



**Advances in the Treatment of
Diabetic Retinopathy:**
Paradigm shifts in patient care
and education

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National Eye Institute



*A program of the National
Institutes of Health*

Presenters



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What is the National Eye Health Education Program (NEHEP)?

- NEHEP was established by the National Eye Institute (NEI) of the National Institutes of Health (NIH) to serve as an extension of activities in vision research so science-based information can be applied to preserving sight and preventing blindness.
- **Goal:** To ensure that vision is a public health priority through the translation of eye and vision research into public and professional education programs.



What is the Diabetic Retinopathy Clinical Research Network (DRCR.net)?

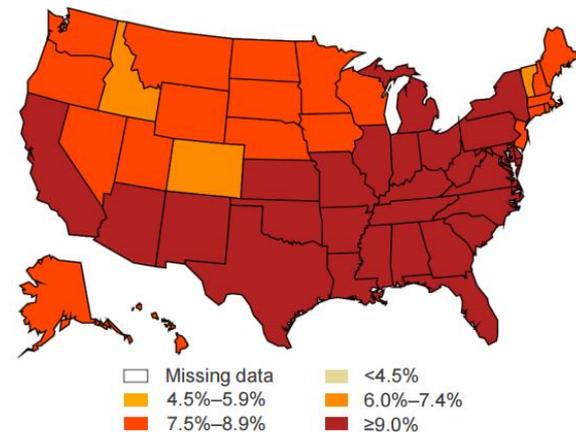
- Is a collaborative network dedicated to facilitating multicenter clinical research of diabetic retinopathy, diabetic macular edema, and associated conditions.
- Supports the identification, design, and implementation of multicenter clinical research initiatives focused on diabetes-induced retinal disorders.
- Emphasizes clinical trials; however, epidemiologic outcomes and other research may be supported as well.

Diabetes in the United States

- 29.1 million Americans have diabetes—9.3 percent of the U.S. population.
- Of these, 8.1 million do not know that they have the disease.
- An estimated 86 million adults have prediabetes.
- One out of four people with prediabetes do not know they have it.
- Diabetes is the 7th leading cause of death in the United States.

Age-Adjusted Prevalence of Diagnosed Diabetes
Among US Adults

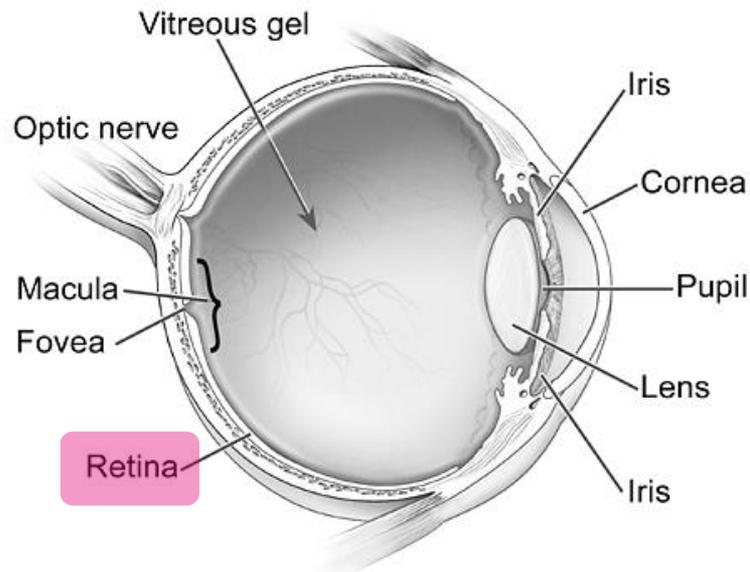
2014



CDC's Division of Diabetes Translation. United States Diabetes Surveillance System available at <http://www.cdc.gov/diabetes/data>

Diabetic Retinopathy

Damage to the blood vessels in the retina due to diabetes.

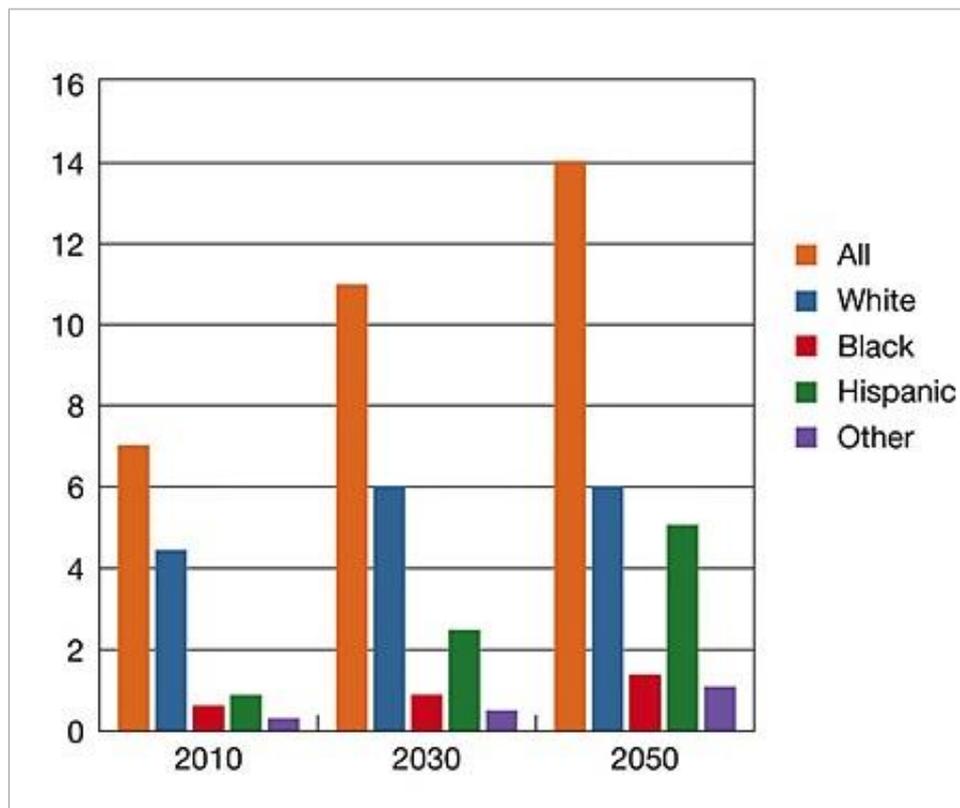


Diabetic Retinopathy Prevalence and Projections*

	2010	2030	2050
Diabetic Retinopathy	7,700,000	11,300,000	14,600,000

* Includes adults age 40 and older in the United States with diabetic retinopathy.

Projections for Diabetic Retinopathy by Ethnic Group in 2030 and 2050 (in millions)

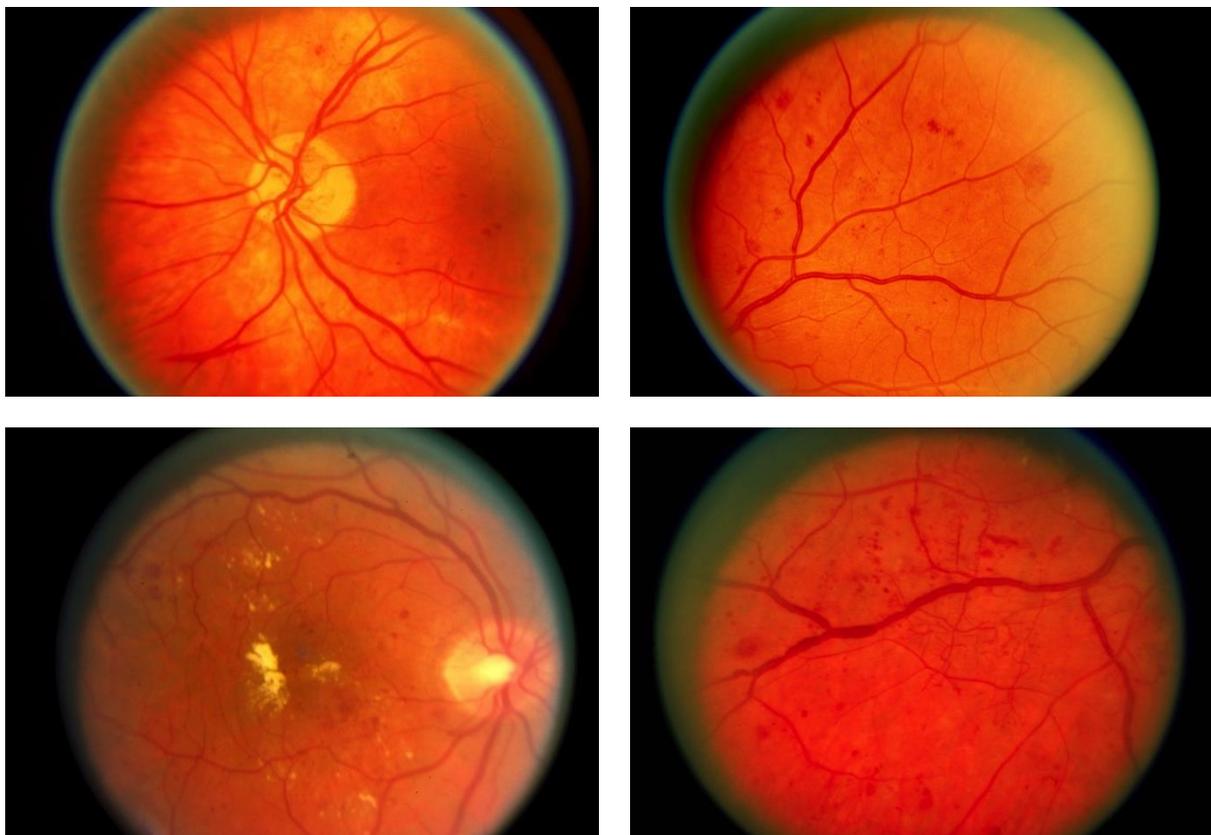




Emily Y. Chew, M.D.

AN OVERVIEW OF DIABETIC RETINOPATHY

Early Treatment of Diabetic Retinopathy Study (ETDRS) Classification of Diabetic Retinopathy



Diabetic Retinopathy

Five pathologic processes:

- Formation of microaneurysms (outpouchings of the small vessels)
- Excessive vascular permeability (leakage)
- Vascular occlusions (closure of blood vessels)
- Proliferation of new vessels (\pm hemorrhage)
- Contraction of new blood vessels: Scarring, retinal detachment

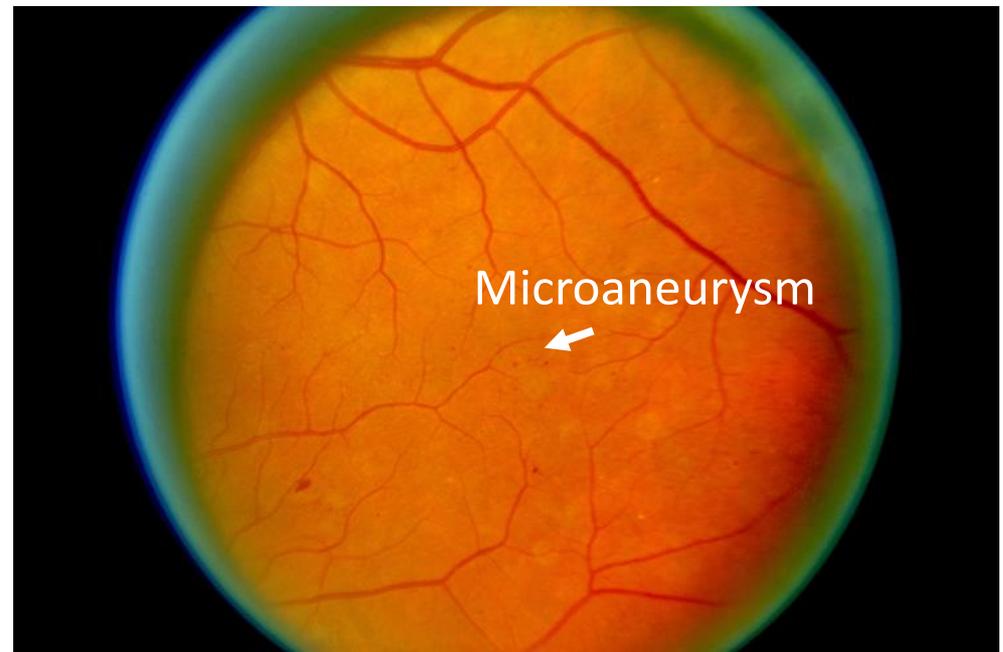
Classification of Diabetic Retinopathy

Nonproliferative:

- No apparent retinopathy (no abnormalities)
- Mild nonproliferative: Microaneurysms only
- Moderate nonproliferative: More than just microaneurysms but less than severe nonproliferative diabetic retinopathy (NPDR)
- Severe nonproliferative (the stage before new vessels develop, so-called proliferative diabetic retinopathy)

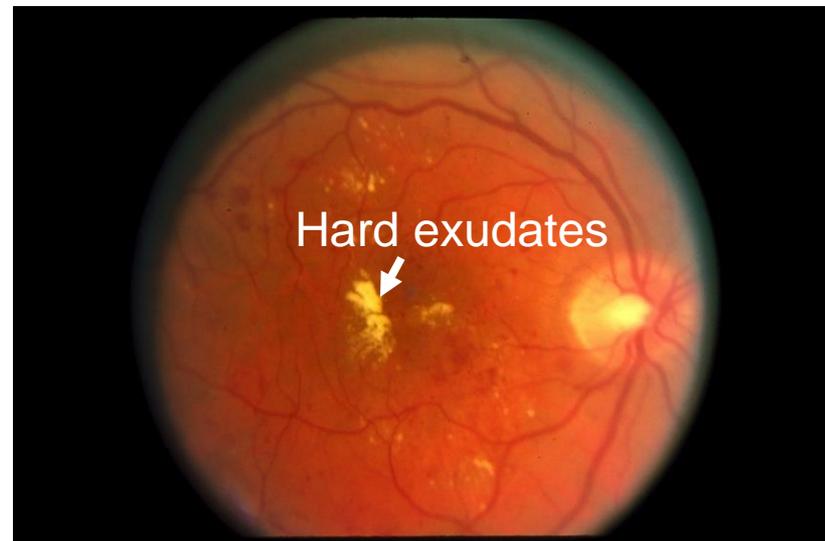
Microaneurysm Formation

- Earliest clinical sign of retinopathy
- Minimal impact on vision at this stage



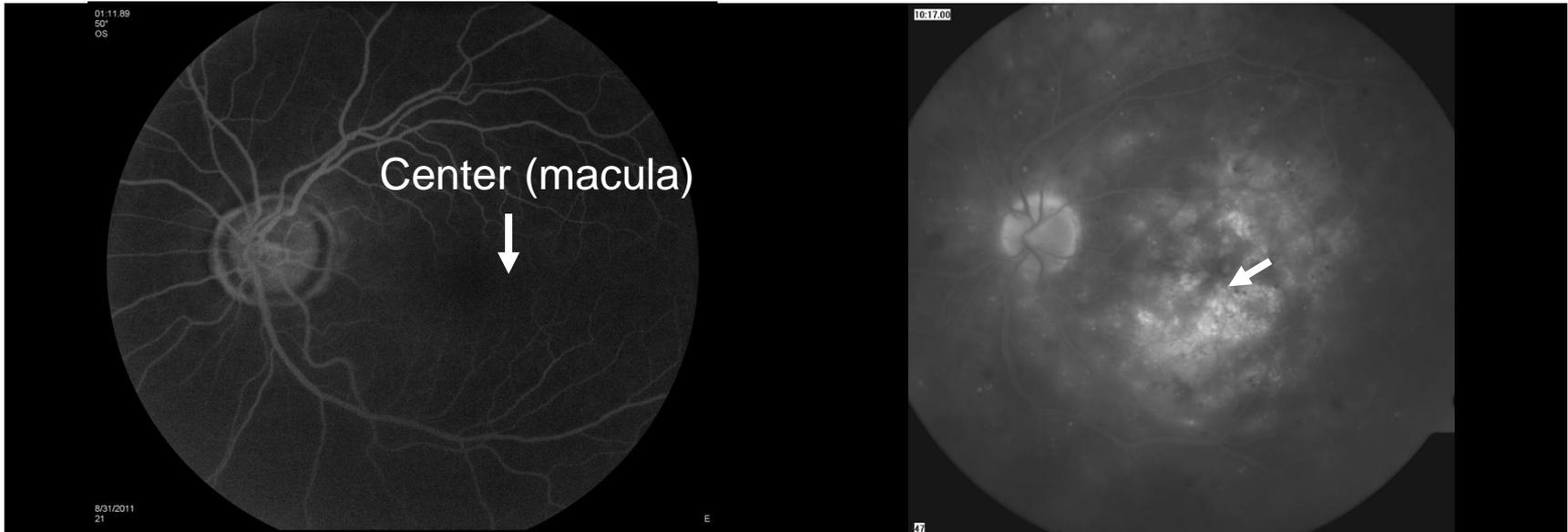
Excessive Vascular Permeability (leakage from blood vessels) Macular Edema (swelling of the center of the retina)

