What You May Not Know About Diabetes

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Objectives

- Understand diabetes and complications associated with diabetes
- Discuss new pharmacologic therapies in diabetic treatment
- Learn how to plan and prepare healthy, low cost meals for diabetics

Objectives

- Know what to look for on labels to identify food ingredients
- List three resources available to low income clients for food assistance

"Americans Not Eating Enough Fruits and Veggies"

- 5/day ACS/AHA/ADA recommended for greatest potential for promoting health, fight/prevent disease
- CDC: Behavioral Risk Factor Surveillance System
  - 32.6% adults fruit >2x/day

"Americans Not Eating Enough Fruits and Veggies"

- 27.2% vegetables >3x/day
- Awareness of benefits is not issue
- Lack of access, ability to afford
- Not first choices
- Processed vs. unprocessed foods

What is Diabetes?

- Diabetes mellitus is a pancreatic disorder
  - Body cannot produce or process insulin
  - Exact cause of the disease is unknown
    - Increase in obesity
    - Inactivity in today's culture increases incidence
    - Genetics

Diagnosing Diabetes

- Scientists say saliva test is in the future for monitoring type 2 diabetes
  - Might someday replace invasive blood work
- Frequently found as incidental diagnosis
  - Metabolic panel-blood glucose
  - After admission for MI/stroke, other diagnosis

Diagnosing Diabetes

- Frequently found as incidental diagnosis
  - When creatinine is elevated
  - On eye exam
  - Or when blindness occurs
- Annual physical exam for adults >35 years old is critical if family history is present or is symptomatic

DM 1

- Diagnosis is usually dramatic
  - Ketoacidosis
  - Chronic nausea, vomiting
  - 3 Ps
- 5-10% of all diabetics
- No cure

DM 1

- Keep under control
  - Insulin through pumps, injections or pen injections
- Monitoring the blood sugar level is critical
- Oral agents are not effective

Manifestations of DM 1

- This type of diabetes used to be known as juvenile diabetes
  - Usually diagnosed in children/young adults
  - Body does not produce insulin at all

Manifestations of DM 1

- "Insulin dependent diabetic"
  - Type 2 diabetic with a completely worn pancreas
  - Happens over time
- Nausea and vomiting
- Frequent urination, with large amounts of urine being produced at one time

Manifestations of DM1

- Polyuria, polydipsia, polyphagia
- Unexplained weight loss
- Irritability
- Fatigue
- A sweet or acetone smell to the breath

DM2

- Is more common
  - 90-95% of all DM
- Insulin continuing to be produced
- Not being properly used in the body
- Normally occurs later in life
- Over past years increase in children is seen

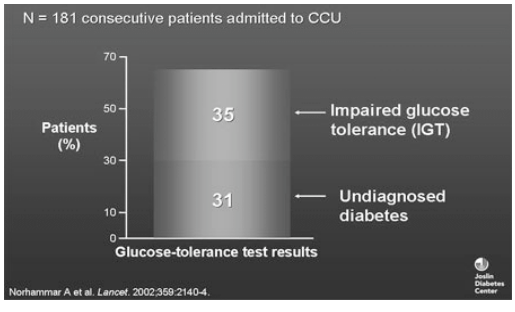
Manifestations of DM 2

- Slow healing cuts
- Recurrent infections of the gums, bladder, and skin
- Itchy skin
- Frequent need to urinate
- Increased thirst
- Tingling in the hands or feet

Manifestations of DM 2

- Fatigue or blurred vision
- High blood pressure
- Impotence
- Worsening eyesight
- Angina or heart attacks

Almost 70% of Patients With First MI Have IGT or Undiagnosed Diabetes



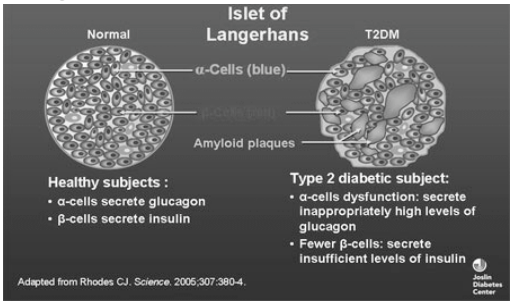
DM2

- Treatment
  - Oral medications or insulin shots
  - Type 2 diabetes treatment involves
    - Exercise
    - Medication
    - Healthy diet

