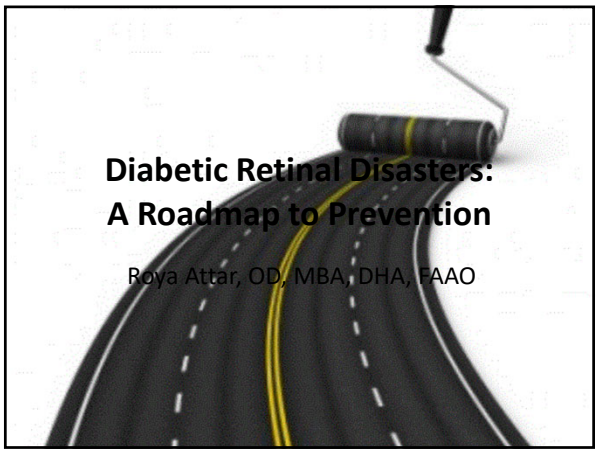


Diabetic Retinal Disasters: A Roadmap to Prevention

Roya Attar, OD, MBA, DHA, FAAO

SPEAKER DISCLOSURES

- Associate Professor and Director of Optometric Services at the University of Mississippi Medical Center
- Advisory board member for
  - Apellis Pharmaceuticals
  - Heidelberg Engineering
  - Ocuterra Therapeutics
- All relevant relationships have been mitigated
- Contact: royaattar@outlook.com

dr.roya_attar

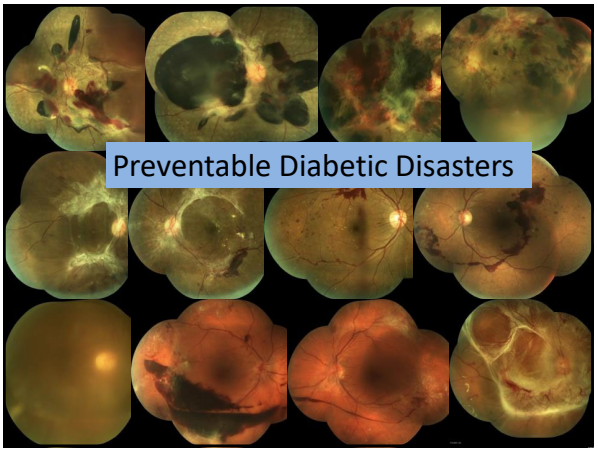
Roya Attar

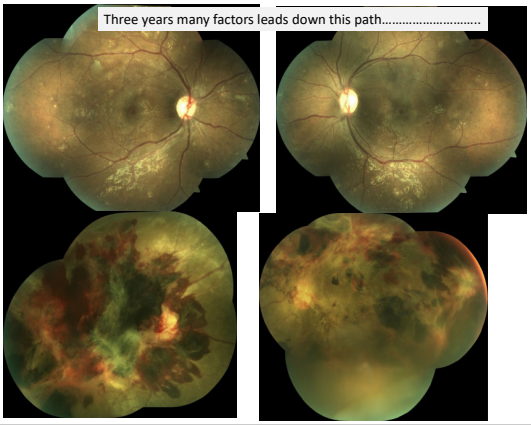
All relevant relationships have been mitigated

Learning Objectives

At the end of the session, attendees should be able to:

1. To review demography and pathophysiology of diabetes and diabetic retinopathy
2. To review classification of diabetic retinopathy
3. To discuss appropriate follow-up intervals and indications for medical and/or surgical intervention for diabetic retinopathy
4. To review the common pitfalls preventing appropriate eye care in patient populations
5. To provide guidelines for proper patient education and communication with patients as well as other healthcare providers to improve overall disease outcomes
6. To exhibit case examples of very advance cases to demonstrate the catastrophic nature of neglected diabetic retinopathy as compared to successfully followed and managed patients





Mechanism of Retinal Vascular Disorders

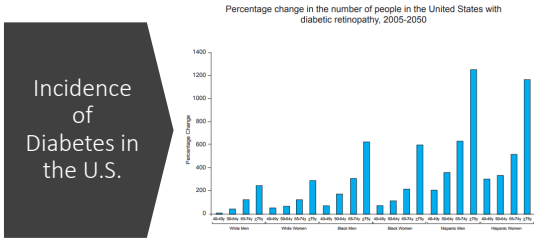
- Conditions that physically alter blood vessels (Retina a/o choroid)
  - Locally or systemically
  - Arteriosclerosis
  - Atherosclerosis
- Conditions that effect hemodynamics
  - Systemic hypertension
- Conditions that alter blood chemistry
- Conditions that do some or all of the above

Diabetes Mellitus

- **Background**
  - The diabetes epidemic is a global threat, with the number expected to rise to a staggering 350 million affected individuals by 2030
  - Increased prevalence in those of non-white European descent
    - Greatest prevalence in Native Americans, Asians/Pacific Islanders, Blacks, and Hispanics (order corresponds to degree of prevalence)

Source: American Diabetes Association

Incidence of Diabetes in the U.S.



Saaddine JB, Honeycutt AA, Narayan KM, Zhang X, Klein R, Boyle JP. Projection of diabetic retinopathy and other major eye diseases among people with diabetes mellitus: United States, 2005-2050. Arch Ophthalmol. Dec 2008;126(12):1740-1747.

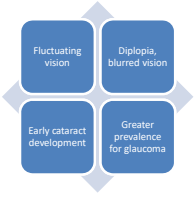
Diabetes

- A group of metabolic diseases associated with high serum glucose level, either due to the body's inability to produce sufficient insulin, or cells do not respond to the produced insulin
- Incidence/Epidemiology (www.diabetes.org)
  - In 2015 1.5 million new cases among ≥18. 1 in 4 adult have diabetes (>7 mil unaware)
- Type 2: primarily lifestyle factors
- Type 1: Multifactorial

Diabetes Mellitus: Type 1

- Onset usually under age 30
- Autoimmune mediated or idiopathic destruction of pancreas beta-cells
- Complete absence of insulin secretion/usually begin taking insulin at diagnosis

Ocular Effects



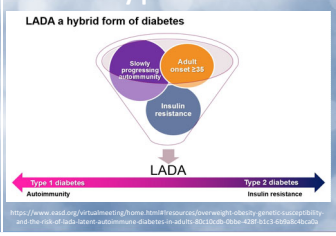
Systemic Effects

https://en.wikipedia.org/wiki/Type_2_diabetes

Diabetes Mellitus: Type 2

90% of all diabetics	Adult-onset (usually after age 40)	Non-insulin-dependent (most of the time)	Resistance of the body tissues to the action of insulin
Many are asymptomatic	Usually treated by diet and weight control early	Hypertension present in 58%	20% will have retinopathy at time of diagnosis
	60-80% will have some retinopathy after 15 years	Vision loss usually the result of DME	

Diabetes Mellitus: Type 1.5



https://www.eaid.org/virtualmeeting/home.html#!resources/overweight-obesity-genetic-susceptibility-and-the-risk-of-lada-latent-autoimmune-diabetes-in-adults-80c10cdb-0bbe-428f-b1c3-6b9a8c4bca0a

- Also known as latent autoimmune diabetes in adults (LADA), is a condition that shares characteristics of both type 1 and type 2 diabetes
- Diagnosed during adulthood, and it sets in gradually, like type 2 diabetes
- Not reversible with changes in diet and lifestyle
- Not obese, over the age of 30 at the time of diagnosis

