Critical Assessment of Diabetes and Complications: Honing your Detective Skills

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Diabetes Education SERVICES

Critical Assessment of Diabetes and Complications: Honing your Detective Skills

Registered Nurses and CA Pharmacists
DES is accredited as a provider of continuing nursing education by the California Board of Registered Nursing (CEP # 12640). This educational program will provide 2.0 contact hours of continuing education credit. CA Pharmacists also earn 2.0 CE (since we are accredited by the BRN).

Registered Dietitians
DES is a Continuing Professional Education (CPE) Accredited Provider with the Commission on Dietetic Registration (CDR) Provider # DI002. Registered dietitians (RDs) will receive 2.0 continuing professional education units (CPEUs) for completion of this program.

Resource Page Underline = Link

- We have added hyperlinks that you can click on for more information.
- So, if you see words underlined click on them to review additional information.
- Critical Assessment Course Resource Page of Articles

Objectives:

Part 1

1. Identify common yet often under diagnosed complications associated w/ type 1 and type 2 diabetes.
2. State strategies to identify previously undiscovered diabetes complications during patient assessments.

Part 2

- 3. Discuss links between hyperglycemia and other conditions including, cancer, transplant, cystic fibrosis and liver disease.

Honing Detective Skills

During patient interviews, strategies to identify previously undiscovered diabetes complications

What Kind of Diabetes

AJ, a 22 year old female admitted to the ICU with a blood glucose of 476 mg/dl and a pH of 7.1 and anion gap of 13.

- What further questions and or testing is needed to determine if patient has type 1 or type 2 diabetes?

Questions and Presentation

- Is she in DKA or HHS?
- Signs/Symptoms, body weight, family history, autoimmunity
- Not sure, check GAD, ICA, IAA

ADA Article on Hyperglycemic Crisis - DKA

8

Autoantibodies Assoc w/ Type 1

Panel of autoantibodies –

- GAD65 - Glutamic acid decarboxylase –
- ICA - Islet Cell Cytoplasmic Autoantibodies
- IAA - Insulin Autoantibodies

AJ – Next Steps?

For AJ, a 22 year old newly diagnosed with diabetes,

1. What baseline lab work, tests, screenings, vaccinations are needed and how often?
2. What would include in your initial physical exam?
3. What referrals would be helpful?
3. Given her age, what special counsel does she require?

Diabetes Lab Evaluation

Test	Frequency
A1c	Dx and 2-4 x's a yr
Fasting lipid profile	Dx and Annually
Microalbuminuria	Dx and annually
Creatinine / GFR	Dx and Annually
Thyroid Stimulating Hormone (type 1, hyperlipidemia, women >50)	Dx and Annually
Liver function test	Annually
Screen for Celiac Disease	*Type 1 Dx, repeat prn*

ADA Clinical Practice Recommendations

Comprehensive Diabetes Evaluation – Physical Exam

- Height, wt, BMI
- B/P – orthostatic hypo, hypertension
- Fundoscopic Evaluation (referral may be needed)
- Thyroid palpation
- Skin exam
- Comprehensive Foot exam (pulses, inspection, sensation, vibration)

ADA Clinical Practice Recommendations

Comprehensive Diabetes Evaluation – Referrals

- Annual dilated eye exam
- Family planning women of reproductive age
- Registered Dietitian for MNT
- Diabetes Self-Mgmt Program
- Dental exam
- Mental Health Professional, if needed

ADA Clinical Practice Recommendations

Special Issues for Children with Type 1

- Assess normal growth and development
  - Mauriac syndrome “diabetic dwarfism.“
    - decreased growth velocity, short stature, and delayed puberty
  - Sexual maturation
  - Appropriate weight gain
  - Disordered eating
  - Balancing hypo/ hyperglycemia

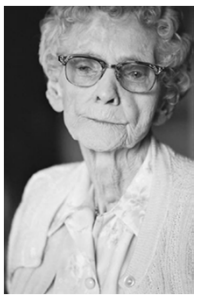
ADA clinical practice recommendations – Glucose Goals for Kids

