Thyrotoxicosis

Dept Of Sugrery

Etiology

- Hyperthyroidism with high RIU
  - Grave's Disease
  - Toxic Multinodular Goitre
  - Toxic Adenoma
  - TSH- producing Pituitary Adenoma

Etiology

- Hyperthyroidism with low/ normal RIU
  - Sub-Acute Thyroiditis
  - Exogenous Hormone intake
  - Struma Ovarii
  - Metastatic Follicular Thyroid CA
  - Amiodarone induced

Diffuse toxic goitre (Graves')

- Autoimmune Disease
- Abnormal Thyroid Stimulating Antibodies to TSH receptors
- 50% familial, with other autoimmune endocrine diseases
- Younger females
- Primary thyrotoxicosis with eye signs

Toxic Multinodular Goitre

- Only 5% of all cases
- 10 times more common in iodine deficient area
- Typically occurs in patients older than 40 with long standing goitre
- Secondary thyrotoxicosis, eye signs rare

Toxic Adenoma (Plummers')

- More common in young patients
- Autonomous functioning single nodule
- Somatic mutations in the TSH receptor gene
- Size usually > 3 cm
- Visualized as a hot nodule on RAI uptake scan

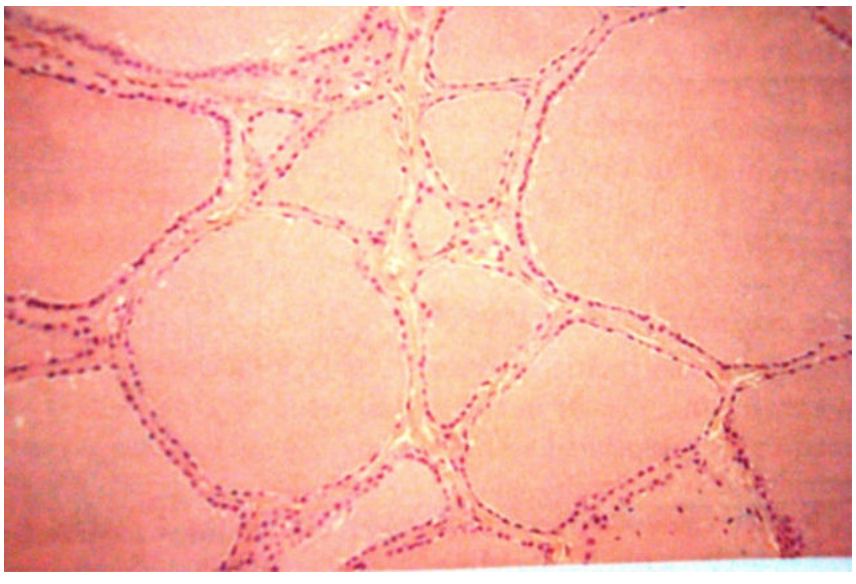
Sub-acute Thyroiditis (De Quervain)

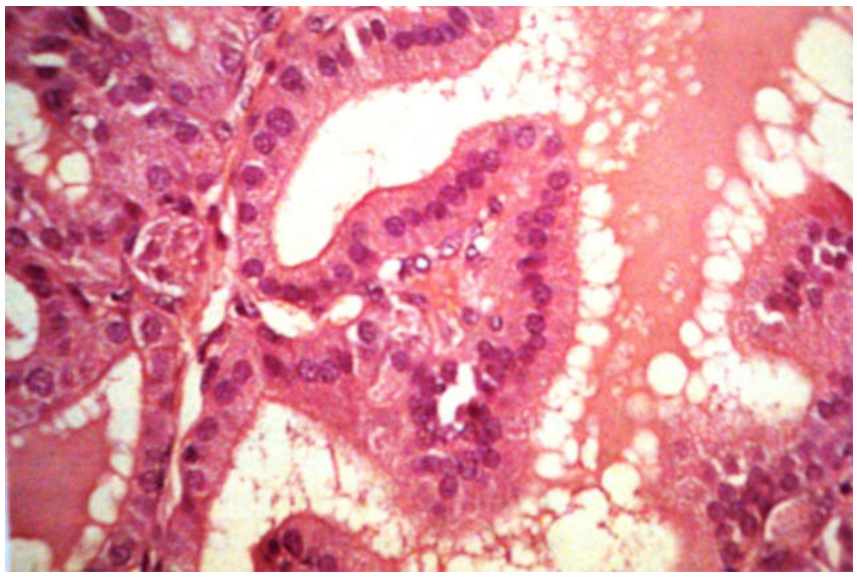
- Abrupt onset due to leakage of preformed hormones following injury to gland
- Follows viral infection
- Resolves within eight months
- Rapid response to Prednisone
- Can re-occur

Treatment Induced Hyperthyroidism

- Iodine induced
  - Radiographic contrast media
  - Medication
- Amiodarone Induced
  - Jod-Basedow thyrotoxicosis
- Thyroid Hormone Induced
  - Metastatic thyroid cancer
  - Struma ovarii
  - TSH secreting tumor

Pathology





Clinical symptoms (Skin)

- Warm, Erythematous
- Smooth- due to decrease in keratin
- Sweaty and heat intolerance
- Infiltrative dermopathy on shins
- Onycholysis –softening of nails and loosening of nail beds
- Thinning of hair