Diabetes

Morbidity and Mortality

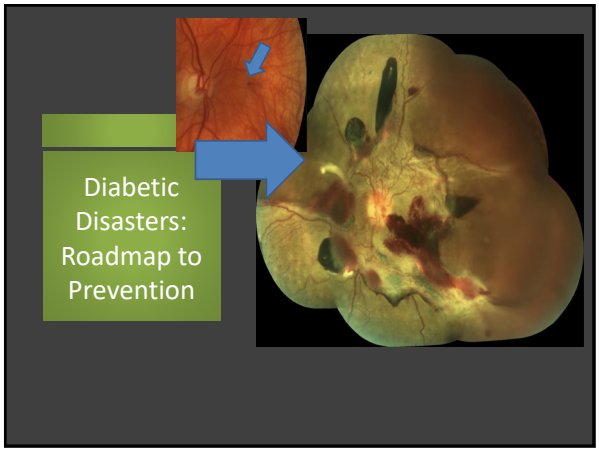
- Major cause of death
- Most common cause of **preventable blindness** in working age adults

Complications

- Nephropathy, Neuropathy, Retinopathy
- Heart disease and stroke
- Hypertension
  - In 2003–2004, 75% of adults with also had hypertension
- Amputation
  - More than 60% of non-traumatic lower limb amputations

Diabetic Retinopathy

- Most Common Vascular Retinopathy
- Diabetes is the leading cause of new cases of adult-onset blindness
- Research
  - ClinicalTrials .gov (more than 900 studies listed)
  - DRCR.net (Diabetic Retinopathy Clinical Research Network)



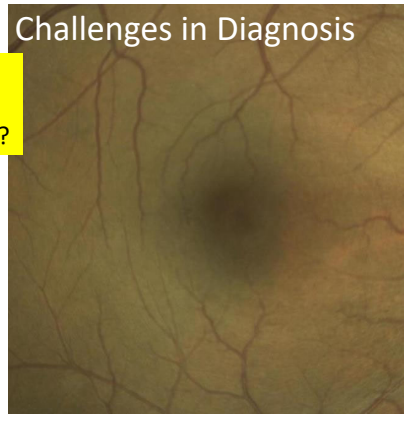
Diabetic Retinopathy

1. How to detect
2. When and how to manage
3. Who to Refer
4. How to Co-Manage

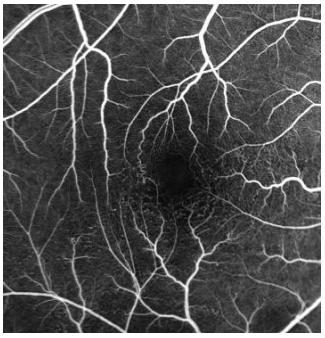
Challenges in Diagnosis

1

Is this a normal macula?

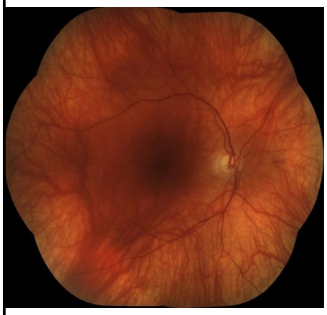


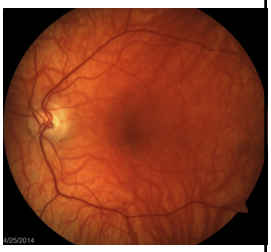
Pitfall:
What may look normal or nearly normal may not be normal!



Patient in her late 30s diabetic,
Sent for Diabetic Eye Examination

20/20 OU all testing
"normal"
Fundus exam as below

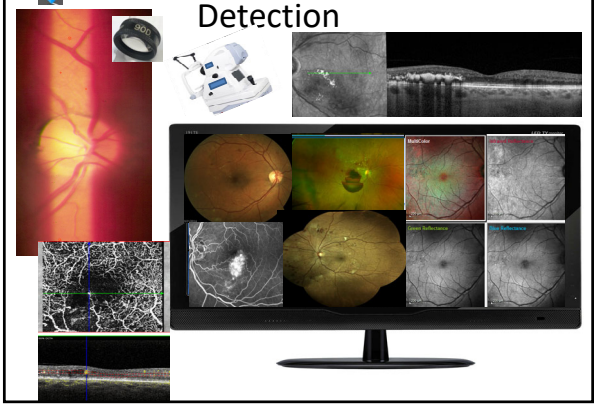




Early Detection

- Visual Acuity
- A1c, Blood Sugar
- Concomitant disease

Detection



Clinical Examination Guidelines

- MUST contain the following elements:
  - Duration of diabetes
  - Past glycemic control
  - Current medications
  - Medical history
  - Ocular history

- Initial exam MUST contain the following:
  - Visual acuity
  - Biomicroscopy
  - IOP
  - Gonioscopy (when indicated)
  - Dilated fundus exam which includes stereoscopic view of posterior pole
  - Presence/absence of macular edema
  - Presence/absence of ONH neovascularization and neovascularization elsewhere
  - Presence/absence of signs of severe NPDR
  - Presence/absence of vitreous/pre-retinal heme

Clinical Examination Guidelines

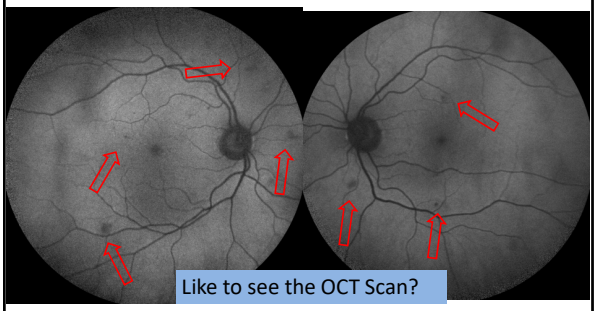
Pertinent Information for Management

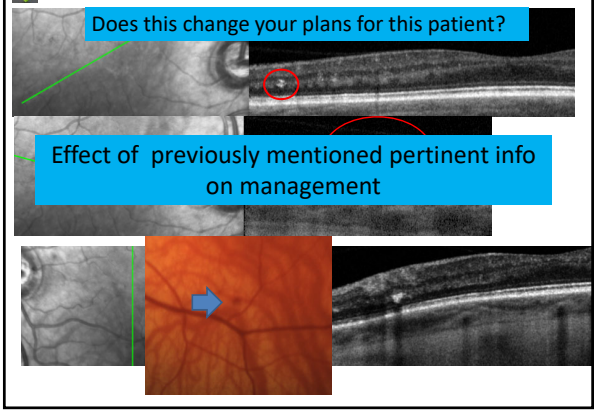
- Type
- Duration
- Control (Daily and Overall)
- Smoker (Y or N)
- Any other medical Dx (HTN, Sleep Apnea, Obesity)
- Any (other) associated complications (Renal Failure)
- Pregnant or plan to be

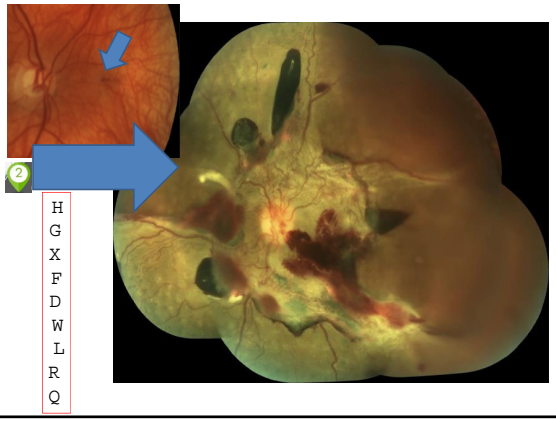
"Once retinopathy is present, duration of DM appears to be a less important factor than glycemic control in forecasting retinopathy progression"
(AAO PPP 2019)

Based on these pictures, how would you manage?

