

DIABETES AND EYE DISEASE: LEARNING OBJECTIVES

- Identify systemic risk factors
- Differentiate clinical stages
- Describe treatment strategies and screening guidelines
- Recognize importance of team approach

DIABETES MELLITUS: EPIDEMIOLOGY

- 135 million people with diabetes worldwide (90% type 2)
- 300 million people with diabetes projected by 2025

DIABETES MELLITUS: EPIDEMIOLOGY

- 18 million Americans affected
- 800,000 new cases/year (type 2)
- 2x greater risk: African-Americans, Latinos, Native Americans

DIABETIC RETINOPATHY

- Retinal complications of diabetes
- Leading cause of blindness in working-age Americans

Primary care physician

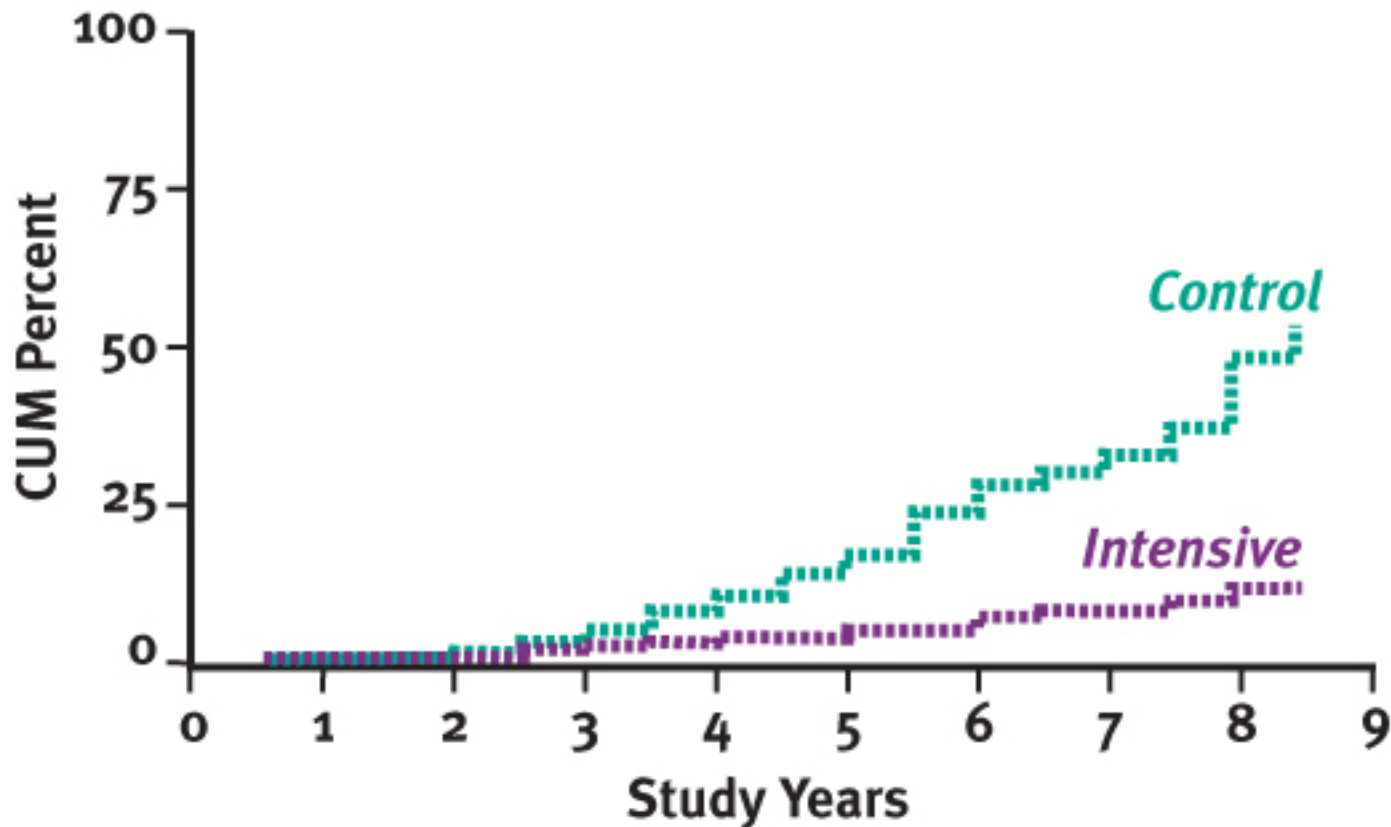
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Ophthalmologist

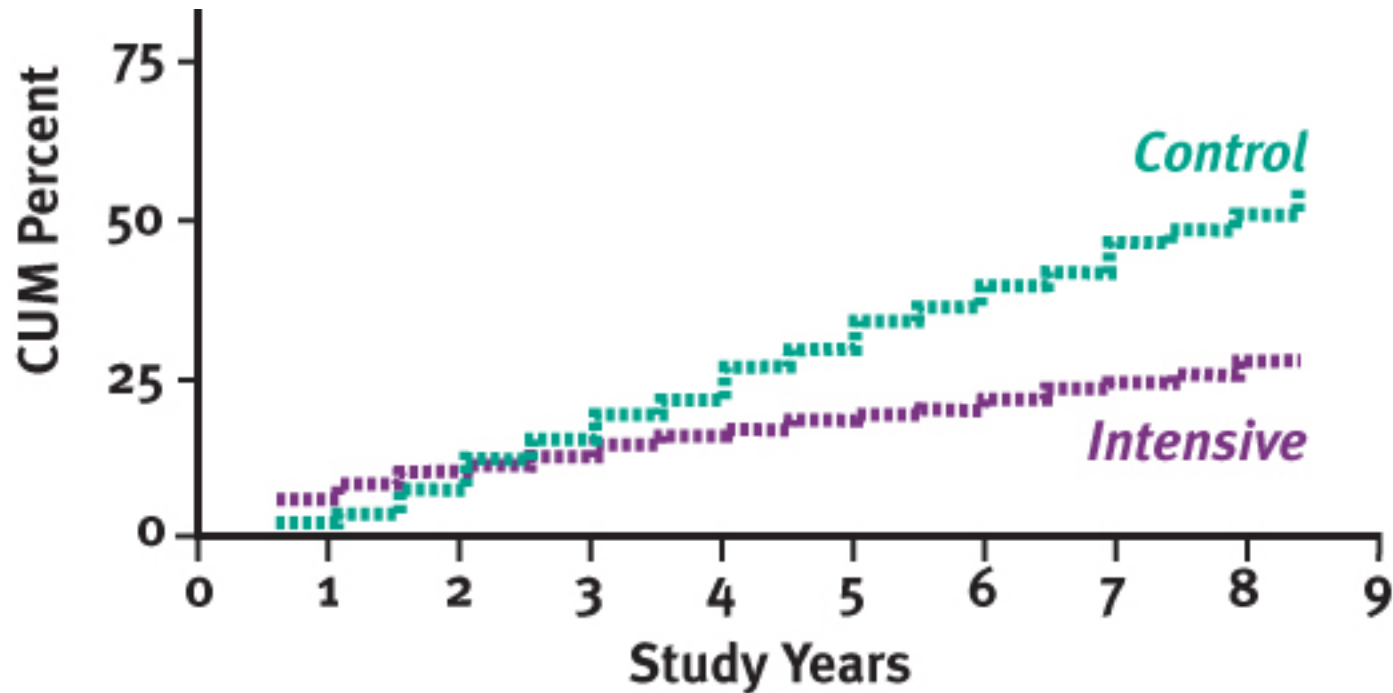


**Systemic control,
timely screening,
and early treatment**

DCCT: NO BASELINE RETINOPATHY



DCCT: MILD TO MODERATE RETINOPATHY



DCCT: INTENSIVE GLUCOSE CONTROL, NO BASELINE

RETINOPATHY

- 27% reduction in developing retinopathy
- 76% reduction in risk of developing progressive retinopathy