- With increasing number of microaneurysms
- Signs: **Hard exudates**
 - Mainly lipids
 - Yellow lesions
 - Accompanies retinal edema or swelling



Decreased vision: 20/60

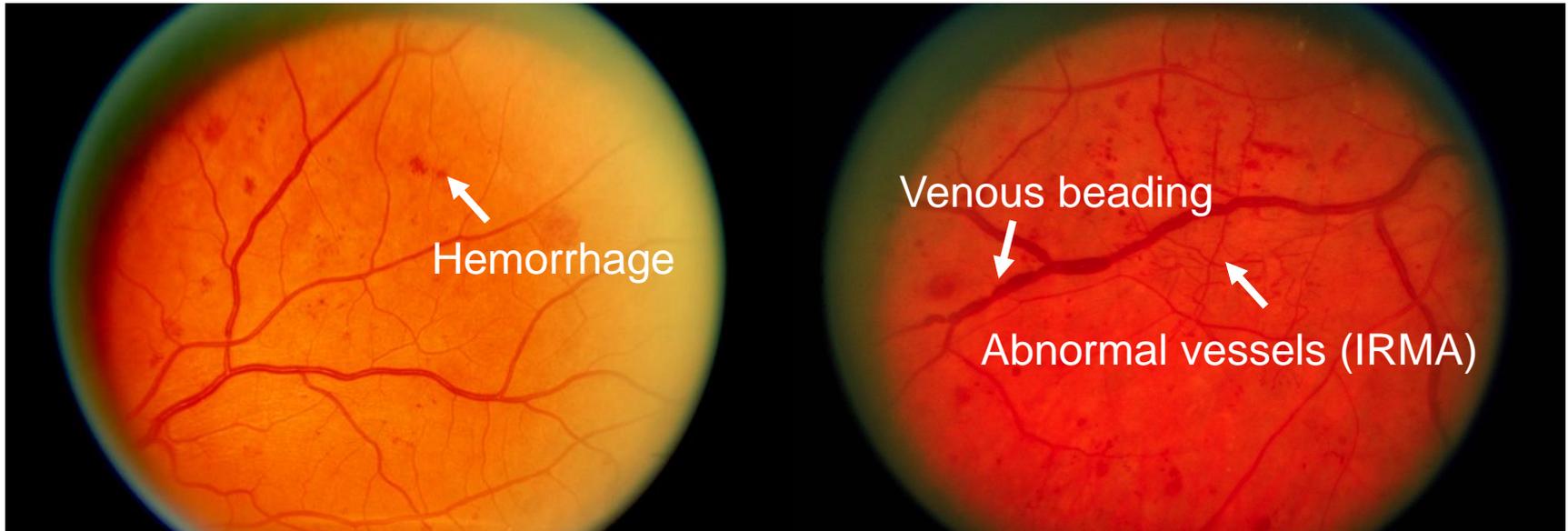
Excessive Vascular Permeability (leakage from blood vessels) Fluorescein Angiography (injection of dye)



Normal

Macular edema

Vascular Occlusions (blockage of vessels) Representing Increasing Lack of Oxygen



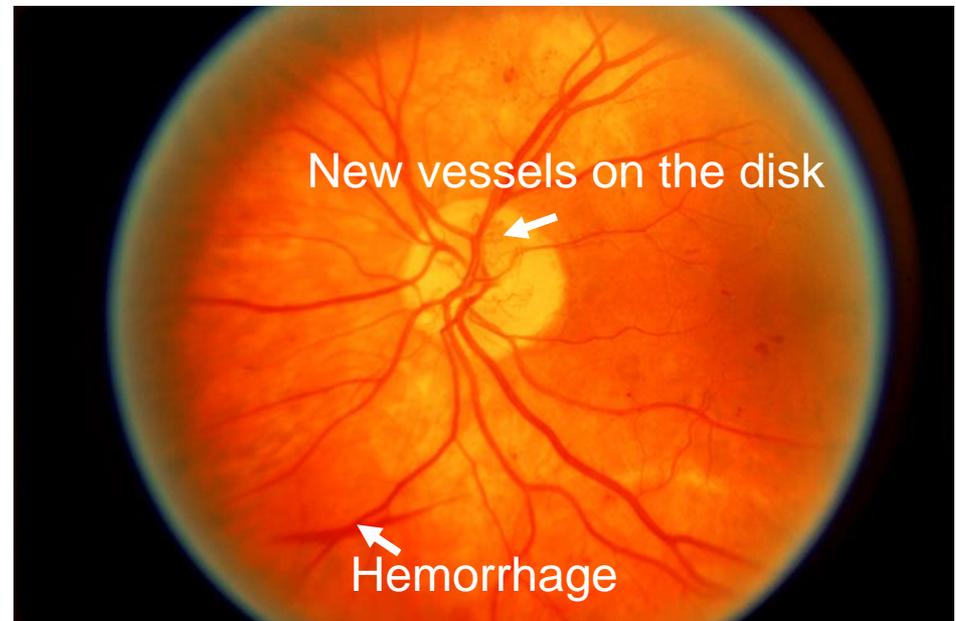
Increasing hemorrhages

Venous abnormalities and
abnormal vessels

Proliferation of New Vessels

Proliferative diabetic retinopathy (PDR):

- Early
- High-risk
- Advanced



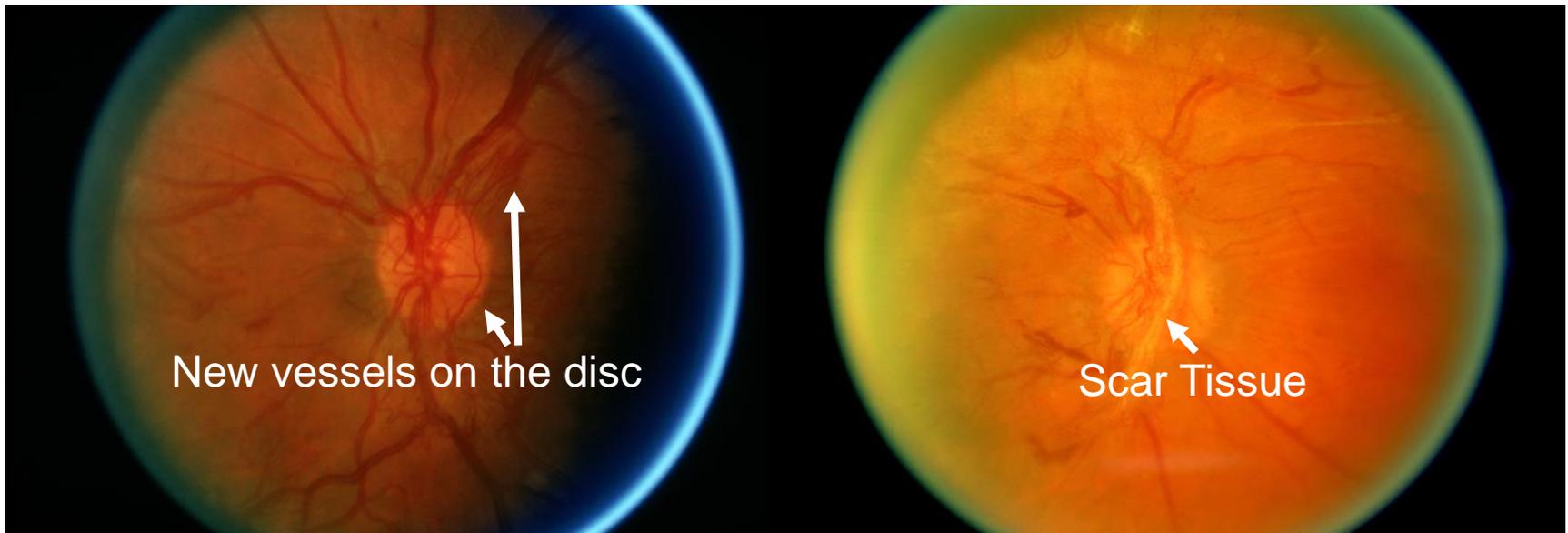
High-risk PDR

Proliferation of New Vessels



Neovascularization Elsewhere (NVE)

Proliferation of New Vessels



Advanced proliferative
diabetic retinopathy

Contraction of scar tissue with
new vessels

Overview of Diabetic Retinopathy

- Clinical Classification
- Global Burden of Diabetic Retinopathy
- Clinical Trials Prior to DRCR.net
- Medical Therapies

Global Burden of Diabetic Retinopathy (DR)

35 studies = 22,896 patients

Among those with diabetes:

- 34.6% with any DR (93M)
- 6.95% with proliferative DR (17M)
- 6.81% with diabetic macular edema
- 10.2% with vision-threatening DR (28M)

Global Burden of Diabetic Retinopathy

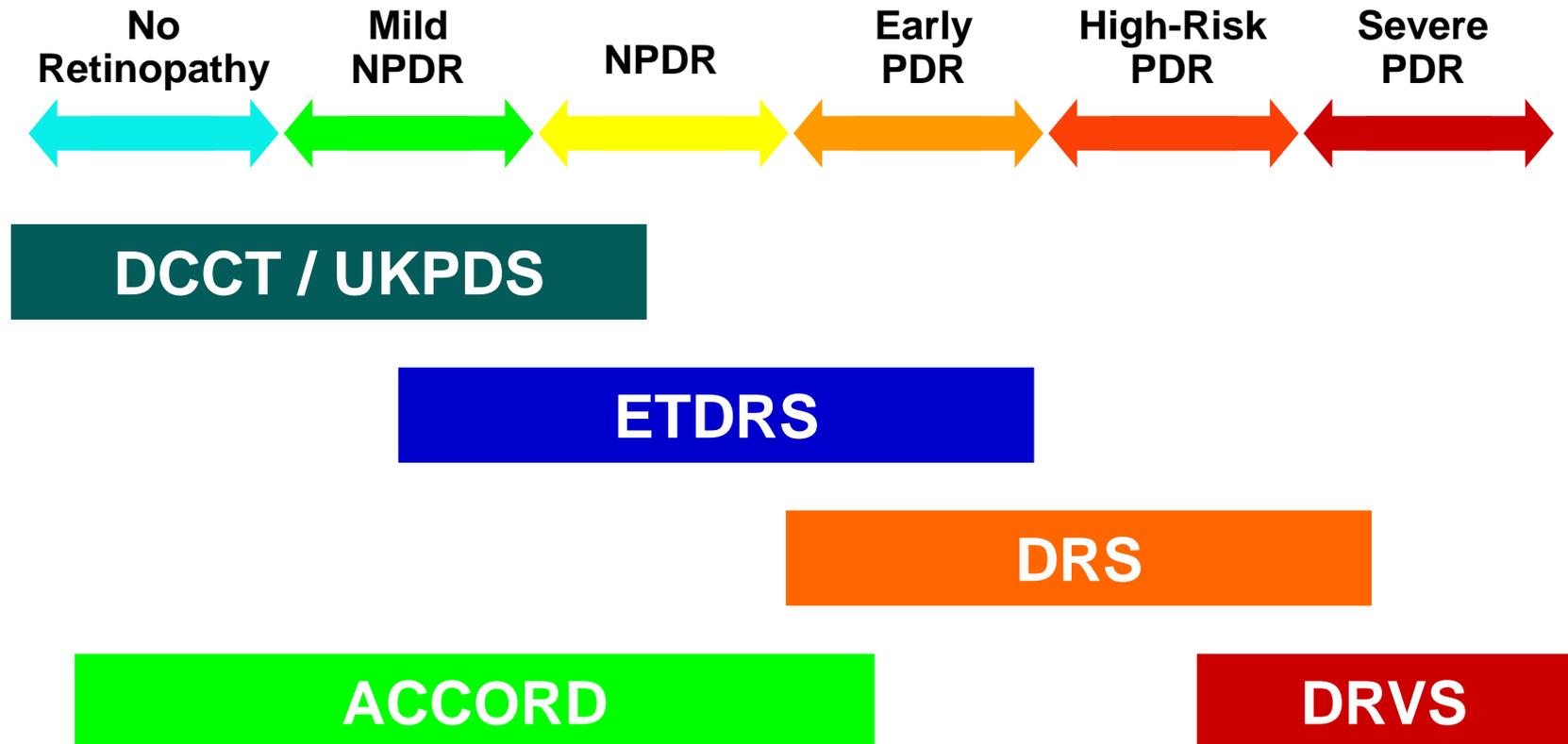
35 studies = 22,896 patients

Among those with diabetes, increased risk of diabetic retinopathy:

- Longer duration of diabetes
- Poorer glycemic control
- Poorer blood pressure control
- Poorer control of blood cholesterol levels

Diabetic Retinopathy

National Institutes of Health-supported Clinical Trials



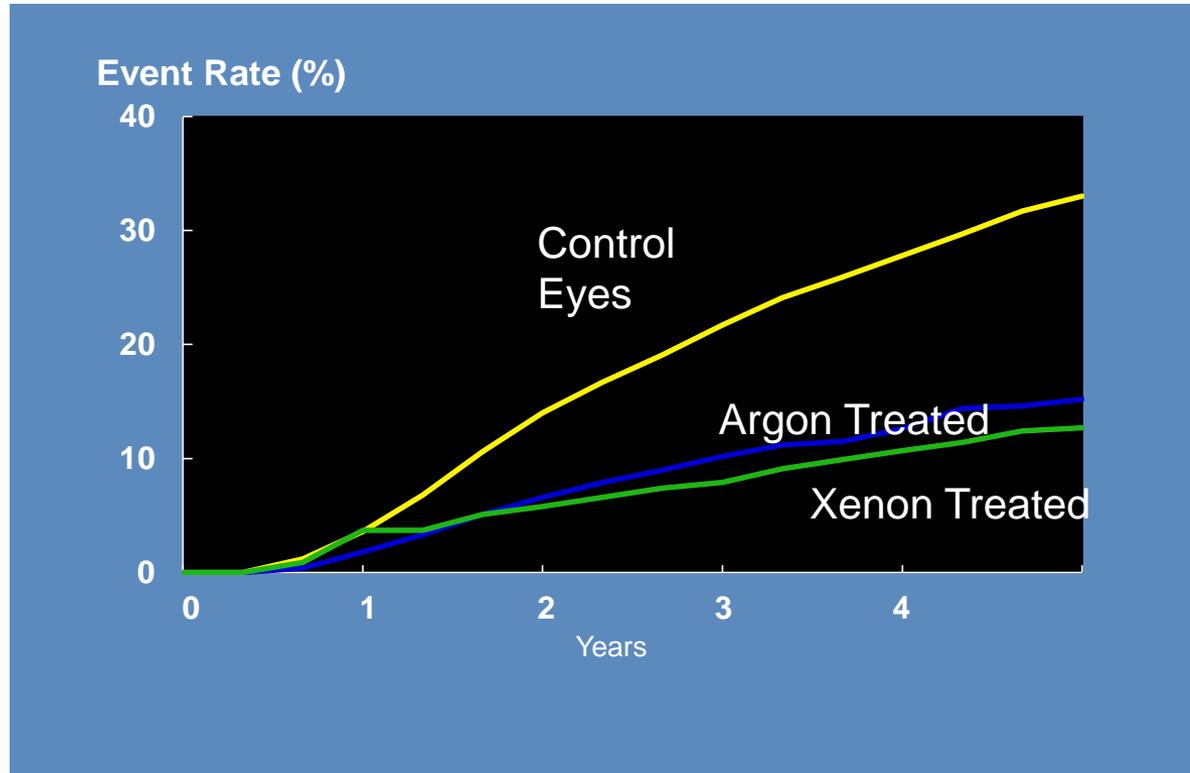
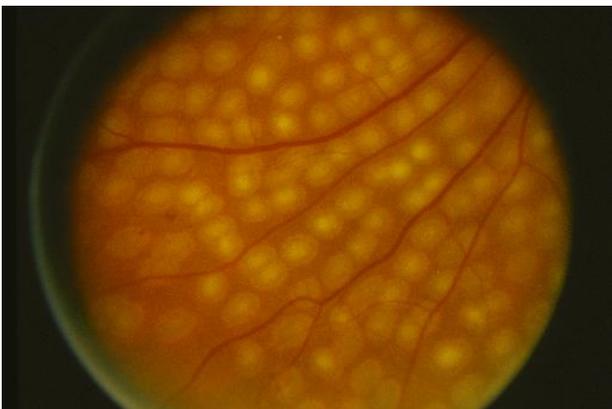
Treatments for Diabetic Retinopathy

Standard therapies:

- Laser photocoagulation
- Surgical intervention (vitrectomy)
- Medical therapies delivered into the eye (intravitreal injections)
- Systemic medical therapies involving blood sugar, blood pressure, and cholesterol control

