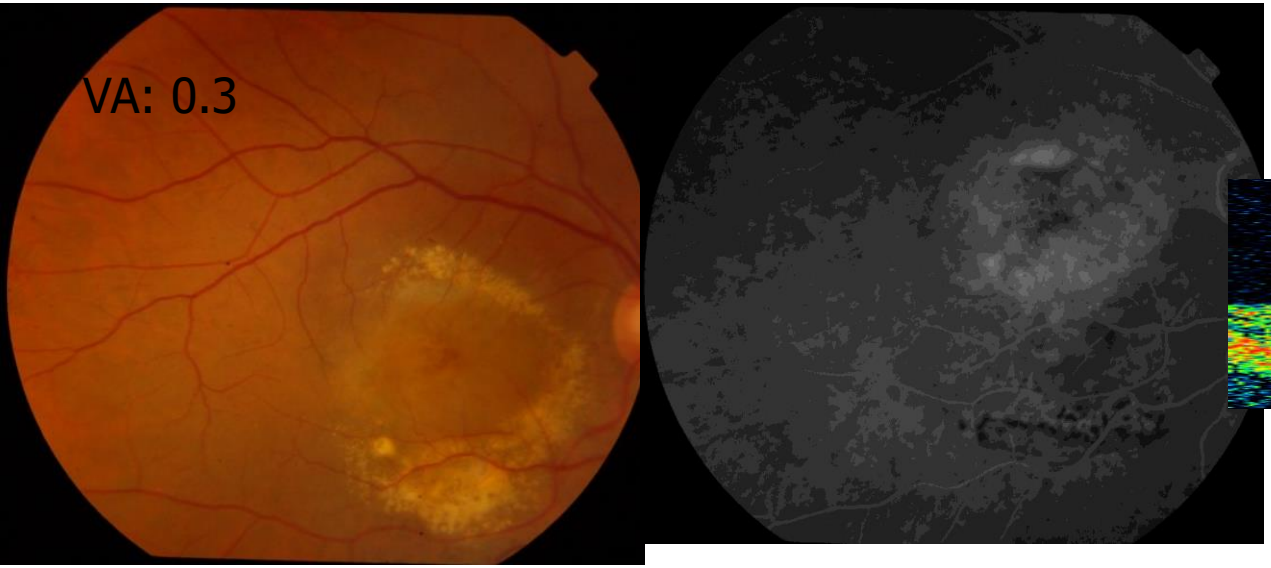
- VA:0.3……VA:1.0

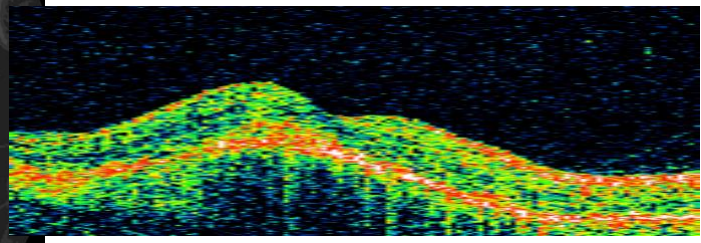
Treatment