DCCT: INTENSIVE GLUCOSE CONTROL, MILD TO MODERATE

- 54% reduction in **NPDR** progression of retinopathy
- 47% reduction in development of severe NPDR or PDR
- 59% reduction in need for laser surgery
- Pre-existing retinopathy may worsen in early stages of treatment

EDIC

- 8.2 % vs 7.9 %
- ↓ ME
- ↓ PPDR, PDR
- ↓ VH
- ↓ laser

Epidemiology of Diabetes Interventions and Complications

UKPDS: TYPE 2 DIABETES

- Increased glucose and BP control decreases progression of retinopathy

UKPDS: RESULTS

- Hemoglobin A1C reduced from 7.9 to 7.0 = 25% decrease in microvascular complications
- BP reduced to <150/85 mm Hg = 34% decrease in retinopathy progression

UKPDS: HYPERTENSION CONTROL

- As important as glucose control in lowering rate of progression of diabetic retinopathy
- ACE inhibitor or beta blocker decreases microvascular complications

DCCT/UKPDS LESSONS

- Professional and patient education
- Good glucose and BP control
- Regular examination

ADDITIONAL SYSTEMIC CONTROLS

- Proteinuria is a risk factor for macular edema
- Lisinopril may benefit the diabetic kidney and retina even in normotensive patients

High cholesterol may be associated with increased macular exudates and vision loss.

WESDR: DIABETIC RETINOPATHY AND

- # CARDIOVASCULAR DISEASE
- PDR a risk indicator for MI, stroke, amputation
 - PDR elevates risk of developing nephropathy

DIABETIC RETINOPATHY: PATHOGENESIS

Increased glucose



VEGF



Increased capillary permeability/
abnormal vasoproliferation



Normal

Diabetic

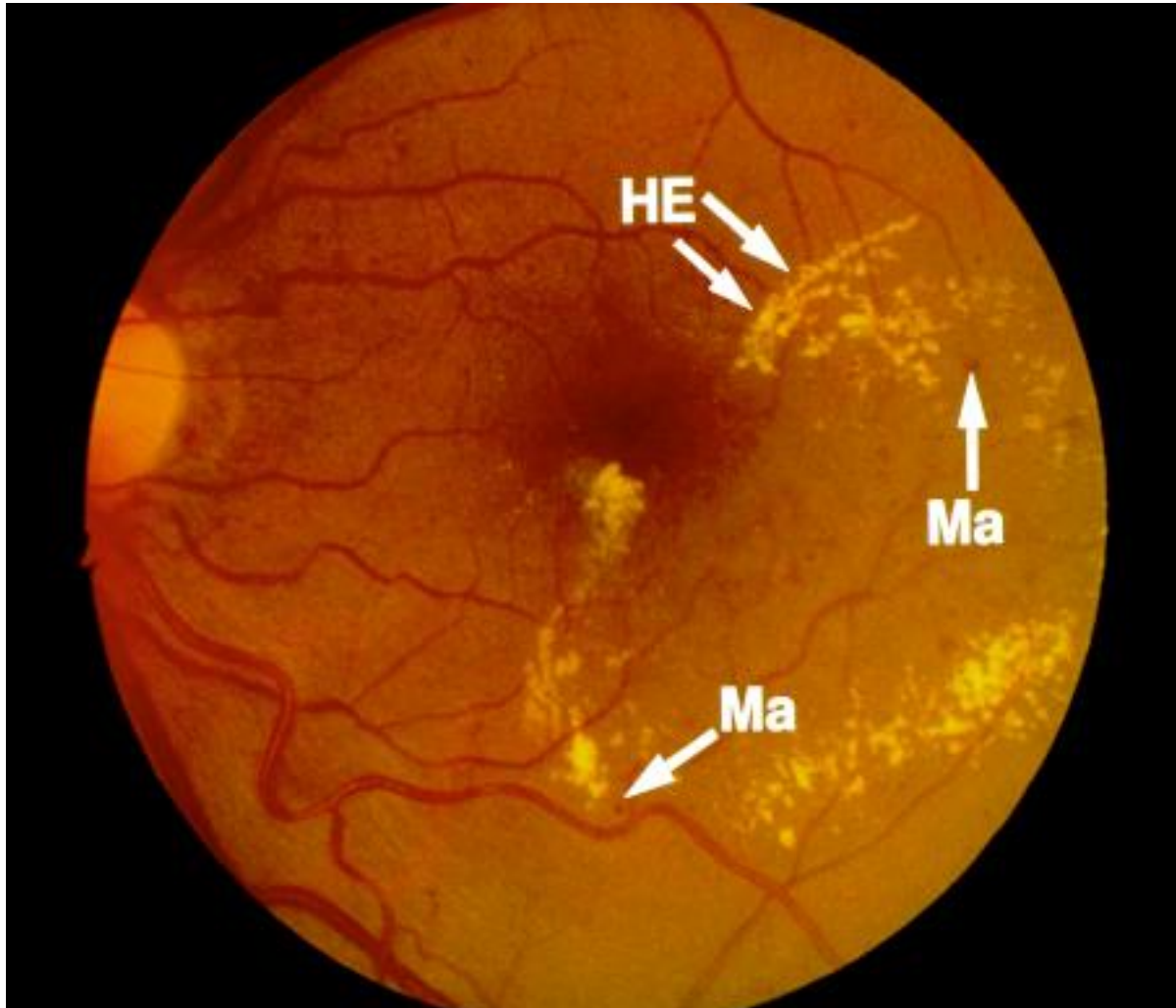
retinopathy

DIABETIC RETINOPATHY: CLINICAL STAGES

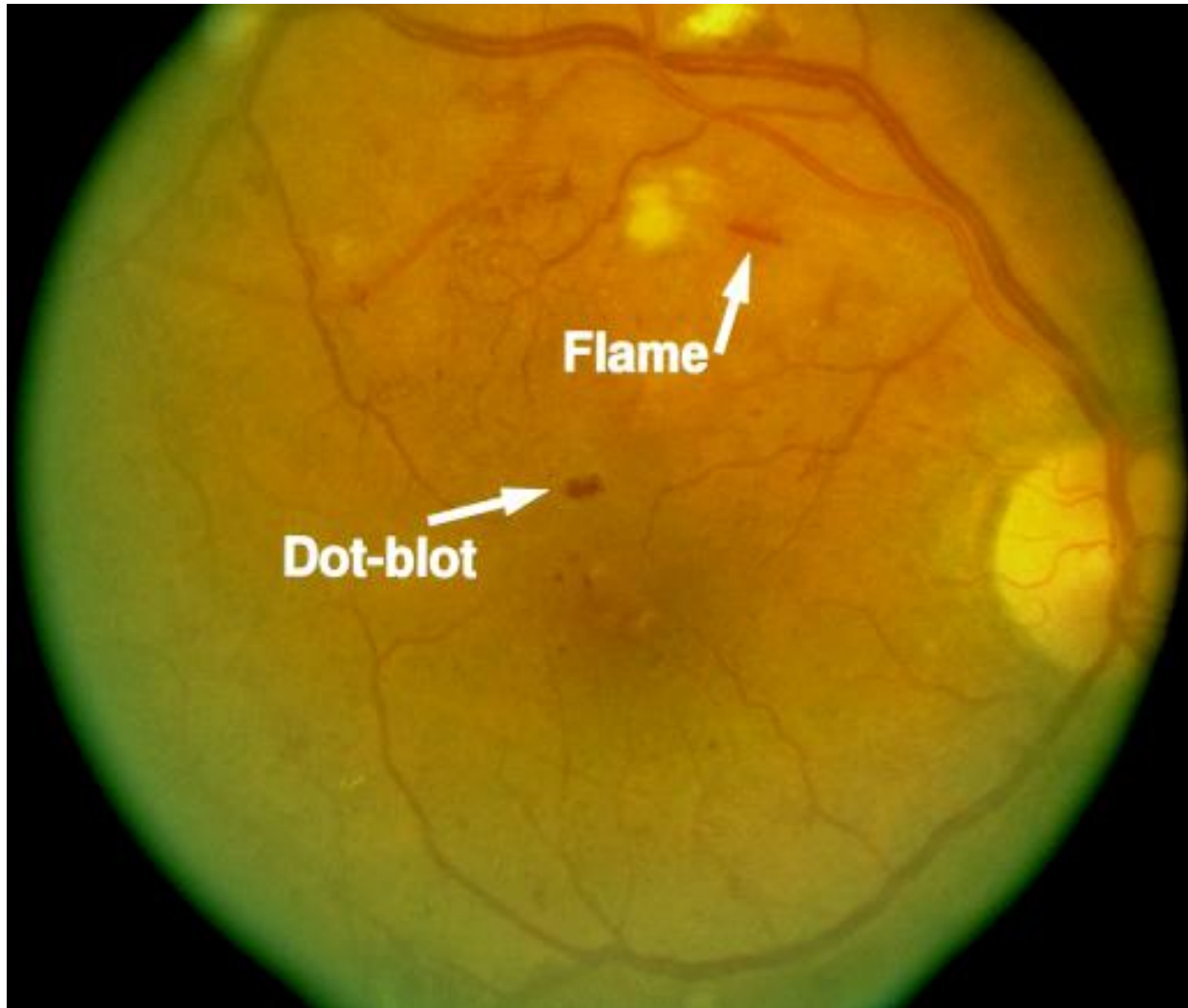
- Nonproliferative diabetic retinopathy (NPDR)
- Preproliferative diabetic retinopathy
- Proliferative diabetic retinopathy (PDR)