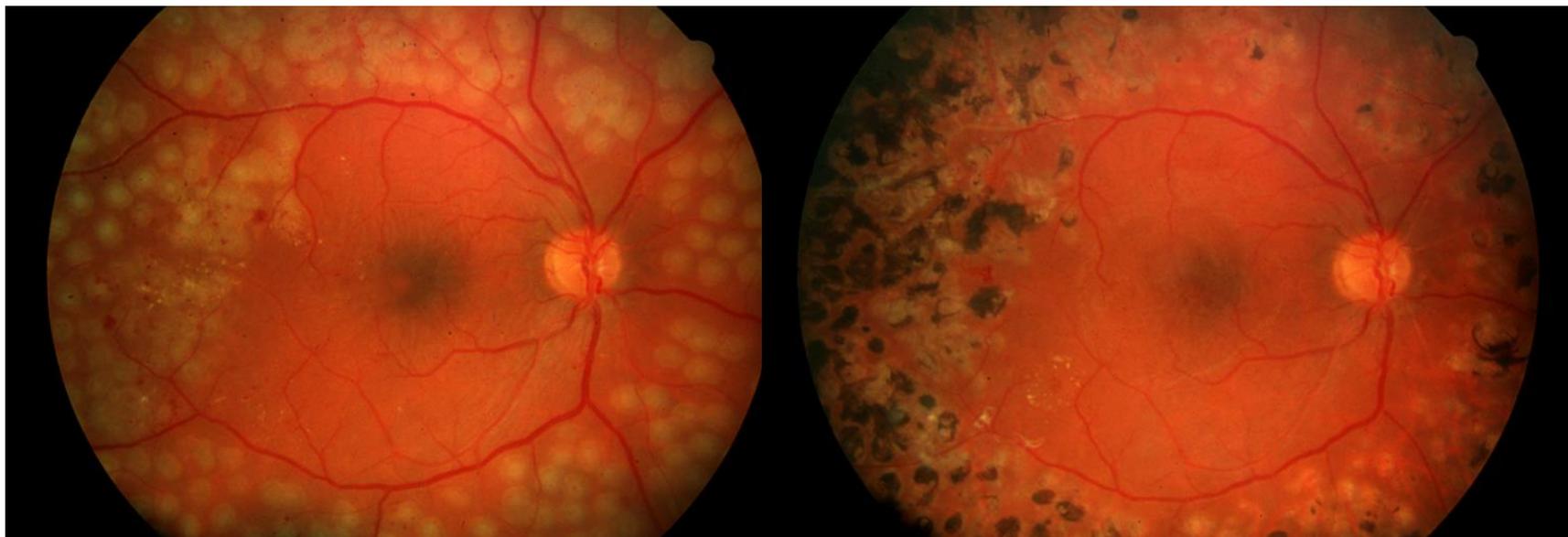
Rates of Severe Vision Loss (SVL)* in Diabetic Retinopathy Study (DRS 1971–1976)

Laser reduced the rate of SVL by **50%** (two types of lasers: Argon and Xenon).



*SVL: < 5/200 on two visits 4 months apart

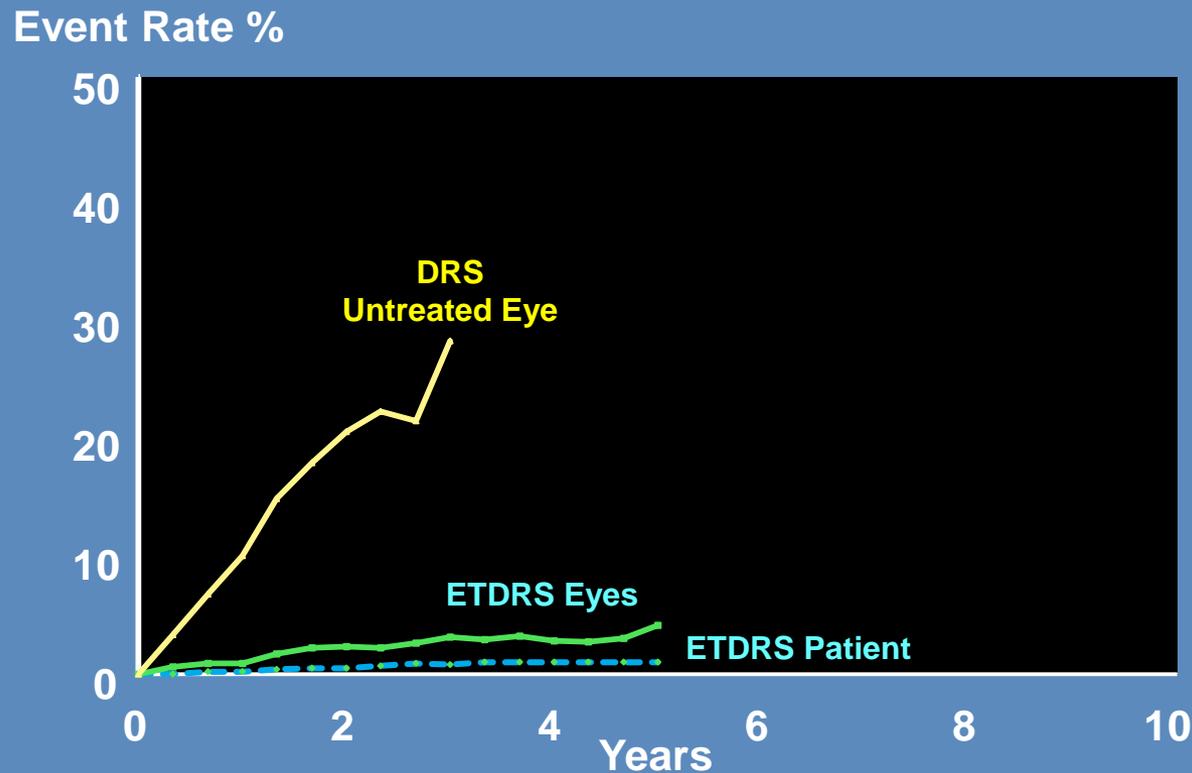
Laser Photocoagulation for Proliferative Diabetic Retinopathy



Immediately after laser

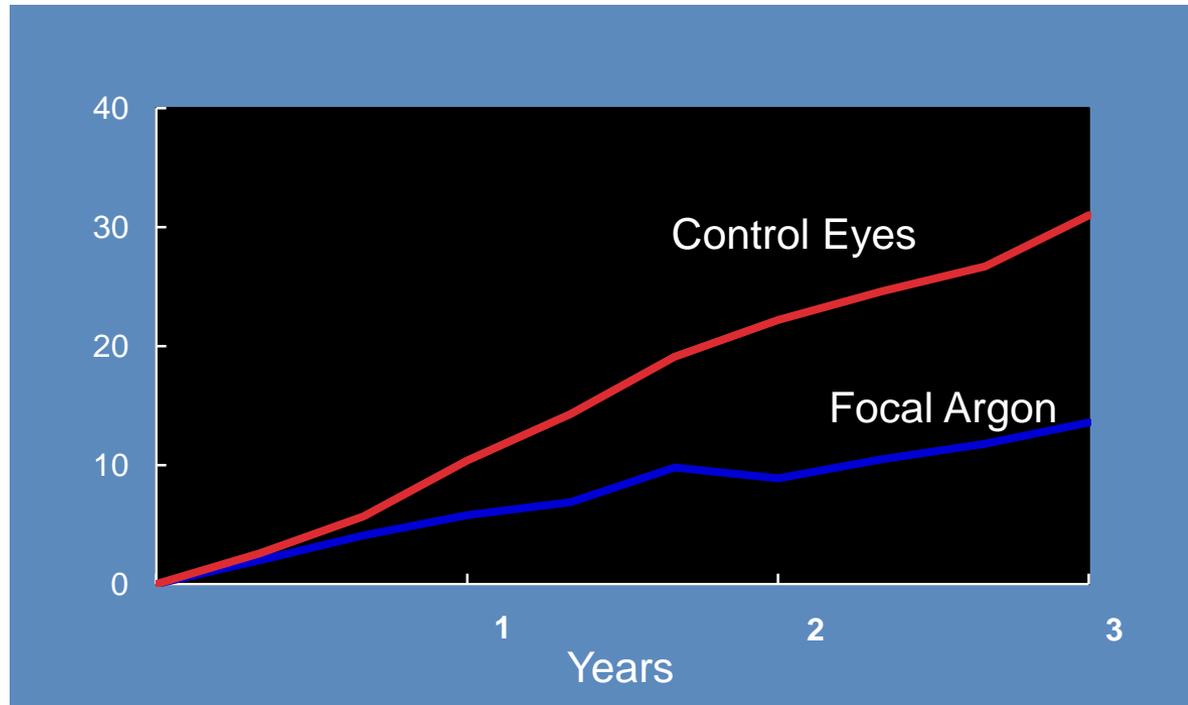
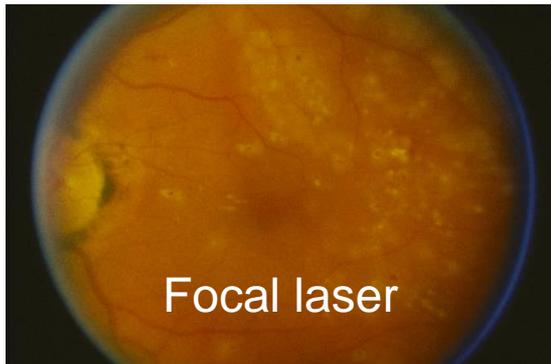
1 year later

Success of Laser Treatment for Diabetic Retinopathy (risk of SVL* reduced by 95%)



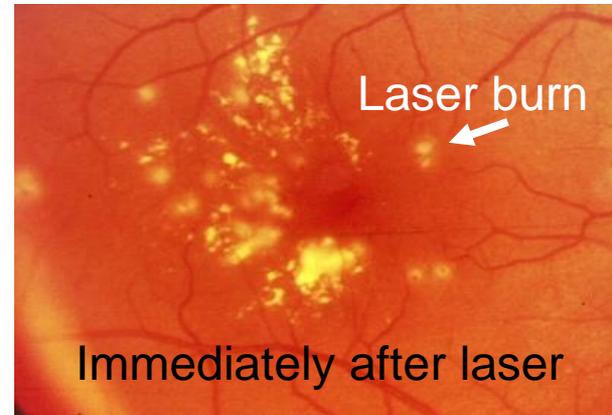
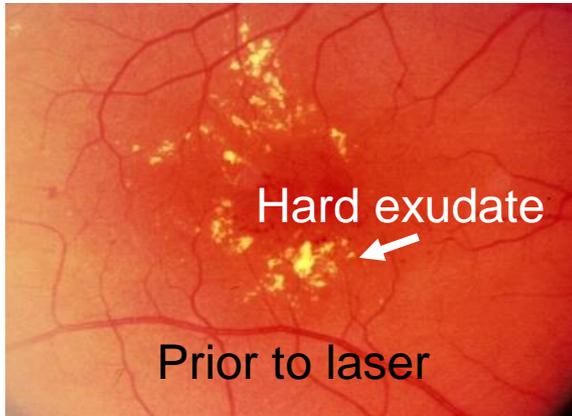
Focal Laser Photocoagulation in the Early Treatment Diabetic Retinopathy Study (ETDRS 1980–1989)

Focal laser photocoagulation reduced the risk of moderate vision loss (going from 20/20 to 20/40) in eyes with macular edema by 50%.



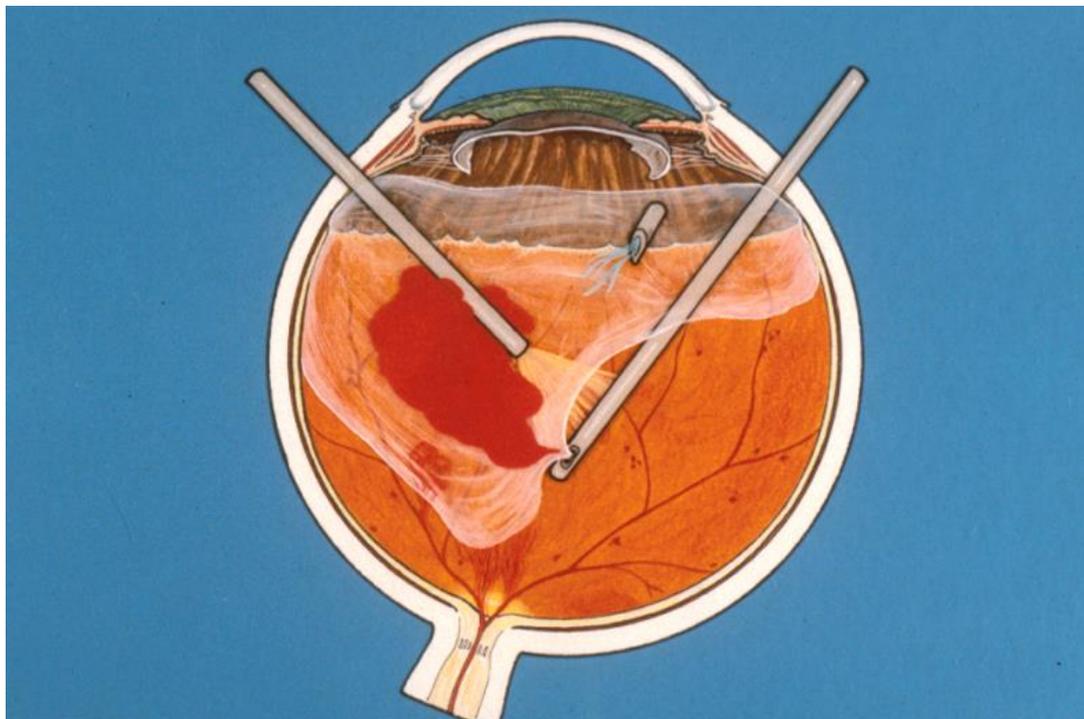
Standard care until the onset of anti-VEGF* therapies

Focal Laser Photocoagulation for Diabetic Macular Edema

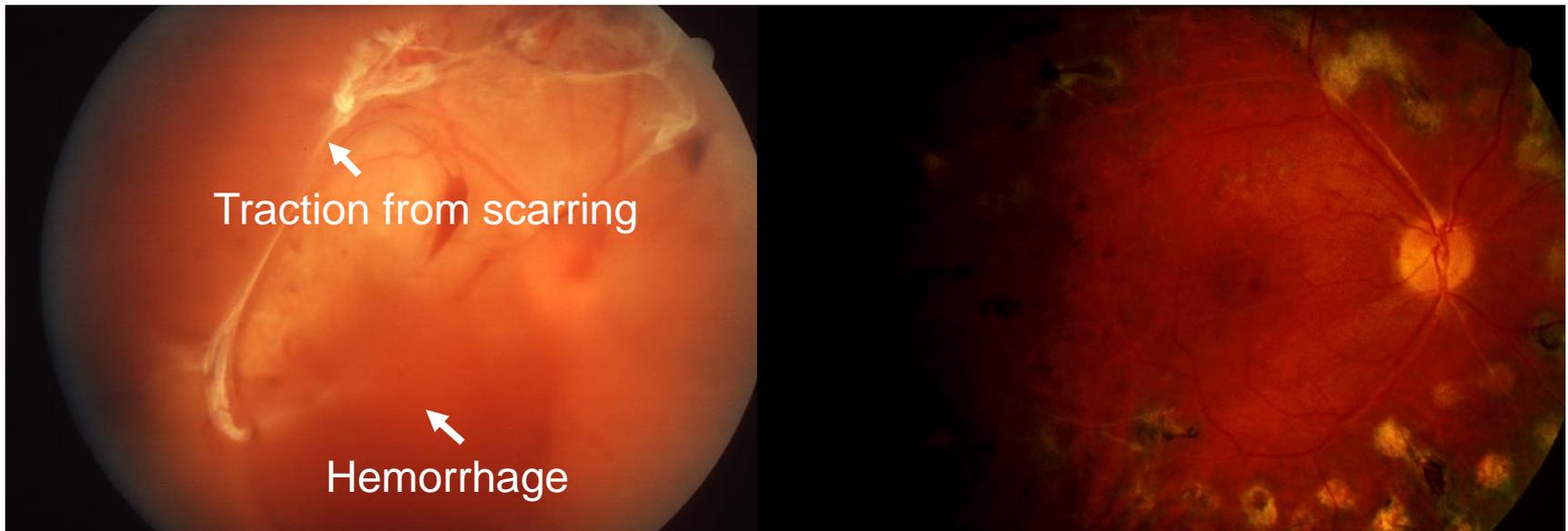


Standard care until the onset of anti-VEGF* therapies

Surgical Intervention: Pars Plana Vitrectomy



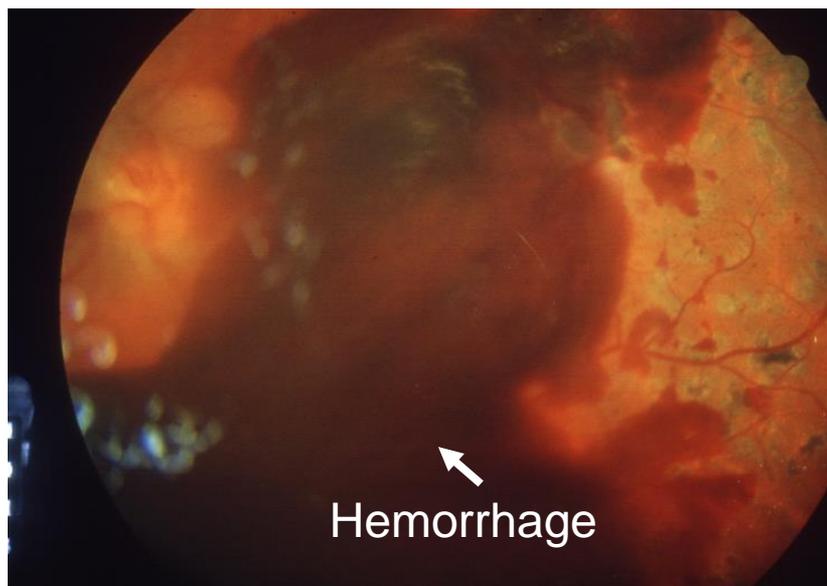
Vitrectomy for Vitreous Hemorrhage and Traction Associated with Proliferative Diabetic Retinopathy



