# Diagnosis and Treatment of Hyperthyroidism

Jennifer Sipos, MD
Assistant Professor
Division of Endocrinology

## High Radioiodine Uptake Hyperthyroidism

- Graves' disease
- Toxic multinodular goiter
- Toxic adenoma (Plummer's Syndrome)
- Hashitoxicosis
- Trophoblastic disease and germ cell tumors
- TSH-mediated hyperthyroidism

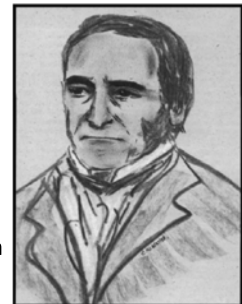
Dr. Henry Plummer

## Low Radioiodine Uptake Hyperthyroidism

- Thyroiditis
  - de Quervain's
  - Silent or subacute
  - Radiation
- Exogenous hyperthyroidism
- Ectopic hyperthyroidism
  - Struma ovarii
  - FTC bony metastases
- Iodine-induced hyperthyroidism
- Amiodarone

## Graves Disease

- Peak incidence 30-50 yo
- Strong familial predisposition
- Female:male 5:1
- TSH Receptor Ab stimulate growth and synthesis
- 20-40% remission rate with medical management

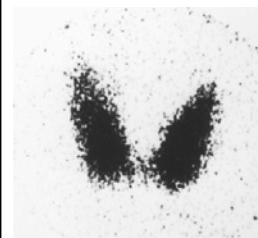


Dr. Robert Graves

## Diagnostic Testing

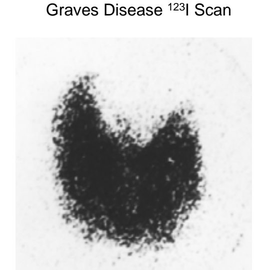
- TSH
- Free T4
- Total T3 (Free T3 if available)
- Thyroid Stimulating Immunoglobulin

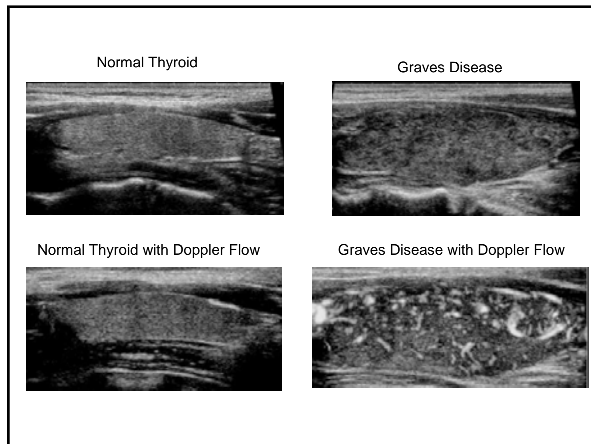
## Radioactive Iodine Scan



Normal Thyroid $^{123}$I Scan

Graves Disease $^{123}$I Scan






## Graves ophthalmopathy (GO)

- Elevate head of bed
- Steroids prior to RAI
- Short course of steroids for acute exacerbations
- Smokers 7x more likely to develop GO

## Symptoms

- Proximal myopathy
- Emotional lability, anxiety restlessness
- Tremor
- Sweating/heat intolerance
- Onycholysis
- Vitiligo and alopecia areata
- Amenorrhea/erectile dysfunction and decreased libido
- Loss of cortical bone density

## Cardiovascular Effects

- 15% of patients with AFib have hyperthyroidism
- 25-35% of elderly with hyperthyroidism will develop AFib that only responds to normalization of thyroid function
- May also rarely present with congestive heart failure

*J Am Geriatr Soc* 1996; 44: 50–53.

*Thyroid* 2002; 12: 489–93.

## Thyrotoxic Periodic Paralysis

- Rare neuromuscular disorder
- Defect in muscle ion channels
- Episodes of painless muscle weakness in setting of hypokalemia
- Most cases are hereditary
- Typically in Asian men 20-30y old

*Circulation* 2007;115:e179–e180

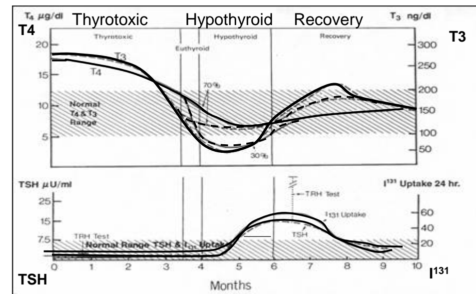
## Toxic adenoma and toxic multinodular goiter

- Focal or diffuse hyperplasia of thyroid follicular cells with functional capacity which is independent of TSH regulation
- Activating mutation in TSH Receptor gene lead to activation of adenylyl cyclase in the absence of TSH

# Treatment

- Thionamides
  - Rash
  - Agranulocytosis
- RAI
  - Hypothyroidism
  - Worsening of eye disease?
- Surgery
  - Recurrent laryngeal nerve injury
  - Hypoparathyroidism