MILD TO MODERATE NPDR

- Microaneurysms
- Hard exudates
- Intraretinal hemorrhages
- **Patients may be asymptomatic**



Microaneurysms



Intraretinal hemorrhages

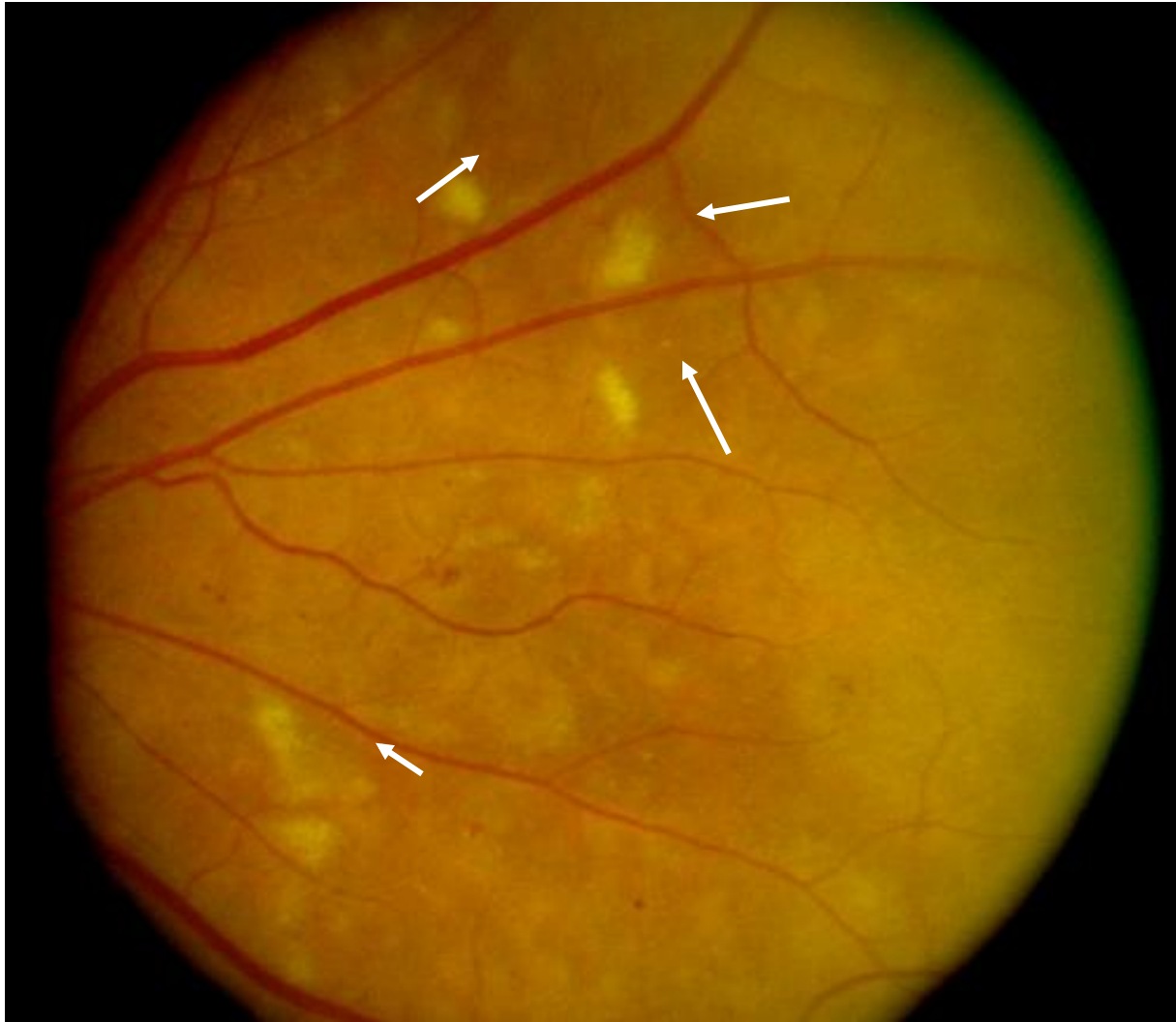


Healthy macula
macula

Edematous

DIABETIC MACULAR EDEMA

- Diabetes ≤ 5 yrs = 5% prevalence
- Diabetes ≥ 15 yrs = 15% prevalence



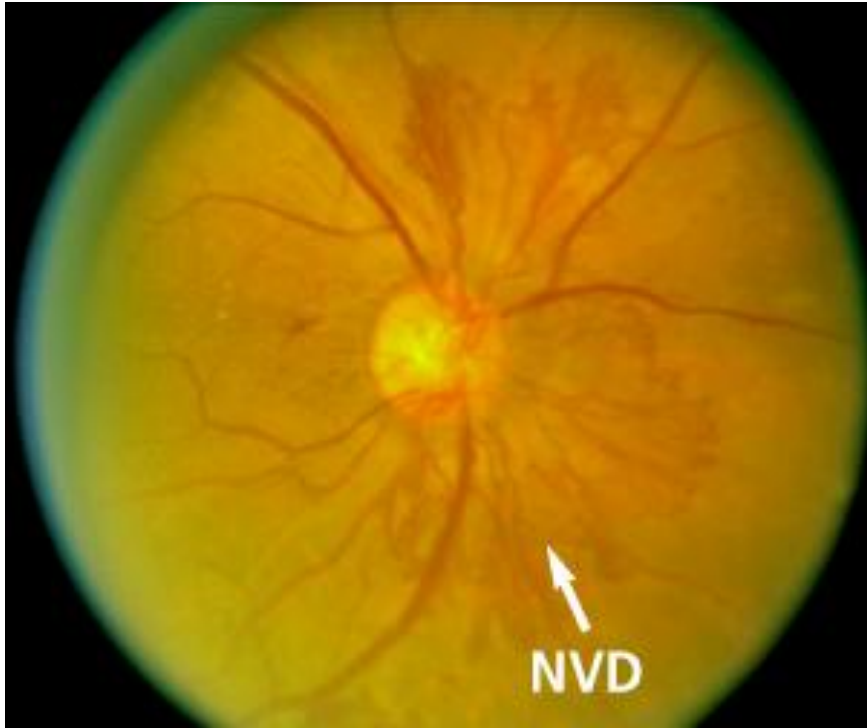
Cotton-wool spots



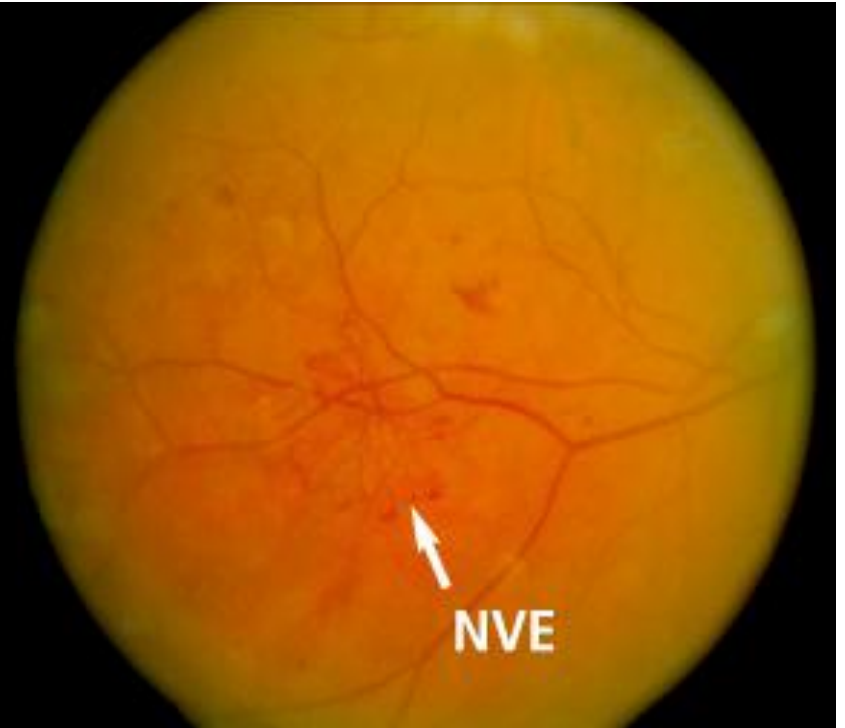
Venous beading and capillary shunt vessels

PDR: CLINICAL SIGNS

- Neovascularization
- Vitreous hemorrhage and traction
- NPDR features, including macular edema



