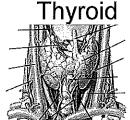
Diabetes and Hypothyroidism

Aaron Rockoff MD Fellow in Endocrinology, UC-Irvine

Topics

- 1)Function of the thyroid
- 2) Autoimmune thyroid disease and Type 1 DM
- 3) Thyroid disease's effect on diabetes
- 4) Clinical presentation of thyroid disfunction
- 5) Diagnosis
- 6) Treatment
- 7)Practice guidelines



- One of the largest endocrine organs
- Functions to regulate energy expenditure of different organs in the body
- Regulated by feedback inhibition at the pituitary gland

Thyroid Hormone

- Work to stimulate cell metabolism and activity
- Key for cell maturity and differentiation
- Two major forms are Thyroxine (T4) and Triiodothyronine (T3)
- T4 has a half life of 6.7 days and T3 around 18 hours

Thyroid Hormone

- About 80% of T3 in circulation comes from conversion of T4 into T3
- lodine necessary for production
- Daily Intake 150 mcg/day
 - Amiodarone contains 500x that in each 200mg pill

Autoimmune Thyroid Disease

- The prevalence of Al thyroid disease in diabetic patients is 10.8% vs. 6.6% in the general population
- Thyroid disease more common with women
 - 30% of T1DM women have thyroid disease
 - The rate of postpartum thyroiditis 3x higher in diabetic patients

Causes of Hypothyroidism

- lodine deficiency or excess
- Radiation
- Surgery
- Medications: Lithium, amiodarone
- Hypothalamic-Pituitary dysfunction

How will it affect my Diabetes?

- Hyperthyroidism
 - Causes increased gluconeogenesis, rapid GI absorption of glucose, and increased insulin resistance
- May unmask latent diabetes
- Also hyperglycemia may resolve when euthyroid

How will it affect my Diabetes?

- Hypothyroidism
 - Lowered insulin degradation may lead to lower exogenous insulin needs
 - Decreased carbohydrate metabolism
 - Worsening dyslipidemia
 - Elevated LDL and triglycerides

Case

A 53 woman with T2DM and obesity comes into her doctor's office. She has avoided switching to insulin and her A1c has risen to 9.8% and she has lost 15lbs. She complains of fatigue, insomnia and feels anxious thinking she may have cancer.

Case

 67 male with T2DM and COPD admitted to the MICU for community acquired pneumonia. Due to some tachycardia, thyroid function tests were ordered and patient found to have a suppressed TSH of 0.8 with a normal FT4 level of 1.1.

Clinical Presentation Difficulties

- Clinical signs such as weight loss, fatigue and increased appetite can go with Graves' disease or uncontrolled diabetes
- Signs and symptoms like edema, pallor, weight gain and fatigue could lead to diabetic neuropathy being mistaken for hypothyroidism

Testing Difficulties

- Thyroid function tests are necessary, but can be misleading
 - Non-thyroidal illness refers to any medical problem causing a temporary change in thyroid function not related to true thyroid disease

Making the Diagnosis

- TSH is still the initial test unless pituitary dysfunction is suspected
- Free T4 is the additional test most often used in evaluating hypothyroidism
- FT4 and total T3 are used with hyperthyroidism

Making the Diagnosis

- Antibodies are useful for predicting the chance of developing hypothyroidism or confirming the diagnosis in Graves' disease
 - TPO antibodies predominantly used to predict hypothyroidism
 - Thyroid Stimulating Immunoglobulins are helpful in the diagnosis of Graves' disease

Making the Diagnosis

- When is subclinical hypothyroidism (mild TSH elevation and normal T4 and T3 levels in asymptomatic patient) important?
 - Subclinical hypothyroidism can make a substantial impact on dyslipidemia
 - TPO antibodies are positive
- Make sure patient is not just recovering from non-thyroidal illness or thyroiditis

Implications of Hyperthyroidism

- One patient's presenting with diabetes when hyperthyroid, may have resolution of diabetes when hyperthyroidism is treated
- Worsening hyperthyroidism will cause deterioration of glucose control
- Treatment may cause improvement in insulin sensitivity, and needs to be anticipated

Implications of Hypothyroidism

- Increased LDL levels will make physicians want to increase statins and other lipid lowering medications
- First treat the hypothyroidism to goal
- Hypothyroidism should not be a cause of hypoglycemia unless related to a pituitary dysfunction and accompanied by adrenal insufficiency

Treatment of Hypothyroidism

- All hypothyroid patients should be treated with levothyroxine (T4)
- Dessicated thyroid hormone (Armour and Nature thyroid) should be avoided due to their high and unpredictable amount of T3
 - Very few people have a problem with conversion of T4 to T3 in the body
 - Can not do genetic testing at this time

Case

- 38 female with hypothyroidism comes in for evaluation. States she is looking for a new physician because her last doctor switched her from Nature thyroid to Synthroid. She has gained weight and feels very fatigued, states she must be a "non-converter"
- What can we do?

Treatment of Hypothyroidism

- Daily replacement dose can be calculated using 1.6mcg/kg
- Titrate the dose to goal TSH every 6-8 weeks
- When dealing with the elderly or patients with risk factors for heart disease, start low and go slow
 - Normal TSH at age >70 may be 5-7.5

Treatment of Hypothyroidism If having trouble getting the patient

- If having trouble getting the patien to the normal TSH range, and requiring higher than expected amounts of levothyroxine:
- Consider celiac disease (look for other vitamin deficiencies)
- Make sure patient taking the medication appropriately
- Tell patient to take a double dose if he/she misses one day of medication

Treatment of Hyperthyroidism

- Definitive treatment includes radioactive iodine ablation and surgery
- Anti-thyroid medications have rare but severe risk factors
 - Remission rates for Graves' with medication alone is <40%

American Thyroid Association Guidelines

- Check TPO antibodies
 - For subclinical hypothyroidism
 - For recurrent miscarraiges
- Use Free T4 in addition to TSH
 - Unless pregnant when total T4 used
- Avoid testing TSH in hospital unless very suspicious for thyroid disease

American Thyroid Association Guidelines

- In central hypothyroidism only check FT4
- Check TSH every 4-8 weeks when initiating levothyroxine or titrating dose
- TSH should be checked every 6-12months once on a stable dose
- Thyroid hormone replacement should not be used for obesity or depression

Questions?