

Diabetic Retinopathy

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Outline

- Statistics
- Anatomy
- Categories
- Assessment
- Management
- Risk factors
- What do you need to do?

Objectives

- Summarize the evidence as it relates to diabetic control on incidence and severity of retinopathy
- Diagnose severe non-proliferative and high-risk proliferative retinopathy
- Understand the recommended initial visit and follow-up schedule
- Recognize the treatment options

Diabetes in Canada

- Over 1.5 million Canadians are believed to have diabetes
- Half of those don't know they have it

Diabetes in the US

- 19 million Americans aged 20 years or older have either diagnosed or undiagnosed diabetes mellitus
- Additional 26% of adults (54 million persons) have impaired fasting blood glucose levels
- Americans of African or Mexican descent have a disproportionately high prevalence of diabetes compared with Americans of European descent (11.0%, 10.4%, 5.2%, respectively)
- ++high prevalence of diabetes is seen in Native American Indians and Alaskan Natives, with a prevalence rate of approximately 9% and a 46% increase in prevalence among those under age 35 years between 1990 and 1998
- An increase in the frequency of type 2 diabetes in the pediatric age group has been noted in several countries and has been associated with the increased frequency of childhood obesity.

Diabetes and Blindness

- Leading cause of new blindness among adults
- People with diabetes 25 times more likely to become blind than people without it
- Blinds 400 Canadians every year

Diabetes

- Detecting and treating diabetic eye diseases through annual, dilated eye exams can help people with diabetes preserve their sight
- The single-most important way to help prevent blindness caused by diabetes is good blood sugar control

Anatomy

Anatomy of the human eye

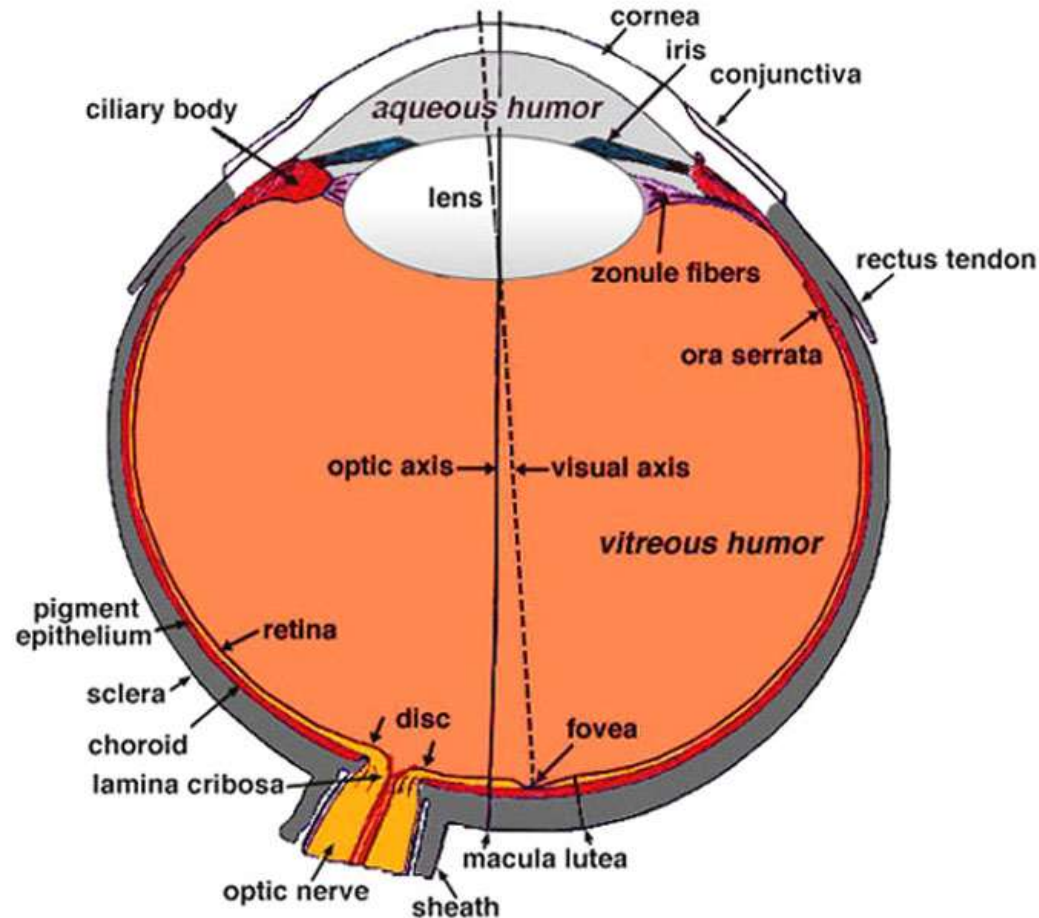


Fig. 2. Sagittal horizontal section of the adult human eye.