**New vessels at the disc
elsewhere**



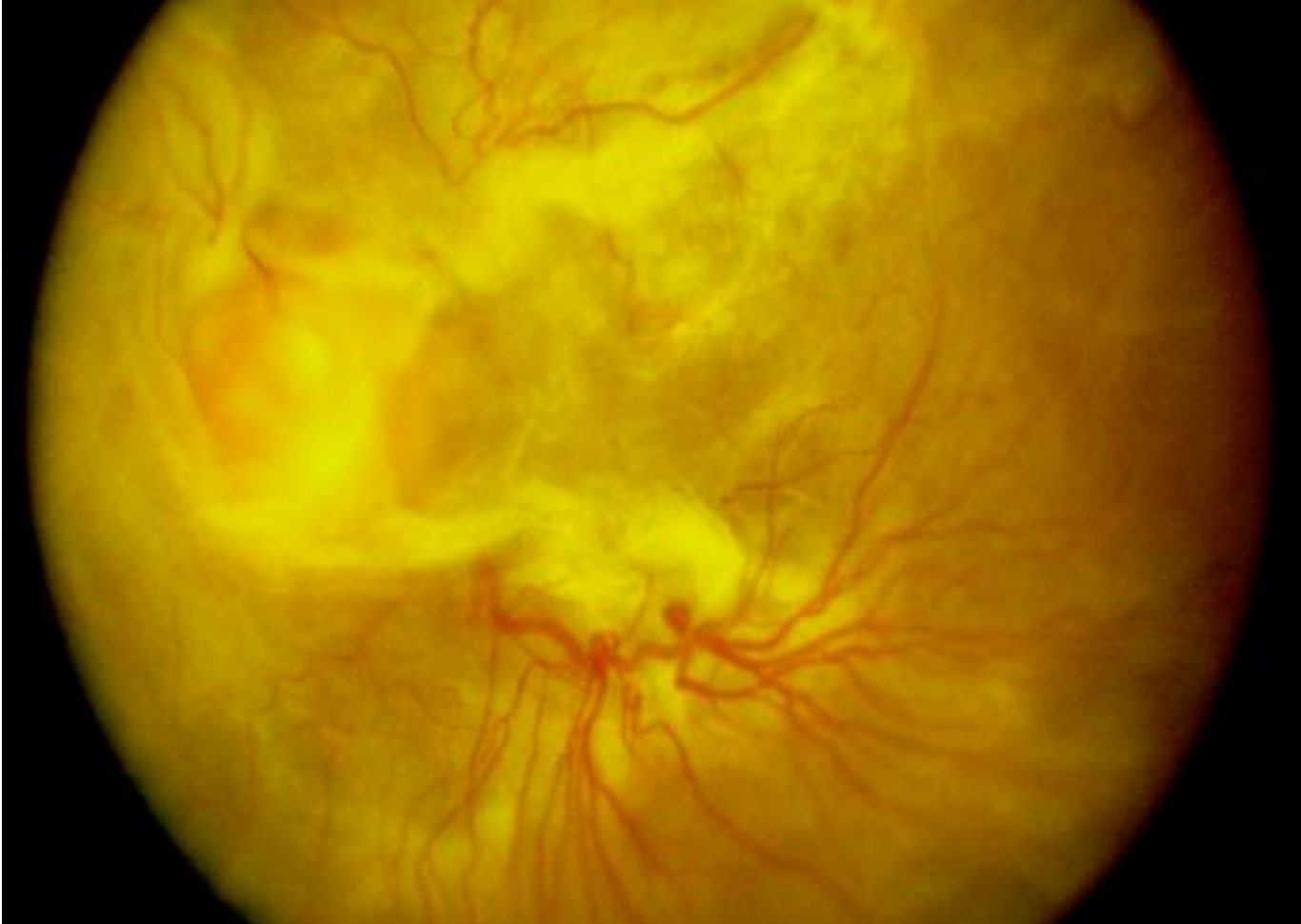
New vessels



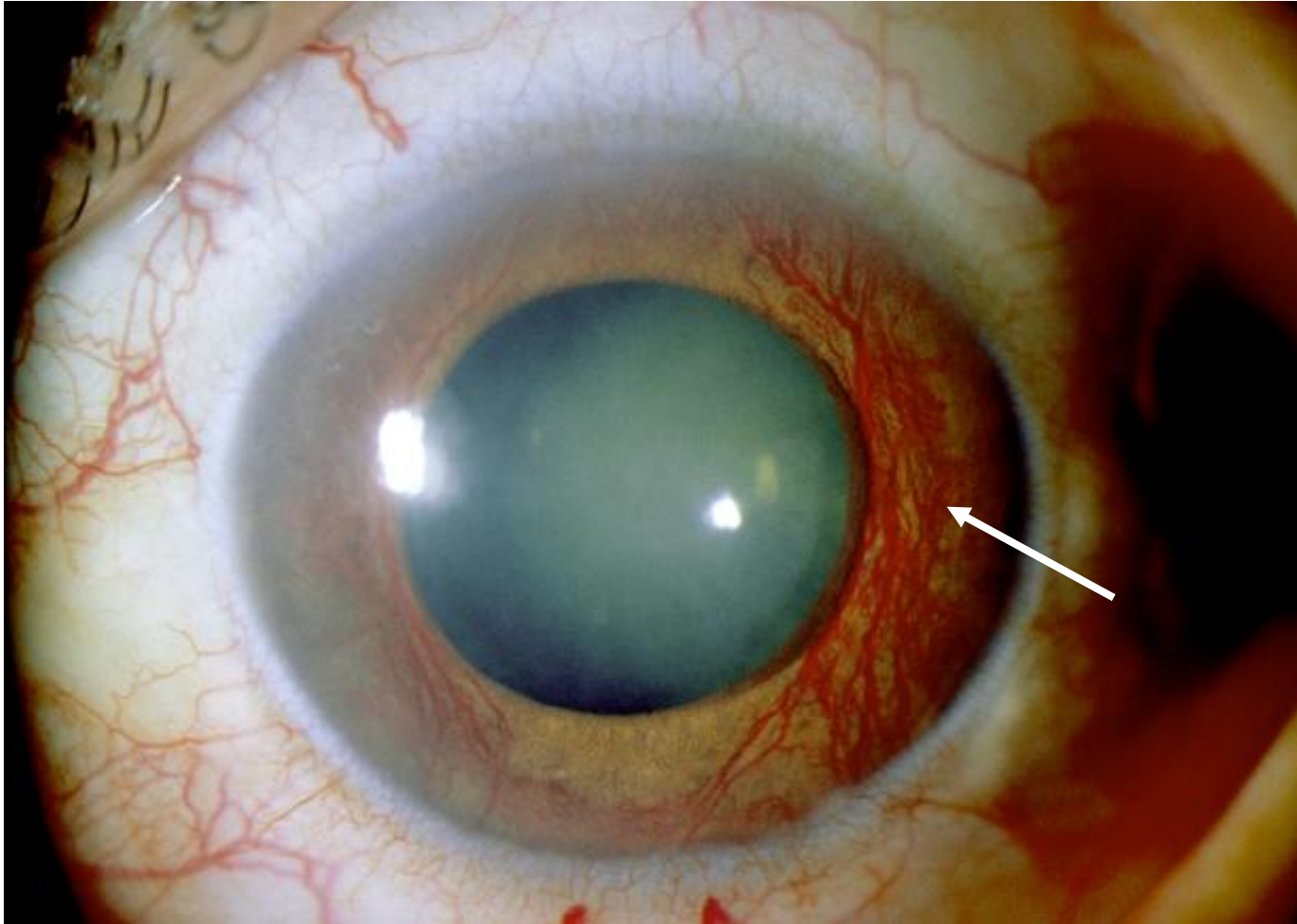
Vitreous hemorrhage

VITREOUS HEMORRHAGE: SYMPTOMS

- Floaters
- Severe visual loss
- **Requires immediate ophthalmologic consultation**



Severely distorted retinal architecture



New vessel growth

INSULIN USERS Dx <AGE 30

<u>Duration (yrs)</u>	<u>PDR Prevalence</u>
5	negligible
10	25%
15	55%

INSULIN USERS Dx >AGE 30