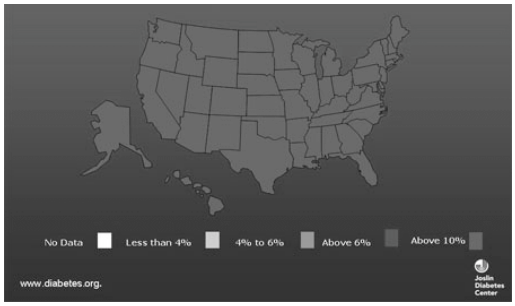
DM2

- Treatment
  - In some patients the diabetic process is reversible until the pancreas completely burns out then patients become insulin dependent

Islet A and B-cell Hormones Regulate Glucose Homeostasis



Diabetes and Gestational Diabetes Trends: U.S. Adults, Estimate for 2010



Diabetes Statistics

- Shortens life by 15 years
- 6th leading cause of death
- Increase of 1.3 million diagnosed diabetics each year
- Occurring more in children, as is hypertension & coronary artery disease
- Prevalent in Asians, African Americans, Native Indians

Diabetes

The Best Treatment Is Prevention

s

- Somogyi syndrome
- Dawn phenomenon

Blood Glucose Levels

- Blood glucose is controlled by
  - Insulin
  - Diet
  - Glucagon
  - Catecholamines
    - Adrenaline
    - Nor epinephrine

FBG vs. PPBG

- Post prandial blood sugars are more telling of diabetic status than fasting blood sugars
- Pattern
  - FBG one day

FBG vs. PPBG

- Rotate testing times other days of week
  - 2 hr. pp breakfast
  - 2hr. pp lunch
  - 2hr. pp supper
  - With all symptoms of hypoglycemia

Targets in Diabetes

- Blood pressure <130/80
- Hemoglobin A1C <7% (ADA)
- LDL <100
- HDL >40 men; >50 women
- Triglycerides <150
- Microalbumin <30
  - >300 is serious renal disease
- Creatinine <1.5

Endotheliitis

- Diabetes is considered a disease of endothelial inflammation caused directly by hyperglycemia

Vascular Endothelial Changes

- Micro-vascular changes (Hyperglycemia)
  - Renal failure
  - Cardiac disease
  - Contributes to dementia-atherosclerosis
  - Neuropathy

Vascular Endothelial Changes

- Micro-vascular changes (Hyperglycemia)
  - Autonomic
  - Peripheral
    - Retinopathy
    - Amputation

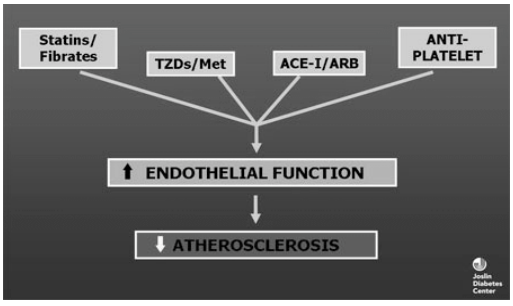
Manifestations of Endotheliitis

- Macrovascular changes
  - Disturbance of vessel wall
  - MI
  - Stroke
  - Embolus
    - Leads quickly to amputation

Manifestations of Endotheliitis

- Macrovascular changes-disturbance of vessel wall
  - Thrombus-DVT
  - 60-85% of diabetics with macro-vascular manifestations die of MI or stroke

The Family of Treatments for Diabetes



Diabetic Care And Maintenance Of All Affected Systems

Bariatric Surgery

- Is strongly recommended by ADA for persons with BMI >35 and type 2 diabetes especially if glycemic control is not attained with pharmacologic therapy and life style changes

Physical Activity

- ADA suggests 150 min/week of moderate intensity aerobic physical activity
  - This achieves a 50-70% of maximum heart rate

Retinopathy Screening

- DM 1 > 10 yr. old
  - Initial dilated eye exam should be done at 5 yr. mark
  - Annually is recommended
  - Ophthalmologist, not optician or optometrist