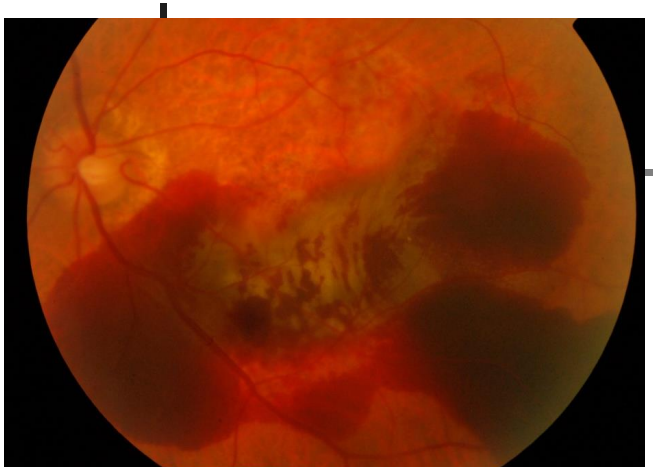


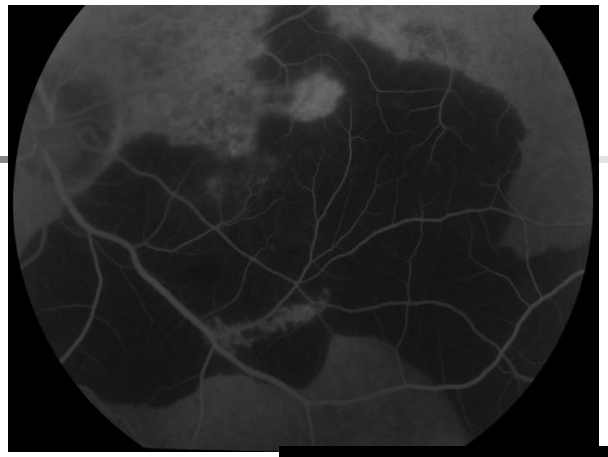
PDT+4xIVL

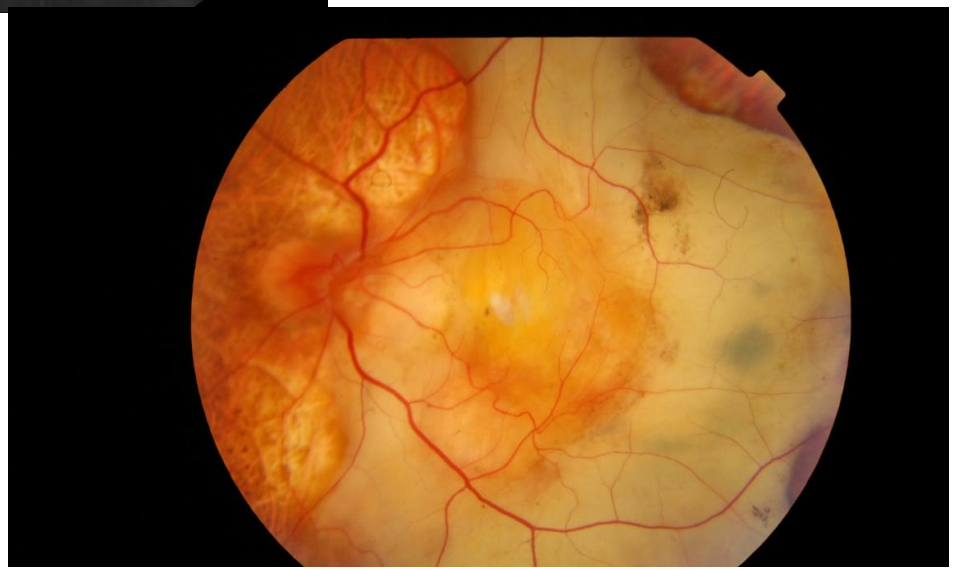