<u>Duration (yrs)</u>	<u>PDR Prevalence</u>
-----------------------	-----------------------

20

20%

PDR less common among noninsulin users

REVIEW OF CLINICAL STAGES

- NPDR: Patients may be asymptomatic
- PPDR: Laser therapy at this stage may help prevent long-term visual loss
- PDR: Major cause of severe visual loss



Ophthalmoscopic examination through dilated pupils



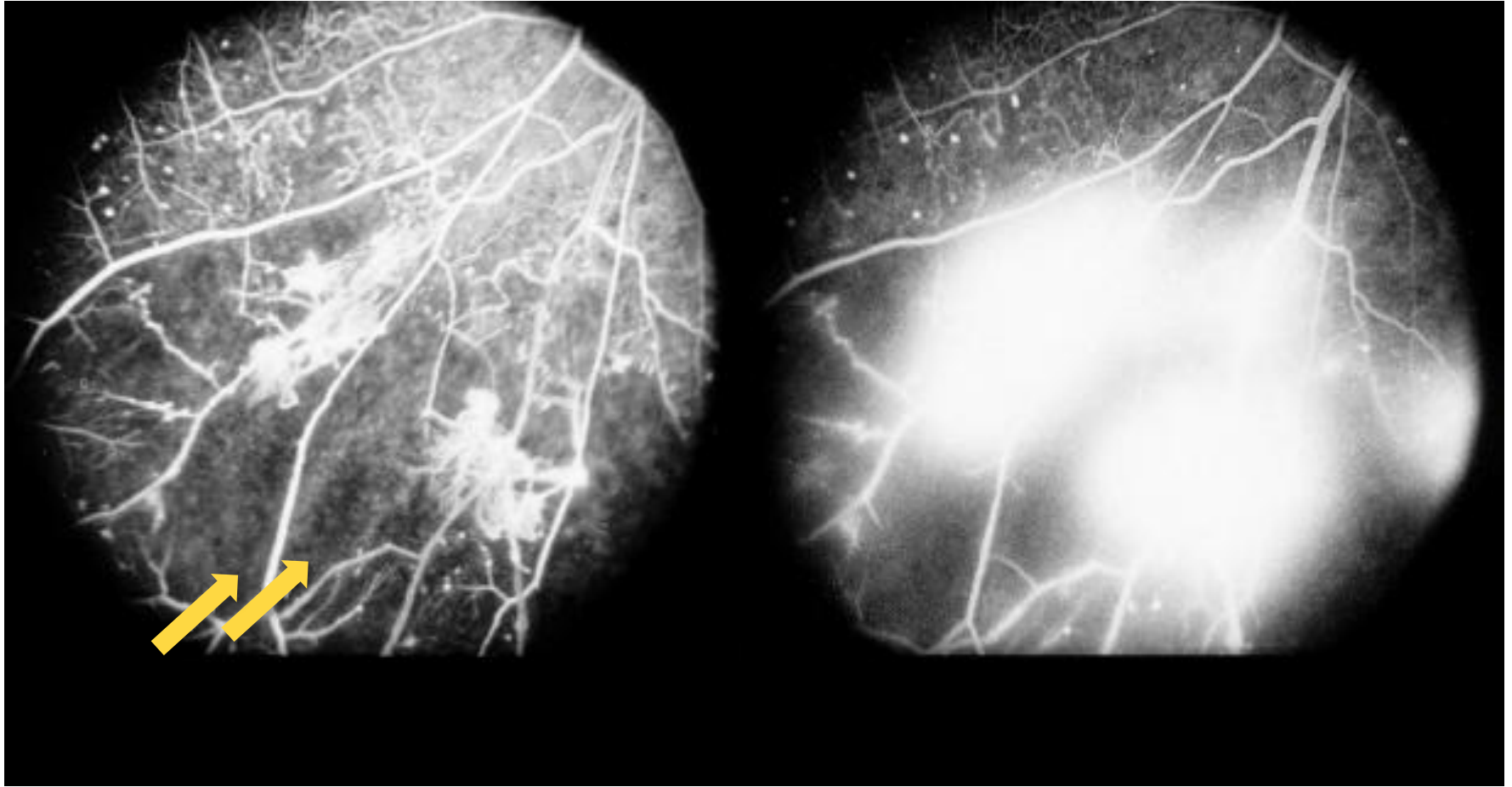
**Slit-lamp biomicroscopy
ophthalmoscopy**