Anatomy of the eye (cont'd)

- Vitreous cavity
 - ❖ Large space filled with transparent gel called vitreous humour
- Retina
 - ❖ Neural tissue lining the vitreous cavity posteriorly
 - ❖ Transparent except for blood vessels on its inner surface
- Macula
 - ❖ Area of retina responsible for fine, central vision
 - ❖ Depression in centre of macula is called the fovea
- Optic Disc
 - ❖ Portion of ON visible within the eye
 - ❖ Axons whose cell bodies are located in ganglion cell layer of retina

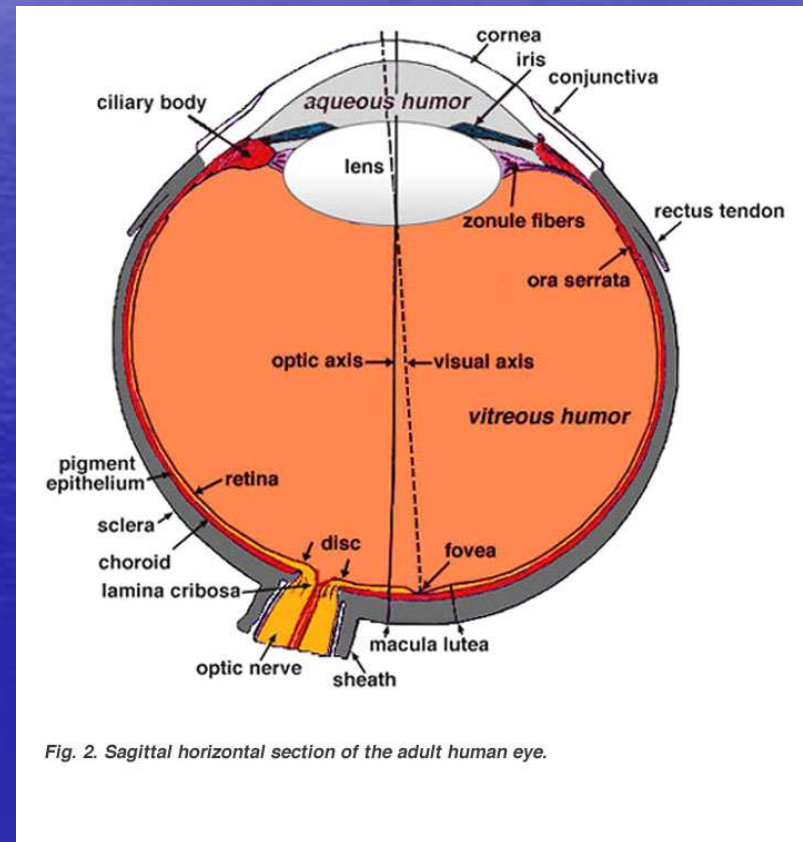


Fig. 2. Sagittal horizontal section of the adult human eye.