55° FAF







How to Manage

- Properly assess the condition
  - Classification
- Consider all the associated factors discussed
- PATIENT EDUCATION
- Follow-up under the standards of care
- Know who and when to refer

Diabetic Retinopathy Classification

- Proper classification, which in turn leads to proper management, can be sight saving

Stages

Diabetic Retinopathy: A Position Statement by the American Diabetes Association

Sharon D. Solomon,[1] Emily Chew,[2] Ella J. Duh,[3] Lucia Sobrin,[4] Jennifer K. Sun,[4] Brian L. VanderBeek,[5] Charles C. Wykoff,[6] and Thomas W. Gardner[7]

Diabetes Care 2017;40:412–418 | DOI: 10.2337/dc16-2641

www.diabetes.org

Table 1—Diabetic retinopathy stages*

Diabetic retinopathy stage	Description
Mild NPDR	Small areas of balloon-like swelling in the retina's tiny blood vessels, called microaneurysms, occur at this earliest stage of the disease. These microaneurysms may leak fluid into the retina.
Moderate NPDR	As the disease progresses, blood vessels that nourish the retina may swell and distort. They may also lose their ability to transport blood. Both conditions cause characteristic changes to the appearance of the retina and may contribute to DME.
Severe NPDR	Many more blood vessels are blocked, depriving blood supply to areas of the retina. These areas secrete growth factors that signal the retina to grow new blood vessels.
PDR	At this advanced stage, growth factors secreted by the retina trigger the proliferation of new blood vessels, which grow along the inside surface of the retina and into the vitreous gel, the fluid that fills the eye. The new blood vessels are fragile, which makes them more likely to leak and bleed. Accompanying scar tissue can contract and cause retinal detachment—the pulling away of the retina from underlying tissue, like wallpaper peeling away from a wall. Retinal detachment can lead to permanent vision loss.

*Adapted from https://nei.nih.gov/health/diabetic/retinopathy.

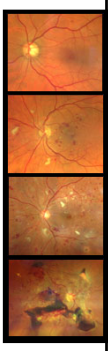
DIABETIC RETINOPATHY STAGING

TABLE 1 Diabetic Retinopathy Disease Severity Scale and International Clinical Diabetic Retinopathy Disease Severity Scale

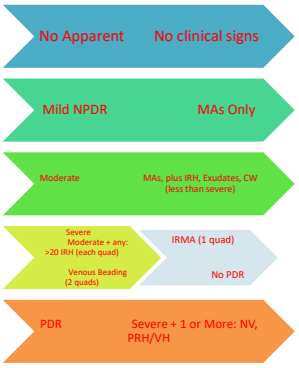
Disease Severity Level	Findings Observable upon Dilated Ophthalmoscopy
No apparent retinopathy	No abnormalities
Mild NPDR (see Glossary)	Microaneurysms only
Moderate NPDR (see Glossary)	More than just microaneurysms but less than severe NPDR
Severe NPDR	
International Definition	Any of the following and no signs of proliferative retinopathy: • More than 20 intraretinal hemorrhages in each of **four** quadrants • Definite venous beading in **two** or more quadrants • Prominent IRMA in **one** or more quadrants
• Any patient with two or more of the characteristics of severe NPDR is considered to have very severe NPDR.	
PDR	One or both of the following: • Neovascularization • Vitreous/preretinal hemorrhage

IRMA = intraretinal microvascular abnormalities; NPDR = nonproliferative diabetic retinopathy; PDR = proliferative diabetic retinopathy

American Academy of Ophthalmology PPP 2019 (p8)

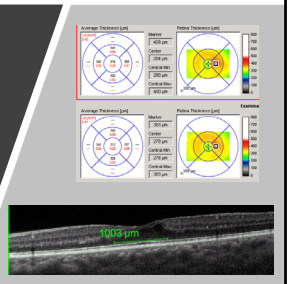


International Classification of DR (ICO)



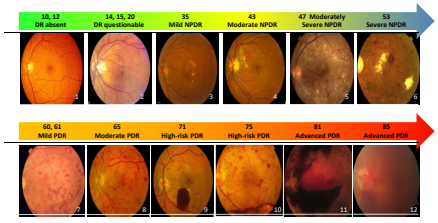
International Classification of DME

- OCT: most sensitive test
- No DME: No Thickening, or Exudates in the Macula
- Non-Center involving DME: Thickening outside of 1mm of fovea
- Center involving DME: Thickening within the 1 mm diameter



*Most used in clinical trials

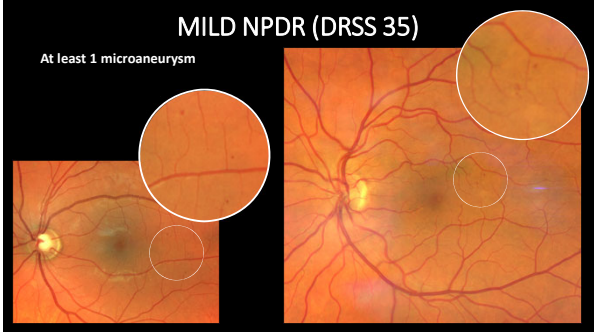
ETDRS Diabetic Retinopathy Severity Scale



- DR, diabetic retinopathy; ETDRS, Early Treatment Diabetic Retinopathy Study; NPDR, non-proliferative DR; PDR, proliferative DR.
- 1. ETDRS. *Ophthalmology*. 1991;98:823-833. 2. Ip MS, et al. *Arch Ophthalmol*. 2012;130:1145-1152.

MILD NPDR (DRSS 35)

At least 1 microaneurysm



MODERATE NPDR (DRSS 43)

MODERATELY-SEVERE NPDR (DRSS 47)

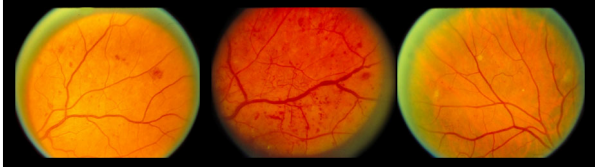
Characterized by the presence of ANY of the following:

- Mild IRMA in 4 quadrants
- Venous beading in 1 quadrant
- Severe retinal hemorrhages in 2 to 3 quadrants

SEVERE NPDR (DRSS 53)

Characterized by the presence of ANY of the following (**4-2-1 rule**):

4	2	1
Severe retinal hemorrhages (≥ standard photograph 2A)	**Definite venous beading** (≥ standard photograph 6B)	**Moderate to severe IRMA** (≥ standard photograph 8A)



ETDRS. Ophthalmology. 1991;98:823-833. 2. Ip MS, et al. Arch Ophthalmol. 2012;130:1145-1152.

4-2-1 Rule

Comparison of ETDRS and International Clinical Diabetic Retinopathy and Macular Edema Severity Scales

Diabetic Retinopathy	ETDRS	International Scale
No apparent DR		No abnormalities
Mild NPDR	At least one Ma	Ma only
Moderate NPDR	H/Mas ≥standard photo 2A or soft exudates, VB, and IRMA present	More than just Mas, but less than severe NPDR
Severe NPDR	One of the following: • H/Mas ≥standard photo 2A in all 4 quadrants; • VB present in at least 2 quadrants; • IRMA ≥standard photo 8A in at least 1 quadrant	No signs of PDR, with any of the following: • >20 intraretinal hemorrhages in each of 4 quadrants; • Definite VB in ≥2 quadrants; • Prominent IRMA in ≥1 quadrant
PDR		Severe NPDR and one or both of the following: • Neovascularization; • Vitreous/preretinal hemorrhage
Mild PDR	One or more of the following: • NVE; FPD or FPE present; • NVD and NVE present	
Moderate PDR	One or more of the following: • NVE elevated; • NVD <standard photo 10A; • VH/PRH and NVE <½ DA; • NVD absent	
High-Risk PDR	One or more of the following: • NVD ≥1/4 to 1/3 DA (standard photo 10A); • NVD and VH/PRH; • NVE ≥½ DA and VH/PRH	