Indirect



**Fundus photograph
angiography**

Fluorescein



Dark, hypofluorescent patches indicative of ischemia

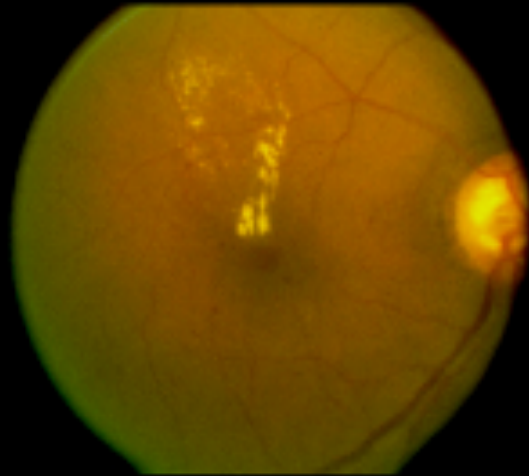


**Laser photocoagulation
surgery**

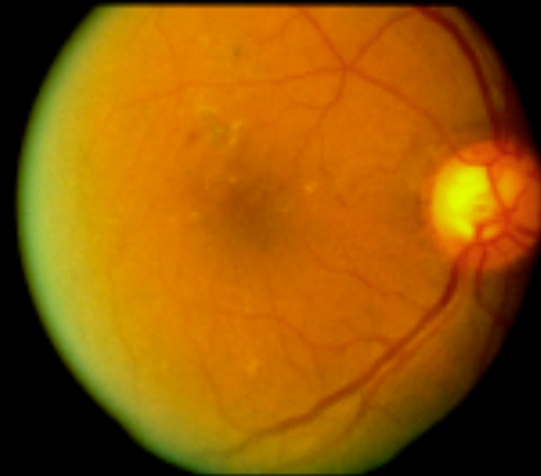


Acute panretinal laser photocoagulation burns

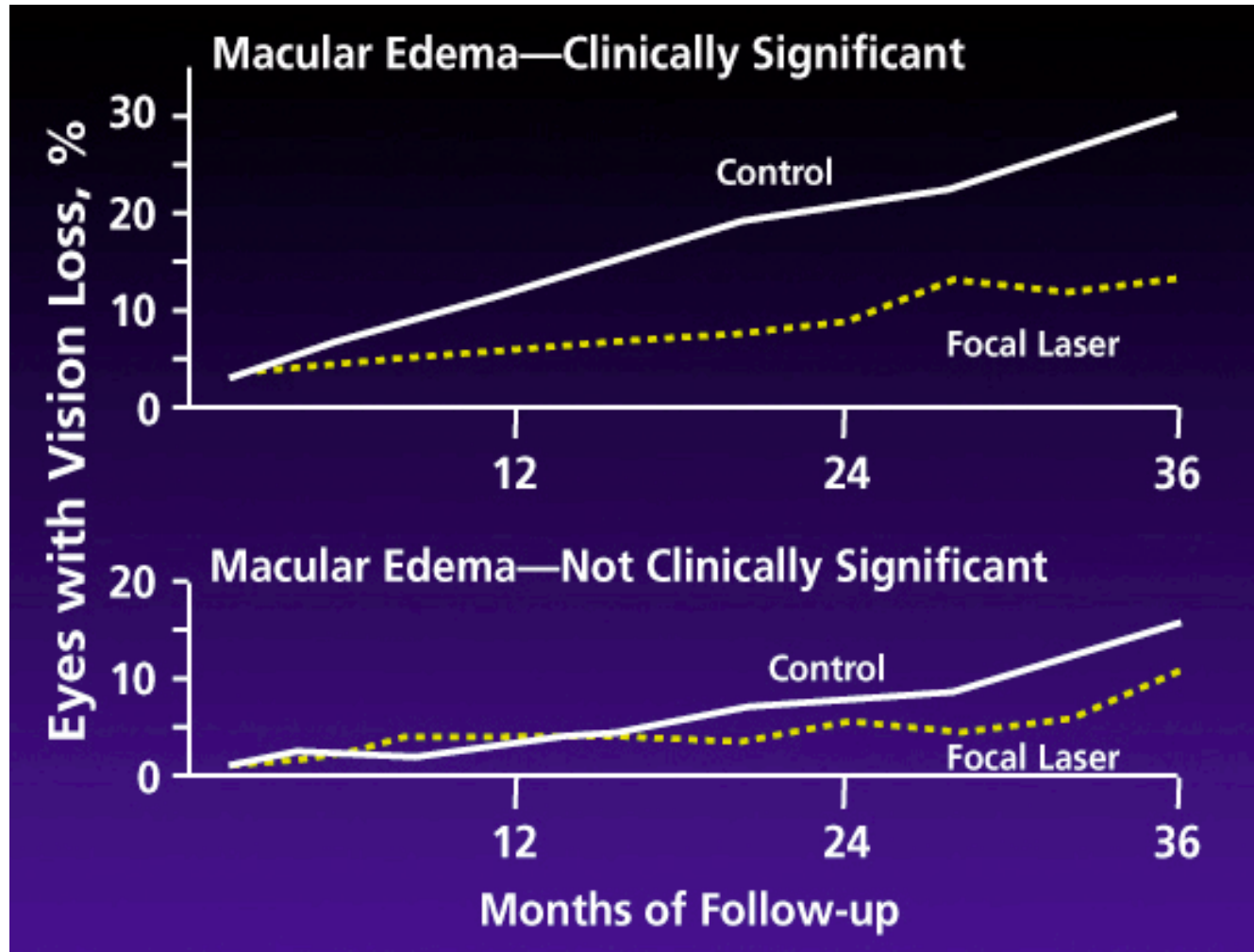
Clinically Significant Macular Edema



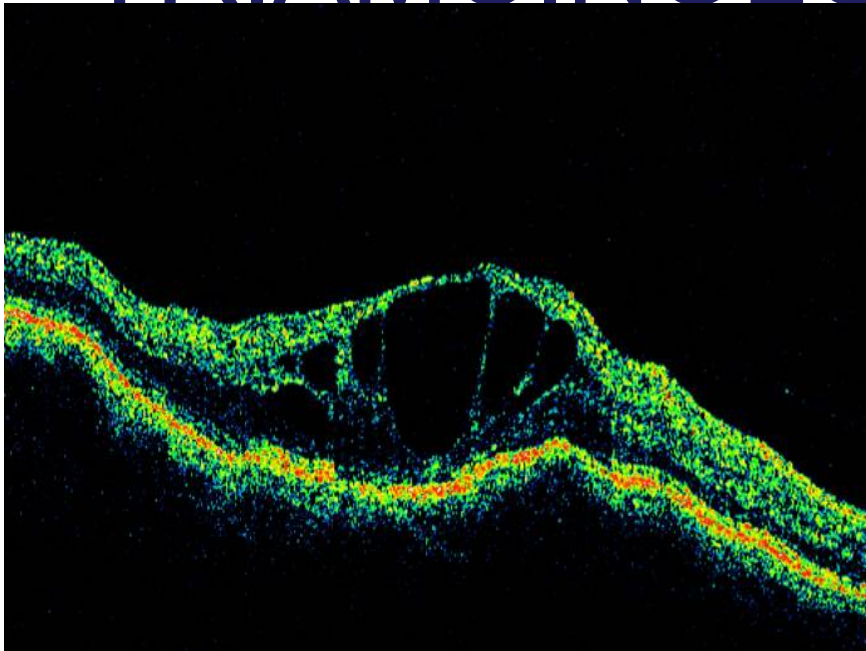