Nonresponders-Hemorrhagic response

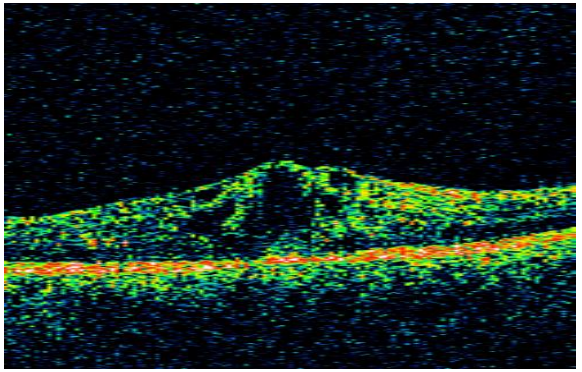




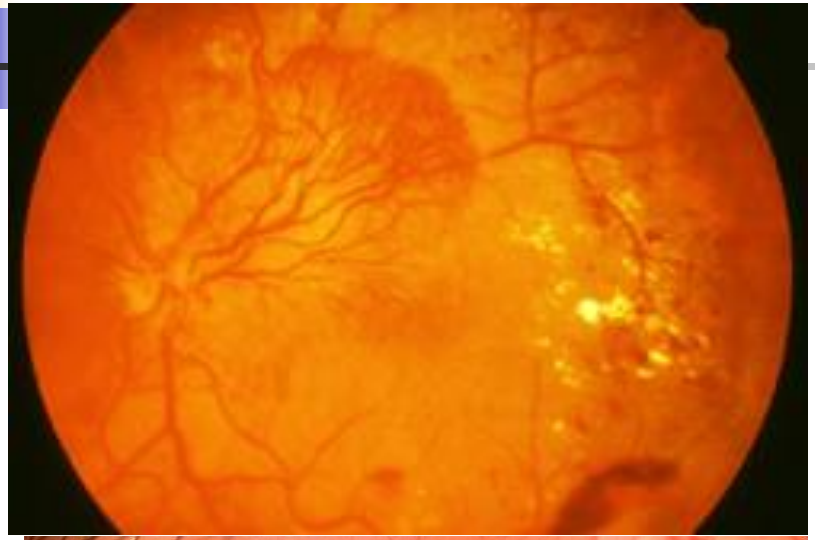