Source: AOA's Evidence-Based Clinical Practice Guideline: Eye Care of the Patient with Diabetes Mellitus, Second Edition

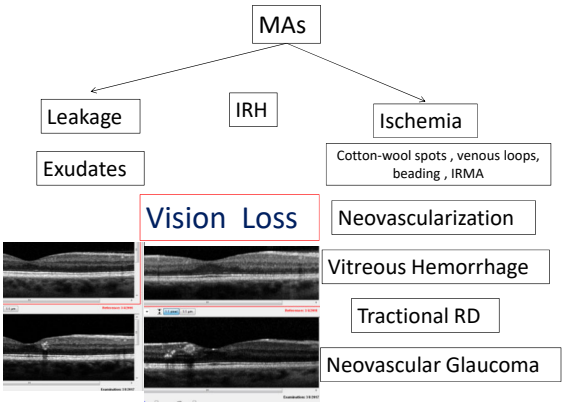
Comparison of ETDRS and International Clinical Diabetic Retinopathy and Macular Edema Severity Scales

Diabetic Macular Edema	ETDRS	International Scale
DME apparently absent		No apparent retinal thickening or HE in posterior pole
DME apparently present		Some apparent retinal thickening or HE in posterior pole
Mild DME	Retinal thickening within 2 DD of center of the macula	Some retinal thickening or HE in posterior pole, but distant from center of the macula
Moderate DME		Retinal thickening or HE approaching, but not involving, the center of the macula
Severe DME		Retinal thickening or HE involving the center of the macula
CSME (non-central involved) CSME (central-involved)	One or more of the following: • A zone or zones of retinal thickening ≥1 DA in size, any portion of which is ≤1 DD from the center of the macula • Thickening of the retina ≤500 microns from the center of the macula; • HE ≤500 microns from the center of the macula with thickening of the adjacent retina	

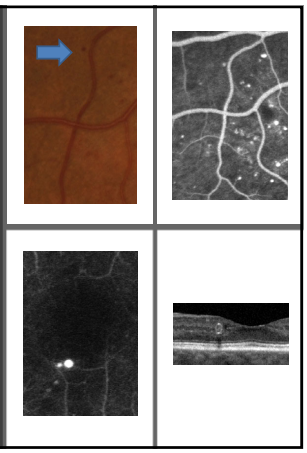
CSME *- clinically significant macular edema* ***DA*** *- disc area* ***DD*** *- disc diameter* ***DME*** *- diabetic macular edema* ***DR*** *- diabetic retinopathy* ***FPD*** *- fibrous proliferation on or within 1 DD of disc margin* ***FPE*** *- fibrous proliferation elsewhere* ***HE*** *- hard exudates* ***H/MA*** *- hemorrhage(s) and/or microaneurysm(s)* ***IRMA*** *- intraretinal microvascular anomaly* ***Ma*** *- microaneurysms* ***NPDR*** *- nonproliferative diabetic retinopathy* ***NVD*** *- new vessels on or within 1 DD of disc margin* ***NVE*** *- new vessels elsewhere* ***PDR*** *– proliferative diabetic retinopathy* ***PRH*** *- preretinal hemorrhage* ***VB*** *- venous beading* ***VH*** *- vitreous hemorrhage*

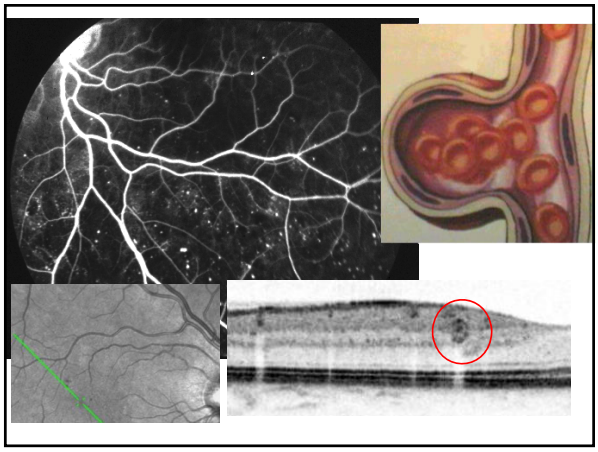
Sources: Early Treatment Diabetic Retinopathy Study Research Group. Grading diabetic retinopathy from stereoscopic color fundus photographs: an extension of the modified Airlie House classification. ETDRS Report Number 10. Ophthalmology 1991; 98:786-806 and Wilkinson CP, Ferris FL 3rd, Klein RE, et al. Proposed international clinical diabetic retinopathy and diabetic macular edema disease severity scales. Ophthalmology 2003;110:1677-82.

Source: AOA's Evidence-Based Clinical Practice Guideline: Eye Care of the Patient with Diabetes Mellitus, Second Edition



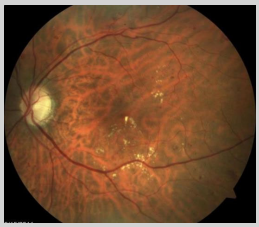
MAs



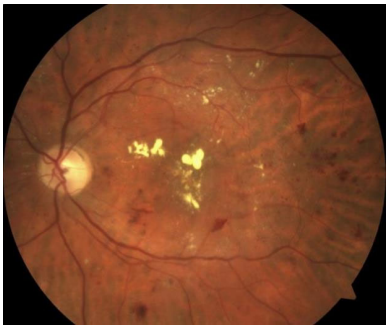


Typical Progression

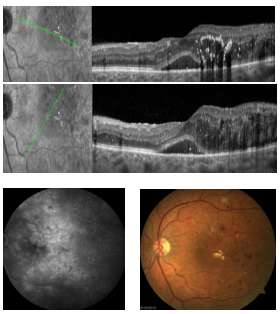
- Patients may present at any stage
- Some still asymptomatic or attribute their symptoms to needing spectacle Rx change
- Most will not understand the significance of the condition
- This patient is suffering chronic macular edema obviously needing referral

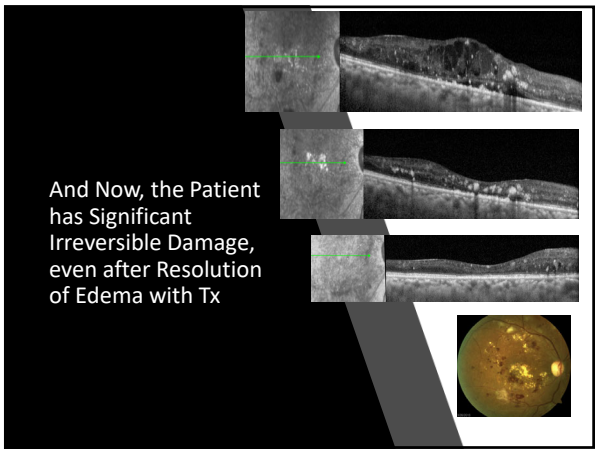


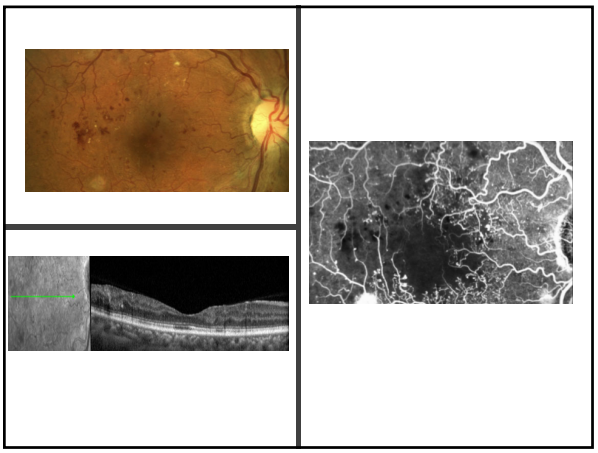
Neglected- Leading to Further Progression