Before



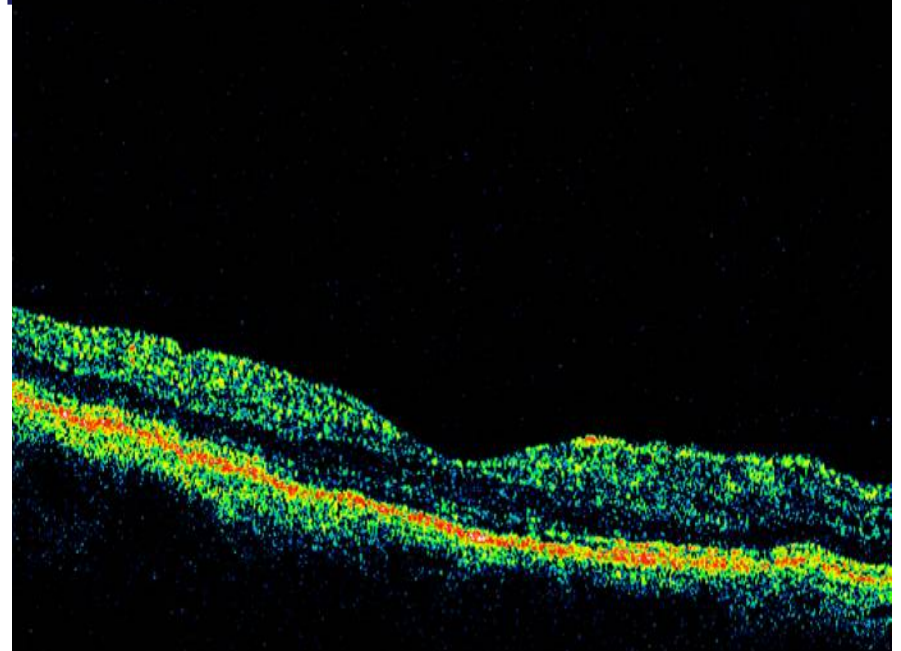
After



MACULAR EDEMA TREATMENT WITH TRIAMCINOLONE INJECTION

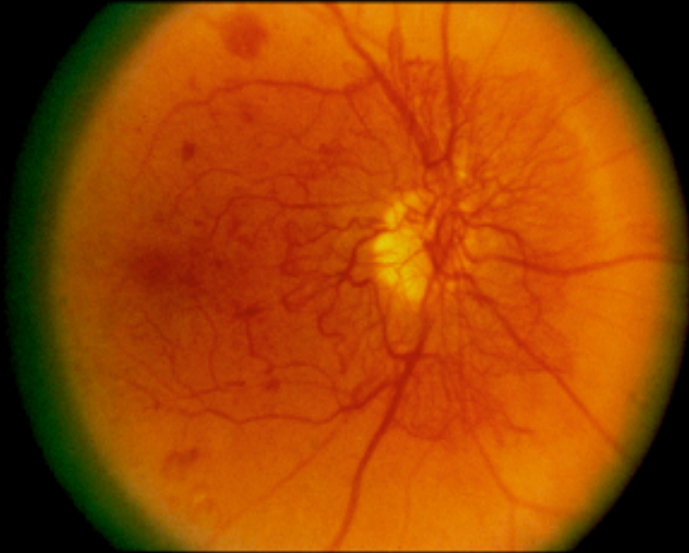


OCT before

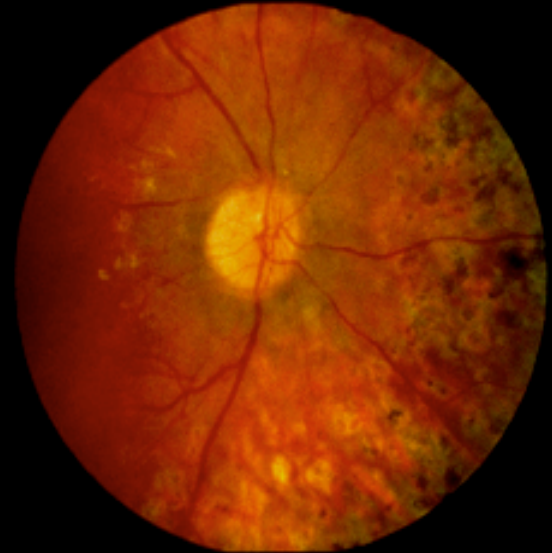


OCT after

PDR



Before

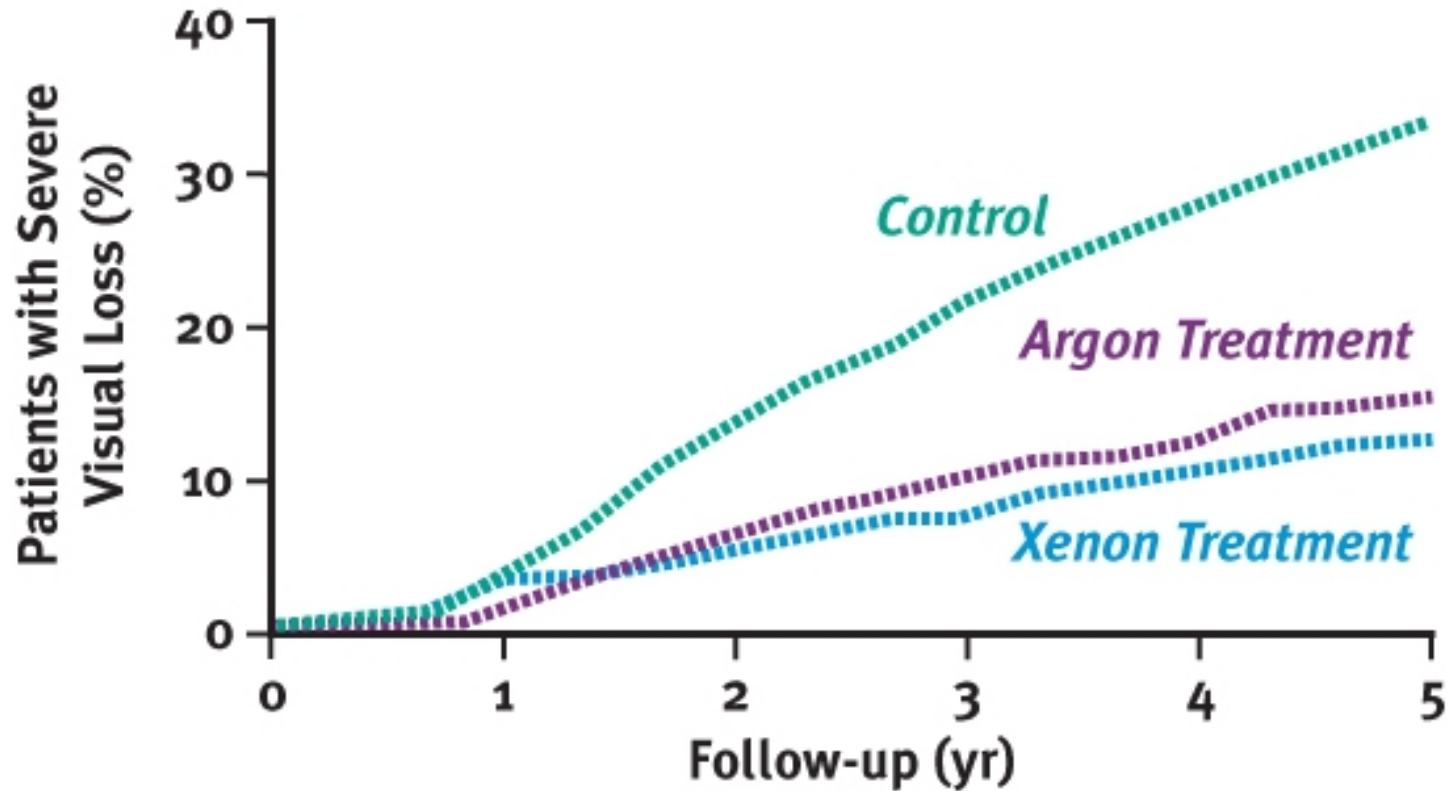


After

PANRETINAL PHOTOCOAGULATION (PRP)

- Outpatient procedure
- Approximately 1000 to 2000 burns per session
- 1 to 3 sessions