Before surgery (vitrectomy)

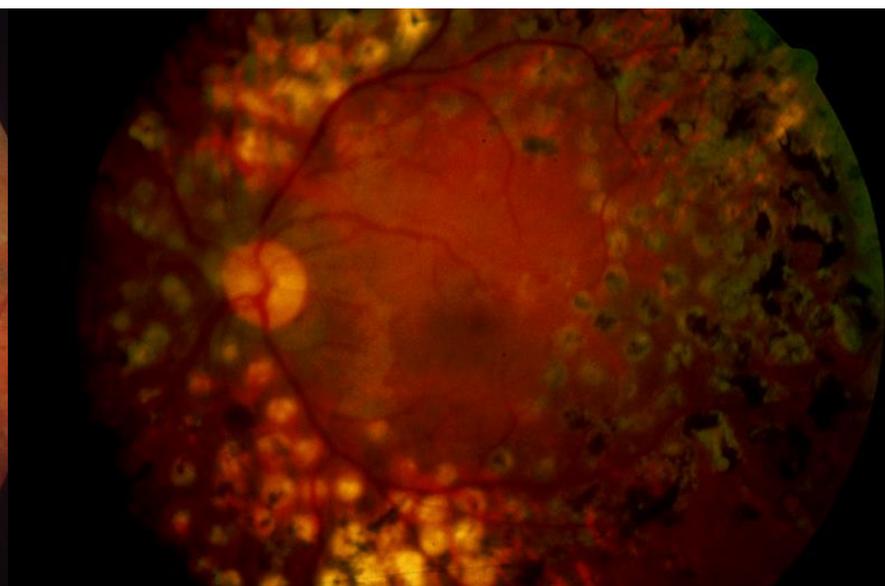
After surgery (vitrectomy)

Vitrectomy for Vitreous Hemorrhage Associated with Proliferative Diabetic Retinopathy



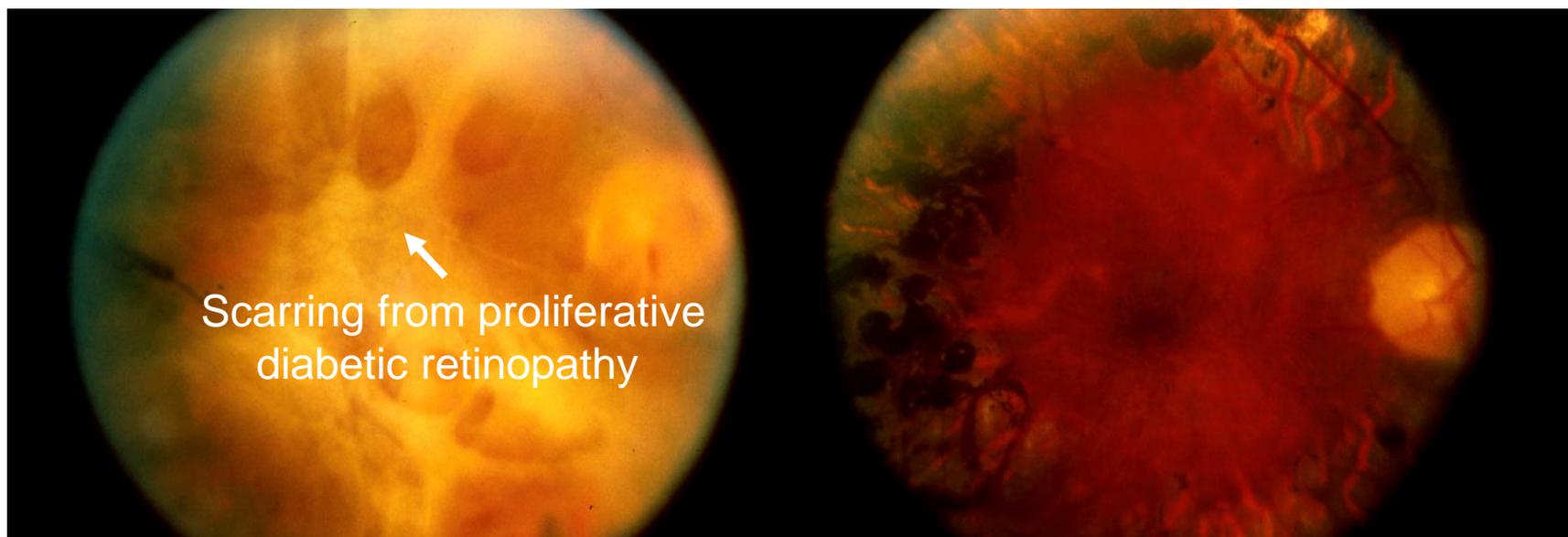
Hemorrhage

Before surgery (vitrectomy)



After surgery (vitrectomy)

Vitrectomy for Severe Scarring of Proliferative Diabetic Retinopathy



Before surgery (vitrectomy)

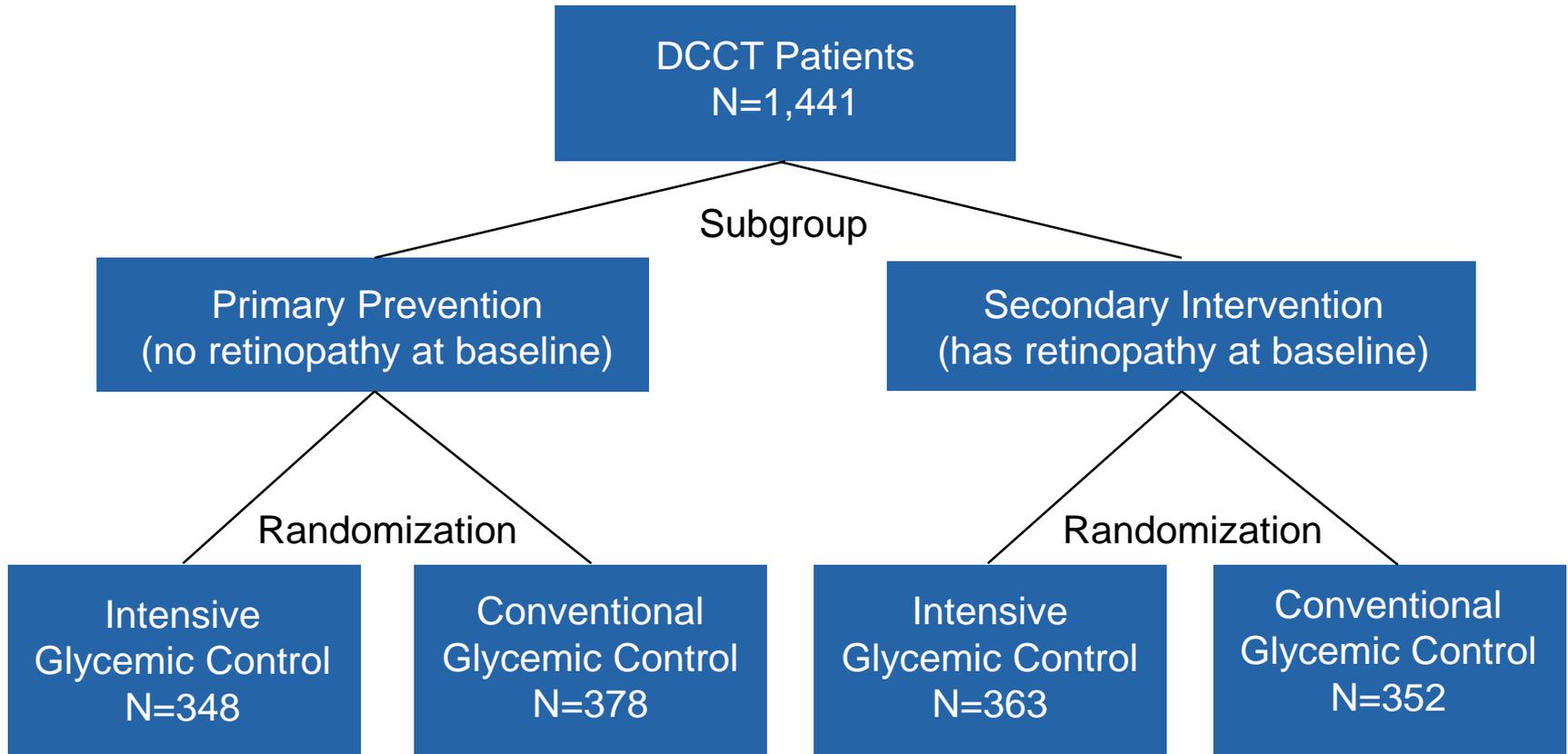
After surgery (vitrectomy)

Medical Management Recommendations

Intensive medical control:

- Blood glucose
- Blood pressure
- Blood lipids

Diabetes Control and Complications Trial (DCCT 1983–1989) in Type 1 Diabetes Study of Glycemic Control



DCCT Study Design Study Question

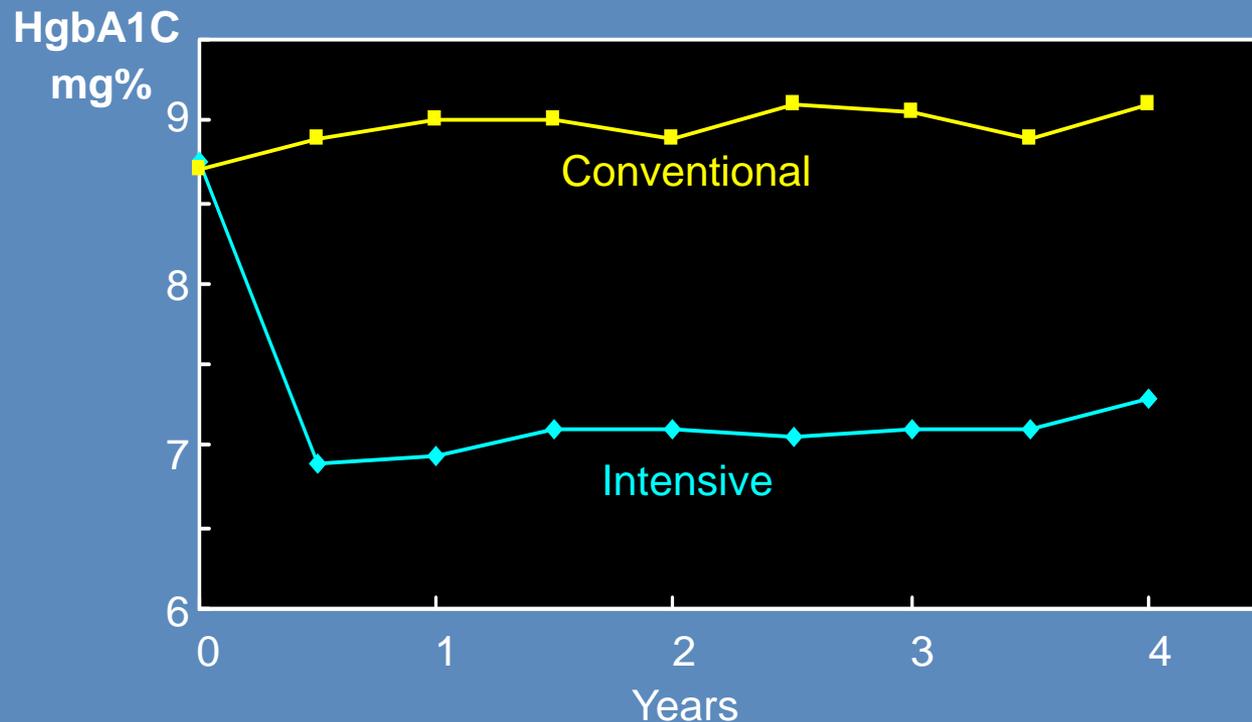
Primary Prevention

- Will intensive insulin therapy prevent the development and subsequent progression of retinopathy?

Secondary Prevention

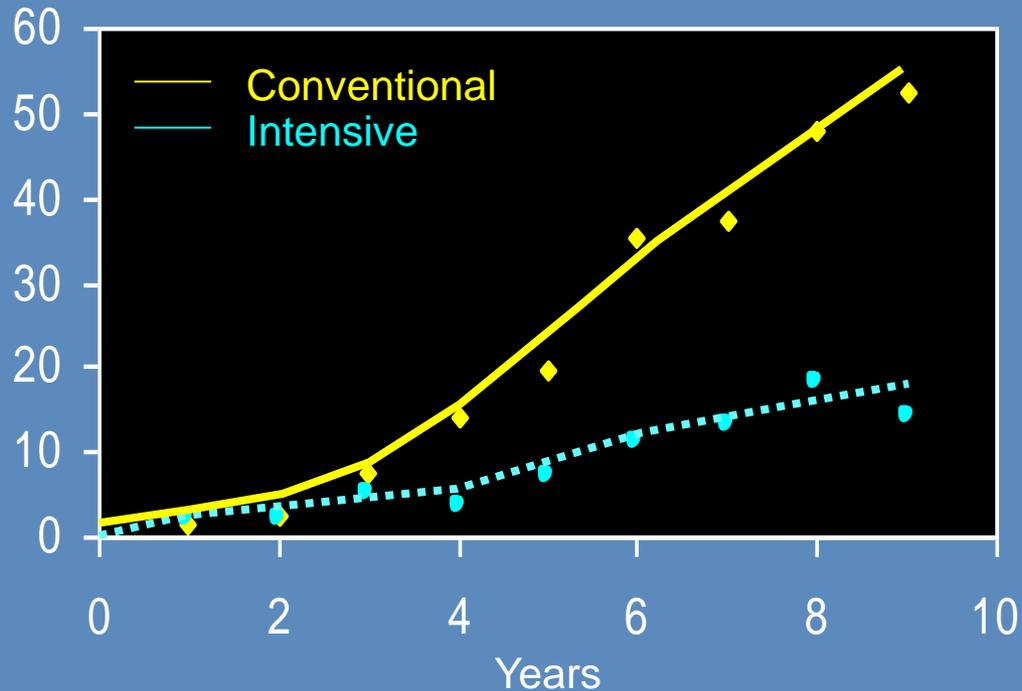
- Will intensive insulin therapy prevent the progression of retinopathy?