Categories

Diabetic Retinopathy: Categories

1. Non-proliferative

I) Mild

II) Moderate

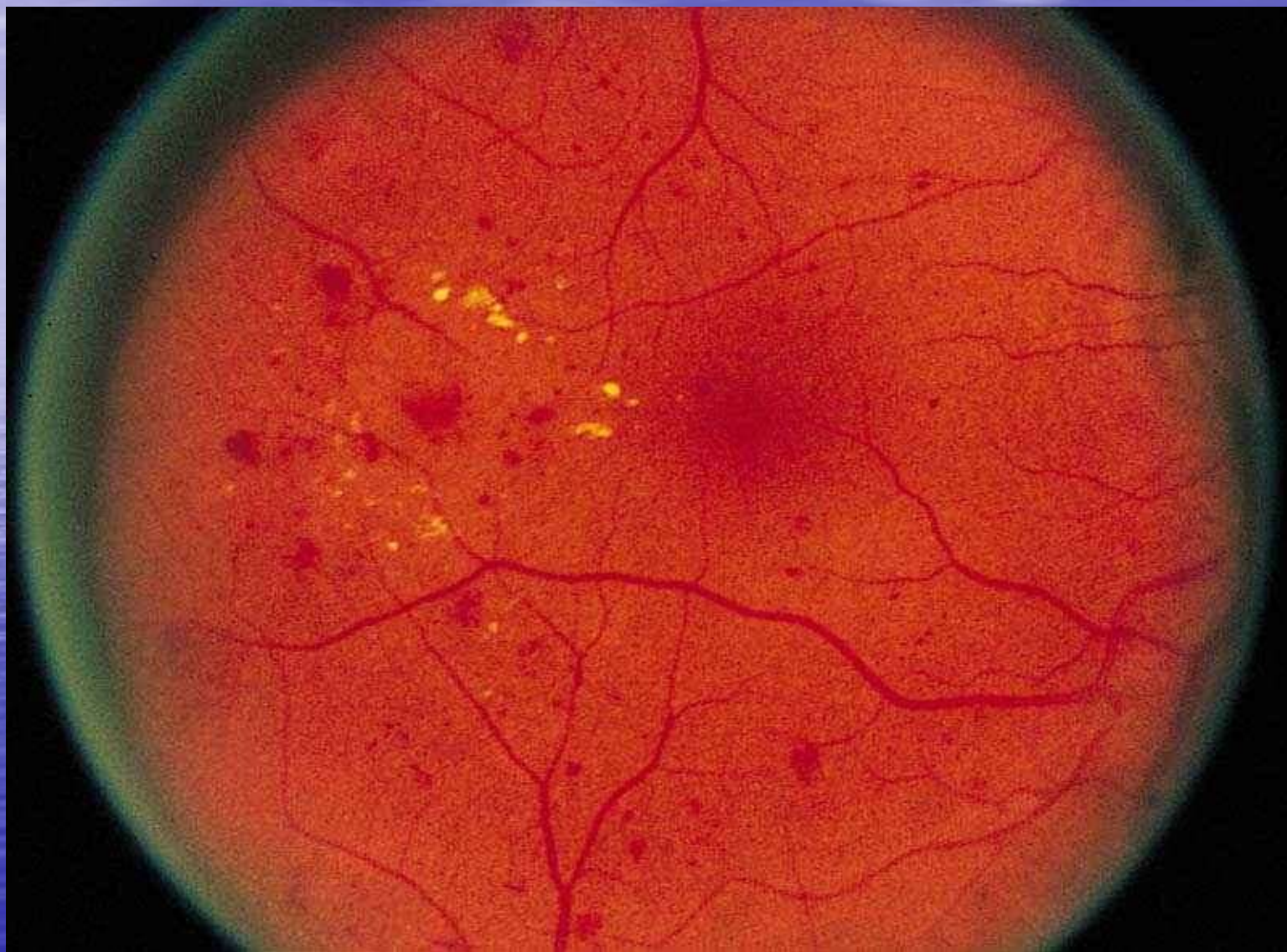
III) Severe

2. Proliferative

Non-proliferative Diabetic Retinopathy

- Microaneurysms
- Intraretinal hemorrhages
- Cotton-wool spots
- Increased retinal vascular permeability that occurs at this or later stages of retinopathy may result in retinal thickening (edema) and lipid deposits (hard exudates)