Retinopathy Screening

- DM2 dilated eye exam shortly after diagnosis
  - Annually
    - Other eye diseases occur
      - Glaucoma
      - Cataracts

Nephropathy Screening

- Annual albumin excretion test in DM1 with DM > 5 yr
  - In all DM2 patients
- Measure creatinine annually in all diabetics
- GFR should be calculated to determine renal functioning

Immunizations

- Influenza vaccine > 6 yr.
- Pneumococcal vaccine all diabetics >2yr.
- Revaccination for those >64 yr., and for those with
  - Nephrotic syndrome

Immunizations

- Revaccination for those >64 yr., and for those with
  - CKD
  - Other immunocompromized states
- Tetanus vaccine q 10 yr.

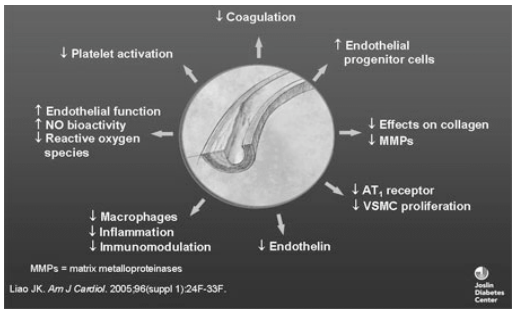
Statins

- Regardless of baseline lipid panel statins and life style changes should be aimed at
  - Those with overt CVD
  - Without CVD over 40 y.o. and have one or more other CVD risk factors

Statins

- Other specifications dictate recommended use of statins for hyperlipidemia, of course
- Statins are contraindicated in pregnancy

Pleiotropic Effects of Statins



Antiplatelet Therapy

- ASA 75-162 mg/day as primary prevention of CVD >40 yr. or with additional primary risk factors for CVD
- For patients with CVD Plavix 75 mg/day
- Aggrenox for 1 yr. post event in CVD
- ASA is not recommended for <30 yr. without CVD

Glucagon-Like Peptide-1 (GLP1)

- Product of the proglucagon gene from intestinal L cells
- Release is rapid in response to meals
- Potent insulinotropic hormone

Glucagon-Like Peptide-1 (GLP1)

- Impaired glucose tolerance (IGT) and DM2 manifest with lower plasma GLP-1 compared to healthy controls
- Is incretin

Examples Sulfonylureas "Oldies and Not So Goodies"

- Sulfonylurea medications:
  - Orinase-Tolbutamide, Tolazamide, Chlorpropamide
  - Glucotrol-Glipizide
  - Micronase, Diabeta-Glyburide
  - Amaryl-Glimepiride

Examples Sulfonylureas "Oldies and Not So Goodies"

- Side Effects
  - Low blood sugar
  - Bloating
  - Nausea
  - Heartburn
  - Anemia
  - Weight gain
  - Sun sensitivity
  - Metallic or change in taste

New Medication Interventions

- Levemir
- Leptin
- New insulin delivery systems
- Byetta-Exenatide
- Symlin- Pramlitide
- GLP 1

Leptin

Applause Now

Let's hear it for: obesity is disease of Leptin deficiency, not failure of the will

Leptin A Gift to Come

- Leptin
  - Secreted by fat cells
  - Regulates food intake by binding to neurons in hypothalamus

Leptin
A Gift to Come

- Leptin:
  - Lean people
    - Controlling appetite>regulate weight, use of stored energy
  - Obese
    - Are resistant to Leptin as diabetics are resistant to insulin

Leptin
A Gift to Come

- Very significant target for drug development
- Proves that obesity is physical disease not just a failure of will
- Three cheers for medical science!!