Patient is Gaining Weight

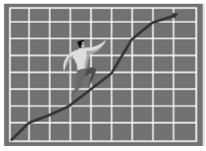
- 68 yr old female complains of 4 lb wt gain a week for past month. Wt 140lbs, BMI 27. BG levels 200-300s. B/P 142/96
- **Reported** daily meds include:
  - glyburide 10mg ac breakfast
  - Actos 30mg ac breakfast
  - Glargine 30units at night
  - Lispro sliding scale with meals
  - Synthroid (not sure of dose)
  - Lasix 20mg a day

Link to PocketCards

Diabetes: 30% Depressed 12% of those, major depression 70% don’t receive treatment



Treatment includes:
- referral to mental health professional
- Medications



Fluid Weight Gain

- People with diabetes at greater risk for Congestive Heart Failure (CHF) due to increased CVD risk factors.
- Actos and Avandia, (TZD's), can cause fluid wt gain and worsen CHF.
- Metformin used cautiously in pt's w/ CHF due to increased risk of renal impairment

Thyroid Disease and Diabetes

- 27 mil Americans have over or under active thyroid glands, but more than half remain undiagnosed.
- More than 8 out of 10 pts w/ thyroid disease women.
- 15 to 30% of people w/ diabetes & their siblings or parents are likely to develop thyroid disease (compared to 4.5 percent of the general population).
- Check TSH on Type 1 & 2 annually or if indicated.

AACE Guidelines

Thyroid & TSH* Levels

- *Thyroid Stimulating Hormone - secreted by pituitary gland
  - controls thyroid hormone thyroxine production
  - first and best test
  - TSH Norm = 0.3 and 3 mIU/mL
    - Lower = hyperthyroidism
    - Higher = hypothyroidism

Treatment depends on levels and symptoms

Link to 2012 AACE Thyroid Guidelines

Hypothyroidism

- Hashimoto's thyroiditis – autoimmune thyroid
  - most common cause of hypothyroidism w/ dm
- Type 1 and type 2 at greater risk
- Screen annually for thyroid disease in diabetes
- Clinical features: fatigue, wt gain, dry skin, cold intolerance, depression, constipation, dyslipidemia
  - Higher risk of CVD – monitor risk
- Dx: high TSH, then test for free T4, autoantibodies, and thyroid scans as needed
- Tx: replacement with levothyroxine (75-125 ug)

AACE Thyroid Guidelines

Novel / Atypical Antipsychotics Linked to Hyperglycemia

- Severe cases of hyperglycemia – even death reported
- Monitor BG regularly for DM patients started on this class of med
- If pt at risk for DM, determine fasting glucose before initiating therapy and monitor closely during treatment
- Weight gain may require increased dosing of diabetes therapies.

Summary of FDA warning statement for atypical antipsychotics, 2004

Novel/ Atypical Antipsychotics Linked to Hyperglycemia

- Zyprexa – olanzapine
- Geodon - ziprasidone
- Seroquel – quetiapine
- Risperdal - risperadone
- Clozaril - clozapine
- Abilify – aripiprazole
- Latuda - lurasidone

Consensus Development Conference on Antipsychotic Drugs and Diabetes 2004

New Insulin Start – No orders

- 71 year old woman, type 2 for 8 years
- Weight 90 kg
- DM Meds -
  - Metformin 2000mg day
  - Actos 15 mg (just started)
  - Admits to taking am meds ~ 4 xs a week, but always takes pm meds
- A1c 10.3% Checks BG ~ 5 xs wk in am (200-250) C/O of Many hyperglycemia SE

What Would You Start her on?

- Intensive insulin therapy based on her wt?
  - 90kg x 0.5 = 45 units a day
  - 7 units bolus each meal, ~ 20 units basal at hs?
- Start w/ 10 units Basal at HS?
- What factors would influence your decision?

What Would You Start her on?

- My insulin suggestion
  - Pre Breakfast - 20 units 70/30 insulin
    - 14 units basal / 6 units bolus
  - Pre dinner - 10 units 70/30 insulin
    - 7 units basal/ 3 units bolus
- BGM suggestion
  - 2 x's a day
  - Before breakfast, 2 hrs after dinner

Bev's Rationale

- Pt not very connected to diabetes
- Does not have a scheduled life
- Limited record keeping skills
- Overwhelmed with all her the medications she is already taking
- Start slow, gradually intensify
- Start where they are at...
- Safe and feasible short and long term?