Diabetes Control and Complications Trial Hemoglobin A1C (a measure of glucose control)



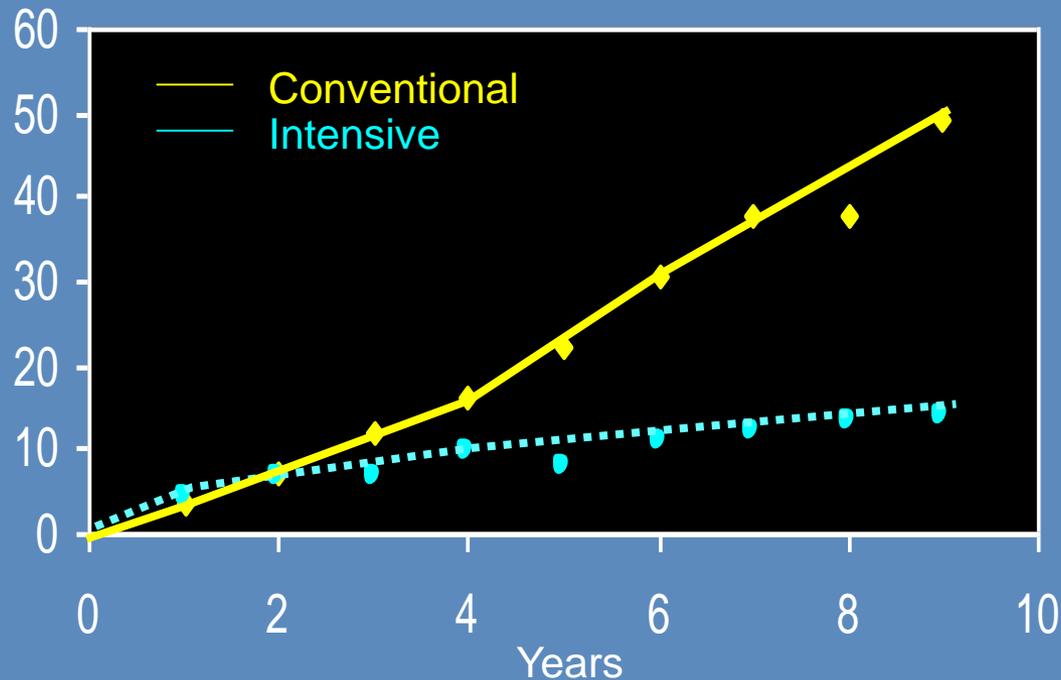
DCCT Results Primary Intervention – (no retinopathy) Development and Three-Step Progression of Diabetic Retinopathy Along the ETDRS Severity Scale

Percentage with Event



DCCT Results Secondary Intervention – (has retinopathy) Three-Step Progression of Diabetic Retinopathy Along the ETDRS Severity Scale

Percentage with Event



DCCT Summary (for Type 1 diabetes)

Results of intensive therapy:

- Reduction in retinopathy
 - Clinically important retinopathy (34%–76%)
 - Photocoagulation (34%)
 - First appearance of retinopathy (27%)

DCCT Summary

Results of intensive therapy:

- Reduction in other 2° complications:
 - Kidney function
 - Microalbuminuria (35%)
 - Clinical albuminuria (45%)
 - Neuropathy
 - Clinical neuropathy (60%)

EDIC/DCCT Study

Epidemiology of Diabetes Intervention & Complications Study

- Extension of the DCCT study after the clinical trial was finished
- Natural history study of DCCT patients
- **Beneficial effects persist for an additional 4–25 years**

UK Prospective Diabetes Study (Type 2 diabetes 1977–1994; N=3,867) Summary: Glycemic and Blood Pressure Control

Intensive Glycemic Control

- Reduced microvascular complications by 12%
- Reduced progression of retinopathy by 25%

Intensive Blood Pressure Control (140 vs. 180 mmHg)

- Reduced microvascular complications by 37%
- Reduced progression of retinopathy by 34%
- Reduced moderate vision loss by 47%

Legacy Effect (metabolic memory) in UKPDS 10 Years After the UKPDS Clinical Trial Stopped

Type 2 Diabetes*	UKPDS (UK Prospective Diabetes Study)
Intensive Glycemic Control	<p>Outcome: Self-reports of vitreous hemorrhage retinal photocoagulation, or renal failure</p> <p>Continued to be reduced significantly by 24% in those previously assigned to tight glycemic control vs. standard glycemic control</p>

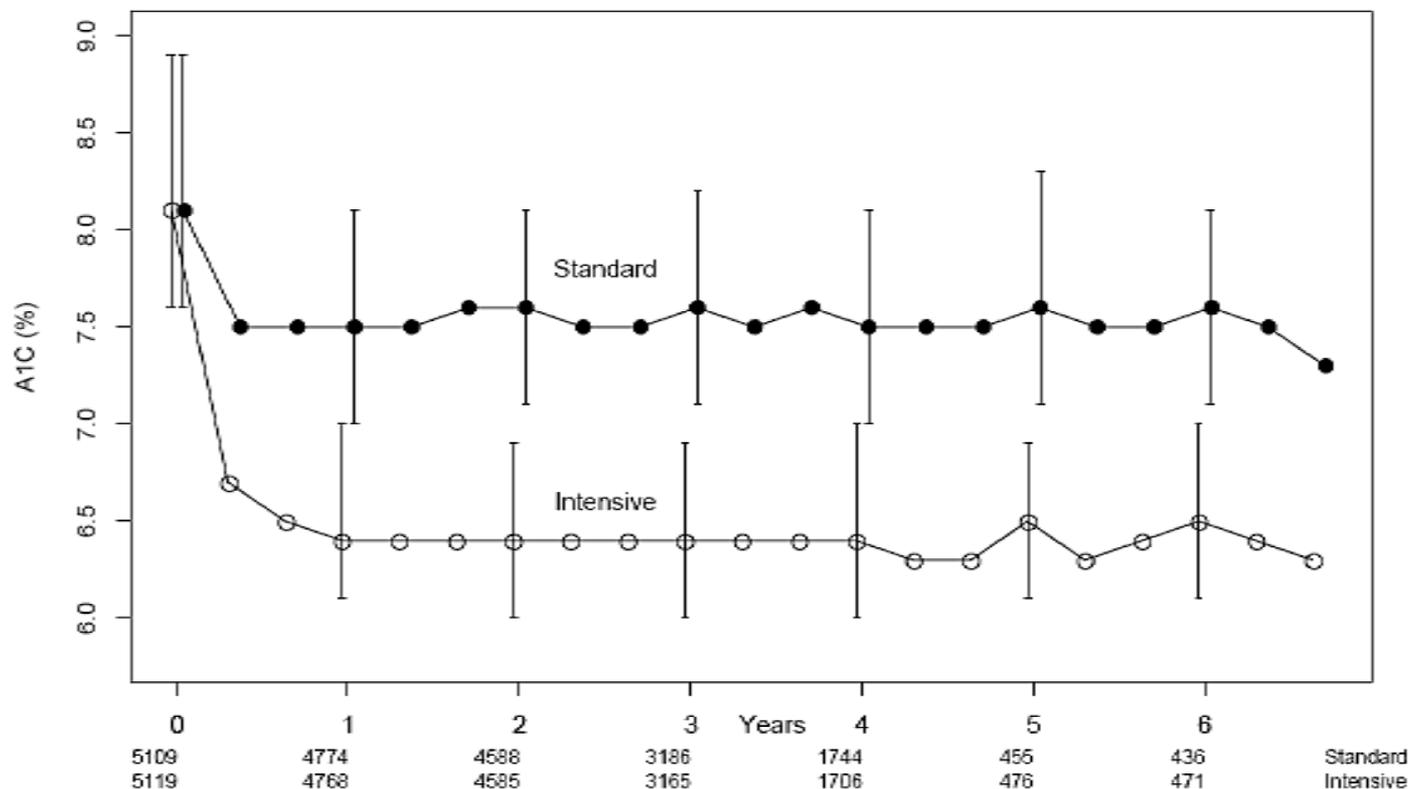
* Newly diagnosed (within the past year)

Actions to Control Cardiovascular Risk in Diabetes (ACCORD) Eye Study (Type 2 diabetes 2003–2009)

Three medical therapies (n=10,251):

- Intensive glycemic control
 - A1C < 6% vs. 7.0%–7.9%
- Treatment to increase high-density lipoprotein cholesterol and lower triglycerides using Fenofibrate 200 mg plus statin vs. placebo + statin
- Intensive blood pressure control
 - SBP < 120 mmHg vs. SBP < 140 mmHg

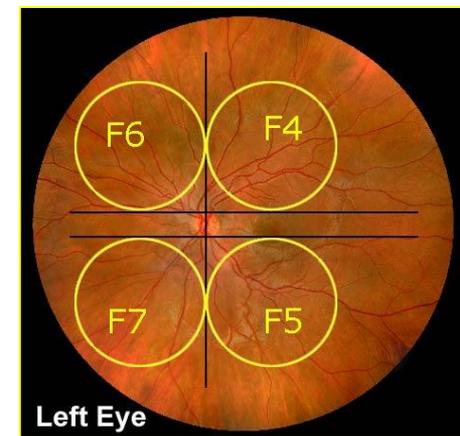
ACCORD Median A1C and Interquartile Ranges



ACCORD Eye Study Design (n=2,856)

Baseline and Year 4 comprehensive eye exams:

- Visual acuity measurements
- Fundus photography of seven standard stereoscopic fields
- Central grading of the fundus photographs using the Early Treatment Diabetic Retinopathy Study (ETDRS) classification of diabetic retinopathy



Primary Analysis – DR Progression

Effect	Odds Ratio	95% CI	P-value
Glycemia	0.67	(0.51, 0.87)	0.0025
Lipid (Fenofibrate)	0.60	(0.42, 0.87)	0.0056
Blood Pressure	1.23	(0.84, 1.79)	0.29

Odds ratio < 1 (and 95% CI not including 1) means that the treatment was beneficial.

ACCORD Eye Study Conclusions

- Intensive glycemic control and combination of Fenofibrate and Simvastatin reduced the proportion whose retinopathy progressed by about one-third.
- No effect on visual acuity.
- No statistically significant effect of intensive blood pressure control.

ACCORDION Eye Study Retinopathy Three-Step Progression of Diabetic Retinopathy at 8 Years



Effect	Odds Ratio	95% CI	P-value
Glycemia	0.42	(0.28, 0.63)	< 0.0001
Lipid	1.13	(0.71, 1.79)	0.60
BP	1.21	(0.61, 2.40)	0.59

Odds ratio < 1 (and 95% CI not including 1) means that the treatment was beneficial.

ACCORDION Eye Study Conclusions



- **Intensive glycemic control** continued to demonstrate beneficial effects 4 years following cessation of the randomized trial.
 - Effects were consistent across subgroups.
- **Fenofibrate and Simvastatin** showed no beneficial effect after stopping Fenofibrate.
- No statistically significant effect of **intensive blood pressure control**.

Summary

- We have highly effective therapies from evidence-based studies.
- The medical therapies are very powerful and durable.
- The treatments using the standard laser have reduced the risk of severe vision loss.
- Laser treatment remains an important part of therapy.



Judy E. Kim, M.D.

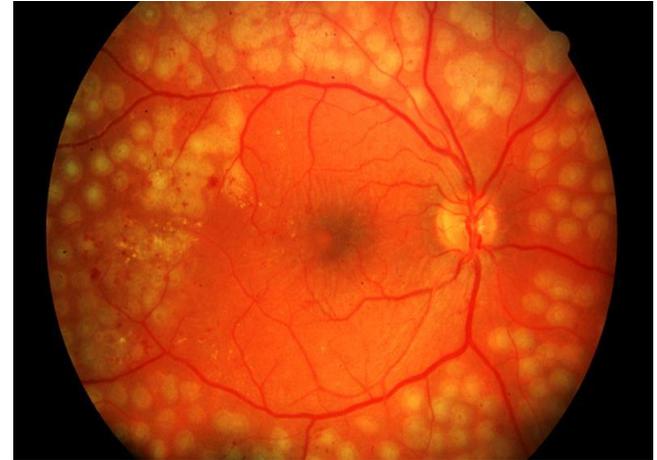
MANAGEMENT OF DIABETIC MACULAR EDEMA AND PROLIFERATIVE DIABETIC RETINOPATHY: Findings from DRCR.net Trials and Paradigm Shift

Objectives

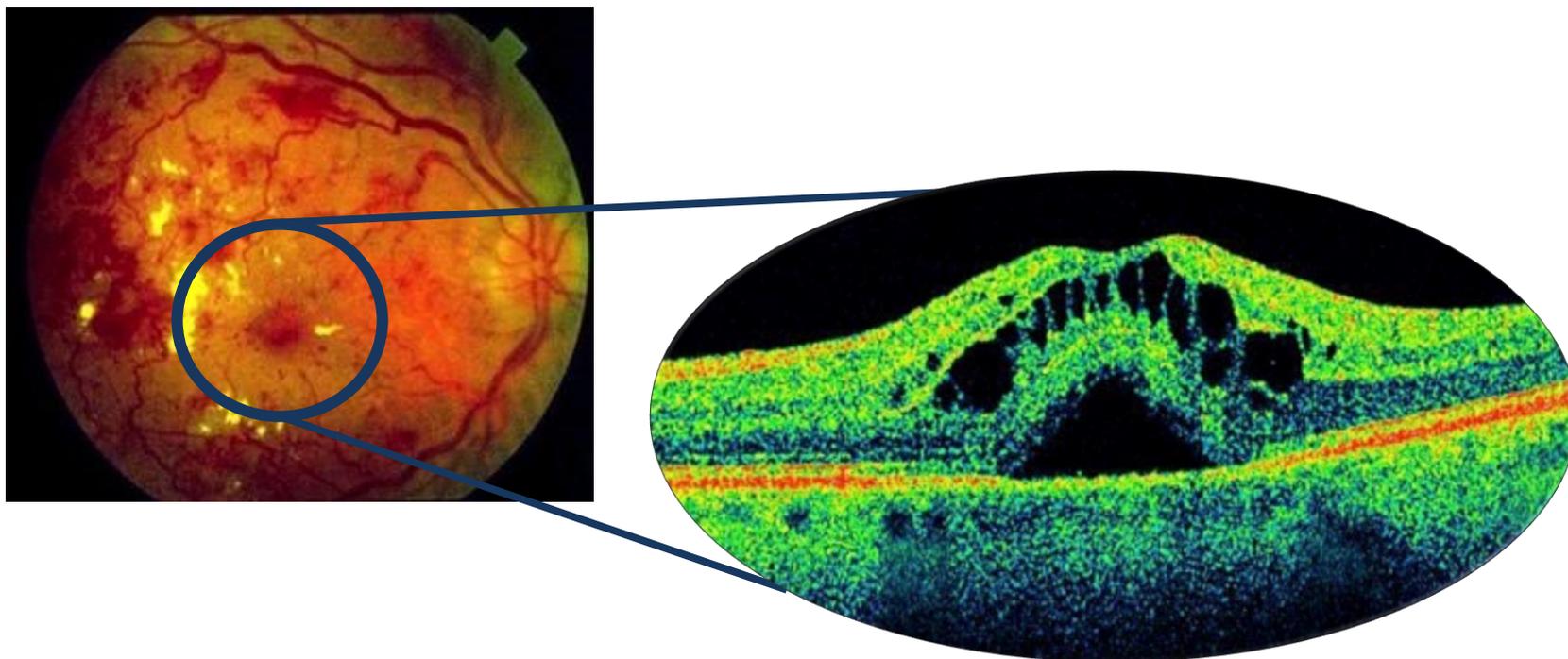
- Review findings from DRCR.net clinical trials for diabetic macular edema and proliferative diabetic retinopathy:
 - Protocol I
 - Protocol T
 - Protocol S
- Discuss paradigm change in management of diabetic retinopathy.

Laser Photocoagulation

- Diabetic Retinopathy Study for PDR (1971–1976)
- Early Treatment Diabetic Retinopathy Study for Diabetic Macular Edema (DME) (1980–1989)



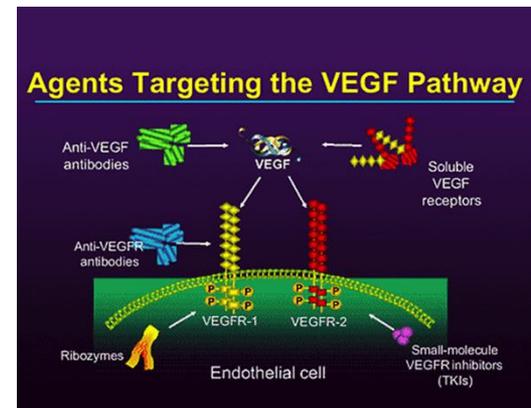
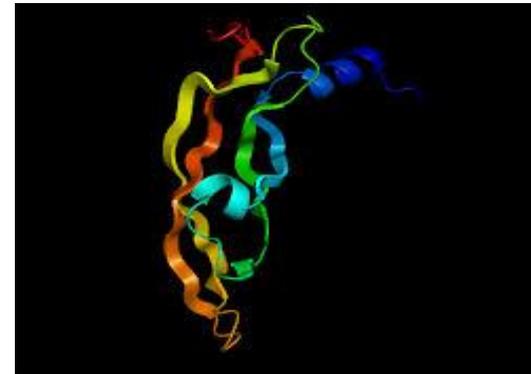
Optical Coherence Tomography (OCT)