Levimir (Detemir) Insulin

- 1-2 doses/day sub q, children + adults
- Duration action 24 hr.
- Do not mix with other insulins
- Improved glycemic control compared to NPH
- Fewer hypoglycemic episodes
- Less eating, less weight gain compared with NPH

Exanetide (Byetta)

- Mimics properties of GLP-1
  - Increases glucose dependent insulin secretion
  - Decrease glucagon secretion
  - Regulates gastric emptying

Exanetide (Byetta)

- Mimics properties of GLP-1
  - Decreases absorption of nutrients
  - Decreased food intake
  - Decrease plasma glucose to near normal levels

Exanetide (Byetta)

- Results in weight loss
- Side effect nausea
- 5 or 10 mcg injections 2-3x/day

Symlin

- Similar action as Byetta
- Nausea is the most common side effect
- Mild nausea during the first weeks after starting Symlin, of short duration

Action of Symlin

- Decreased amylin production (diabetics)> brain registers as hunger
  - Overeating occurs
  - Weight gain/hyperglycemia

Action of Symlin

- Action: In stomach
  - Decreased amylin results in food moving through stomach faster during/after meals
  - Sends sugar to blood faster > hyperglycemia

ACE Inhibitors

- Should be started at age 30 in both DM forms
- Given originally for renal protection
- Decreases pre-load/after-load
- Decreases sympathetic stimulation
- Decreases atherosclerosis
- Decreases smooth muscle cell proliferation and migration

ACE Inhibitors

- Decreases vascular inflammation
- Increases fibrinolysis
- Increases endothelial function
- Increases plaque stabilization

ACE Inhibitors

- Side effects (most common)
  - Hypotension
  - Cough, dry
  - Angioedema up to 11 yr. after initiating therapy
- If not tolerated change to
  - Angiotensin-renin blocker for BP control, renoprotection

Januvia/Janumet

- Orally-active inhibitor of the dipeptidyl peptidase-4 (DPP-4) enzyme
  - DPP-4 enzyme inactivates incretins
  - Increases levels of natural hormones

Januvia/Janumet

- Incretins
  - Help to control blood sugar
  - Increase insulin release, especially after a meal
  - Decreases gluconeogenesis
  - Has not been tested with insulin

Januvia/Janumet

- Sitagliptin (Januvia), Janumet (Metformin)
  - When used with a sulfonylurea medication known to cause hypoglycemia

Januvia/Janumet

- Careful with seniors
- If sulfonylurea is used the dose is usually decreased
  - Orinase, Tolinase, Diabinase, Glucotrol, Micronase,

Continuous Glucose Monitoring

- CGMS- continuous glucose monitoring system
  - Subcutaneous sensor
  - Communicates directly with insulin pump
  - "Closed loop"

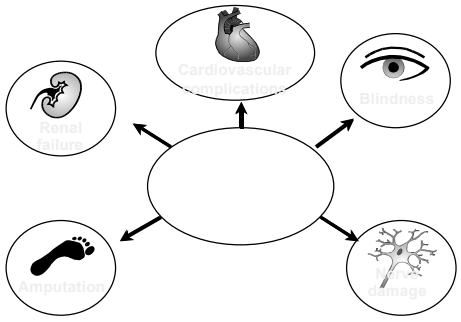
Continuous Glucose Monitoring

- Implanted insulin pump
  - Artificial pancreas
  - Catheter to vessel

Continuous Glucose Monitoring

- Implanted insulin pump
  - Pump controlled with transcutaneous computer
  - Uses U 500 insulin
  - Requires frequent assessment of syringe
  - Filled with syringe when necessary

Complications of Diabetes



Insulin Pump Therapy

- Not all diabetics are appropriate candidates for insulin pumps
  - Must have knowledge of impact of nutrients on glycemic state
  - Strongly urged to use carbohydrate counting to self dose with insulin
    - Basal dose is given continually
    - Bolus dose for meals

Insulin Pump Therapy

- Benefits to patient
  - Patient has more power in living with disease
  - One stick every 2-3 days to replace sq catheter
  - Rare hypoglycemia

Insulin Pump Therapy

  - Connected monitors now provide 24 hr. readout of BG
  - Patient is more motivated to make lifestyle changes

Omnipod by Insulet Corporation

Omnipod

- 200u insulin
- Communicates with meter wirelessly, no tubes
- Apply to selected infusion site with automated cannula insertion

Omnipod

- Presses start and insulin is delivered with basal rate and boluses
- Uses FreeStyle test strips
- Includes ready access food reference library for carb counting