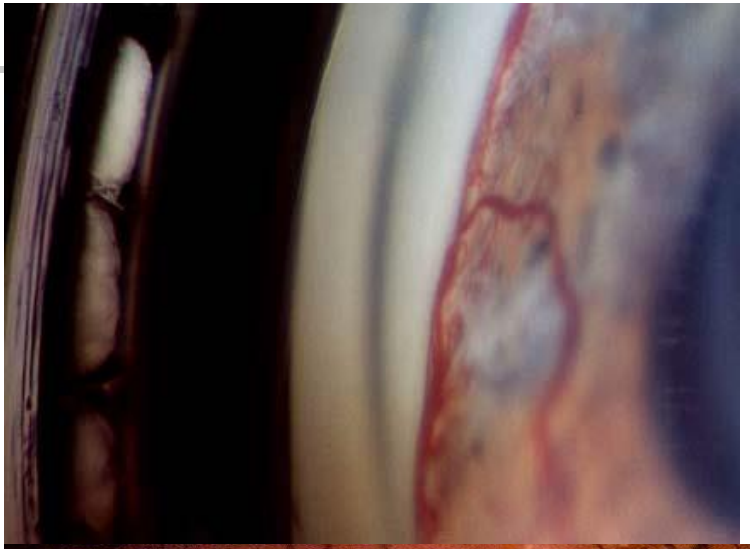
DIABETIC RETINOPATHY

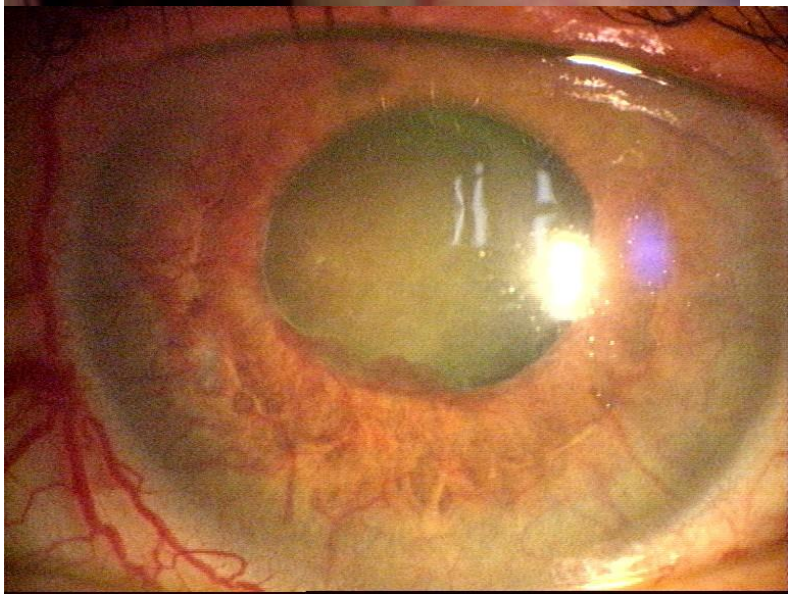