Patient is Losing Weight

SR, 49 yr old woman w/ lean "type 2" 7 yrs.
Monitors BG 1 x daily
A1c 13.9%
Insulin: 14 u Lantus at hs (uses pens)
Humalog if BG > 200 (says too expensive)
Also on Metformin 500mg BID
At 5'7, her usual wt is 120, but now 106 lbs
C/O of nausea, fullness, fatigue
No health insurance
.

Diabetes Detective

- What other comorbidities are you suspecting?
- Any labs you would like to check?
- What type of diabetes?
- Medication changes?
- Social situation?
- Consider her lack of insurance and low income level during your discussion.

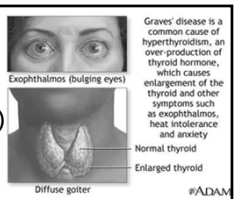
Diabetes Detective

- Other comorbidities?
  - Gastroparesis, eating disorder
- Any labs you would like to check?
  - GAD, ICA, IAA
- What type of diabetes? - LADA or Type 1
- Medication changes? Stop metformin, change insulin to regular, NPH
- Social situation – Takes care of elderly father – husband has drinking problem
-

Suggested changes

- Regular insulin 3 times a day – 3 units if don't check BG (eat 45 gms of carb)
- If check BG, add 1 unit for each 50 pts above 150
- Try and eat 3 times a day – use liquid calories as needed, low fiber
- Check BG at least once a day
- Weekly phone call check in

Hyperthyroidism



- Graves Disease (most common)
- 0.5 – 2.0% risk in type 1
- Autoimmune disorder:
  - Symptoms: wt loss, hypermetabolism, tremor, exopthalmus, palpitations, tachycardia, heat intolerance, nervousness, hyperglycemia
  - Diagnosis: Dx: low TSH, then check T3 & T4, autoantibodies, and thyroid scans
  - Treatment: antithyroid drugs, surgery, radioactive iodine. After treatment, may need thyroid replacement therapy

AACE Thyroid Guidelines 2013

Gastroparesis

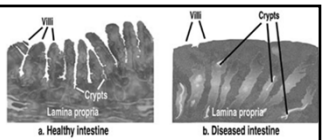
- Gastroparesis: affects 20 – 30% of pt's w/ longstanding dm
- Delayed emptying of stomach contents due to nerve damage
- S/S include early satiety, fullness, postprandial hypo, vomiting
- Diagnosis: gastric emptying studies, post-prandial hypoglycemia
- Tx: improve BG, small, low fat & fiber meals meds: reglan, erythromycin

SR struggling w/ eating

- Gained 20 lbs
- Low blood sugar after meals
- Doesn't feel very hungry
- Doesn't want to check BG
- A1c 9.7%

- Strategies?
- Worries?

Celiac Disease



- Type 1 – Affects 1-16%
- Immune reaction to gluten - affects function of villi in intestine, decreasing nutrient absorption
- S/S: bloating, malabsorption, wt loss, fatty stools, diarrhea, muscle tenderness, failure to thrive
- Diagnosis: measure either anti-endomysial antibodies (EMA) titers or tissue transglutaminase.
- If positive, refer to GI specialist for endoscopy and biopsy of small intestine to confirm diagnosis.

Treatment – Gluten Free for Life

- Avoid
  - wheat (einkorn, durum, faro, graham, kamut, semolina, spelt),
  - rye,
  - barley

ASSOCIATED AUTOIMMUNE DISORDERS

- Insulin-dependent Type 1 Diabetes Mellitus, Liver diseases, Thyroid Disease-Hashimoto's Thyroiditis, Lupus (SLE), Addison's Disease, Chronic Active Hepatitis, Rheumatoid Arthritis

