# NURS 821 Metabolic and Endocrine Disorders; Alterations in Reproduction

Lecture 9

Part 4 Complications of Diabetes Mellitus

## Acute Complications of DM

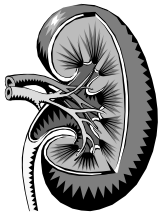
- Hypoglycemia-cellular starvation
- Ketoacidosis-cellular starvation despite high BS leads to compensatory efforts to find energy sources: fatty acids, glycogen breakdown, protein breakdown
- Somogyi Effect
- Dawn Phenomenon-BG drop around 5 a.m. before normal diurnal output of glucocorticoids

## Somogyi Effect

- Iatrogenic complication
- body compensates to combat hypoglycemia from hyperinsulinemia
  - Epinephrine and glucagon-glycogen release and fatty acid mobilization
  - ACTH, corticosteroids cause inhibition of peripheral insulin use; hepatic gluconeogenesis and glycogenolysis
  - GH inhibits peripheral insulin use and causes gluconeogenesis
  - ***END RESULT IS HYPERGLYCEMIA!***

## Chronic Complications of DM

- Microvascular disease
  - Retinopathy
  - nephropathy
- Macrovascular disease
  - CAD
  - CVA
  - PVD



## Diabetes Complications

- Close glucose control can
  - significantly delay eye, nerve, and kidney complication
  - significantly reduce infant mortality and morbidity in pregnant diabetics (NIDDK, 2000).

## Gangrene

## Diabetes Control and Complications Trial (DCCT)

- Conducted by the NIDDK from 1983-1993
- Largest most comprehensive DM study
- 1,441 subjects with type 1 DM from 29 medical centers across U.S. and Canada
- Subjects had DM for $\geq$1 and $\leq$15 yrs.
- No or only early signs of eye complications
- Randomly assigned to standard or intensive control

## DCCT

- Findings: keeping blood sugar as close to normal as possible slows onset and progression of eye, kidney, and neurological diseases;
- Any sustained B.S. lowering is efficacious, even if hx of poor control;
- Intensive treatment problems-hypoglycemia; not recommended under 13, elderly, frequent hypoglycemia, advanced complications, or H.D.
- Intensive tx resulted in moderate wt. ncrease, therefore not for obese

## DM Complications

- Diabetic retinopathy
  - Deterioration of blood vessels leading to impaired vision, blindness
  - 40-50% higher in African Americans, also compounded by HTN
- Kidney Failure
  - Leading cause of ESRD
  - 4x>in African Americans (NIDDK, 2000)

## Syndrome X

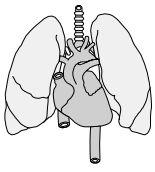
- Definition: A syndrome of insulin resistant states characterized by obesity, HTN, DM, lipid disorders
- Tobacco contributes
- Insulin resistance is a metabolic state in which a normal amount of insulin produces a subnormal response!

## Hyperinsulinemia and CAD

- Emphasis on decreasing BG (exercise, diet, wt. Loss) not increasing insulin
- Hyperinsulinemia leads to:
  - HTN due to increased Na reabsorption and increased SNS stimulation
  - Athrogenesis due to anabolic effects, smooth muscle proliferation, increased collagen synthesis, increased clotting, altered lipid profile

## DM and CAD

- Associated risk factors
  - Obesity
  - HTN
  - Lipid abnormalities
  - Physical inactivity
  - Microvascular angina
- Type I DM
  - High triglycerides
  - High cholesterol
  - Low HDLs



## DM and Cardiac Concerns

- ANS neuropathy leads to silent ischemia, no hypoglycemia manifestations, loss of HR variability, poor exercise tolerance
- High BG associated with immune deficiencies-decreased phagocytosis, decreased chemotaxis, increased bacterial growth

## DM and Cardiac Concerns (cont'd)

- DM associated with larger infarcts and CHF
- Electrolyte changes with acidosis

## DM Comparisons

- **Type 1**
  - 10%
  - Juvenile onset or insulin dependent
  - Before age 40
  - Ketosis prone, "brittle", poor control
  - Autoimmune, genetic predisposition
  - Total insulin lack
- **Type II**
  - 90%
  - Adult onset
  - Diagnosed after 35-40
  - Associated with Syndrome X
  - Hereditary, associated with obesity
  - Too much circulating insulin, insulin resistance, tolerance

## Case Study

- CC: Mr. J, a 55 yo black male w multiple health problems. Admitted w dehydration from v, d attributed to flu. Admission- bg=440 mg/dl; K=6.0 meq/L, ABG Ph= 7.32; $PO_2$=88, $PCO_2$=33, VS 102, 104, 26, 200/110.
- HPI: Wife voices concerns that even prior to illness, had experienced episodes of dizziness, memory loss, confusion. During one episode at mall, he grabbed a display table and slid to ground.

## Case Study

- HPI: Mr. J. notes that his leg just “gave way”. Neuro consult ordered.
- PMH: Childhood dx w Type I DM following insignificant viral illness. Brittle, although compliant. HTN meds x 10 yrs. Had silent MI, dx by EKG. Recently seen for c/o bilateral calf pain w walking, relieved by rest. C/o visual changes in addition to those noted w elevated bg.