DR-DMÖ

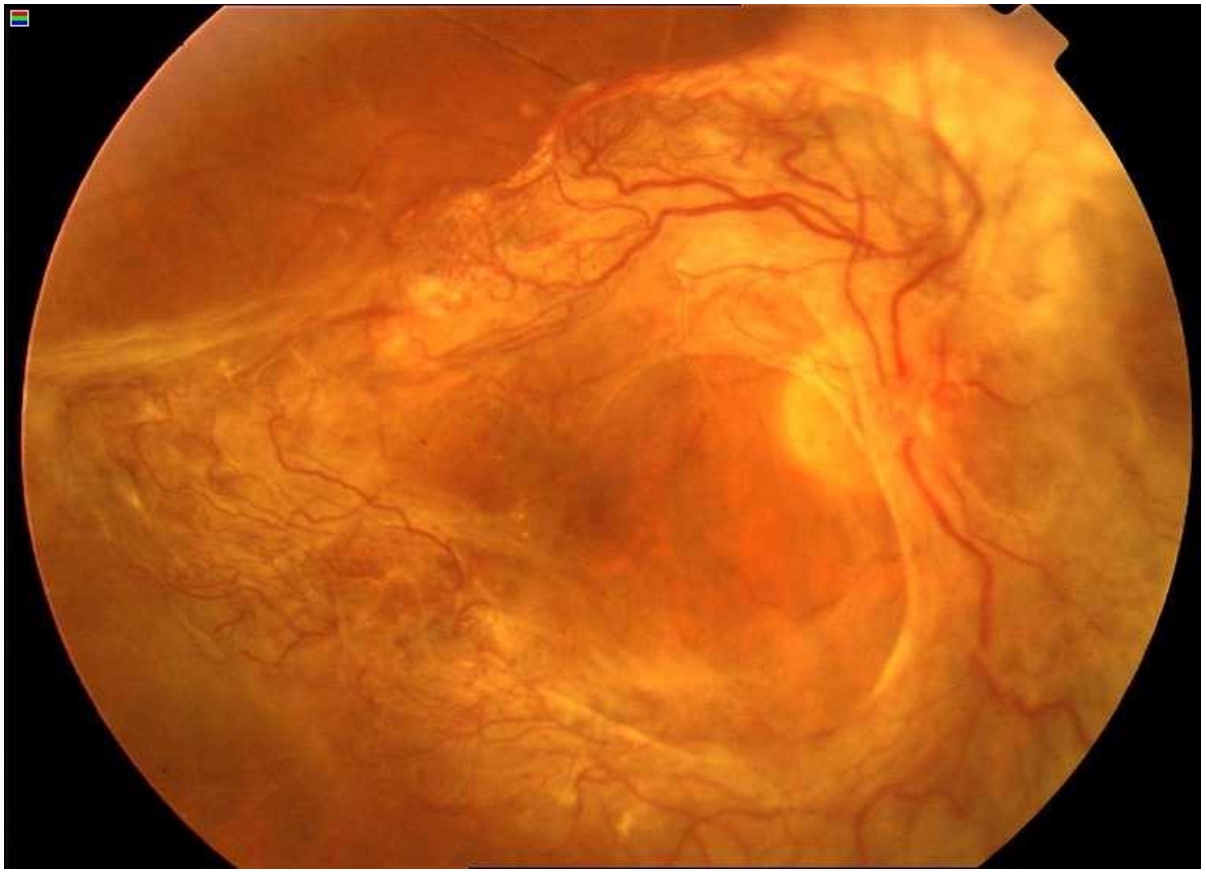


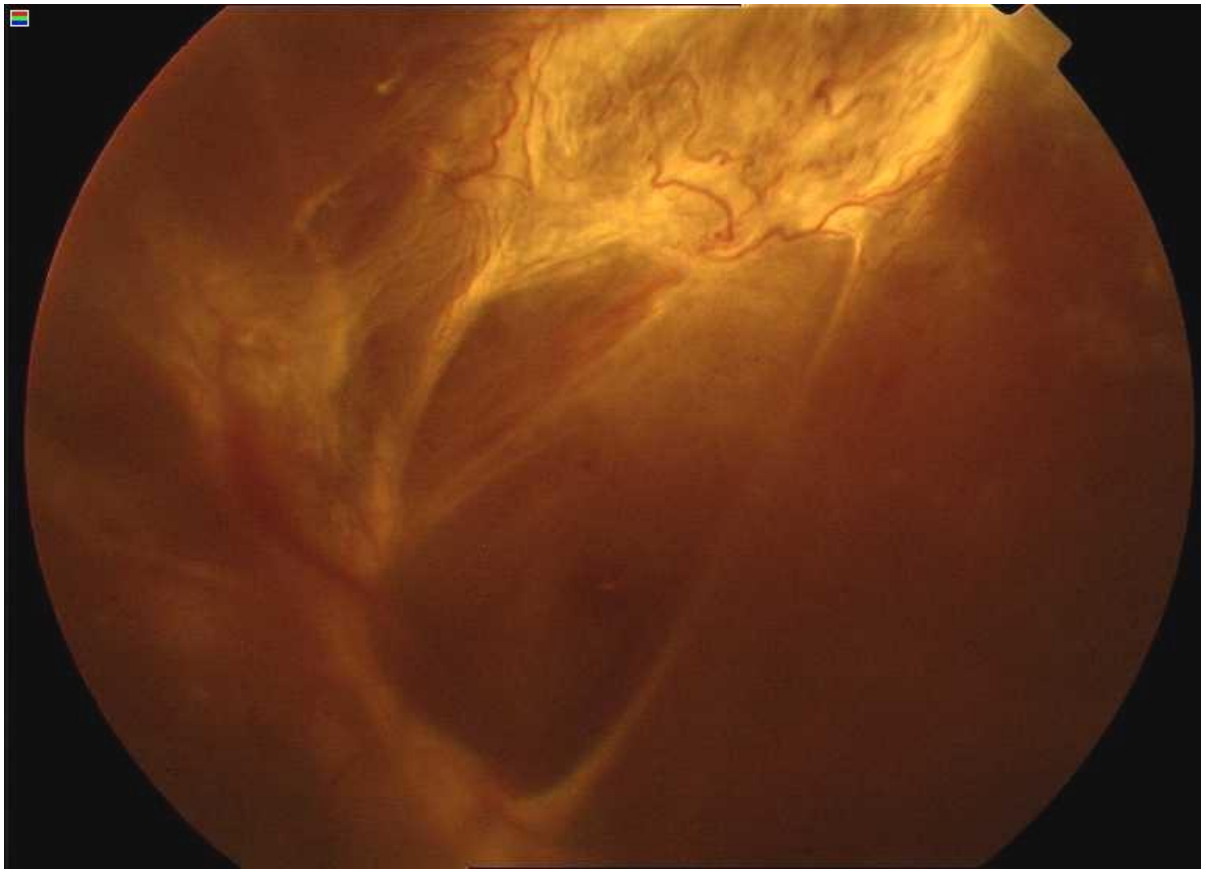
PDR-NV