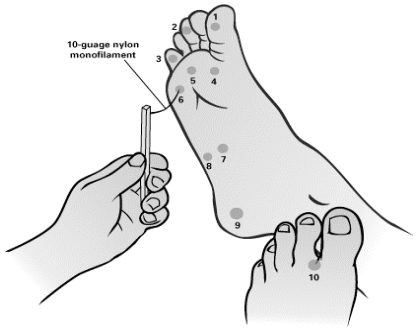
Medtronic Minimed

- Paradigm® 515 and Paradigm® 715 Insulin Pump Systems and CareLink™ Therapy Management System for Diabetes

Testing for Pedal Neuropathy

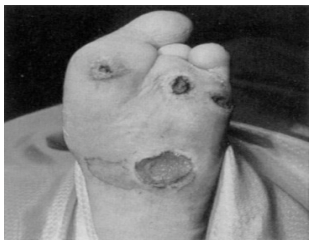
- Nylon Monofilament Test
  - Risk of ulcer formation
- Say "yes" each time he or she feels the filament
  - Failure to feel the filament at four of 10 sites is 97% sensitive and 83% specific for identifying loss of protective sensation

Use of Monofilament



Chacot Foot

- Need for custom shoes



Foot Care

- Wash feet daily, dry thoroughly
- Properly fitted shoes
  - Check for pressure points, fungus each visit
  - Test for decreased sensation

Foot Care

- Osteomyelitis may result from innocent looking pressure area
- If onychomycosis use LAMISIL tablet
- Must use LAMISIL spray in all shoes

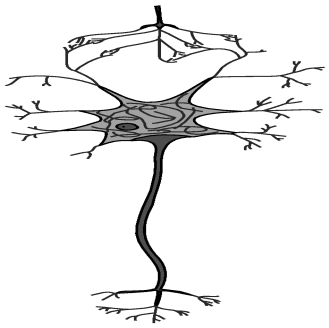
Diabetic Neuropathy

- About 60-70% of people with diabetes have mild to severe forms of nervous system damage, including
  - Impaired sensation/pain in feet/hands
  - Slowed digestion in the stomach
  - Carpal tunnel syndrome
  - Other nerve problems

Diabetic Neuropathy

- More than 60% of non-traumatic lower-limb amputations in the United States occur among people with diabetes

Diabetic Neuropathy



Complications of Polyneuropathy

- Ulcers
- Charcot arthropathy
- Dislocation and stress fractures
- Amputation - risk factors include
  - Peripheral neuropathy with loss of protective sensation
  - Altered biomechanics (with neuropathy)

Complications of Polyneuropathy

- Amputation
- Risk factors include
  - Evidence of increased pressure (callus)
  - Peripheral vascular disease
  - History of ulcers or amputation
  - Severe nail pathology

Autonomic Neuropathy

- Possible symptoms of autonomic neuropathy
  - Sweating
    - None/reduced/excessive sweating
  - Temperature regulation
    - Hypothermia or hyperpyrexia
    - Disruption of temperature regulatory mechanisms

Autonomic Neuropathy

- Face
  - Pallor
  - Reduced or absent sweating
- Vision
  - Blurring of vision
  - Tunnel vision
  - Light sensitivity

Autonomic Neuropathy

- Vision
  - Difficulty focusing
  - Reduced lacrimation
  - Gradual reduction of pupillary size

Autonomic Neuropathy

- Cardiovascular
  - Orthostatic hypotension
    - Exacerbated, eating, exercise, raised temperature
  - Other orthostatic symptoms
    - Nausea, palpitations, light-headedness, tinnitus, shortness of breath

Autonomic Neuropathy

- Syncope
  - With voiding, defecation
- Standing>syncope
- Arrhythmias
- Supine hypertension
- Loss of diurnal variation in blood pressure

Autonomic Neuropathy

- Respiratory
  - Reduced bronchoconstrictor reflexes
    - Contributing to reduced responses to hypoxia
- Gastrointestinal
  - Constipation
  - Diarrhea

Autonomic Neuropathy

- Gastrointestinal
  - Incontinence
  - Dry mouth
  - Disturbance of taste

Autonomic Neuropathy

- Sexual
  - Impotence
  - Ejaculatory failure
  - Female sexual dysfunction

Autonomic Neuropathy

- Feet
  - Burning sensation
  - Hair loss
  - Pruritus
  - Dry skin
  - Pale, cold feet
  - Worsening of symptoms at night

