

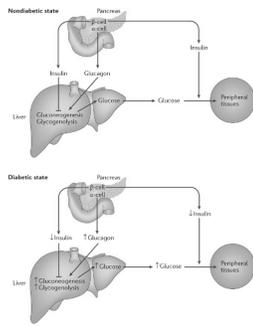
The Diabetic Patient

2021 OAO Tech Conference
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Pathophysiology of Diabetes

Abnormal glucose metabolism due to either decreased insulin production or insensitivity to insulin



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Classification of Diabetes

- **Type 1 Diabetes** (< 10% of all cases): autoimmune destruction of beta cells in pancreas, more commonly presents in children with severe ketoacidosis
- **Type 2 Diabetes** (> 90% of all cases): insulin resistance, more commonly diagnosed in adults, but becoming more common in children
- **Gestational diabetes**: glucose intolerance that starts during pregnancy, occurs in about 5-20% of pregnancies

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Defining Diabetes

	HbA1c (percent)	Fasting Plasma Glucose (mg/dL)	Oral Glucose Tolerance Test (mg/dL)
Diabetes	≥ 6.5	≥ 126	≥ 200
Prediabetes	5.7 – 6.4	100 - 125	140 – 199
Normal	~ 5.7	≤ 99	≤ 139

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Burden of Diabetic Eye Disease

- 12% of people over the age of 20 have diabetes
- 50% of people over the age of 65 have diabetes
- Diabetes is the leading cause of blindness in American adults aged 20 to 74 years old
- 12,000 to 24,000 new patients each year are blind from complications of diabetes

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Diabetes in the Ophthalmology Office

What matters when evaluating a patient with diabetes?

- Duration of diabetes
 - 25% of patients with T1DM for 5 years have retinopathy vs 80% of patients with T1DM for 15 years
- Most recent A1c
 - Higher A1c correlated with increased risk of diabetic macular edema
- Medications for diabetes
- Other medical history especially hypertension
- History of retina laser treatments, injections, surgeries

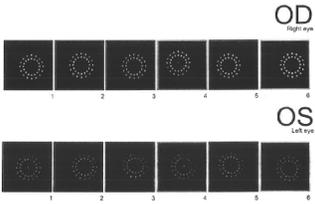
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Ocular Manifestations of Diabetes

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Dry Eye

- Diabetes contributes to tear film instability
- Decreases performance on visual acuity testing and visual fields
- Affects biometry measurements for cataract surgery



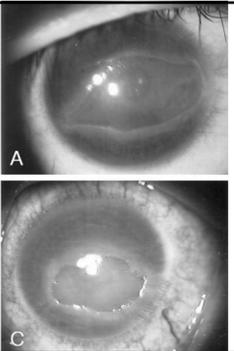
OD
Right eye

OS
Left eye

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Cornea

- Decreased corneal sensation and neurotrophic keratopathy
- Predisposes to recurrent non-healing epithelial defects and delayed epithelial healing during refractive surgery



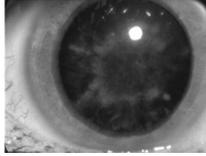
A

C

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Lens

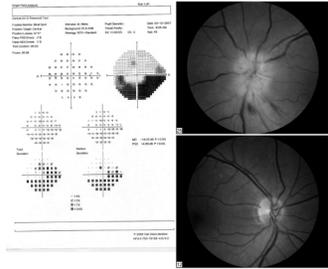
- Elevated blood sugar causes more glucose in the lens to be metabolized through the sorbitol pathway – this increases lens hydration and more rapid development of cataracts
- Acute changes in blood glucose also causes refractive shifts
- Refraction may not be accurate when glucose is labile – better to wait until glucose is stable for ~2 months before dispensing prescription
- Affects pupillary dilation – can make cataract surgery more challenging



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Neuro-ophthalmology

- Along with HTN and arteriosclerotic disease, diabetes is a risk factor for NAION
- Predisposes to microvascular cranial nerve palsies
- Risk factor for transient visual loss from cerebrovascular ischemia



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Oculoplastics

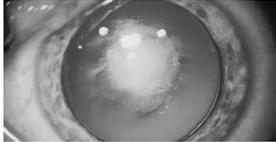
- Associated with fulminant fungal infections of the orbit and sinus
- Increased likelihood of wound dehiscence and poor wound healing