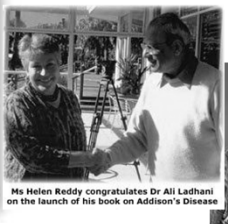
Ex of Gluten Containing Foods

- •Brown rice syrup
- •Breading & coating mixes
- •Croutons
- •Energy Bars
- •Flour or cereal products
- •Imitation bacon
- •Imitation seafood
- •Marinades
- •Pastas
- •Processed luncheon meats
- •Sauces, gravies
- •Self-basting poultry
- •Soy sauce or soy sauce solids
- •Soup bases
- •Stuffings, dressing
- •Thickeners (Roux)
- •Communion wafers

Celiac Disease Resources

- Celiac Association www.csaceliacs.org
- Gluten intolerance group www.gluten.net
- Gluten-Free Mall www.glutenfreemall.com
- www.Celiac.org
- Gluten Free Diet: A Comprehensive Resource Guide – Shelley Case
- New laws mandate labeling for "gluten free"

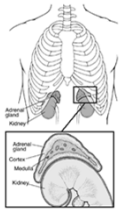
What do JFK, Helen Reddy and Jane Austin have in common?



Ms Helen Reddy congratulates Dr Ali Ladhani on the launch of his book on Addison's Disease

Addison's Disease

- 1 in 250 w/ type 1 (thyroid dx = > risk)
- Autoimmune destruction adrenal glands
- Cortisol deficiency
  - decreases hypoglycemia awareness
  - decreases glycogenolysis
- S/S weakness, wt loss, hypoglycemia, dehydration, hyperpigmentation, muscle weakness, salt craving, hyponatremia, hyperkalemia
- Diagnosis: test Anti-21- hydroxylase autoantibody, adrenocorticotropic hormone cortisol stimulation test
- Treatment: oral hydrocortisone replacement



Something's Not Right

Type 2 pt referred to you for MNT and DSMT. BMI 23, on max dose glyburide and Actos, but blood glucose levels are climbing. A1c at diagnosis 6.8%, 6 months later, 8.2%. Pt has maintained weight and is exercising 30 minutes 4 times a week.

Diabetes Types *Key characteristics of type 1, LADA (latent autoimmune diabetes in adults), and type 2.*

	Type 1	LADA	Type 2
Typical age of onset	Youth or adult	Adult	Adult
Progression to insulin dependence	Rapid (days/weeks)	Latent (months/years)	Slow (years)
Presence of autoantibodies*	Yes	Yes	No
Insulin dependence	At diagnosis	Within 6 years	Over time, if at all
Insulin resistance	No	Some	Yes

*Proteins that indicate the body has launched an autoimmune attack on the insulin-producing beta cells in the pancreas.

Latent AutoImmunity Diabetes in Adults (LADA)

- Antibody positive to 1-2 of below
  - GAD-65 autoantibodies
  - Insulin Autoantibodies
  - Islet Cell antigen-2
- Adult Age at onset
- No need for insulin in first 6 mos

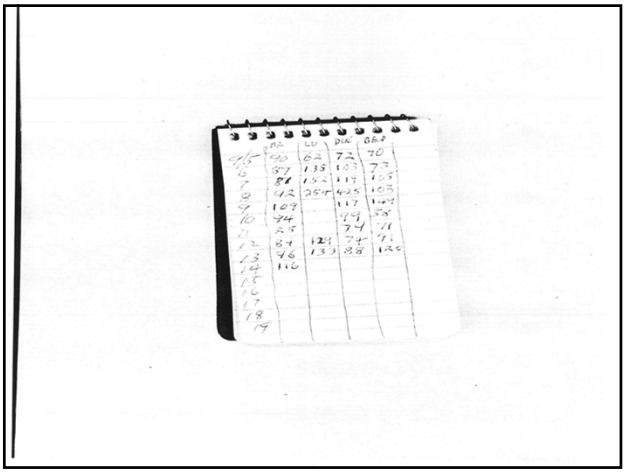
J Clin Endo Metab, 2009 Jerry P. Palmer, MD

Don't feel it

- 78 year old man, w/ type 2 for 20+ years. History of heart attack. Admitted to hospital for hypoglycemia (BG 38). He tells you, "I didn't feel any signs of low. During assess, he tells you, when I exercise on treadmill, my heart rate never goes above 100.
- Meds
  - Detemir 10 units, BID Novolog sliding scale
  - Atenolol (Tenormin) Lipitor ASA

Questions – "don't feel it"

- Why doesn't he feel low blood glucose?
- Should we be concerned about his heart rate during exercise?
- Would you make any changes in his medication regimen?



