Thyroid Function

- chemistry & pathophysiology
- causes of hyper- & hypothyroidism
- thyroiditis
- tests of thyroid function
- test strategies
- case studies
Chemistry & Pathophysiology

- T4 - 80 ug/d produced by the thyroid gland
- T3 - 30 ug/d; 80% by peripheral action of 5’ deiodinase
- T4 - 99.97% bound & T3 99.0% bound to TBG, albumin & pre-albumin
- FT4 & FT3 exert negative feedback on TSH
- Hypothalamic TRH modulates feedback setpoint

Thyroid Binding Proteins

- INCREASES
  - estrogen/pregnancy
  - methadone & heroin
  - acute & chronic active hepatitis
  - hereditary
- DECREASES
  - glucocorticoids
  - androgens
  - L-asparaginase
  - nephrosis
  - hereditary

Causes of Hyperthyroidism

- Graves Disease
- Functioning Thyroid Nodule (Plummer’s)
- Toxic Multinodular Goiter
- Thyroiditis
- Factitious Hyperthyroidism
- Drug Induced: iodine, amiodarone, lithium
- Pituitary-Hypothalamic origin

Causes of Hypothyroidism

- Chronic Thyroiditis (Hashimoto’s)
- After radioiodine, surgery or antithyroid drug therapy
- Drugs: amiodarone, lithium,
- Congenital - 1 in 4000 births:

Thyroiditis

- Acute suppurative
- Subacute: granulomatous
- Subacute: lymphocytic
  - 10% postpartum (silent)
  - hamburger toxicosis
- Chronic Thyroiditis (Hashimoto’s)

Subacute Thyroiditis

- Granulomatous
- post viral
- painful thyroid
- systemic symptoms
- high sed rates
- Lymphocytic
- painless
- simulates Graves
- normal or slightly elevated sed rates
Thyroid Function tests

- TSH-2sd generation
- FT4
- TSH-3rd generation
  - Total T4
  - T3 Resin Uptake
  - Free T4 Index
  - TRH Stimulation Test
  - Thyroglobulin
  - antithyroid antibodies

TSH

- Immunometric Assays
  - Analytical Sensitivity (CV ≤ 20%)
  - 1st generation: 1.0 uU/mL
  - 2nd generation: 0.1 uU/mL
  - 3rd generation: 0.01 uU/mL

TSH

- INCREASES
  - hypothyroidism
  - inadequate T4 Rx
  - lithium, iodine, antithyroid drugs
  - nonthyroidal illness

- DECREASES
  - hyperthyroidism
  - L-dopa, dopamine, steroids
  - excessive T4 Rx
  - 2dry hypothyroidism
  - nonthyroidal illness

Thyroid Function: References

- Lindsay, RS, Toft, AD: Hypothyroidism. Lancet 1997;349:413-17
- Smith, SA: Commonly asked questions about Thyroid Function Mayo Clin Proc 1995;70:573-577
- Dayan, C: Interpretation of Thyroid Function Tests Lancet 2001;357:619-624
- Fatourechi, V: Subclinical Thyroid Disease Mayo Clin Proc 2001;76:413-417