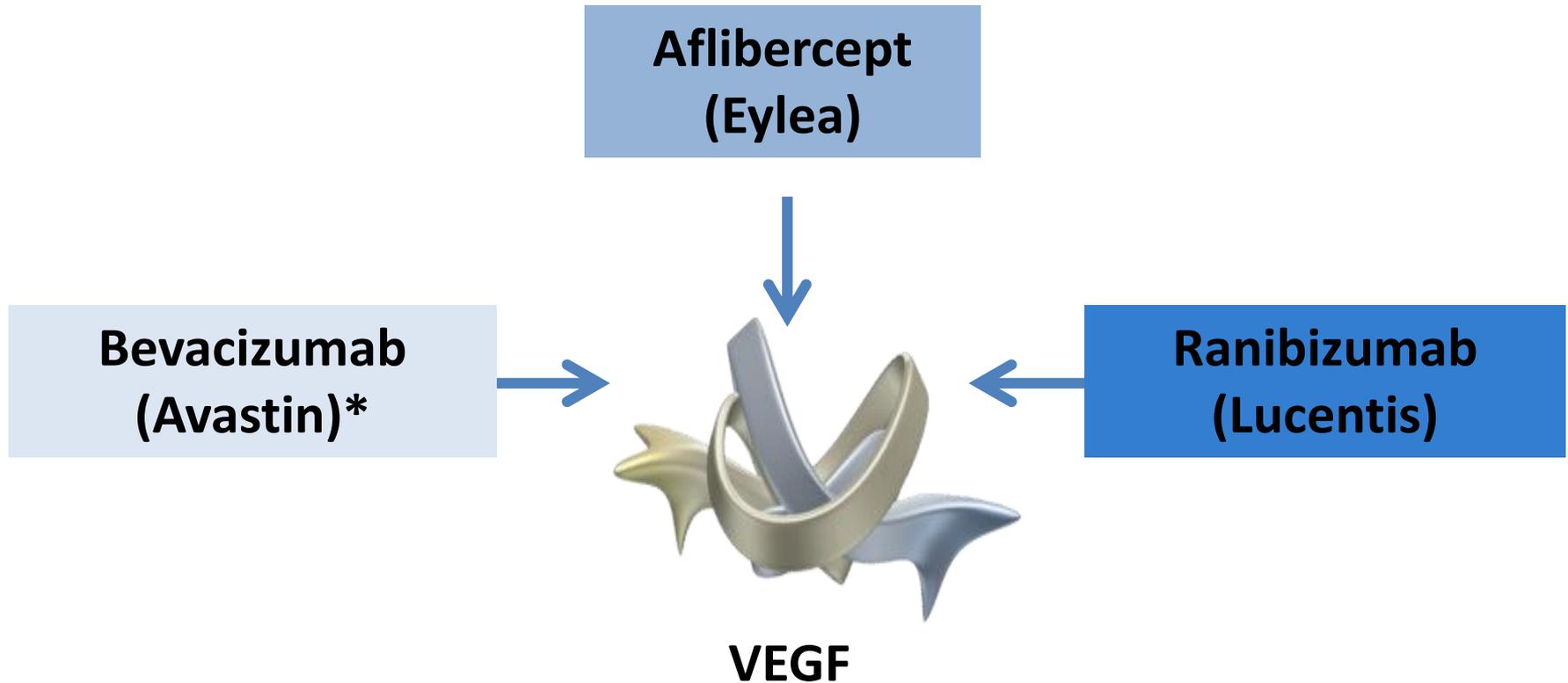
OCT image showing macular edema with fluid in the retina and under the retina

Vascular Endothelial Growth Factor (VEGF)

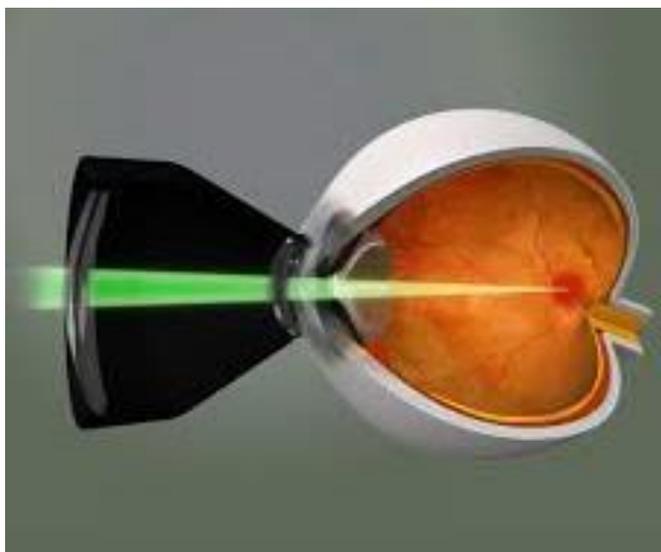
- Elevated in active PDR
- Overexpression is associated with DME
- A central mediator of angiogenesis and vascular permeability
- A target for therapy



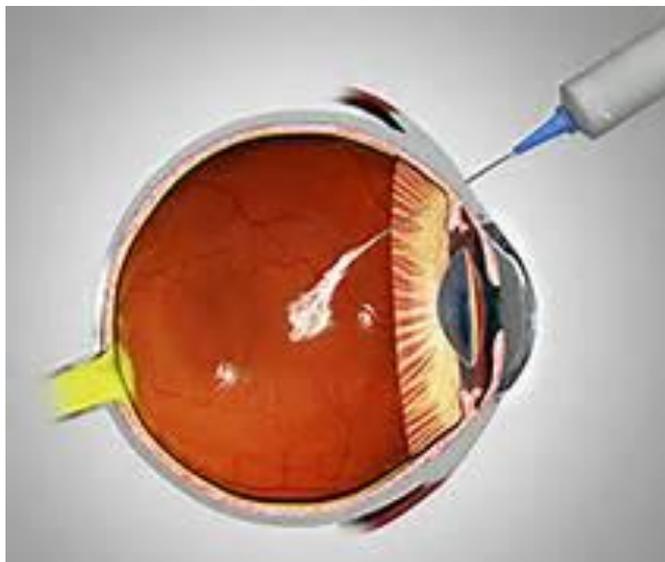
Anti-VEGF Agents



Laser Photocoagulation



Intravitreal Injection of Anti-VEGF Agents



Diabetic Retinopathy Clinical Research Network (DRCR.net)

- A collaborative network to facilitate multicenter clinical research on diabetic retinopathy, diabetic macular edema, and associated conditions



DRCR.net Protocol I

Intravitreal Ranibizumab or Triamcinolone Acetonide in Combination with Laser Photocoagulation for DME

**Sham
+
Prompt Laser**

**Ranibizumab
(Lucentis)
0.5 mg
+
Prompt Laser**

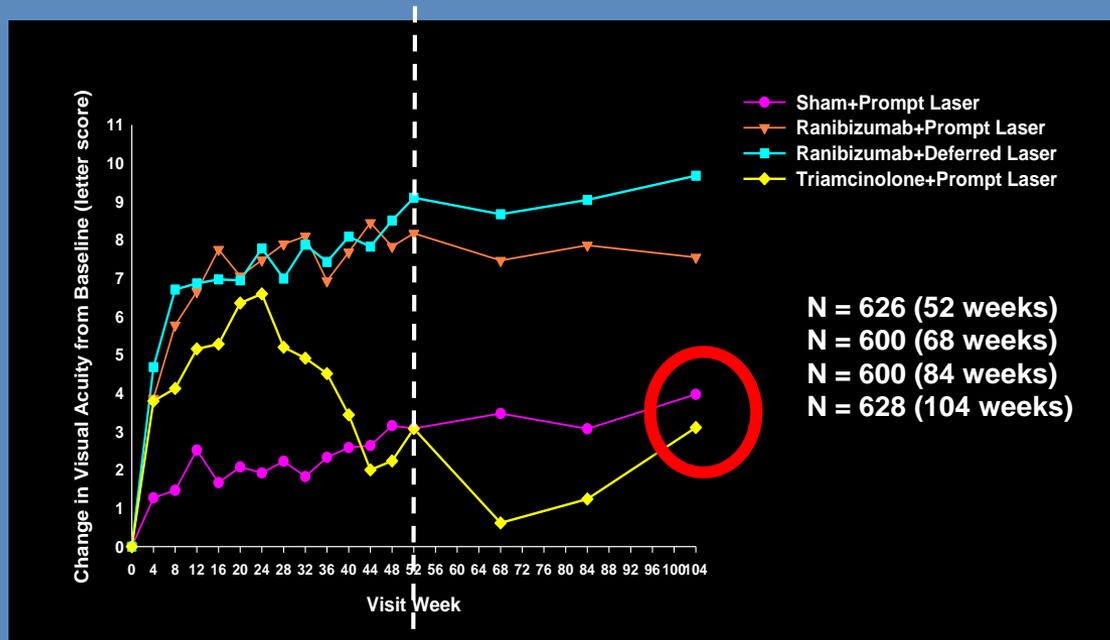
**Ranibizumab
(Lucentis)
0.5 mg
+
Deferred Laser**

**Triamcinolone
4 mg
+
Prompt Laser**

Protocol I

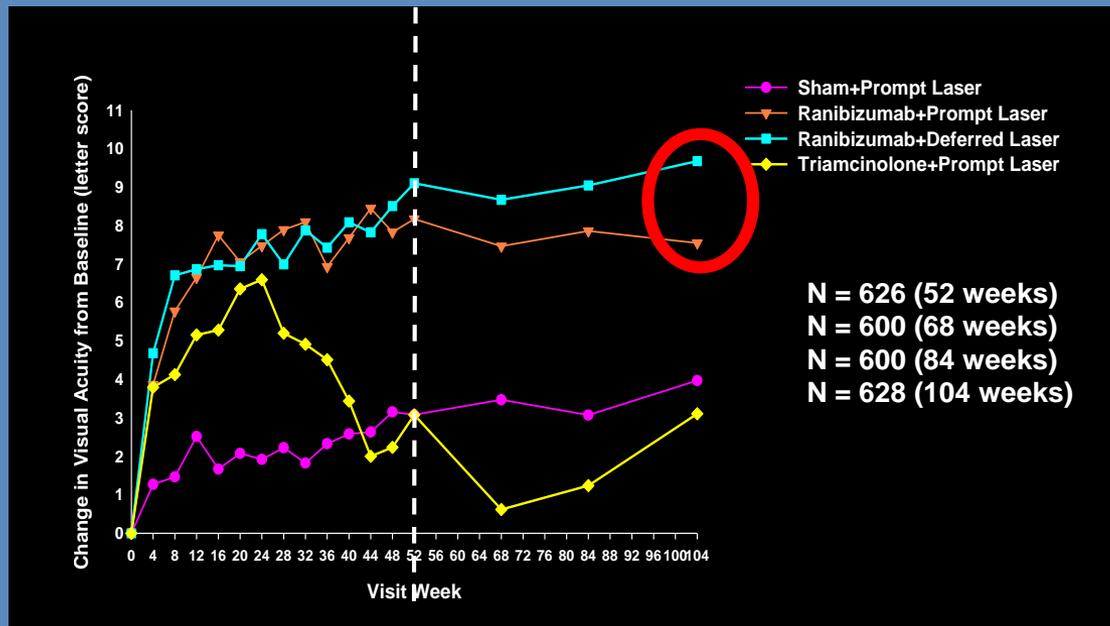
Objective	To evaluate the safety and efficacy of intravitreal anti-VEGF treatment in combination with immediate or deferred focal/grid laser photocoagulation and intravitreal corticosteroids in combination with focal/grid laser compared with focal/grid laser alone in eyes with center-involved DME.
Major Eligibility Criteria	Diabetic macular edema involving the center of the macula (optical coherence tomography central subfield thickness \geq 250 microns) responsible for visual acuity of 20/32 or worse.
Protocol Status	Total enrolled (3/07–12/08): 691 subjects/854 eyes at 52 sites

Mean Change in Visual Acuity (VA) at Follow-up Visits



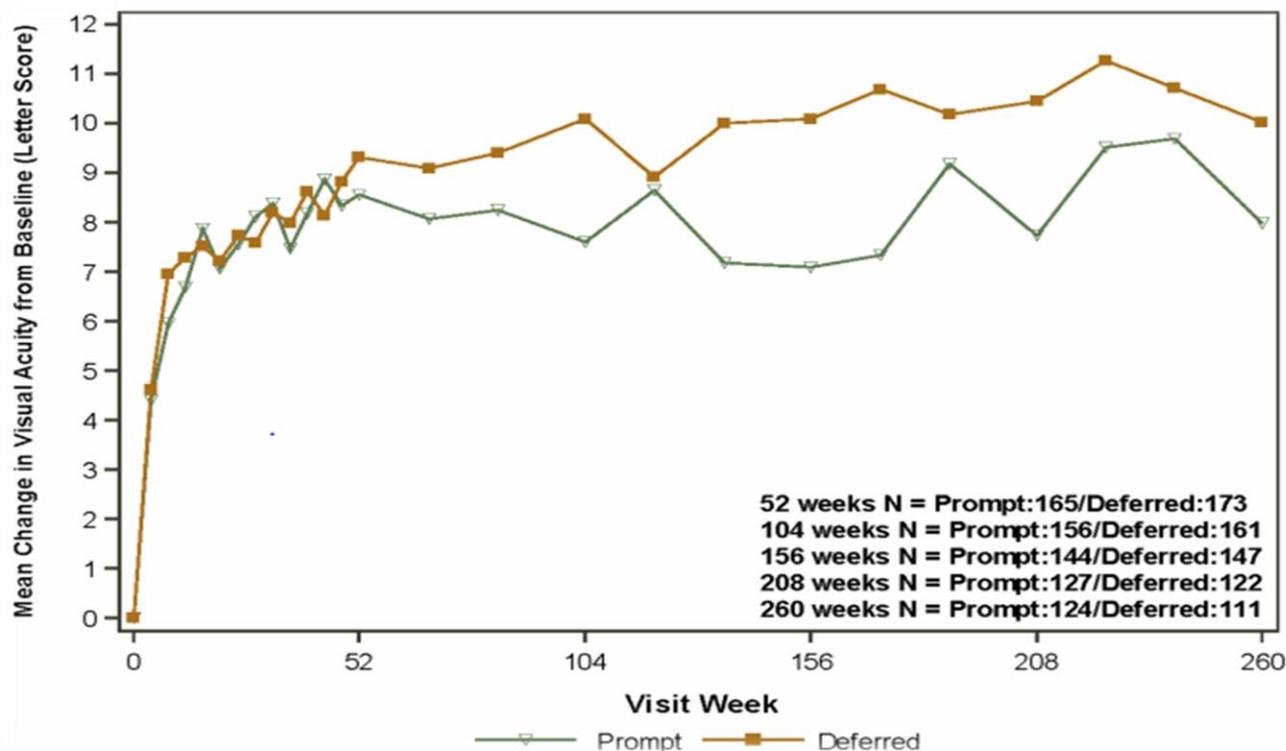
P-values for difference in mean change in VA from sham + prompt laser at the 104-week visit: Ranibizumab + prompt laser = 0.03; Ranibizumab + deferred laser < 0.001; and triamcinolone + prompt laser = 0.35.

Mean Change in Visual Acuity (VA) at Follow-up Visits



P-values for difference in mean change in VA from sham + prompt laser at the 104-week visit: Ranibizumab + prompt laser = 0.03; Ranibizumab + deferred laser < 0.001; and triamcinolone + prompt laser = 0.35.

Mean Change in Visual Acuity Through 5-year Follow-up in the Lucentis Groups



P = 0.09

Median Number of Injections Prior to 5 Year

	Lucentis + Prompt Laser (N=124)	Lucentis + Deferred Laser (N=111)
Median no. (range) of injections in Year 1	8 (7–11)	9 (6–11)
Median no. in Year 2	2 (0–5)	3 (1–6)
Median no. in Year 3	1 (0–4)	2 (0–5)
Median no. in Year 4	0 (0–3)	1 (0–4)
Median no. in Year 5	0 (0–3)	0 (0–3)
Median no. (range) of injections before the 5-year visit	13 (9–24)	17 (11–27)

What has been learned from Protocol I for diabetic macular edema treatment?

- Intravitreal Lucentis with or deferred laser is more effective in increasing vision compared with laser in eyes with DME involving the central macula.
- Visual benefit from intravitreal Lucentis was maintained for up to 5 years of follow-up despite the decreasing number of injections needed.
- Intravitreal anti-VEGF (Lucentis) therapy should be considered for patients with DME and decreased visual acuity.

DRCR.net Protocol T

Comparative Effectiveness Study of Intravitreal Aflibercept, Bevacizumab, and Ranibizumab for DME



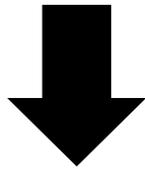
Background

- Eylea and Lucentis: FDA approved for DME.
- Avastin: Not FDA approved for intraocular use.
 - Repackaged into aliquots ~1/500 of systemic dose in cancer treatments.
- Medicare allowable charges vary.

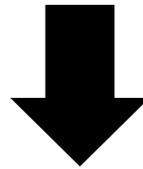
Protocol T

Objective and Treatment Arms

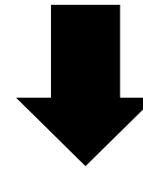
To compare the efficacy and safety of intravitreal Aflibercept, Bevacizumab, and Ranibizumab when given to treat center-involved DME in eyes with visual acuity of 20/32 to 20/320.