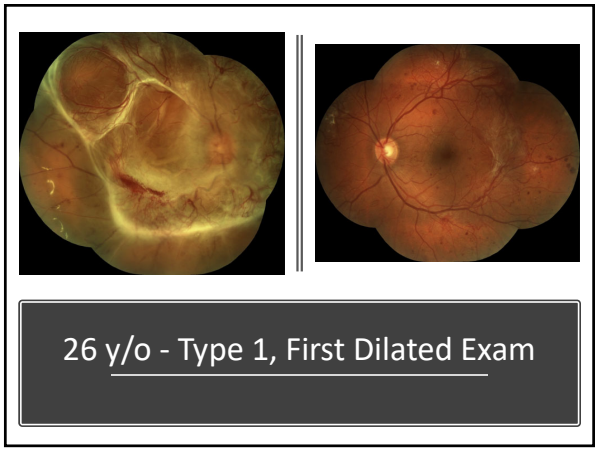


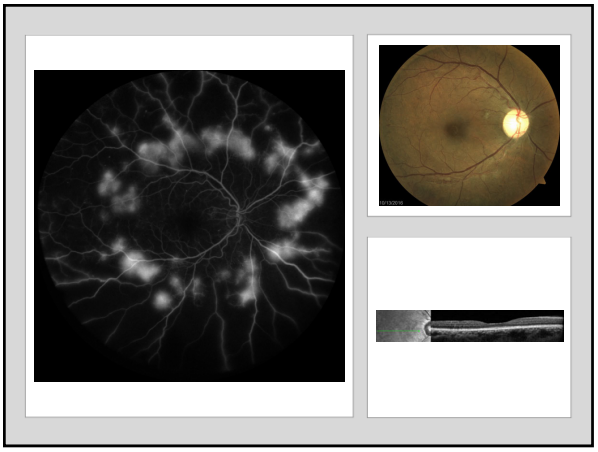
Now the Patient is Symptomatic and has Severe Disease

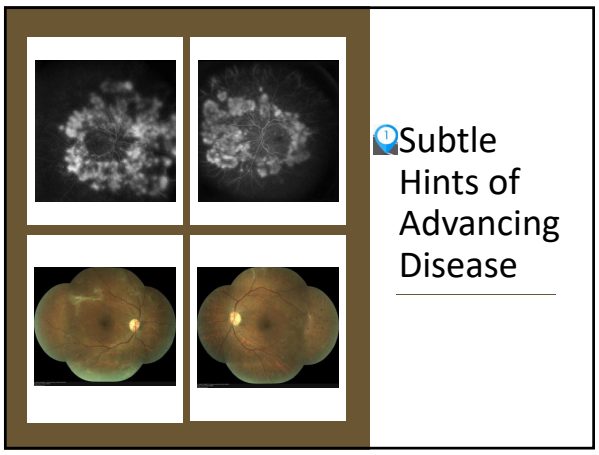


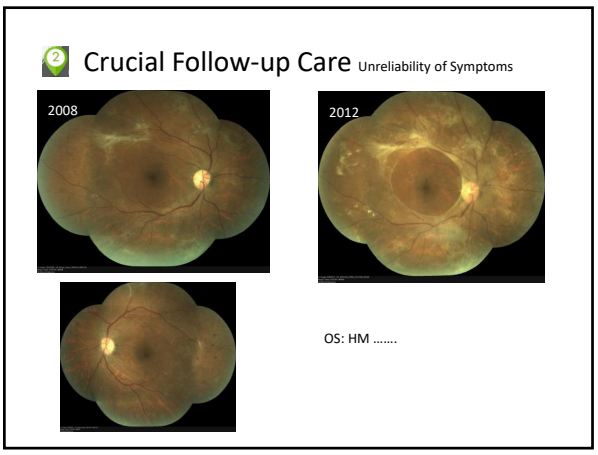

And Now, the Patient has Significant Irreversible Damage, even after Resolution of Edema with Tx




26 y/o - Type 1, First Dilated Exam




Subtle Hints of Advancing Disease


Crucial Follow-up Care Unreliability of Symptoms
2008
2012
OS: HM .....

Frequency of Ocular Examination

- The recommended frequency of ocular examination is determined based on several factors, including, but not limited to:
  - Type of diabetes
  - **Duration of the disease**
  - Age of the patient
  - Level of patient adherence to and understanding of their treatment plan
  - Concurrent medical status
  - Both nonretinal and retinal ocular findings and symptoms
  - Subjective changes in vision (Refractive Status)

Screening and Follow-up

2017 American Diabetic Association Guidelines

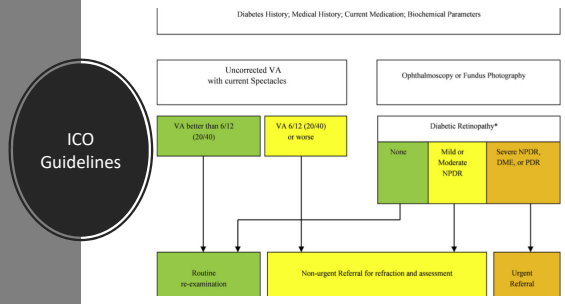
- Adults with type 1 diabetes should have an initial dilated and comprehensive eye examination by an ophthalmologist or optometrist within 5 years after the onset of diabetes. **B**
- Patients with type 2 diabetes should have an initial dilated and comprehensive eye examination by an ophthalmologist or optometrist at the time of the diabetes diagnosis. **B**
- If there is no evidence of retinopathy for one or more annual eye exams, then exams every 2 years may be considered. If any level of diabetic retinopathy is present, subsequent dilated retinal examinations for patients with type 1 or type 2 diabetes should be repeated at least annually by an ophthalmologist or optometrist. If retinopathy is progressing or sight-threatening, then examinations will be required more frequently. **B**

Screening and Follow-up

2017 American Diabetic Association Guidelines

- Women with preexisting type 1 or type 2 diabetes who are planning pregnancy or who have become pregnant should be counseled on the risk of development and/or progression of diabetic retinopathy. **B**
- Eye examinations should occur before pregnancy or in the first trimester in patients with preexisting type 1 or type 2 diabetes, and then these patients should be monitored every trimester and for 1 year postpartum as indicated by the degree of retinopathy. **B**
- While retinal photography may serve as a screening tool for retinopathy, it is not a substitute for a comprehensive eye exam, which should be performed at least initially and at intervals thereafter as recommended by an eye care professional. **E**

ICO Guidelines



ICO Recommendations for Follow-up

Table 2. Screening and Referral Recommendations Based on International Classification of Diabetic Retinopathy* and Diabetic Macular Edema for High-Resource Settings

Classification	Re-examination or Next Screening Schedule	Referral to Ophthalmologist
DR		
No apparent DR, mild nonproliferative DR, and no DME	Re-examination in 1–2 yrs	Referral not required
Mild nonproliferative DR	6–12 mos	Referral not required
Moderate nonproliferative DR	3–6 mos	Referral required
Severe nonproliferative DR	<3 mos	Referral required
Proliferative DR	<1 mo	Referral required
DME		
Non–center-involving DME	3 mos	Referral required
Center-involving DME	1 mo	Referral required

DME = diabetic macular edema; DR = diabetic retinopathy.
*In cases where diabetes is controlled.