CAN

Cardiac Autonomic Neuropathy

- **Silent ischemia** – delays treatment
  - Consider chest pain in any location to be of myocardial origin in diabetes pts
  - Also carefully assess unexplained:
    - Fatigue, confusion, tiredness, edema, hemoptysis, N/V, diaphoresis, arrhythmias, cough or dyspnea
- EKG testing, refer to specialist for at risk pts
- Assess for resting tachycardia

CAN
Cardiac Autonomic Neuropathy

- **Fixed heart rate**(~100 beats per min)
  - Doesn't change w/ exercise or anything
  - "cardiac denervation"

- **Orthostatic hypotension**:
  - Fall in B/P >20mm/Hg systolic upon standing
  - Due to diminished epinephrine response
  - S/S include lightheadedness, presyncopal symptoms
  - Treatment; increase B/P, avoid situations that can trigger syncopal episodes, adjust B/P meds

Questions – "don't feel it"

- Why doesn't he feel low blood glucose?
- Should we be concerned about his heart rate during exercise?
- Would you make any changes in his medication regimen?

Part 2

Hyperglycemia and Special Situations

- Cancer
- Post transplant hyperglycemia
- Cystic Fibrosis
- Liver Disease

Diabetes and Cancer

People with diabetes have a

- 2 fold higher risk for cancers of
  - the liver, pancreas and endometrium
- 1.2 to 1.5 fold risk of cancers of the
  - colon, breast and bladder.
- Lower risk of prostate cancer only.

Diabetes and Cancer: A Consensus Report Cancer J Clinic 2010
Joint statement American Cancer Society and American Diabetes Assoc

Links

- Cancer is the 2nd leading cause of death in U.S.
- Diabetes is the 7th leading cause of death
- *Cancer and diabetes diagnosed within the same individual more frequently than would be expected, even after adjusting for age.*

Risk Factors Common to Both Diseases

- Aging
- Sex
- Obesity
- Diet
- Physical inactivity
- Smoking
- Alcohol

Biologic links incompletely understood

Possible Mechanisms for a Direct Link

- Hyperinsulinemia
- Hyperglycemia
- Inflammation

What Can Health Professionals Do?

- Promote healthy diet, physical activity and weight management.
- Encourage appropriate screening for cancer and to report any symptoms
- Studies indicate metformin may decrease cancer risk
- Focus on DM **prevention**

The Problem w/ Cancer + Hyperglycemia:

- Increased risk of infection in an already immuno-compromised patient
- Increased weight loss
- Fatigue
- Dehydration / lack of sleep
- Depression

How to Manage Steroid Diabetes in the Pt w/ Cancer
Oyer et al Supportive Oncology, v4/#9 Oct 2006

Mr. Carter – 83 yrs young Diagnosed w/ Leukemia

- Medical situation
  - Diabetes 11 years, usually controlled on oral medications (glipizide).
  - A1c usually less than 6.5%. Now 7.6%
  - On prednisone taper
  - Creat 1.1
  - Blood transfusions every 2 weeks
  - 5'11 – weighs 182 (has lost 10 lbs over past 6 months, but is holding now)

Mr. Carter – 83 yrs young Social Situation

- Social Situation
  - Lost wife 3 months ago
  - Lives alone – very active
  - Rates his health as good to excellent
  - Has extensive social network
  - Tells you "I am worried about my blood sugars and want to get them down".

What Action?

- Blood glucose testing frequency
- Med changes?
- Activity suggestions?
- Nutrition ideas?

7 Key Facts about Steroids and Cancer

- Primarily effects post meal BG
- Glucose levels tend to normalize overnt
- Oral agents usually don't work
- Insulin always works
- Bolus / prandial insulin primary need
- Basal insulin given in am
- Consult w/ RD, CDE's and other specialists as needed.