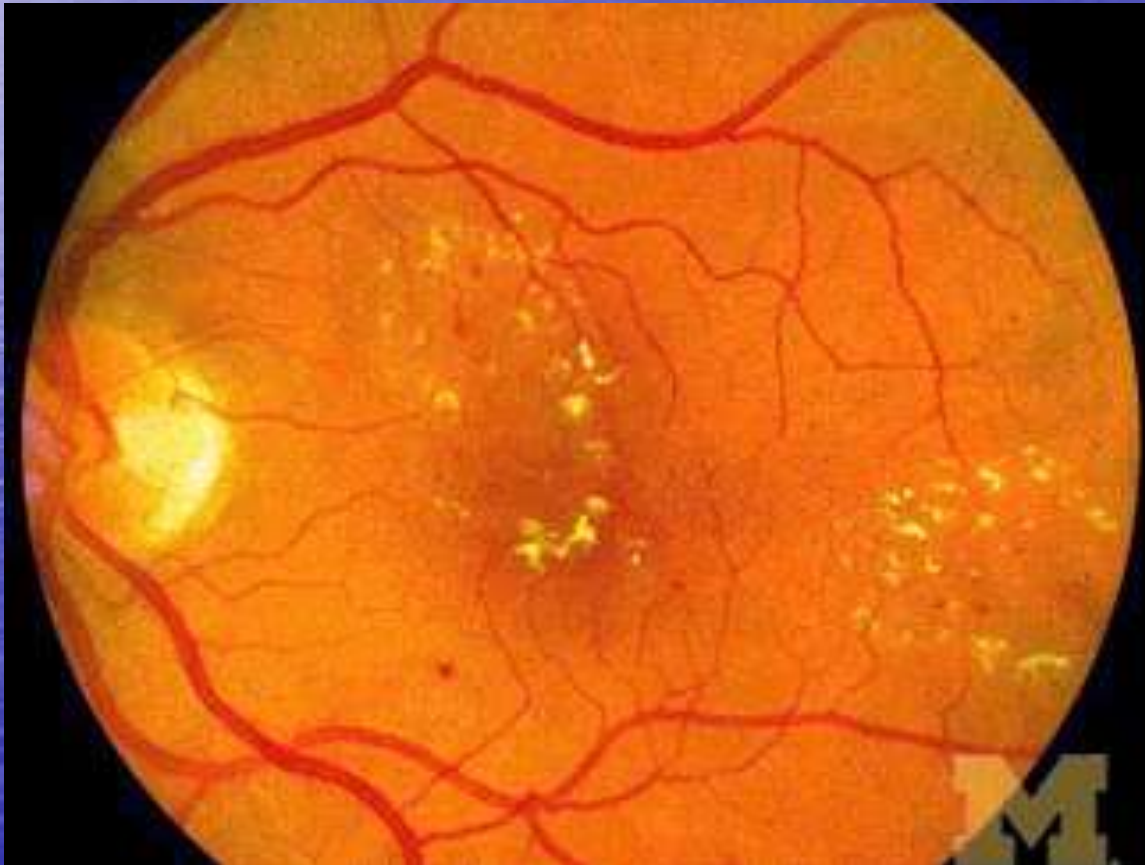
Mild Diabetic Retinopathy



Non-proliferative Diabetic Retinopathy

- No new blood vessels (neovascularization).
- About 25% of diabetics will show nonproliferative signs 15 years after diagnosis
- No disturbance of vision unless the macular region fills with fluid (diabetic macular edema)
- Vision-reducing diabetic macular edema is present in about 10% of diabetics 15 years after diagnosis