Peripheral Autonomic Dysfunction

- Manifestations
  - Neuropathic arthropathy (Charcot foot)
  - Aching, pulsation, tightness, cramping, dry skin, pruritus, edema, sweating abnormalities
  - Weakening of the bones in the foot leading to fractures

Retinopathy

- #1 cause of blindness worldwide
- Is excellent indicator of generalized atherosclerotic disease
- Cardiac workup is recommended
- Assess lipids, treat aggressively
- May be first indicator of diabetes, found by ophthalmologist

Treat the Depression

- 50% of diabetics are said to be depressed
- Self care becomes impossible
- Life becomes a circular problem ending in early disability, loss of life

Depression in Diabetes

- The "noncompliant" patient
- Issues due to complications
  - # of medications
  - Cost of co-pays for meds
  - Office visits to you, podiatry, ophthalmology, GI consultant, cardiologist, pulmonologist, gyn, urologist (ED), psychiatrist, etc.

Depression in Diabetes

- Erectile dysfunction
- Rent/mortgage, cost of food, car, gas, education, entertainment, lost time at work, life events, etc.
- Can be overwhelming, but, rarely discussed openly by patient without professional approach in initial assessment and at least biannually

Depression in Diabetes

- Cost of medications for depression
- Memory problems
  - Forgetting medications
- Knowledge deficit
  - Feeling "stupid"

Depression in Diabetes

- Marital problems
- Challenges of parenting
- Caring for elderly parents "sandwich generation"
- Diabetes in addition to problems of life
  - Job, relationships, etc.

Depression in Diabetes

- Expectation of complications as inevitable
  - Amputation, loss of vision
- Refusal to start insulin treatment
  - Perceived as death sentence

Management of Diabetes to Prevent Depression

- Gentle "cheerleader," motivator
  - When the most minute positive change is made in the correct direction
- Ask about ED in males
  - May often be what it takes to get attention

Management of Diabetes to Prevent Depression

- Download meter
  - Provide patient with printout of success or need to improve
- Provide patient with copy of labs
  - Keep notebook for future referral, self-tracking of success
- Don't give up on even most uncooperative patient!

Prevention of Complications

- Microalbumin annually, q 6 mo.
  - Indicator of diabetic renal disease
  - Foamy urine
- 24 hr. urine protein, creatinine, creatinine clearance if serum creatinine > 2.0 refer to nephrologist
- Annual EKG, stress test post MI
- Frequent testing; AIC q 3-6 mo.

Foot Care

- Onychomycosis
  - Very common condition
  - Often caused by dermatophyes, fungi living under nails and skin, between toes

Foot Care

- Nails become thick, hard to cut
- Nail edges grow into skin of toe resulting in infection
  - Trimming straight across
  - No digging into corners with sharp objects

Foot Care

- Do not use straight razors
- Corns need corn pads or removal by podiatrist

- Nail care is covered by Medicare (at least this week it is)

Signs of Osteomyelitis

- Watch for signs of osteomyelitis
  - Open sore
  - Closed wound with mushy center
  - Closed round wound with depressed center, raised edges

Signs of Osteomyelitis

- Watch for signs of osteomyelitis
  - Tunneling of infection occurs frequently and is not detected till bone is very involved with infection
  - Get the patient to the podiatrist
  - Teach patients to use mirror with bright lights to detect red areas

Signs of Osteomyelitis

- Resulting infection of osteomyelitis will result in 6-8 weeks of intravenous antibiotics
  - Often longer and non-load bearing status

Signs of Osteomyelitis

- Requires ambulation without weight bearing
  - Walker
  - Special boot
  - May end up requiring surgery for removal of infected bone

Summary

- New medications, new indications
- New insulin delivery systems
- Prevention is still key
- Avoidance of complications is critical
- Non-compliance is means of expressing lack of income to meet needs of practitioner to provide care
- Patients are very prone to depressions

References

- Joslin Diabetes Clinic
- NHANES Update 2006
- American Diabetes Association Website for Professionals
- Centers for Disease Control

References

- National Institutes of Health
- American Association of Diabetes Educators
- American Heart Association