ADULT TRACK

DIABETES COMPLICATIONS

Neda Rasouli, MD
Professor of Medicine & Clinical Pharmacy
Division of Endocrinology, Metabolism and Diabetes
Director, CU Diabetes and Endocrinology Clinical Trial Program
University of Colorado, School of Medicine
VA Rocky Mountain Regional Medical Center

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Why We care so much about glycemic control?

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<th>Glucose</th>
<th>A1c</th>
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<tr>
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<td>9.2%</td>
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<td>6.7%</td>
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<td>8.3%</td>
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<tr>
<td></td>
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<tr>
<td>231</td>
<td>12.3%</td>
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<tr>
<td></td>
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<table>
<thead>
<tr>
<th>Glucose</th>
<th>A1c</th>
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<tbody>
<tr>
<td>61</td>
<td>10.1%</td>
</tr>
<tr>
<td>81</td>
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<tr>
<td>123</td>
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Diabetes complications

1. Relations between glycemic control and diabetes complications
   - Why glucose control is important?
   - Brief summary of UKPDS and DSST trials?

2. What are complications of diabetes?
Glycemic control

“The attempt to keep the blood sugar constantly normal may be ideal in theory, but in practice it is very difficult to achieve and makes the diabetic life unnecessarily hard without adequate benefit”

R.D. “Robin” Lawrence, the preeminent diabetologist of his time and who had type 1 diabetes himself

Lawrence RD. The Diabetic Life: It’s Control by Diet and Insulin. 3rd ed. J&A Churchill, 1944
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DCCT: Relative Risk of Progression of Diabetic Complications by Mean HbA1c

Glycemic Target

- HbA1c as close to normal as possible without causing hypoglycemia

- For most patients with diabetes, target HbA1c is less than 7% without hypoglycemia
The UK Prospective Diabetes Study (UKPDS) in Type 2 Diabetes

**HbA\(_1c\) (7 vs 7.9%)**

- Conventional
- Intensive

Cross-sectional, median values

5.2% upper limit of normal range

Years from randomisation

Rationale for near-normoglycemia Lessons from UKPDS: Better control means fewer complications

**EVERY 1% reduction in HbA\(_1c\)**

- Deaths from diabetes: -21%
- Heart attacks: -14%
- Microvascular complications: -37%
- Peripheral vascular disorders: -43%

UKPDS 35: BMJ 2000; 321: 405-12
Major Complications of Diabetes

**Microvascular**
- **Eye**: High blood glucose and high blood pressure can damage eye blood vessels, causing retinopathy, cataracts, and glaucoma.
- **Kidney**: High blood pressure damages small blood vessels and excess blood glucose overworks the kidneys, resulting in nephropathy.
- **Neuropathy**: Hyperglycemia damages nerves in the peripheral nervous system. This may result in pain and/or numbness. Feel wounds may go undetected, get infected, and lead to gangrene.

**Macrovascular**
- **Brain**: Increased risk of stroke and cerebrovascular disease, including transient ischemic attack, cognitive impairment, etc.
- **Heart**: High blood pressure and insulin resistance increase risk of coronary heart disease.
- **Extremities**: Peripheral vascular disease results from narrowing of blood vessels, increasing the risk for reduced or lack of blood flow in legs. Feel wounds are likely to heal slowly contributing to gangrene and other complications.

What Is The Leading Cause Of Blindness In The United States?

a. Cataracts  
b. Glaucoma  
c. Diabetic Retinopathy  
d. Eye injuries
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Retinopathy (Eye problems)

- Damage to the vessels in the back part of the eye (called the retina). Symptoms include blurry vision and poorer daytime and nighttime vision. If left untreated, diabetic retinopathy causes vision loss.

- Lowering HbA1c by 1% decreases the risk of retinopathy by 30%
EYE EXAMS

Annual comprehensive vision evaluations with a dilated retinal examination is recommended.

Goal:
- Educate high-risk patients on how to care for and monitor their eye health.
- Prevent low-risk patients from becoming high-risk.