Non-proliferative Diabetic Retinopathy



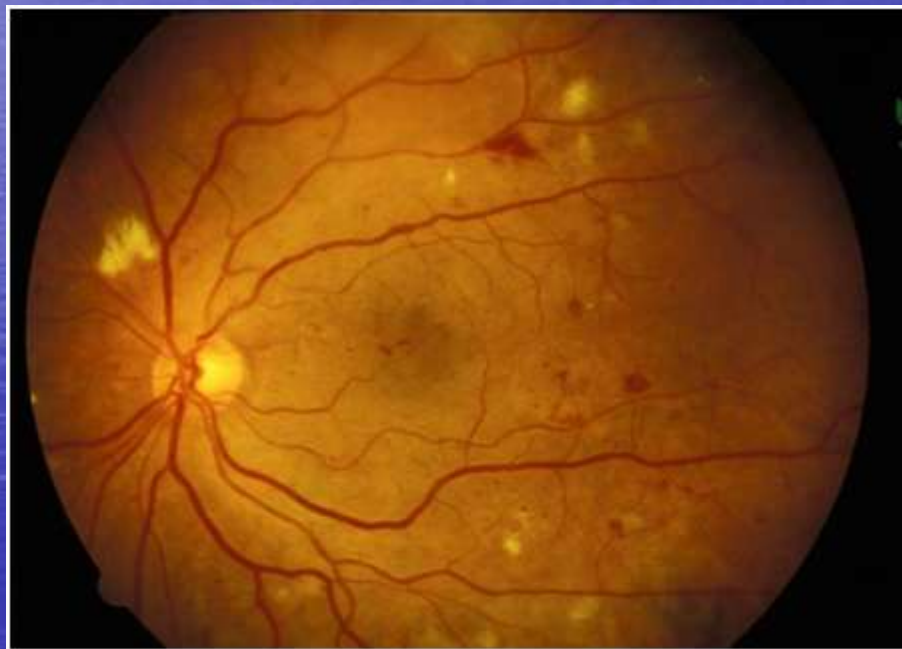
Non-proliferative Diabetic Retinopathy

[NPDR Video](#)

Severe Non-proliferative Diabetic Retinopathy

- Gradual closure of retinal vessels
- Impaired perfusion and retinal ischemia
- Venous abnormalities (e.g., beading, loops)
- IRMA (**I**ntra**R**etinal **M**icrovascular **A**bnormality)
- More severe and extensive vascular leakage characterized by increasing retinal hemorrhages and exudation

Severe Non-proliferative Diabetic Retinopathy



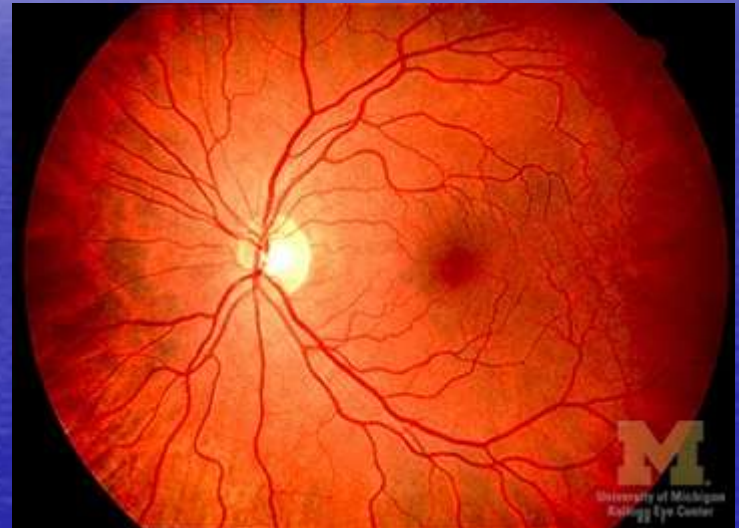
Proliferative Diabetic Retinopathy

- **Neovascularization**
- Blood vessels on surface of optic disc and nearby retina form a tangle instead of an orderly branching
- Arising under chronic retinal ischemia, these new blood vessels are weak-walled and bleed easily into the retina or vitreous cavity
- If not treated, they will grow out into the vitreous cavity as a fibrovascular scaffold, detach the retina, and blind the patient

Neovascularization



Normal Fundus



Proliferative Diabetic Retinopathy

[PDR - Video](#)

Advanced Proliferative DR



Advanced Proliferative DR

- Fibrovascular stalk results from untreated retinal neovascularization
- Vessels bleed into the vitreous cavity
- Vitreous fills up with blood and the retina detaches
- Laser photocoagulation is ineffective at this stage
- Vitreoretinal surgery may preserve rudimentary vision

Assessment

Assessment

History

- Duration of diabetes
- Past glycemic control (hemoglobin A_{1c})
- Medications
- Medical history (e.g., obesity, renal disease, systemic hypertension, serum lipid levels, pregnancy)
- Ocular history (e.g., trauma, ocular injections, surgery, including laser treatment and refractive surgery)

Assessment

Examination

- Visual acuity
- Slit-lamp biomicroscopy
- Intraocular pressure
- Gonioscopy when indicated
- Dilated funduscopy including stereoscopic examination of the posterior pole
- Examination of the peripheral retina and vitreous

Assessment

- Categorize the disease based on examination
 1. NO DR
 2. NPDR(MILD/MODERATE/SEVERE)
 3. PDR