ICO Follow-up Care Exceptions

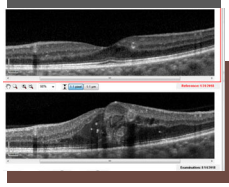
Pregnancy

- Antenatal Screening
  - If No DR then 28 weeks
  - If DR 16-20 weeks

Cataract

- DR and DME can progress faster with Cat SX
- Cat SX when visually or Optically Significant
- Severe NPDR PRP before SX
- DME Focal or Anti-VEGF stabilize DME
- If view not adequate for laser (if DME anti-VEGF before SX) monitor closely after cataract surgery

When to Refer



3

- Any Macular Edema
- Severe NPDR, Suspicious of NV
- NV (PDR), VH, TRD
- NVI urgent

Moderate and Severe NPDR

- New Paradigm in Managing
  - Ride and Rise Studies Demonstrated Reversal
  - Protocol S (DRCR)
    - Compared ranibizumab (Lucentis) to PRP FDA approves it for NPDR (Jan 2017)
  - Panorama (Regeneron)
- Anti-VEGF for Severe NPDR (EDTRS 47 and 53 severity) will perhaps become standard of care
  - Many unanswered

PDR

- PRP
- Anti-VEGF
- Combo
- Vitrectomy

Patient Education

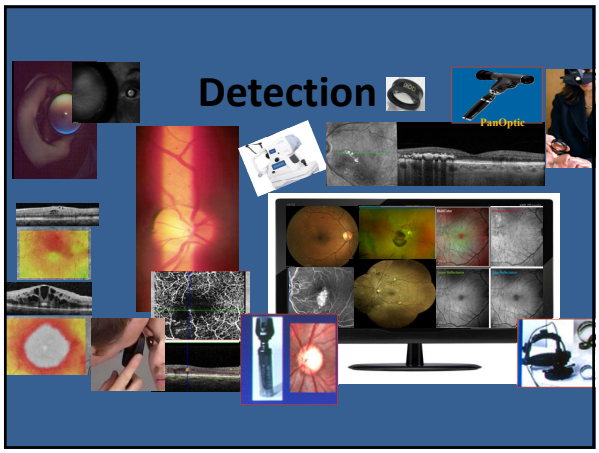
Vision	Vision not indicator presence, absence or a measure for level and status of retinopathy
Know	Patients undergoing treatment must know this is a chronic condition needs chronic and continuous care
Convey	Patient education must convey understanding of the gravity of the condition and avoidable catastrophes

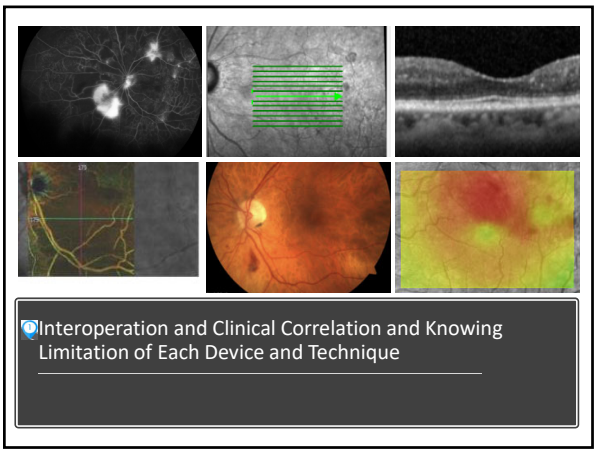
How to Co-Manage

- Establishing a relationship with the treating provider
- Your comfort level to deal with high risk high complexity conditions
- Having the proper diagnostic tools
- Recognizing the chronicity of these conditions some requiring long-term care
- Diabetic Retinopathy is a Chronic Disease Needing Continuous Care

Pitfalls Leading to Disasters

- Beyond patient's misconceptions
  - Poor follow-up compliance
- Inadequate screening (Examination)
- Inadequate attention to certain findings



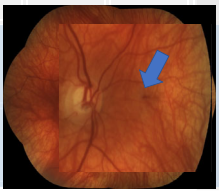


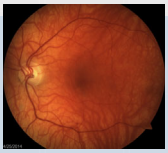
- Fundus Photography
- Optical Coherence Tomography (OCT)
- Fluorescein Angiography (FA)
- Fundus Autofluorescence (FAF)
- Ocular Ultrasound
- OCT-A

Diagnostic Testing

Diagnostic Strategies

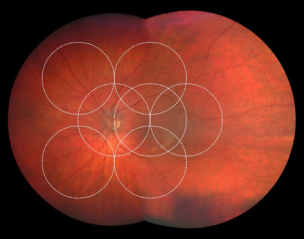
- Fundus Photos: Useful for documenting substantial progression of disease and response to treatment





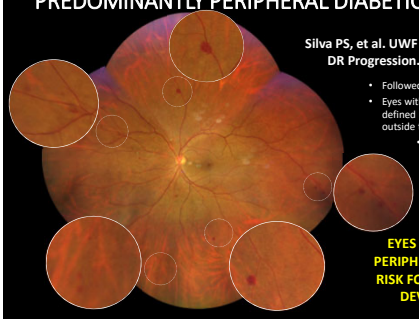
ULTRA-WIDEFIELD vs 7 FIELD ETDRS

UWF= Includes at least 4 vortex vein ampullae, ~200° and 80% retinal surface



200° UWF vs 75° Standard 7 field ETDRS

PREDOMINANTLY PERIPHERAL DIABETIC RETINOPATHY



Silva PS, et al. UWF Peripheral Lesions Predict DR Progression. Ophthalmology 2015.

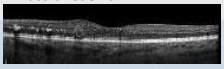
- Followed 200 DR eyes for ~ 4 yrs
- Eyes with predominately peripheral DR defined as majority of DR lesions outside the 75° ETDRS standard 7 fields
- Compared to eyes without, eyes with predominately peripheral DR had a 3.2-fold ↑ risk of ≥2-step DR progression (11% vs. 34%), and a 4.7-fold ↑ risk for progression to PDR (6% vs. 25%).

EYES WITH PREDOMINANTLY PERIPHERAL DR HAVE A GREATER RISK FOR DR PROGRESSION AND DEVELOPMENT OF PDR!!

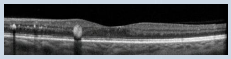
Diagnostic Strategies

- Optical Coherence Tomography (OCT): Useful for quantifying retinal thickness, monitoring macular edema, and identifying vitreomacular traction in selected patients with diabetic macular edema

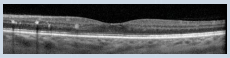
Large perifoveal MA identified



1 month after laser

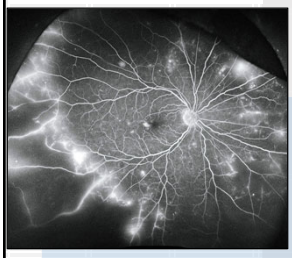


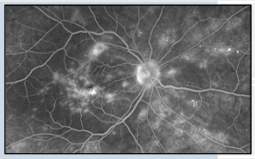
3 months after laser



Diagnostic Strategies

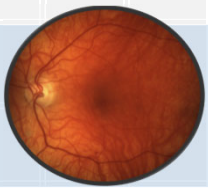
- Fluorescein Angiography: Indicated when DME is suspected, to evaluate unexplained VA loss
- Identify vascular leakage and treatable lesions in eyes with DME
- Visualize non-perfusion and detect subclinical neo

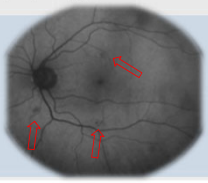




Diagnostic Strategies

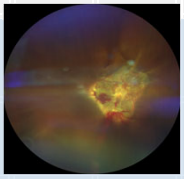
- Fundus Autofluorescence (FAF):Obscuration or hypoautofluorescence by opacities such as retinal hemorrhages.