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Pediatrics

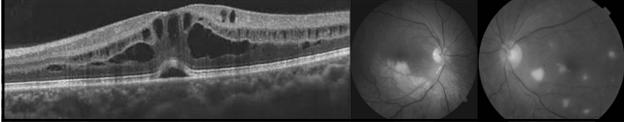
- Cataracts may be the first sign of diabetes in children
- Diabetic retinopathy is rare in children
- Microvascular paralytic strabismus



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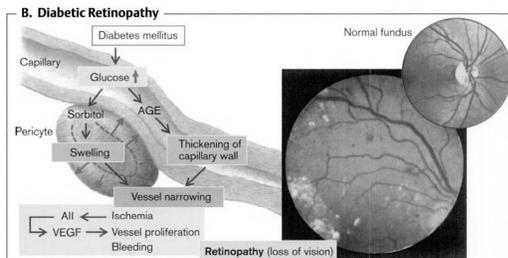
Retina

- Risk factor for central retinal vein occlusion
- Risk factor for ocular ischemia
- Predisposes to endogenous bacterial endophthalmitis
- Risk factor for retinal embolic disease
- Higher risk for cystoid macular edema after cataract surgery



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Pathophysiology of Diabetic Retinopathy

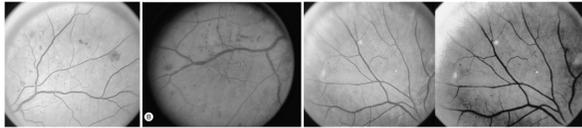


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Diabetic Retinopathy

Non-proliferative diabetic retinopathy: intraretinal vascular changes, but **no extraretinal** fibrovascular tissue

- **Severe:** 4 quadrants of > 20 microaneurysms / dot-blot hemorrhage OR 2 quadrants of venous beading OR 1 quadrant of intra-retinal microvascular abnormalities (IRMAs)
- Has 15% chance of becoming proliferative diabetic retinopathy in 1 year



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Diabetic Retinopathy

Non-proliferative diabetic retinopathy: intraretinal vascular changes, but **no extraretinal** fibrovascular tissue

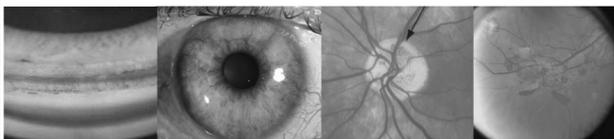
- **Mild:** microaneurysms only
- **Moderate:** more than microaneurysms but less than severe NPDR

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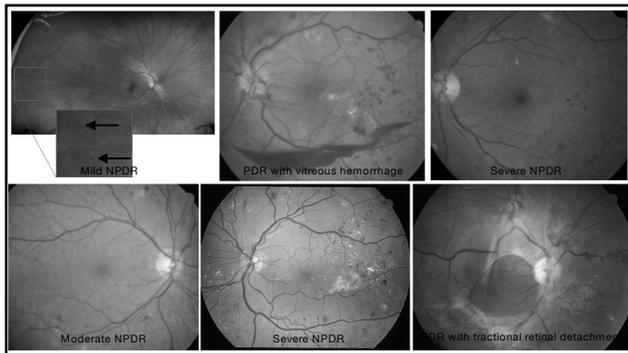
Diabetic Retinopathy

Proliferative diabetic retinopathy: retinal neovascularization and/or **vitreous hemorrhage**

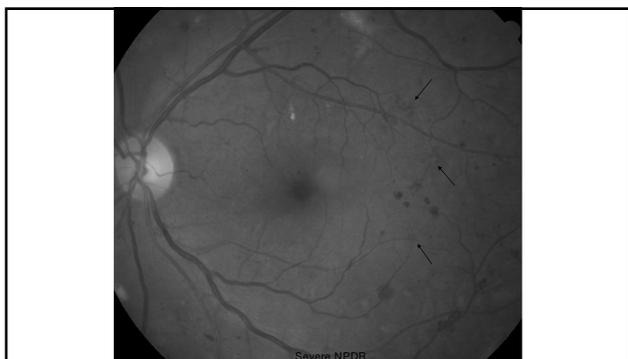
- Look specifically at the angle (NVA), iris (NVI), and disc (NVD)
- Other retinal neovascularization (NVE)