# Thyroiditis

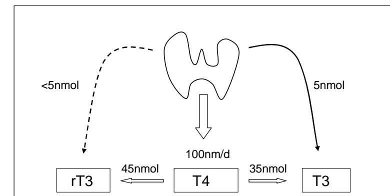


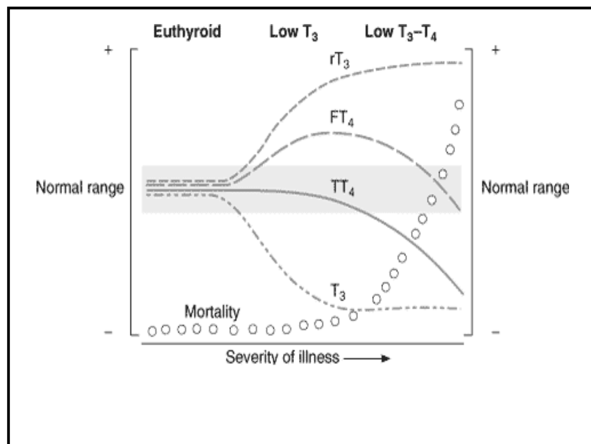

# Amiodarone

- 37% iodine
- 2% of patients develop thyrotoxicosis
  - Dumping of stored hormone – thyroiditis
    - Low flow doppler imaging
    - Treat with steroids, surgery
  - Excess iodine load
    - High flow doppler imaging
    - Treat with methimazole, beta blockers

# Sick Euthyroid Syndrome

- TSH may be low or normal
- T3 may be low or normal
- TT4 may be low or normal



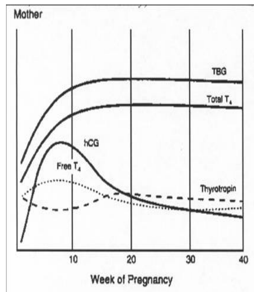

# Thyroid storm

Delirium, severe tachycardia, vomiting, diarrhea, high fever.

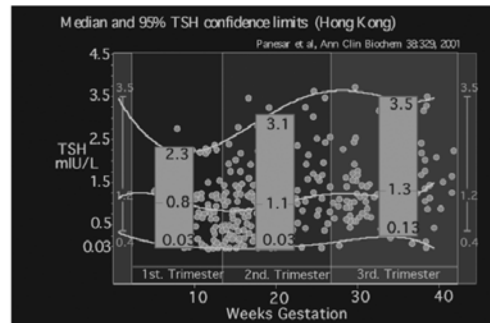
- Beta blockers
- PTU 250mg q6h
- Sodium iodide (1 hour AFTER antithyroid drugs given) 10 gtt BID…acutely lowers hormone secretion
- Hydrocortisone 50mg IV q6h
- Aspirin is contraindicated

## Thyroid function in pregnancy

- Common $\alpha$ subunit of TSH and hCG
- TT4 x 1.5 in 2nd & 3rd trimester
- T4 requirements increase 30% during pregnancy




Trimester-specific changes in TSH in normal women




## Hyperthyroidism in Pregnancy

- Prevalence 0.1-0.4%
- Graves accounts for 85% of cases
- Autoimmune thyroid disease (AITD) may be worse in first trimester, then improve in later trimesters
- May be exacerbated post-partum
- Delivery can trigger thyroid storm

## Fetal thyroid function

- Concentrates iodine at 12 weeks
- Under control of fetal pituitary TSH at 20 weeks
- Thyroid antibodies and antithyroid drugs cross the placenta
- Untreated maternal hyperthyroidism leads to increased risk of preterm delivery, IUGR, low birth weight, preeclampsia, CHF, and intrauterine death.

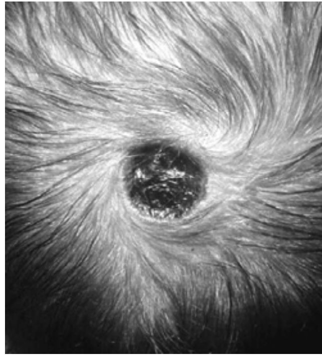
## Fetal effects of maternal hyperthyroidism

- Thyroid antibodies are cleared more slowly than the thionamides in the fetus.
- Can lead to delayed presentation of hyperthyroidism postpartum
- Moms who had $I^{131}$ or surgery may still pass the antibodies on to the fetus.

## Treatment during pregnancy

- PTU preferred
- Target is FT4 in upper limit of normal range
- Follow TFTs every 4 weeks
- Fetal Thyroid Ultrasound recommended

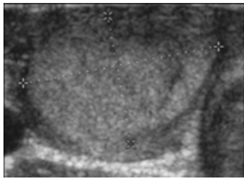
Aplasia Cutis



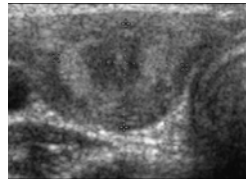
# ATDs and breastfeeding

- PTU (<300 mg/day) and MMI (<20mg/day) may be used
- Take the drug AFTER the feeding
- Propranolol may be safely used
- No 131I while breastfeeding…should be completed for 1-2 months before treatment to reduce breast exposure

# Percutaneous Ethanol Injection



Volume 3.8cm$^3$



Volume 1.5cm$^3$

AJR:180, June 2003