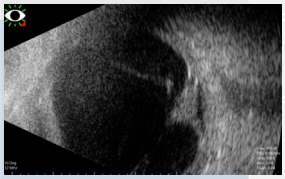


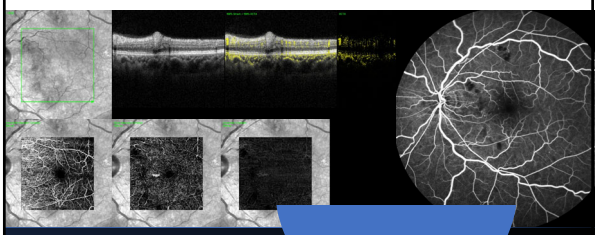


Diagnostic Strategies

- Ocular Ultrasound: Valuable test to detect retinal detachment in diabetic eyes with opaque media





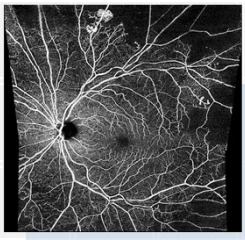


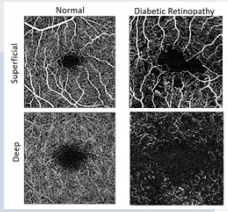
Diagnostic Strategies

OCT- A: Allows for evaluation of deep vascular plexus

Diagnostic Strategies

- OCT- A:
  - Earliest detection of vascular pathology possible ("subclinical DR")
  - Detection of macular ischemia
  - Detection of non-perfusion (predictive) and neo





Other Ancillary Testing

Contrast Sensitivity Testing
- Can be used as an early indicator of visual changes not shown by visual acuity
- Deficits in contrast sensitivity may occur before the onset of clinically detectable retinopathy

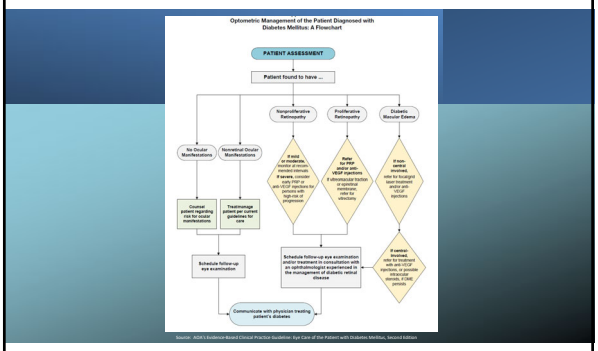
Blood Pressure Measurement

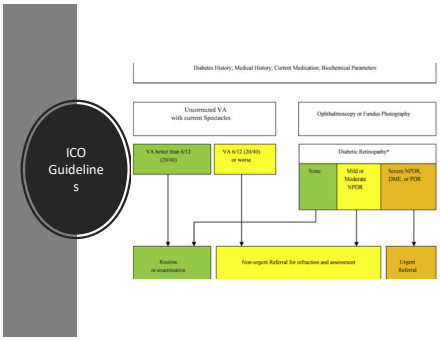
Color Vision Testing
- Changes in color perception may occur in persons with diabetes, but it should not be used for the diagnosis of DR

Amsler Grid
- Can be used to detect the presence of metamorphopsia in persons with DME

Management Strategies

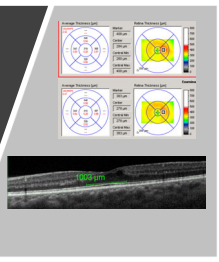
- Properly assess the condition
  - Classification
- Consider all the associated factors discussed
- PATIENT EDUCATION
- Follow-up under the standards of care
- Know who and when to refer





International Classification of DME

- OCT: most sensitive test
- No DME: No Thickening, or Exudates in the Macula
- Non-Center involving DME: Thickening outside of 1mm of fovea
- Center involving DME: Thickening within the 1 mm diameter



ICO Recommendations for Follow-up

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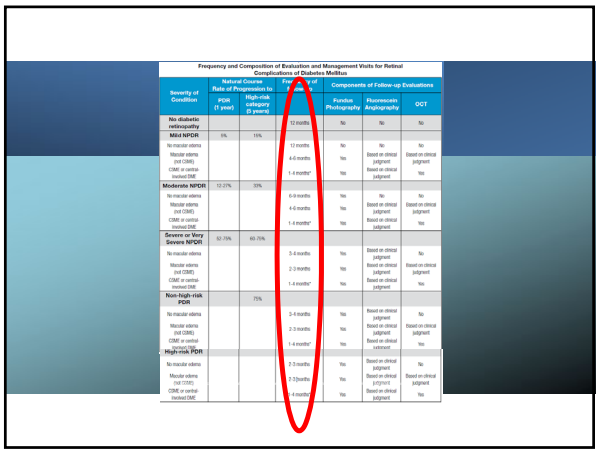
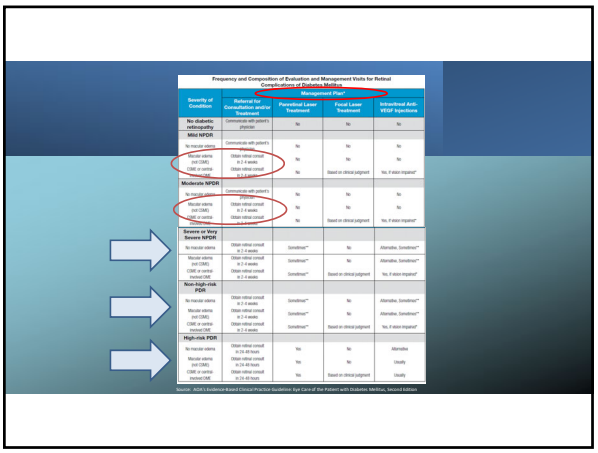
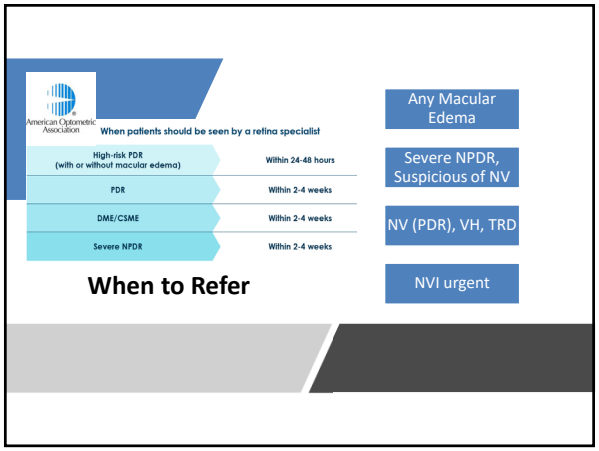
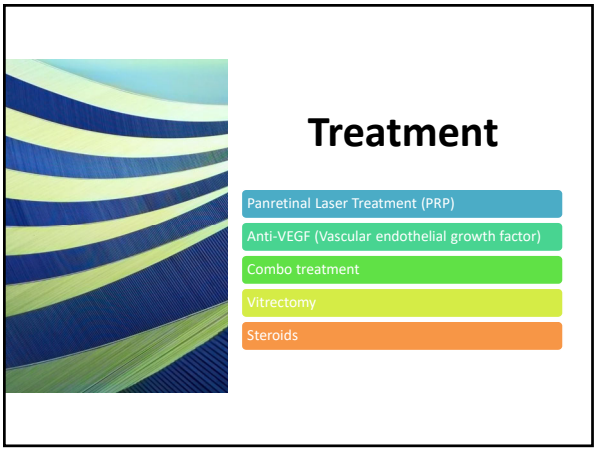
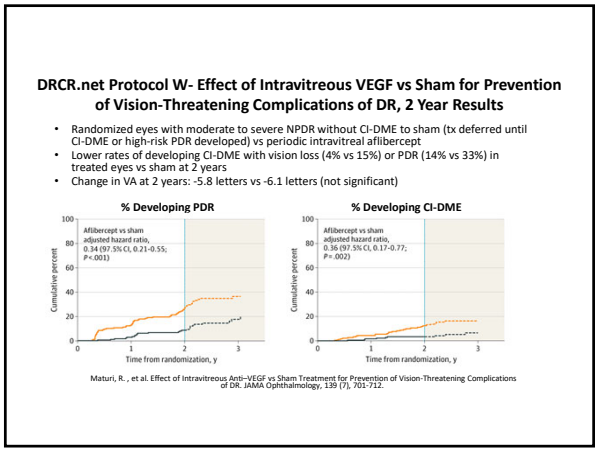
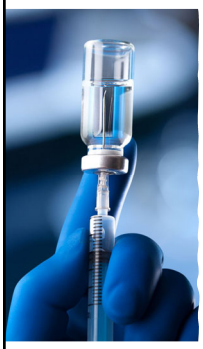