Management

Management

- Guided by landmark clinical trials in diabetes and diabetic retinopathy
- Diabetic Control and Complications Trial (DCCT)
- Early Treatment of Diabetic Retinopathy Study (ETDRS)
- Diabetic Retinopathy Study (DRS)

Management Recommendations for patients with diabetic retinopathy

- Normal/minimal NPDR 12 months
- Mild to moderate NPDR 6 -12 months
- Severe NPDR or worse 2-4 months

Management

- Diabetic Control and Complications Trial (DCCT)
 - *Strict glucose control resulted in a 50% reduction in the rate of progression of retinopathy in patients with existing retinopathy*

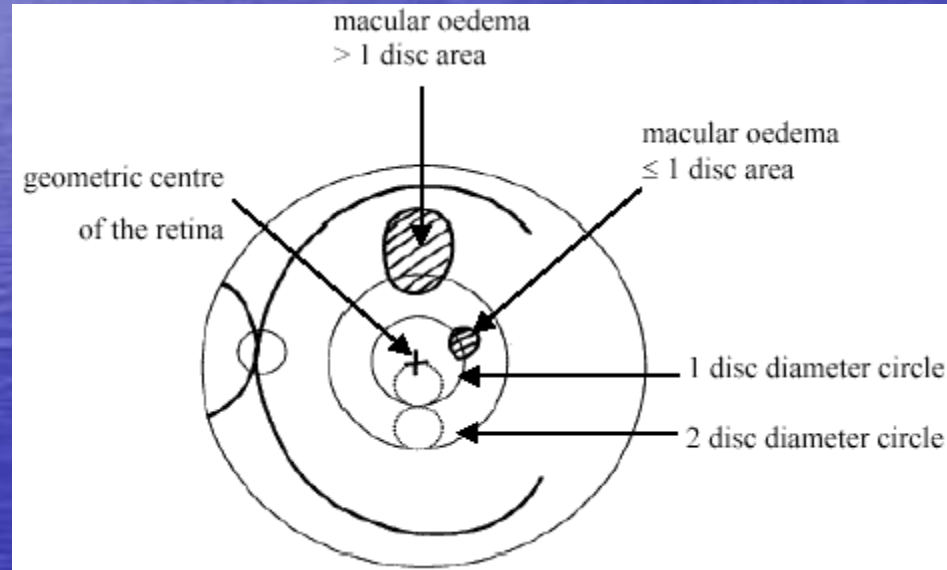
Management

- Early Treatment of Diabetic Retinopathy Study (ETDRS)
 - *ETDRS results showed the risk of moderate visual loss (i.e., doubling of the visual angle; for example, a visual acuity decrease from 20/40 to 20/80) in patients with severe NPDR or non-high risk PDR is reduced by more than 50% for patients who undergo appropriate laser photocoagulation surgery, compared with those who are not treated*
 - *no evidence that aspirin therapy at a dose of 650 mg per day retards or accelerates the progression of diabetic retinopathy or that it causes more severe or more long-lasting vitreous hemorrhages in patients with PDR*

Clinically Significant Macular Edema

- Clinically significant macular edema is defined by the ETDRS to include any of the following features:
- Thickening of the retina at or within 500 microns of the center of the macula, that is approximately one-half optic disc diameter
- Hard exudates at or within 500 microns of the center of the macula, if associated with thickening of the adjacent retina (not residual hard exudates remaining after the disappearance of retinal thickening)
- A zone or zones of retinal thickening one disc area or larger, any part of which is within one disc diameter of the center of the macula

Clinically Significant Macular Edema



Macular Edema

Management

- Diabetic Retinopathy Study (DRS)
 - *Designed to investigate the value of xenon arc and argon photocoagulation surgery for patients with severe NPDR and PDR*
 - *Reduced risk of severe visual loss by more than 50%*

High-Risk PDR

The Diabetic Retinopathy Study high-risk characteristics for severe visual loss with high-risk PDR include the following:

- *New vessels within one disc diameter of the optic nerve head that are larger than one-third disc area*
- *Vitreous or preretinal hemorrhage associated with less extensive NVD or with NVE one-half disc area or more in size*

What do these studies mean?