Retinopathy Management

- Intensive glucose management
  - Lowering HbA1c by 1% decreases the risk of retinopathy by 30%

- Treatment
  - Injections of blood vessel growth inhibitor (prevents the growth of abnormal blood vessels.)
  - Laser coagulation
  - surgery
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Nephropathy (kidney disease)
- Diabetes Nephropathy is progressive kidney diseases
- Most common cause of end stage renal disease

**Different stages of diabetes nephropathy**
- Albuminuria: leaking protein in the urine (albuminuria)
- Kidney function impairment
- End stage renal disease
- Hemodialysis
- Kidney transplant
Annual urine test to measure Albumin/creatinine ratio is recommended.

Treatment with ACE inhibitor or Angiotensin inhibitor is recommended in the presence of albuminuria or high blood pressure. Some anti-diabetes medications could potentially prevent worsening of kidney function: (SGLT2 inhibitors and GLP1)
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End Stage Renal Disease

- When kidneys are unable to get rid of body toxins

Management

- Hemodialysis
- Kidney transplant
Major Complications of Diabetes

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Diabetes Neuropathy

- Diabetic peripheral neuropathy (DPN) is the most common complication of diabetes.
FOOT EXAMS

Annual comprehensive exams is recommended

- Help determine risk for developing foot complications.
- Educate high-risk patients on how to properly care for their feet.
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Macrovascular Complications Of Diabetes

Atherosclerotic CardioVascular Disease (ASCVD) is the leading cause of morbidity and mortality in patients with diabetes

- Coronary Artery Disease
- Peripheral Vascular Disease
- Stroke
Diabetes Increases the Risk of Large Blood Vessel Damage

Macrovascular complications:
- Stroke
- Heart attack
- Poor circulation

Over time, fatty deposits can clog large blood vessels
Prevention of Cardiovascular Disease

Risk factor modifications
- Physical activity
- Healthy diet
- BP control
- Lipid management
- Glucose management
- Smoking cessation

Target: 130/80
statins for all >40 y/o

ADA/ EASD Guideline Update on the Management of Type 2 Diabetes

- Medications from 2 different classes of glucose-lowering drugs have shown reduction in cardiovascular events in patients with established cardiovascular disease.
  - Sodium-glucose Cotransporter-2 (SGLT2) Inhibitors
    (Empagliflozin, Canagliflozin)
  - Glucagon-like peptide-1 (GLP-1) agonist
    (liraglutide).
DIABETES COMPLICATIONS

- Diabetes increases your risk for many serious health problems
- Most of the complications are NOT reversible

The good news?
With the correct treatment and recommended lifestyle changes, many people with diabetes are able to prevent or delay the onset of complications.

Trends in Age-Standardized Rates of Diabetes-Related Complications among U.S. Adults with and without Diagnosed Diabetes

[Graph showing trends]

KEY MESSAGE TO PREVENT DIABETES COMPLICATIONS: CONTROL THE ABCS

A1c: Blood glucose control
B: Blood pressure control
C: Cholesterol (Blood lipid) control
S: Smoking (and use of other tobacco products) cessation (and don’t start)

KEEP YOUR HEALTH ON TRACK

Take your medications as prescribed by your doctor.
Reach and maintain a healthy weight.
Add more physical activity to your daily routine.
Control your A1c, blood pressure, and cholesterol levels.
Kick the smoking habit.

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Diabetes increases your risk for many serious health problems.
Every 24 Hours...

4557 adults are diagnosed with diabetes.

136 people begin treatment for end-stage renal disease.

200 nontraumatic lower-limb amputations are performed.

641 people die from diabetes, or diabetes is a contributing cause of their death.

Research Advancements >> Dramatic Drop in Diabetes-Related Complications

Heart Attack  Stroke  Amputation  Kidney Failure

-67.8%  -52.7%  -51.4%  -28.3%

Provided by the American Diabetes Association