Frequency and Composition of Evaluation and Management Visits for Retinal Complications of Diabetes Mellitus
Severity of Condition
Natural Course Rate of Progression to
PDR (1 year)
High-risk category (5 years)
Frequency of Follow-up
Components of Follow-up Evaluations
Fundus Photography
Fluorescein Angiography
OCT
No diabetic retinopathy
Mild NPDR
Moderate NPDR
Severe or Very Severe NPDR
Non-high-risk PDR
High-risk PDR


Frequency and Composition of Evaluation and Management Visits for Retinal Complications of Diabetes Mellitus
Severity of Condition
Management Plan*
Referral for Consultation and/or Treatment
Panretinal Laser Treatment
Focal Laser Treatment
Intravitreal Anti-VEGF Injections
No diabetic retinopathy
Mild NPDR
Moderate NPDR
Severe or Very Severe NPDR
Non-high-risk PDR
High-risk PDR


American Optometric Association
When patients should be seen by a retina specialist
High-risk PDR (with or without macular edema)
Within 24-48 hours
PDR
Within 2-4 weeks
DME/CSME
Within 2-4 weeks
Severe NPDR
Within 2-4 weeks
When to Refer
Any Macular Edema
Severe NPDR, Suspicious of NV
NV (PDR), VH, TRD
NVI urgent

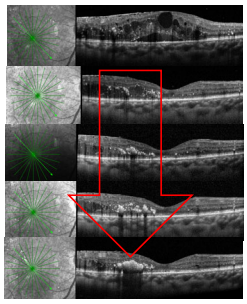

Treatment
Panretinal Laser Treatment (PRP)
Anti-VEGF (Vascular endothelial growth factor)
Combo treatment
Vitrectomy
Steroids


DRCR.net Protocol W- Effect of Intravitreous VEGF vs Sham for Prevention of Vision-Threatening Complications of DR, 2 Year Results
Randomized eyes with moderate to severe NPDR without CI-DME to sham (tx deferred until CI-DME or high-risk PDR developed) vs periodic intravitreal aflibercept
Lower rates of developing CI-DME with vision loss (4% vs 15%) or PDR (14% vs 33%) in treated eyes vs sham at 2 years
Change in VA at 2 years: -5.8 letters vs -6.1 letters (not significant)
% Developing PDR
Aflibercept vs sham adjusted hazard ratio, 0.34 (97.5% CI, 0.21–0.55; P<.001)
Cumulative percent
Time from randomization, y
% Developing CI-DME
Aflibercept vs sham adjusted hazard ratio, 0.36 (97.5% CI, 0.17–0.77; P=.002)
Cumulative percent
Time from randomization, y
Maturi, R. , et al. Effect of Intravitreous Anti–VEGF vs Sham Treatment for Prevention of Vision-Threatening Complications of DR. JAMA Ophthalmology, 139 (7), 701-712.



Treatment
Intravitreal Anti-VEGF Injections
Used to treat DME/NPDR/PDR
Intravitreal Anti-VEGF Medications
Bevacizumab (Avastin, off-label)
Ranibizumab (Lucentis)
Aflibercept (Eylea)
Faricimab (Vabysmo) recently approved
Brolucizumab (Beovu) on the horizon to be approved
Benefits of injections typically include improvement in vision or prevention of worsening vision

Treatment



In this example, while DME is improving with monthly anti-VEGF, hard exudates are increasing. This may result in temporary worsening of the patient's symptoms.

Treatment

- Educate the patient!
- Therapy for NPDR, PDR, and CSME is aimed at preserving the remaining vision
- Goal = STABILIZATION

How to Co-Manage

- Establish a relationship with the treating provider
- Your comfort level to deal with high-risk/high complexity conditions
- Having the proper diagnostic tools
- Diabetic retinopathy is a chronic disease requiring long-term & continuous care
- Follow-up on referrals

Patient Education

Vision	Vision not indicator presence, absence or a measure for level and status of retinopathy
Know	Patients undergoing treatment must know this is a chronic condition needs chronic and continuous care
Convey	Patient education must convey understanding of the gravity of the condition and avoidable catastrophes

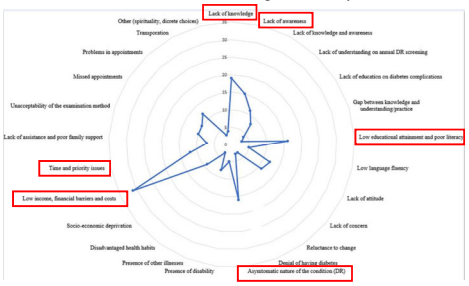
OVERALL MANAGEMENT

Educate	**Educate the patient** • Make them aware of their status • Emphasize strict glucose control
Work	**Work closely with PCP or diabetes specialists** • Send letter after each visit with an update on visual status

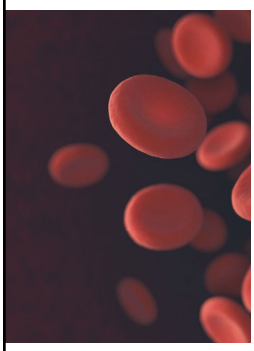
Pitfalls Leading to Disasters

- Beyond patient's misconceptions
  - Poor follow-up compliance
- Inadequate screening (Examination)
- Inadequate attention to certain findings

Systematic review on barriers for access to DR screening services: Frequent themes harvest plot



Piyasena MMPN, et al. Systematic review on barriers and enablers for access to DR screening services in different income settings. PLoS One. 2019;14(4):e0198979.

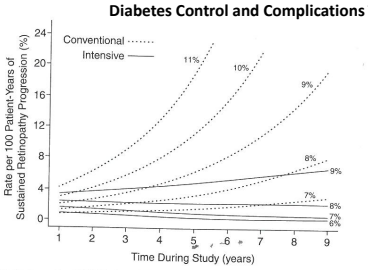


Control

- ABC's
  - A1c
  - Blood pressure
  - Cholesterol
- Blood pressure: < 130/80 mmHg
- Blood Lipids:
  - Total Cholesterol < 200 mg/dl
  - Triglycerides < 150 mg/dl
  - LDL < 100 mg/dl
  - HDL > 50 mg/dl
- Blood Glucose: HbA1c < 7%
  - The Diabetes Control and Complications Trial (DCCT)

EFFECT OF GLYCEMIC CONTROL ON DR

Diabetes Control and Complications Trial (DCCT)



- **Intensive TX ↓ the risk of developing DR by 76%, and slowed the progression of existing DR by 54%**
- For each 10% decrease in the HbA1C, there was ~ 40% ↓ in the relative risk of DR!

Progression of retinopathy with intensive versus conventional treatment in the DCCT. DCCT Research Group. Ophthalmology. 1995 Apr;102(4):647-61.

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THANK YOU!

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