DIABETES AND EYE DISEASE: LEARNING OBJECTIVES

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

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

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

• Retinal complications of diabetes
• Leading cause of blindness in working-age Americans
Primary care physician + Ophthalmologist ↓ Systemic control, timely screening, and early treatment
DCCT: NO BASELINE RETINOPATHY
DCCT: MILD TO MODERATE RETINOPATHY
DCCT: INTENSIVE GLUCOSE CONTROL, NO BASELINE RETINOPATHY

- 27% reduction in developing retinopathy
- 76% reduction in risk of developing progressive retinopathy
DCCT: INTENSIVE GLUCOSE CONTROL, MILD TO MODERATE NPDR

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

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

Epidemiology of Diabetes Interventions and Complications
UKPDS: TYPE 2 DIABETES

- Increased glucose and BP control decreases progression of retinopathy
UKPDS: RESULTS

• Hemoglobin A1C reduced from 7.9 to 7.0 = 25% decrease in microvascular complications

• BP reduced to <150/85 mm Hg = 34% decrease in retinopathy progression
UKPDS: HYPERTENSION CONTROL

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

- Professional and patient education
- Good glucose and BP control
- Regular examination
ADDITIONAL SYSTEMIC CONTROLS

- Proteinuria is a risk factor for macular edema
- Lisinopril may benefit the diabetic kidney and retina even in normotensive patients
High cholesterol may be associated with increased macular exudates and vision loss.
WESDR: DIABETIC RETINOPATHY AND CARDIOVASCULAR DISEASE

- PDR a risk indicator for MI, stroke, amputation
- PDR elevates risk of developing nephropathy
DIABETIC RETINOPATHY: PATHOGENESIS

Increased glucose
↓
VEGF
↓
Increased capillary permeability/abnormal vasoproliferation
Pathogenesis

Normal retinopathy

Diabetic retinopathy
DIABETIC RETINOPATHY: CLINICAL STAGES

- Nonproliferative diabetic retinopathy (NPDR)
- Preproliferative diabetic retinopathy
- Proliferative diabetic retinopathy (PDR)
MILD TO MODERATE NPDR

- Microaneurysms
- Hard exudates
- Intraretinal hemorrhages
- Patients may be asymptomatic
Clinical Stages of Retinopathy

Microaneurysms
Intraretinal hemorrhages
Clinical Stages of Retinopathy

Healthy macula

Edematous macula
DIABETIC MACULAR EDEMA

- Diabetes $\leq 5$ yrs = 5% prevalence
- Diabetes $\geq 15$ yrs = 15% prevalence
Cotton-wool spots
Clinical Stages of Retinopathy

Venous beading and capillary shunt vessels
PDR: CLINICAL SIGNS

- Neovascularization
- Vitreous hemorrhage and traction
- NPDR features, including macular edema
Clinical Stages of Retinopathy

New vessels at the disc elsewhere

New vessels
Vitreous hemorrhage
VITREOUS HEMORRHAGE: SYMPTOMS

- Floaters
- Severe visual loss
- Requires immediate ophthalmologic consultation
Severely distorted retinal architecture
Clinical Stages of Retinopathy

New vessel growth
### Clinical Stages of Retinopathy

#### INSULIN USERS Dx < AGE 30

<table>
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<tr>
<th>Duration (yrs)</th>
<th>PDR Prevalence</th>
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<td>5</td>
<td>negligible</td>
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<tr>
<td>10</td>
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<td>15</td>
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# INSULIN USERS Dx > AGE 30

<table>
<thead>
<tr>
<th>Duration (yrs)</th>
<th>PDR Prevalence</th>
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<tbody>
<tr>
<td>20</td>
<td>20%</td>
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PDR less common among noninsulin users
REVIEW OF CLINICAL STAGES

- **NPDR**: Patients may be asymptomatic.
- **PPDR**: Laser therapy at this stage may help prevent long-term visual loss.
- **PDR**: Major cause of severe visual loss.
Ophthalmoscopic examination through dilated pupils
Diagnosis

- Slit-lamp biomicroscopy
- Indirect ophthalmoscopy
Diagnosis

Fundus photography  Fluorescein angiography
Diagnosis

Dark, hypofluorescent patches indicative of ischemia
Treatment

Laser photocoagulation surgery
Acute panretinal laser photocoagulation burns
Clinically Significant Macular Edema

Before

After
MACULAR EDEMA TREATMENT WITH TRIAMCINOLONE INJECTION

OCT before

OCT after
Treatment

Before

After
PANRETINAL PHOTOCOAGULATION (PRP)

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

![Graph showing the effectiveness of PRP treatments compared to control.](image-url)
PRP: SIDE EFFECTS

- Decreased night vision
- Decreased peripheral vision
VITRECTOMY

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

Before

After
TREATMENT OPTIONS: SUMMARY

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

• Anti-VEGF agents decrease capillary permeability and angiogenesis
• May prove useful as adjuvant treatment to laser therapy for diabetic retinopathies
SCREENING GUIDELINES: PATIENTS WITH TYPE 1 DIABETES

- Annual ophthalmologic exams starting 5 years after diagnosis and not before puberty
PATIENTS WITH TYPE 2 DIABETES

- Annual ophthalmologic exams starting at time of Dx
DIABETES AND PREGNANCY

- Ophthalmologic exam before conception
- Ophthalmologic exam during first trimester
- Follow-up depends on baseline grade
WESDR: PATIENTS’ ACCESS AND COMPLIANCE

- 36% missed annual ocular exam
- 60% missed laser surgery
GOALS FOR SUCCESS

• Timely screening reduces risk of blindness from 50% to 5%
• 100% screening estimated to save $167 million annually
GOALS FOR SUCCESS

Better systemic control of:

• Hemoglobin A1C
• BP
• Kidney status
• Serum lipids
REDUCING THE RISK OF BLINDNESS

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