What Action?

- Blood glucose testing frequency
- Med changes?
- Activity suggestions?
- Nutrition ideas?

Special Populations: Post Organ Transplant

- Post transplant kidney, heart, liver, lung transplant have about 20% chance of developing diabetes
- Increased risk for hyperglycemia due to steroid therapy, tacrolimus, cyclosporine, physical stress, pre-existing risk factors
- Early detection and aggressive treatment important to prevent infection and complications
- Mgmt: oral agents/insulin, BGM, exercise, MNT

New Onset Diabetes Mellitus After Transplantation
Endocrinol Metab Clin N Am36 (2007) 873–890

Cystic Fibrosis Related Diabetes (CFRD)

- Cystic fibrosis
  - Affects >30,000 in U.S.
    - 1000 children dx each year
  - Abnormally thick mucus clogs lungs
  - Partial fibrotic destruction of islet cell mass leads to hyperglycemia
  - Due to improved treatment, survival rates improving

Cystic Fibrosis Related Diabetes (CFRD)

- CFRD distinct clinical entity
  - Insulin deficient but not prone to ketosis
  - Slow moving – 2-4 yrs before diagnosis
  - Abnormal glucose tolerance associated with progressive clinical deterioration
  - Associated w/ poor nutritional status, lung disease, resp failure
  - Lowers survival rate at 30 yrs
    - Only 25% live to 30 w/ CFRD
    - 60% live to 30 years when no CFRD

Cystic Fibrosis Related Diabetes (CFRD)

- CFRD Magnitude with CF
  - 20% of adolescents
  - 40% of adult pts, develop CFRD
- CFRD Consensus Panel recommends:
  - FPG yearly after 14 yrs age or symptoms
  - Monitor BG closely during steroid therapy
  - A1c may not be accurate (false low)

Clinical Practice Recommendations for CFRD 2010

Cystic Fibrosis Related Diabetes (CFRD)

- Treatment Philosophy
  - "Eat, we will cover"
- Goal of therapy: maintain glucose/ weight
  - Daily cals – 120 to 150% RDA (2,400 – 3000)
    - 40% fat, 15-20% protein,
  - May be on steroid pulses
- Med regimen needs flexibility
  - Bolus insulin w/meals, carb counting + basal
- Monitor BG levels annually or if s/s of DM

23 yr old newly diagnosed CFRD

- A1c 8.3%
- Lost 6 lbs over past 3 months
- BMI 21
- Creat 0.9
- On and off steroids
- Meds?
- Insulin?
- Food?
- Activity?

23 yr old newly diagnosed CFRD

- A1c 8.3%
- Lost 6 lbs over past 3 months
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- Creat 0.9
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- Insulin?
- Food?
- Activity?

NonAlcoholic Fatty Liver Disease (NAFLD)

- Increasing worldwide prevalence
  - 25% of adults
  - 75% of people w/ DM or obese
  - Up to 50% of obese children

NAFLD = greater than 5.5% fat in liver that can't be attributed to other cause .

Due to Insulin Resistance and Obesity

The Metabolically Benign & Malignant Fatty Liver - 2011

DM & Fatty Liver

- Fatty Liver and hepatic inflammation is associated with insulin resistance and measures of visceral adiposity
- It also predicts:
  - Incidence of type 2 diabetes
  - Heart disease
- Fatty liver disease is directly involved in the pathogenesis of these diseases. Maybe a cause?

Finding Liver Disease

- No makers are accurate for diagnosing NASH – only biopsy
- Obese pts or those with metabolic syndrome should be evaluated
- Signs of advanced disease include:
  - Portal hypertension, spider angiomas, reddening of palms, declining platelet counts an family hx

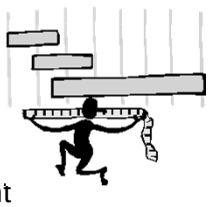
Treating NAFLD

- Since there is no approved treatment for NAFLD and almost every patient with NAFLD will have to change their lifestyle – lose weight, exercise, and eat a healthy diet – it is not necessary to biopsy routinely." *NIH Clinical Center, Dr. Yaron Rotman*