- DCCT → tight glucose control
- ETDRS → laser for macular edema
- DRS → PRP for High Risk PDR



Risk Factors

Risk Factors

- Duration of diabetes
- Severity of hyperglycemia
- Hyperlipidemia
- Hypertension

Risk Factors: Duration of diabetes

- For Type 1
 - 5 years, approximately 25% have retinopathy
 - 10 years, almost 60% have retinopathy
 - 15 years, 80% have retinopathy
 - PDR in 50% at 20 years

Risk Factors: Duration of diabetes

- Type 2 patients
 - less than 5 years, 40% of those taking insulin and 24% of those not taking insulin have retinopathy
 - Rates increase to 84% and 53%, respectively, when the duration of diabetes has been documented for up to 19 years
 - PDR in 25% at 25 years

What do you need to do?

Refer

TABLE 4 RECOMMENDED EYE EXAMINATION SCHEDULE FOR PATIENTS WITH DIABETES MELLITUS

Diabetes Type	Recommended Time of First Examination	Recommended Follow-up*
Type 1	3-5 years after diagnosis ¹⁵ [A:II]	Yearly ¹⁵ [A:II]
Type 2	At time of diagnosis ^{19,69} [A:II]	Yearly ^{19,69} [A:II]
Prior to pregnancy (type 1 or type 2)	Prior to conception and early in the first trimester ⁷⁰⁻⁷² [A:I]	No retinopathy to mild or moderate NPDR: every 3-12 months ⁷⁰⁻⁷² [A:I] Severe NPDR or worse: every 1-3 months ⁷⁰⁻⁷² [A:I]

NPDR = nonproliferative diabetic retinopathy

*Abnormal findings may dictate more frequent follow-up examinations.

What do you need to do?

Tight Glucose Control



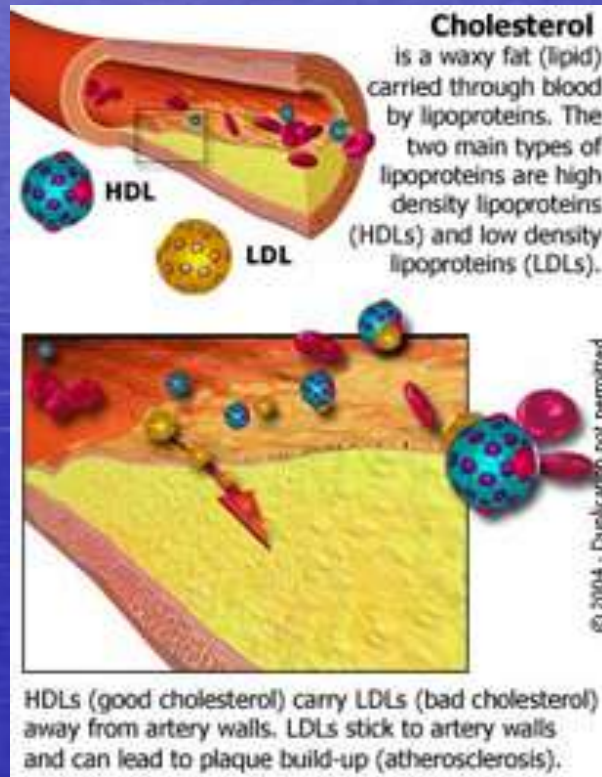
What do you need to do?

Tight Blood Pressure Control

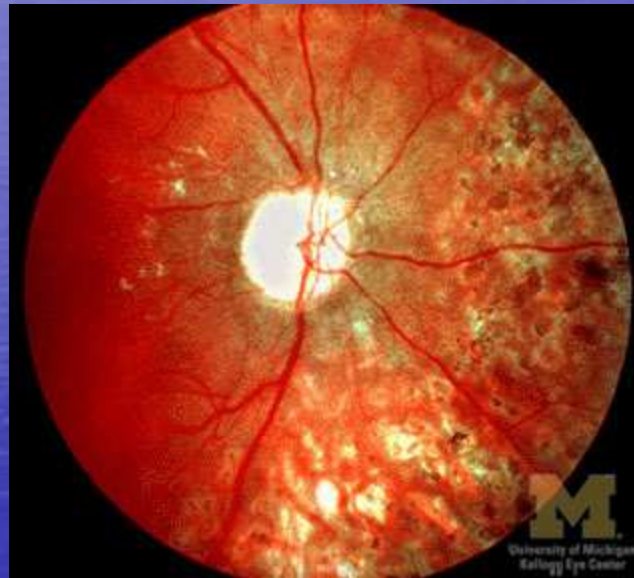


What do you need to do?