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Diabetic Macular Edema

Diabetic macular edema: fluid accumulation in the central retina

- Can occur in any stage of diabetic retinopathy
- Center-involving if the central 1mm of the retina is thickened
- Non-center-involving if retinal thickening occurs outside the central 1mm

1A
1B

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Screening for Diabetic Retinopathy

TABLE 2 RECOMMENDED EYE EXAMINATIONS FOR PATIENTS WITH DIABETES MELLITUS AND NO DIABETIC RETINOPATHY

Diabetes Type	Recommended Initial Evaluation	Recommended Follow-up*
Type 1 [†]	5 years after diagnosis ^{1,4}	Yearly ^{1,4}
Type 2 [†]	At time of diagnosis ^{1,2,22}	Yearly ^{2,22}
Pregnancy [†] (type 1 or type 2)	Soon after conception and early in the first trimester ^{23,25}	<ul style="list-style-type: none"> No retinopathy to mild or moderate NPDR: every 3-12 months^{23,25} Severe NPDR or worse: every 1-3 months^{23,25}

NPDR = nonproliferative diabetic retinopathy

* Abnormal findings may dictate frequent follow-up examinations.

[†] Pubertal patients require increased vigilance due to increased risk of progression

Women who develop gestational diabetes do not require an eye examination during pregnancy and do not appear to be at increased risk for diabetic retinopathy during pregnancy.

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Management of Diabetic Retinopathy

TABLE 5 INITIAL MANAGEMENT RECOMMENDATIONS FOR PATIENTS WITH DIABETES

Severity of Retinopathy	Presence of Macular Edema	Follow-up (Months)	Panretinal Photocoagulation (Scatter) Laser	Focal and/or Grid Laser*	Intravitreal Anti-VEGF Therapy
Normal or minimal NPDR	No	12	No	No	No
Mild NPDR	No	12	No	No	No
	NCDME CI-DME	3-6 1 [†]	No No	Sometimes Rarely	No Usually
Moderate NPDR	No	6-12	No	No	No
	NCDME CI-DME	3-6 1 [†]	No No	Sometimes Rarely	Rarely Usually
Severe NPDR	No	3-4	Sometimes	No	Sometimes
	NCDME	2-4	Sometimes	Sometimes	Sometimes
	CI-DME	1 [†]	Sometimes	Rarely	Usually
Non-high-risk PDR	No	3-4	Sometimes	No	Sometimes
	NCDME CI-DME	2-4 1 [†]	Sometimes Sometimes	Sometimes Sometimes	Sometimes Usually
High-risk PDR	No	2-4	Recommended	No	Sometimes ^{1,14}
	NCDME CI-DME	2-4 1 [†]	Recommended	Sometimes	Sometimes Usually

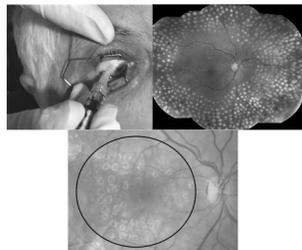
Anti-VEGF = anti-vascular endothelial growth factor; CI-DME = center-involving diabetic macular edema; NCDME = noncenter-involving diabetic macular edema; NPDR = nonproliferative diabetic retinopathy; PDR = proliferative diabetic retinopathy

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Management of Diabetic Retinopathy

Treatment generally recommended with **PDR, severe NPDR, center-involving DME**

- Intravitreal anti-VEGF injections
- Intravitreal steroid injections
- Pan-retinal photocoagulation
- Focal laser photocoagulation
- Vitrectomy



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Summary

- Diabetes is a widely prevalent disease that affects all parts of the eye
- Patients with diabetes should have screening eye exams at regular intervals
- Diabetic retinopathy can progress more rapidly in pregnancy and should be followed more closely
- Cataract may be the first presenting sign of diabetes in childhood and occurs more frequently than retinopathy
- The severity of retinopathy and macular edema determines monitoring interval and treatment

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References

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- Basic and Clinical Science Course 2020-2021.
- Geloneck MM, Forbes BJ, Shaffer J et al. Ocular complications in children with diabetes mellitus. Ophthalmology 2015;122(12):2457-64.

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