**2.0 mg/0.05mL
Aflibercept
(Eylea)**



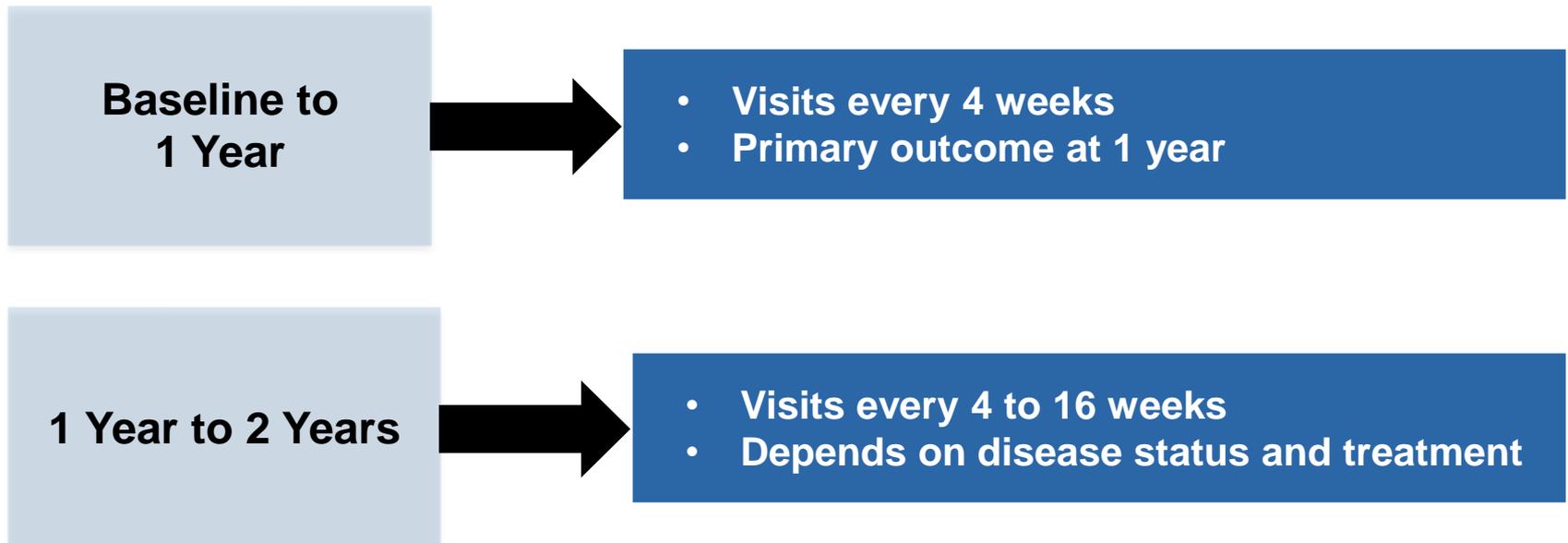
**1.25 mg/0.05mL
Bevacizumab
(Avastin)**



**0.3 mg/0.05mL
Ranibizumab
(Lucentis)**

660 eyes from 89 sites were equally randomized to each group

Follow-up Schedule



- Injection every 4 weeks until stable.
- Starting at the 6-month visit, laser treatment was administered if DME persisted and was not improving.

Comparison of Anti-VEGF for DME: Number of Injections

	Eylea	Avastin	Lucentis	Global <i>P</i> -value
No. of Injections: Median				
Year 1	9	10	10	0.045[†]
Year 2	5	6	6	0.32
Over 2 Years	15	16	15	0.08

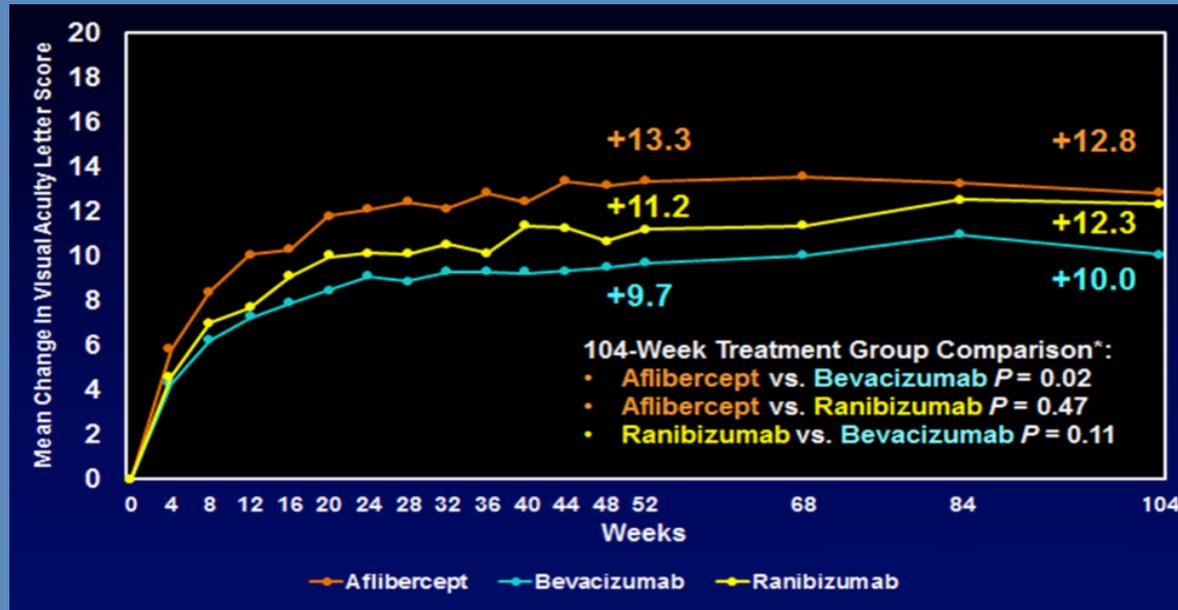
[†] Pairwise comparisons (adjusted for multiple comparisons): Eylea-Avastin: $P = 0.045$, Eylea-Lucentis: $P = 0.19$, Avastin-Lucentis: $P = 0.22$.

Comparison of Three Anti-VEGF for DME: The Need for Laser Treatment

	Eylea	Avastin	Lucentis	Global P-value
At least one focal/grid laser				
Year 1	37%	56%	46%	< 0.001
Year 2	20%	31%	27%	0.046
Over 2 Years	41%	64%	52%	< 0.001

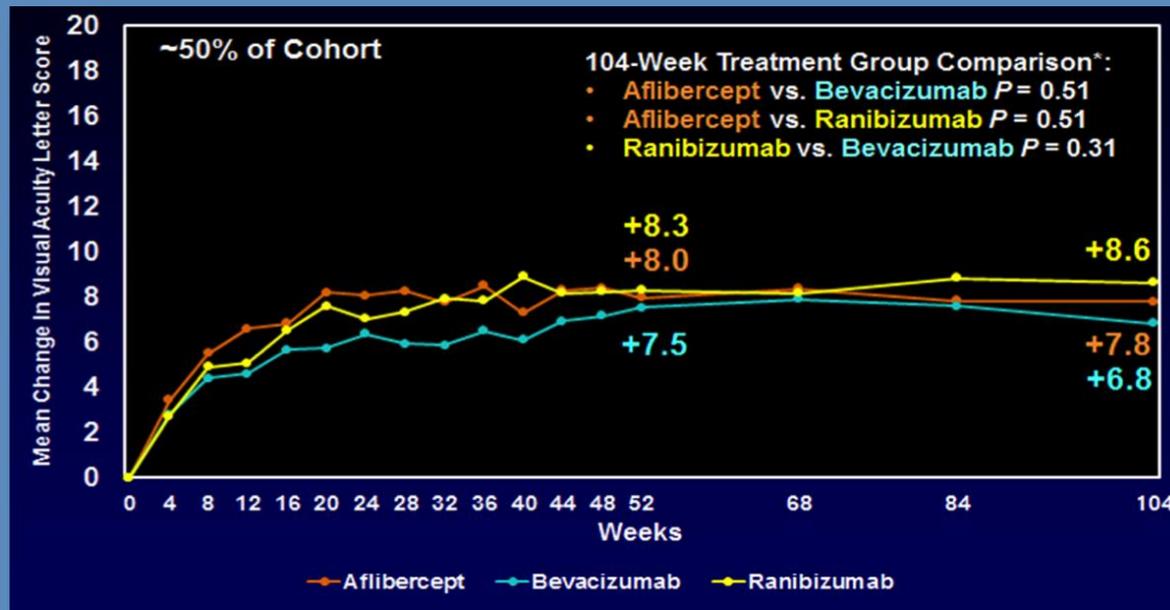
What did we learn from Protocol T for diabetic macular edema? At 2 years:

- Vision gains were seen with all three drugs.



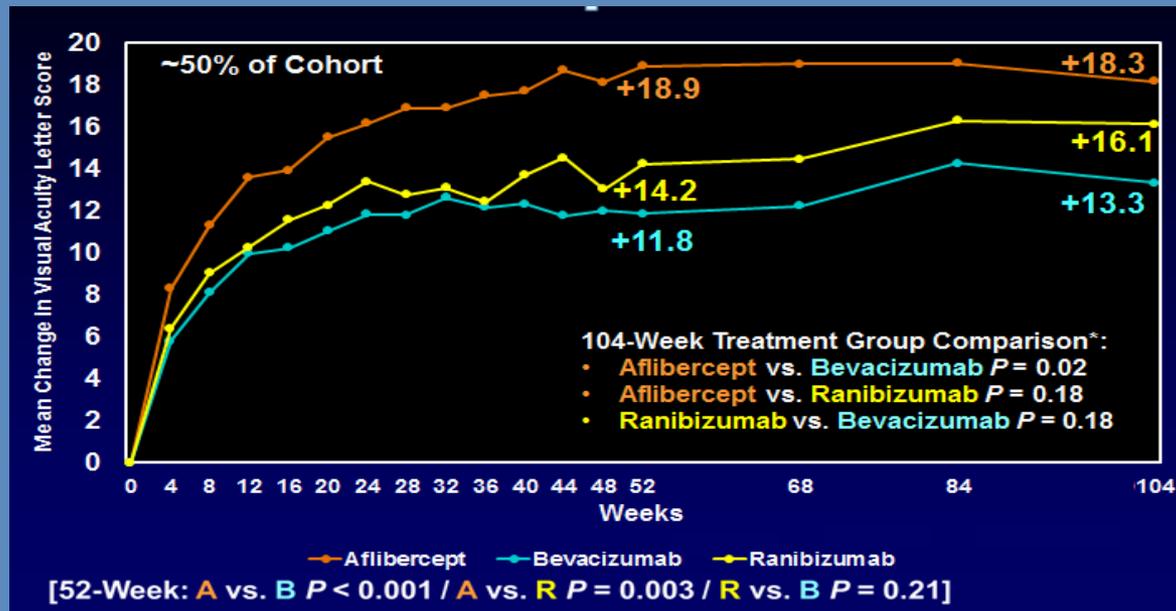
What did we learn from Protocol T for diabetic macular edema? At 2 years:

- When initial vision loss is mild (20/32 to 20/40), there is little difference between the three drugs.



What did we learn from Protocol T for diabetic macular edema? At 2 years:

- When initial vision loss is greater (20/50 or worse), Eylea and Lucentis are more effective.



What did we learn from Protocol T for diabetic macular edema?

- Anti-VEGF agents (Avastin, Eylea, Lucentis) with or without deferred laser are effective in improving vision in eyes with central DME with vision loss.
- Depending on the initial visual acuity, different anti-VEGF agents may be considered.

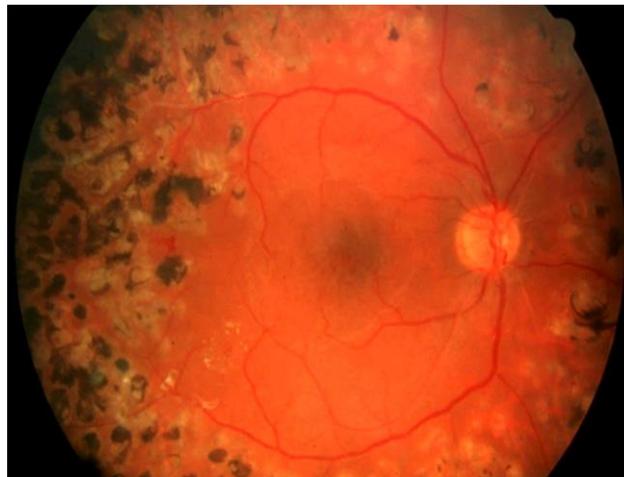
DRCR.net Protocol S

Prompt panretinal photocoagulation vs. intravitreal Ranibizumab with deferred panretinal photocoagulation for proliferative diabetic retinopathy



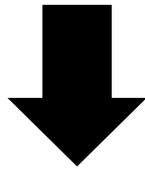
Background

- Current treatment for PDR is panretinal photocoagulation (PRP):
 - Inherently destructive
 - Adverse effects on visual function
- Some eyes with PDR that have DME now receive anti-VEGF as standard care for DME.

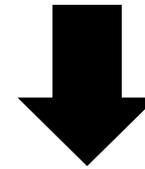


Study Objective and Treatment Groups

To determine if visual acuity outcomes at 2 years in eyes with PDR (with or without concurrent DME) that receive anti-VEGF therapy with deferred PRP are non-inferior to those in eyes that receive prompt PRP therapy.

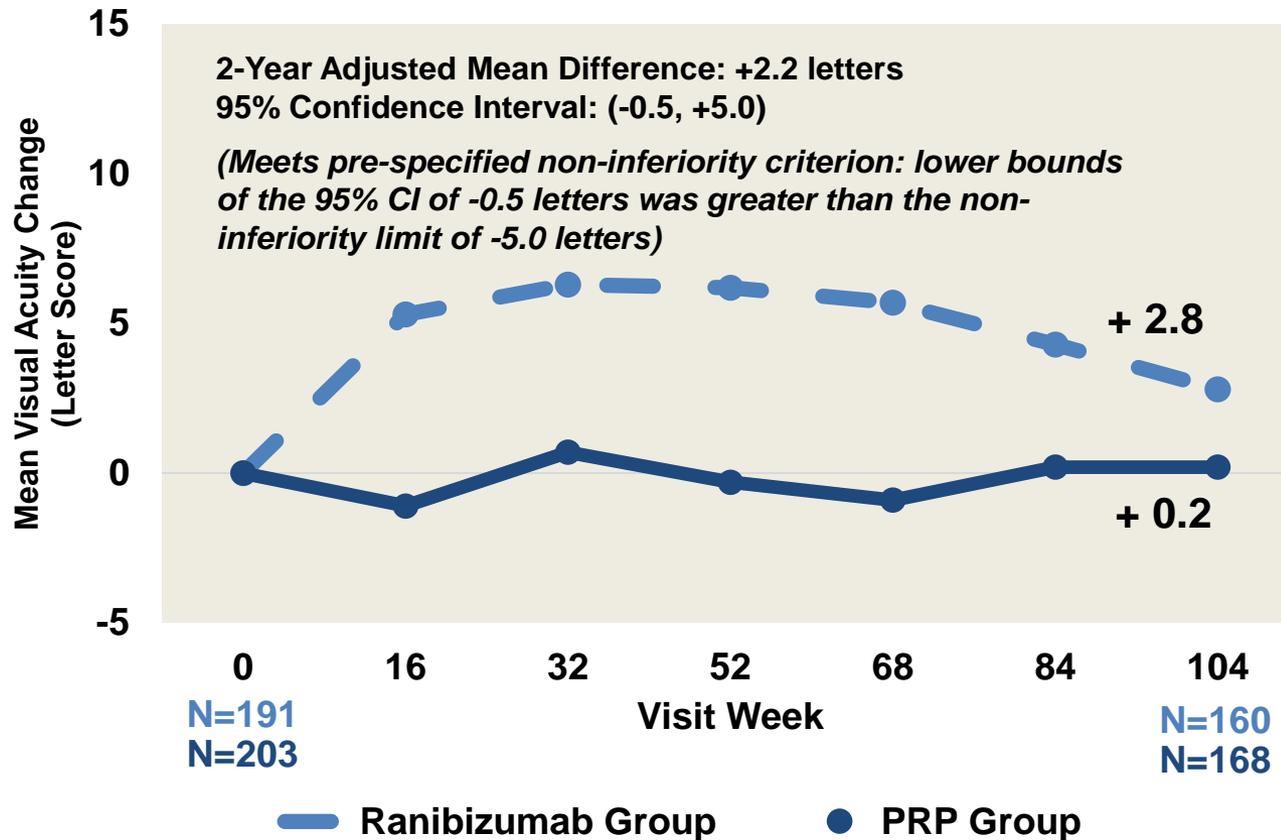


Prompt PRP



0.5 mg
Lucentis with
deferred PRP

Mean Change in Visual Acuity



Peripheral Visual Field Outcomes: 2-Year Visit

Humphrey Visual Field 30-2 + 60-4		
	Lucentis Group (N=58)	PRP Group (N=57)
Cumulative Point Score Change from Baseline		
Mean	-23	-422
<i>Difference (P-value)</i>	372 dB (P < 0.001)	

Anti-VEGF treatment is less likely to cause peripheral vision loss.

Complications of PDR

	Lucentis Group (N=191)	PRP Group (N=203)	P-value
Any retinal detachment	6%	10%	0.08
Neovascular glaucoma	2%	3%	0.50
Iris neovascularization	1%	1%	0.96
Vitreous hemorrhage	27%	34%	0.09
Vitrectomy surgery	4%	15%	< 0.001

Eyes treated with anti-VEGF are less likely to have surgery for PDR-related complications.