Wt loss of 7-10% linked with a 50% drop in liver fat

Clinical Endocrinology News 12/12

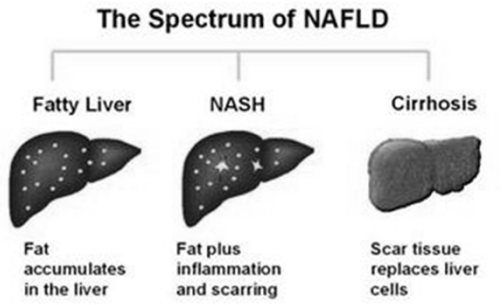
Natural History of NAFLD -

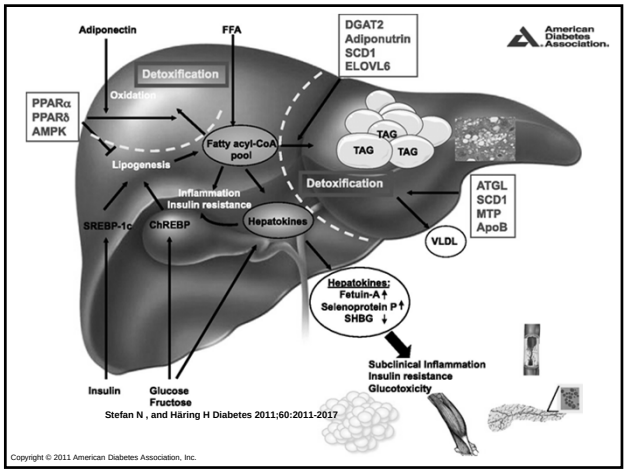


- Over 3.5 - 11 year period
- "Benign" Group
  - 60% remain stable
  - 13% have improvement
- "Malignant" Group
  - 28% progress to liver damage

The Metabolically Benign & Malignant Fatty Liver - 2011

Natural History of NAFLD to NASH





Diabetes + Obesity = Progressesion to NASH

- 50% progress from “Benign” fatty liver to Steatohepatitis.
- 2-4 fold risk of developing advanced liver disease compared to those without diabetes.
- About 15% develop cirrhosis and are at increased risk for liver cancer

NASH

- *Represents the hepatic manifestation of metabolic syndrome:*
  - Abdominal obesity
  - Hypertension
  - Diabetes
  - Dyslipidemia

25 million Americans will develop NASH by 2025 with 20% progressing to cirrhosis, cancer or both

Over Time Leads to

NASH or SteatoHepatitis …

- Fibrosis and Cirrhosis
- Liver Cancer
- Liver Failure

Future epidemic of liver transplants??

Liver Disease & Glucose

- Hepatitis-C > 40, 3x's rate of diabetes
  - Increased risk if familial history
- Cirrhosis: 80% of pts have glucose intolerance
- Hepatic failure: associated w/ hypoglycemia due to destruction of hepatocytes, increased insulin production, inadequate storage of glucose
- Hemochromatosis – up to 75% have diabetes
  - Condition characterized by excessive production and accumulation of iron in liver & other tissues. "bronze diabetes"

Levinthal, Gavin, Tavill, Anthony: Liver Disease and Diabetes Mellitus *Clinical Diabetes* 1999, v17, n2
Annals of Internal Medicine 2000;133:592-599.

Important Stuff to Remember

- Always start with where the patient is at!
- Consider the entire milieu
- Listen
- Keep it simple
- Check in often
- Open lines of communication with medical team

Consider these Clinical Books as additional resources

Other Resources

- Medications and Insulin Online Courses
- Level 3 Online Courses
- Free Webinar – Preparing For BC-ADM
- PocketCards
- Other Free Webinars

Thank you for joining our Web Clinic

Wrap up notes

1. You have 1 year to complete this program and take the post test to receive your CE credit (from time of purchase)

2. Complete the post test – click test button

3. Complete program survey – we appreciate your feedback

4. Now, your certificate is ready to print out

5. Join us on FaceBook for special events

Keep in touch!
Beverly Thomassian and
Lainey Koski

Diabetes Education SERVICES