PRP: EFFECTIVENESS



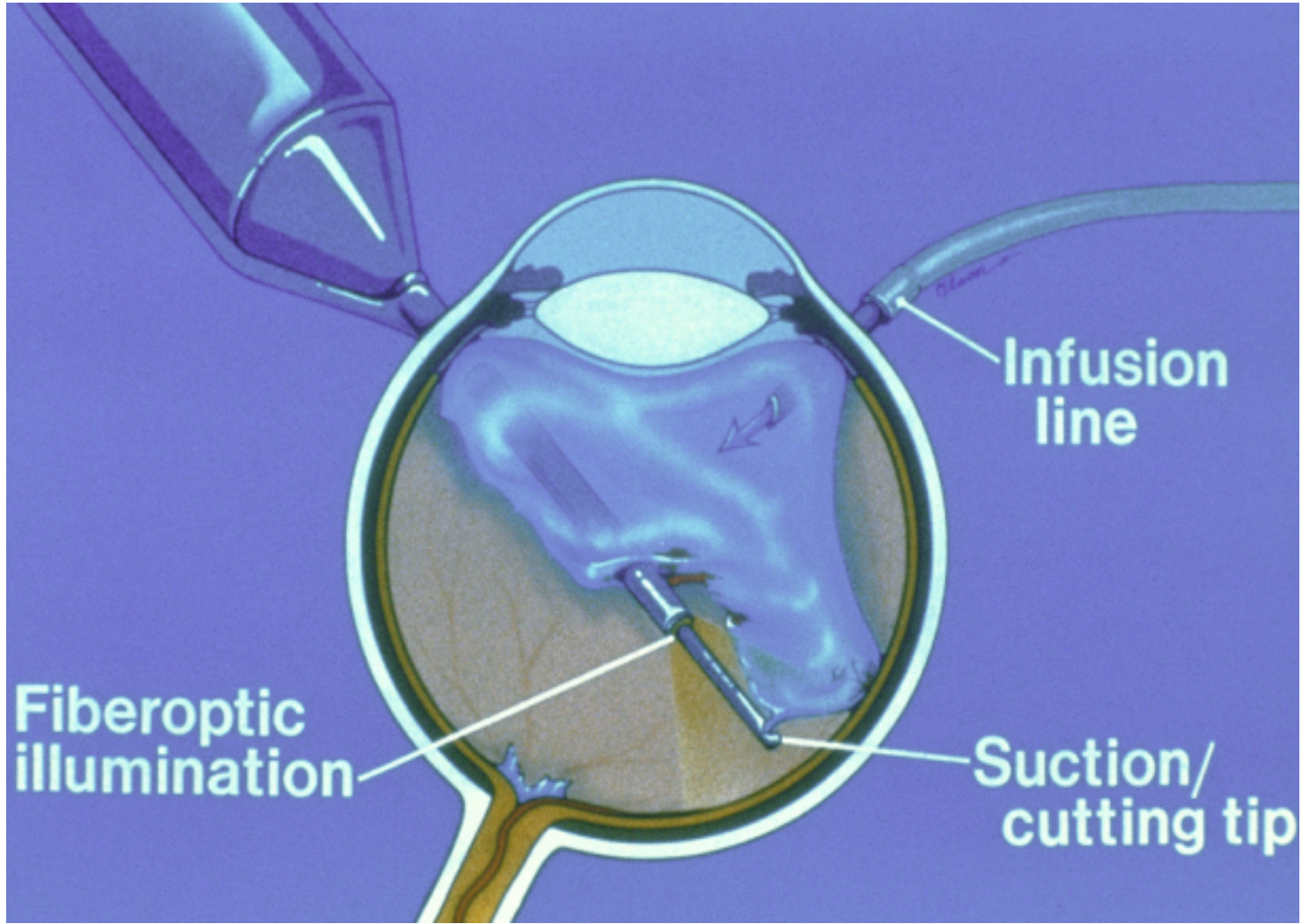
PRP: SIDE EFFECTS

- Decreased night vision
- Decreased peripheral vision

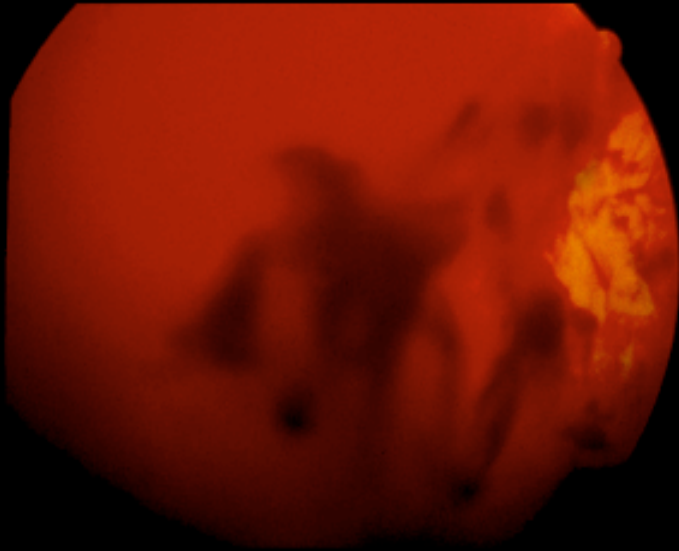
VITRECTOMY

- Remove vitreous hemorrhage
- Repair retinal detachment
- Allow treatment with PRP

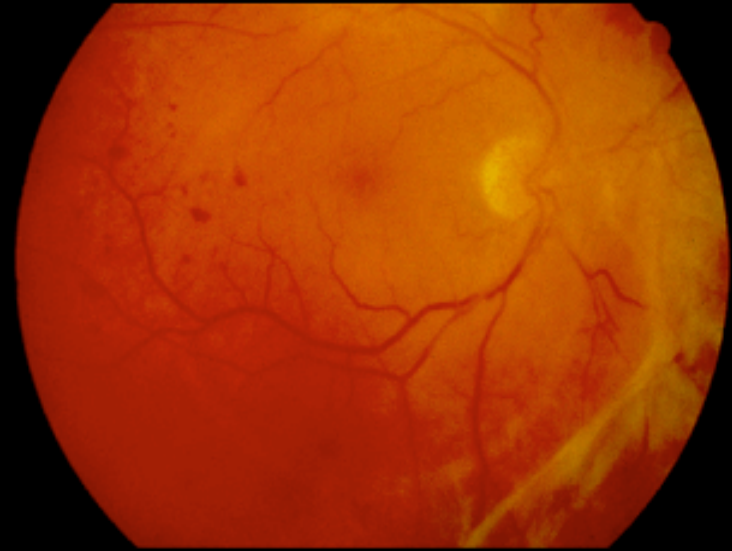
Treatment



Vitrectomy



Before



After

TREATMENT OPTIONS: SUMMARY

- Laser photocoagulation surgery
 - Focal macular laser for CSME
 - Panretinal photocoagulation for PDR
- Vitrectomy
 - May be necessary for vitreous hemorrhage or retinal detachment

FUTURE THERAPIES

- Anti-VEGF agents decrease capillary permeability and angiogenesis
- May prove useful as adjuvant treatment to laser therapy for diabetic retinopathies

SCREENING GUIDELINES: PATIENTS WITH TYPE 1

DIABETES

- Annual ophthalmologic exams starting 5 years after diagnosis and not before puberty

PATIENTS WITH TYPE 2 DIABETES

- Annual ophthalmologic exams starting at time of Dx

DIABETES AND PREGNANCY

- Ophthalmologic exam before conception
- Ophthalmologic exam during first trimester
- Follow-up depends on baseline grade

WESDR: PATIENTS' ACCESS AND COMPLIANCE

- 36% missed annual ocular exam
- 60% missed laser surgery

GOALS FOR SUCCESS

- Timely screening reduces risk of blindness from 50% to 5%
- 100% screening estimated to save \$167 million annually

GOALS FOR SUCCESS

Better systemic control of:

- Hemoglobin A1C
- BP
- Kidney status
- Serum lipids

REDUCING THE RISK OF BLINDNESS

- Team approach: primary care physician, ophthalmologist, nutritionist, endocrinologist, nephrologist
- Access to eye care
- Systemic control