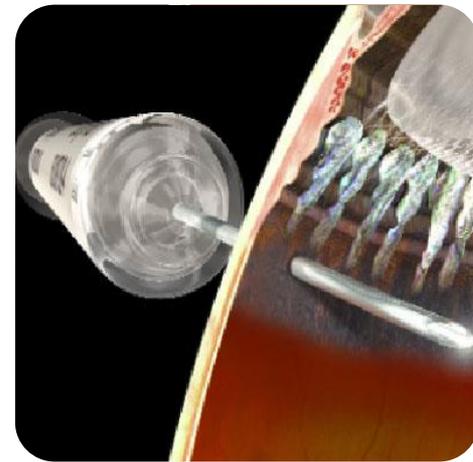
What did we learn from Protocol S for proliferative diabetic retinopathy?

- Treatment with intravitreal anti-VEGF (Lucentis) was not worse than laser (PRP) for vision outcome at 2 years.
- Superior mean visual field outcomes.
- Decreased need for vitrectomy surgery.
- Anti-VEGF treatment may reduce the need for PRP.

Paradigm Shift

1976

2016



Era of intravitreal injections with anti-VEGF agents

New Treatments Mean Better Outcomes...

- But we still have a lot to do.
- Only half of people with diabetes get an annual comprehensive dilated eye exam.
- Early detection and treatment are key to preventing vision loss.
- Everyone working with people with diabetes can play a role in eye health education.

What Can You Do?

- Educate people about diabetic retinopathy and diabetes control.
- Encourage people with diabetes to protect their vision by getting a comprehensive dilated eye exam every year and keep their health on TRACK.

**Protect Your Vision From
DIABETES**

Have a **dilated eye exam** every year, and follow these steps to keep your health on **TRACK**.

T Take your medications as prescribed by your doctor. 

R Reach and maintain a healthy weight. 

A Add more physical activity to your daily routine. 

C Control your ABC's—A1C, blood pressure, and cholesterol levels. 

K Kick the smoking habit. 

www.nei.nih.gov/diabetes

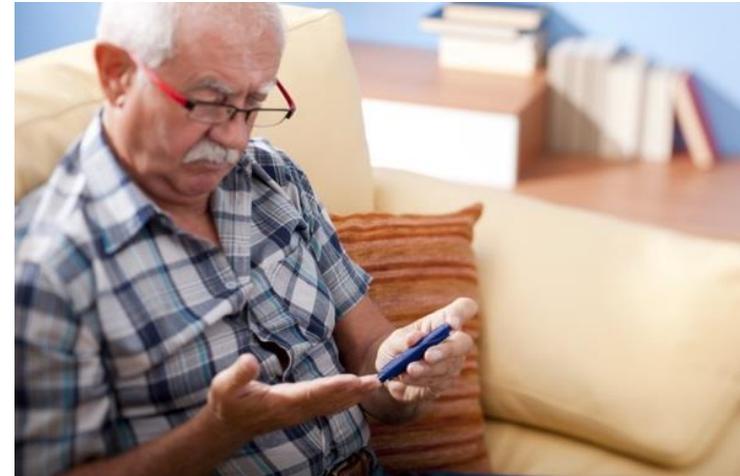
 

NEHEP Diabetic Eye Disease Education Program

Designed to increase awareness about diabetic eye disease and the need for people with diabetes to have a comprehensive dilated eye exam at least once a year to help prevent vision loss and blindness.

Key Program Messages

- Eye diseases have no early warning signs or symptoms.
- Early detection, timely treatment, and appropriate follow-up may prevent vision loss or blindness.
- People with diabetes need a comprehensive dilated eye exam at least once a year.



NEHEP Diabetic Eye Disease Resources

Educational resources to use with patients and in the community

www.nei.nih.gov/NEHEP

The screenshot shows the NEHEP website page for Diabetic Eye Disease. At the top, there is a navigation menu with links for About NEI, Health Information, News and Events, Grants and Funding, Research at NEI, Education Programs, and Training and Jobs. Below the menu, the page title is "National Eye Health Education Program (NEHEP) Diabetic Eye Disease". A sidebar on the left contains a list of navigation options: NEHEP Home, About NEHEP, NEHEP Partnership, Diabetic Eye Disease, Glaucoma, Low Vision, ¡Ojo con su visión!, Vision and Aging, and Outlook Newsletter. The main content area features a heading "Diabetic Eye Disease" and a sub-heading "Help raise awareness about diabetic eye disease". Below this, there is a paragraph of text and a bulleted list of key messages. Three resource cards are displayed: "Learn about diabetic eye disease" with a photo of a group of people, "Diabetes and Healthy Eyes Toolkit" with a photo of a toolkit, and "Resources" with a photo of educational materials. At the bottom, there are three more resource cards: "Outreach tools and tips" with a photo of a woman holding a booklet, "Watch, listen, and learn" with a photo of a woman speaking, and "Social media" with a photo of an older couple looking at a tablet.

Home > NEHEP Programs > Diabetic Eye Disease

National Eye Health Education Program (NEHEP)

Diabetic Eye Disease

Help raise awareness about diabetic eye disease

All people with diabetes are at risk for vision loss and blindness from diabetic eye disease. African Americans, American Indians and Alaska Natives, Hispanic/Latinos, and older adults with diabetes are especially at higher risk.

The NEHEP Diabetic Eye Disease Education Program is designed to help you raise awareness about diabetic eye disease among the people you serve. Our educational resources are designed to communicate the following messages that can help prevent vision loss in people at higher risk:

- Diabetic eye disease often has no early symptoms.
- People with diabetes need a comprehensive dilated eye examination at least once a year.
- Early detection, timely treatment, and follow-up are key to preventing vision loss and blindness.

Learn about diabetic eye disease
What is diabetic eye disease? Why is it important for people with diabetes to have a comprehensive dilated eye exam at least once a year? Get important background information here.

Diabetes and Healthy Eyes Toolkit
Find everything you need to hold educational sessions about diabetic eye disease.

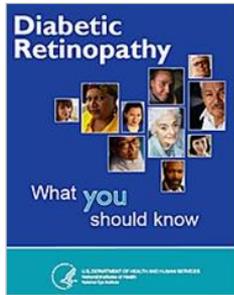
Resources
Access educational materials, training tools, and other diabetic eye disease resources.

Outreach tools and tips
Learn how to increase awareness about diabetic eye disease and generate support from your local media.

Watch, listen, and learn
Hear from health professionals, community health workers, and people with diabetic eye disease in these videos, webinars, and more.

Social media
Extend your reach with these messages created especially for social media.

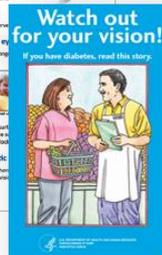
Diabetic Eye Disease Resources



Booklet



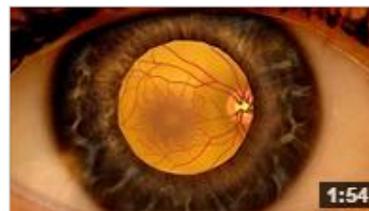
Handouts and Brochures



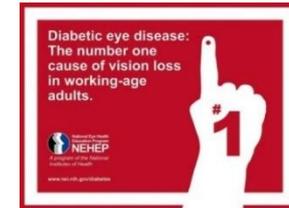
Infographics



Tip Sheets



Animations



Infocards



Consumer Website



Teaching Tools

Treating Diabetic Retinopathy Fact Sheet

What You Should Know

Treating Diabetic Retinopathy

Fact Sheet



Diabetic retinopathy occurs when diabetes damages the tiny blood vessels inside the retina—the light-sensitive tissue at the back of the eye. This can lead to vision loss in two ways. In the most severe form of diabetic retinopathy, called proliferative diabetic retinopathy (PDR), abnormal new blood vessels and scar tissue form on the surface of the retina. The blood vessels damaged by diabetic retinopathy may also swell and leak fluid into the macula, the part of the retina used for straight-ahead vision. This condition is called diabetic macular edema (DME).

How People With Diabetes Can Protect Their Vision

Because diabetic retinopathy often lacks early symptoms, you may not know you have it. People with diabetes should get a comprehensive dilated eye exam at least once a year to help detect the disease in its early stages. Sometimes, vision lost due to diabetic retinopathy cannot be regained. However, with early detection and treatment, you can reduce your risk of blindness by 95 percent. Controlling diabetes may help slow the progression of diabetic retinopathy. Keeping your blood glucose level as close to normal as possible reduces the risk of developing diabetic retinopathy, as well as kidney and nerve diseases. Also, controlling high blood pressure and cholesterol, not smoking, and maintaining a healthy weight can reduce the risk of vision loss.

When Treatment Is Needed

If you are diagnosed with nonproliferative diabetic retinopathy—an early stage of the disease—you may not need treatment. However, more frequent comprehensive dilated eye exams—as often as every two to four months—may be advised by your

eye care professional to check for worsening of the disease. If your condition advances to either PDR or DME, then treatment may be necessary.



Normal Vision Vision With Diabetic Retinopathy

What Are the Numbers?*

- Nearly 7.7 million people ages 40 and older have diabetic retinopathy, and this number is projected to increase to more than 11 million by 2030.
- Almost 1.2 million Hispanics/Latinos have diabetic retinopathy, and this number is expected to reach 3 million by 2030.
- More than 800,000 African Americans have diabetic retinopathy, and this number will likely exceed 1 million by 2030.

*National Eye Institute. Progression for Diabetic Retinopathy (2010–2030–2050). 2012. Available at <http://www.nei.nih.gov/retinopathy>



Treatment Options for DME

DME can be treated with several therapies that may be used alone or in combination with others.

Injection Therapy

In DME, a protein called vascular endothelial growth factor (VEGF) causes blood vessels in the retina to leak fluid. Anti-VEGF drugs can be injected into the eye to block the VEGF protein, decrease fluid in the retina, and improve the chances of retaining and even gaining vision. Available anti-VEGF drugs include Avastin® (bevacizumab), Eylea® (aflibercept), and Lucentis® (ranibizumab).

Research sponsored by the National Eye Institute (NEI) compared Avastin®, Eylea®, and Lucentis® in a clinical trial. The study found all three drugs to be safe and effective for treating most people with DME-related vision loss. Compared with the other two drugs, Eylea® was more likely on average to improve vision for people with moderate or worse vision loss over one year of treatment. These three drugs vary in cost and in how often they need to be injected, so you may wish to discuss these issues with your ophthalmologist.

Many people require monthly anti-VEGF injections for the first six months of treatment. Thereafter, injections typically are needed less frequently, with most people needing few or none by four to five years after starting therapy. These injections are performed in the doctor's office. Comprehensive dilated eye exams also may be needed less often as the disease stabilizes.

Focal/Grid Laser Surgery

This type of treatment applies small laser burns to leaking blood vessels to help slow the leakage of fluid and reduce swelling in the retina. The procedure is usually completed in one session, but some people may need more than one treatment. Focal/grid laser surgery is sometimes conducted before anti-VEGF injections, sometimes on the same day or a few days after an anti-VEGF injection, and sometimes only when DME fails to respond to anti-VEGF therapy.

Corticosteroids

Corticosteroids, a class of drugs that control inflammation, can be used to treat DME. They include short-acting injections and biodegradable implants for longer sustained release.

Corticosteroid use in the eye increases the risk of cataract and glaucoma. Patients who use corticosteroids should be monitored for increased eye pressure and glaucoma, and for cataract if they have not had cataract surgery previously.

Treatment Options for PDR

Scatter laser treatment has been the standard treatment for PDR for decades. This treatment involves making tiny laser burns in areas of the retina away from the macula to shrink abnormal blood vessels. Scatter laser treatment may require more than one session. While it can preserve central vision, it may cause some loss of side, color, and night vision. It also can cause worsening of pre-existing DME. Recent studies have shown that anti-VEGF treatment is also effective for slowing the progression of PDR. Anti-VEGF treatment does not have the vision side effects seen with laser, but does have the risks associated with injections into the eye, such as infection. If you have PDR, talk with your doctor about whether scatter laser or anti-VEGF is the better choice for you.

Diabetic Eye Disease

Diabetes can cause vision loss and blindness from diabetic eye disease. Diabetic eye disease includes diabetic retinopathy, cataract, and glaucoma. Diabetic retinopathy is the leading cause of vision loss and blindness in adults 20–74 years of age.



Other Treatment Options

If there is severe bleeding into the eye or retinal detachment from PDR, a surgery called vitrectomy may be performed to remove the vitreous (the gel-like substance that fills the center of the eye) and laser may be applied during the surgery. The procedure is done under local or general anesthesia. Depending on the level of monitoring needed afterward, vitrectomy may require an overnight stay in the hospital, although the majority is done on an outpatient basis. After treatment, the eye may be covered with a patch at night and may be red and sore. Drops are applied for several weeks to the eye to reduce inflammation and the risk of infection. The surgeon will follow recovery of the eye during the postoperative period.

How To Find Help

If treatment fails to improve vision, ask for a referral to a low vision specialist. Vision rehabilitation can help you learn about strategies and devices to make the most of your remaining sight. You can also check with a nearby school of medicine or optometry. Many community organizations and agencies offer information about low vision counseling, training, and other special services for people with visual impairment.

Free Diabetic Retinopathy Resources

NEI's National Eye Health Education Program (NEHEP) has a variety of educational materials to help you learn more and share information about diabetic retinopathy.

- Diabetic Retinopathy: What You Should Know Booklet**—This booklet describes causes, symptoms, diagnosis, and treatment and provides answers to commonly asked questions about the disease.
- Diabetic Retinopathy Animation**—Watch and share this animated explanation of what happens to the retina with diabetic retinopathy.



Diabetic Eye Disease Infographics and Infocards—Share these through social media, on websites, and in publications and newsletters to inform people about eye diseases associated with diabetes.



Diabetic Macular Edema Video—See how treatment of diabetic macular edema can improve vision.

To find these and other resources, visit the NEHEP Diabetic Eye Disease Education Program website at <http://www.nei.nih.gov/nehep/programs/diabeticeyedisease>.



Diabetic Retinopathy Animation—Watch and share this animated explanation of what happens to the retina with diabetic retinopathy.



<http://bit.ly/29o0MnC>

Social Media Resources

1/2

Only half of all people with diabetes get an annual comprehensive dilated eye exam.

This exam is the only way to detect diabetic eye disease before vision loss occurs.

**National Eye Health Education Program
NEHEP**
A program of the National Institutes of Health

www.nei.nih.gov/diabetes

New treatments offer more hope for people with diabetic retinopathy.

Talk with your eye care professional about the best treatment options for you.

**National Eye Health Education Program
NEHEP**
A program of the National Institutes of Health

www.nei.nih.gov/diabetes

Adults age 50+ with diabetes are at higher risk for developing diabetic retinopathy.

This disease often has no early symptoms but can be detected with a comprehensive dilated eye exam.

**National Eye Health Education Program
NEHEP**
A program of the National Institutes of Health

www.nei.nih.gov/diabetes

Keep your diabetes in control to prevent or slow the progression of diabetic retinopathy.

**National Eye Health Education Program
NEHEP**
A program of the National Institutes of Health

www.nei.nih.gov/diabetes

LEARN THE FACTS

About **DIABETIC RETINOPATHY**

Diabetic retinopathy occurs when diabetes damages the tiny blood vessels inside the retina, the light-sensitive tissue at the back of the eye.

A GROWING ISSUE

Diabetic retinopathy is the leading cause of blindness in working-age adults ages 20-74.

TODAY	2030	2050
7.7 MILLION	11 MILLION	14.5 MILLION

NO EARLY SYMPTOMS

However, over time, diabetic retinopathy can get worse and cause vision loss or blindness.

WHO IS AT RISK?

All people with diabetes—both type 1 and type 2—are at risk.

95% REDUCED RISK OF VISION LOSS

Early detection, timely treatment, and appropriate follow-up care can reduce the risk of severe vision loss by 95 percent.

Don't forget to—

- T** Take your medications.
- R** Reach and maintain a healthy weight.
- A** Add physical activity to your daily routine.
- C** Control your blood sugar, blood pressure, and cholesterol.
- K** Kick the smoking habit.

YOU CAN PROTECT YOUR VISION.

Get a comprehensive dilated eye exam at least once a year if you have diabetes.

LEARN MORE AT:
www.nei.nih.gov/diabetes

NIH National Eye Institute
NEHEP National Eye Health Education Program
A program of the National Institutes of Health

QUESTIONS

For More Information

- **Visit:** www.nei.nih.gov/nehep
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Additional Resources



- YouTube: **/NEINIH**



- Facebook: **/NationalEyeHealthEducationProgram**



- NEHEP Twitter: **@NEHEP**
- NEI Twitter: **@NatEyeInstitute**



- Pinterest: **/neinih**
- NEHEP website: **<http://www.nei.nih.gov/nehep>**



- NEI LinkedIn: **/company/national-eye-institute-nei**

Thank you!



National Eye Institute



*A program of the National
Institutes of Health*