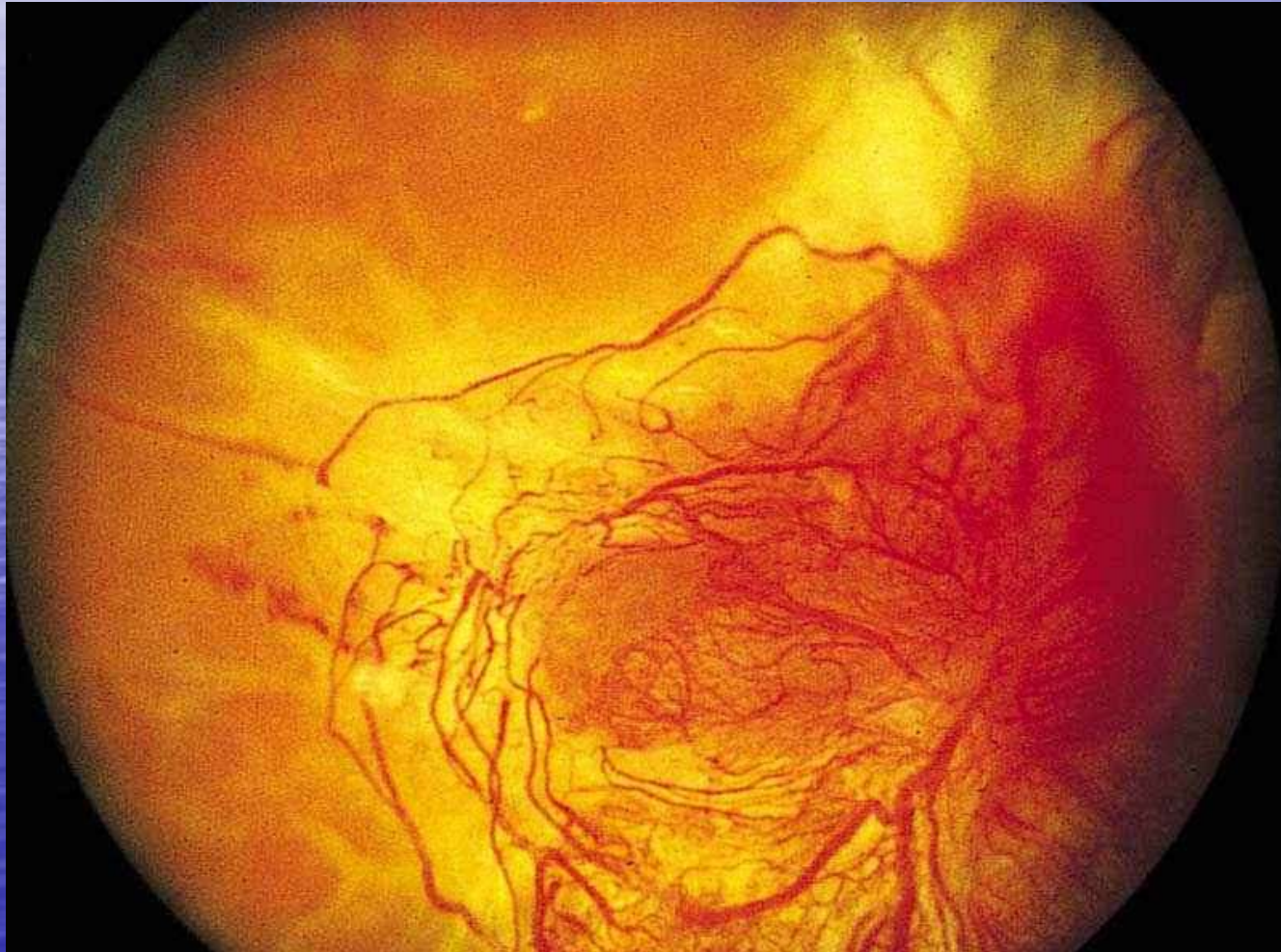
Good Lipid Control



Panretinal Photocoagulation



Severe Diabetic Retinopathy



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Thank you