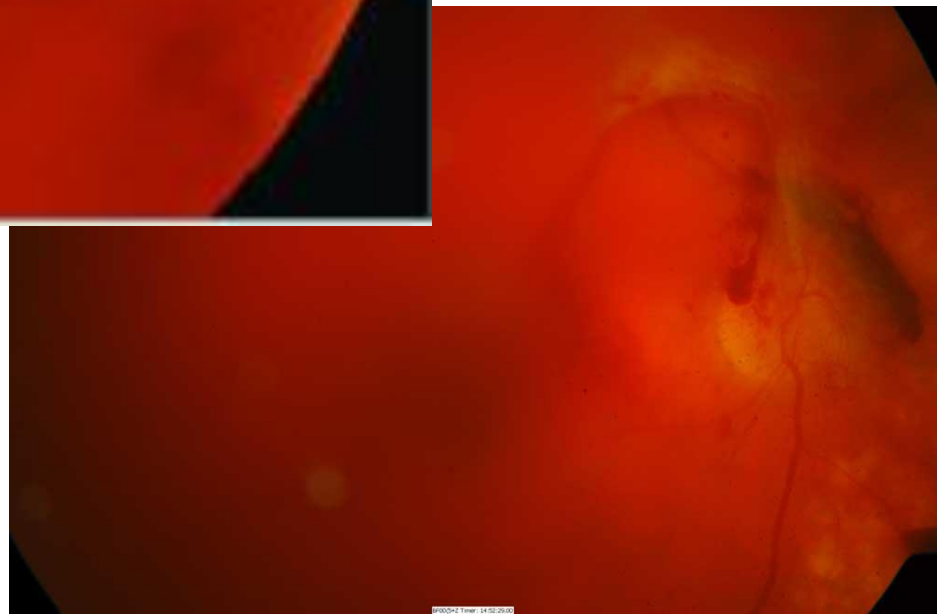


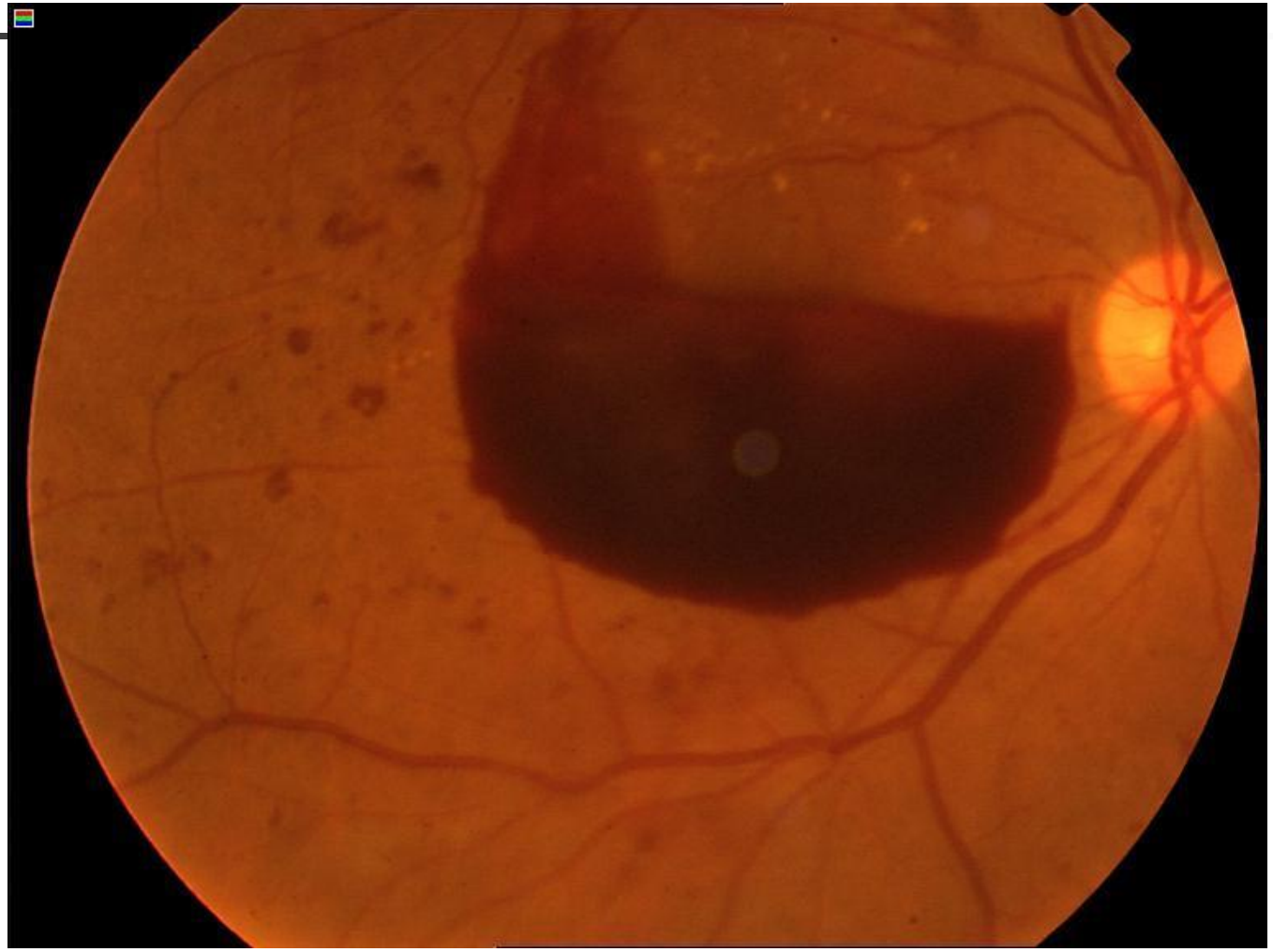












Panretinal Laser Photocoagulation treatment