Clinical symptoms

- Graves disease has ophthalmopathy
- Antibody mediated effect on ocular muscles
- Exophthalmos
  - Infiltration of retro-bulbar tissues with fluid & round cells with lid retraction/spasm*
  - *Due to sympathetic over activity

Clinical symptoms (Eye)

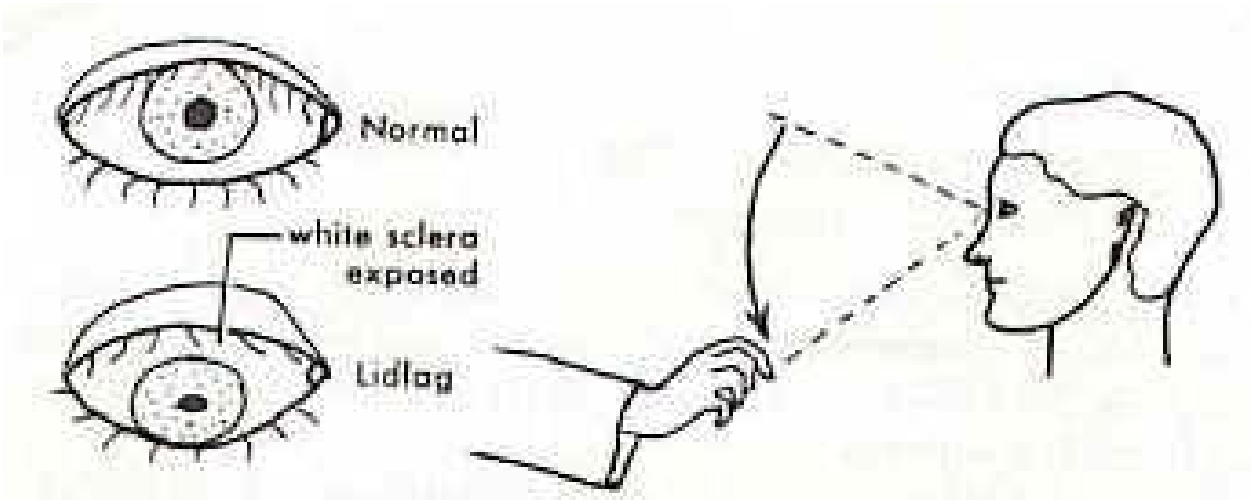
- Impaired extraocular eye muscle function (Diplopia)
- Periorbital and conjunctival edema
- Corneal ulceration due to lid lag and proptosis
- Optic neuritis and even blindness
- Gritty feeling or pain in the eyes

Eye signs

- Lid retraction (Dalrymple's sign)
- Lid lag (von Graefe's sign)
- Periorbital puffiness* (Enroth's sign)
- Difficulty in eversion of upper lid (Gifford's sign)
- Infrequent blinking (Stellwag's sign)
- Absent creases on forehead on superior gaze (Goffroy's sign)
- Difficulty in convergence (Moebius sign)

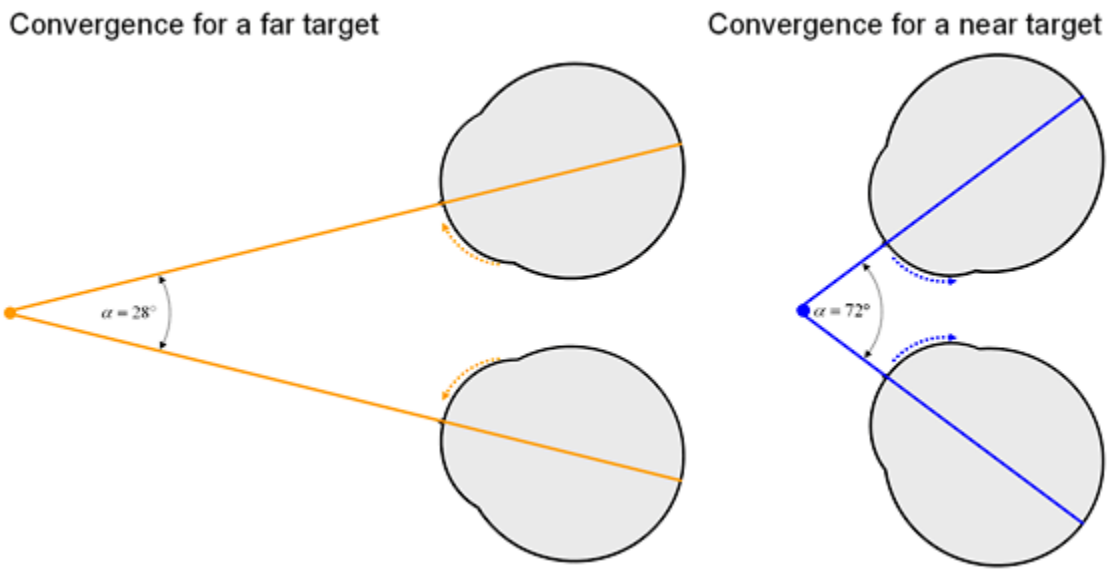
Long-standing thyroid ophthalmopathy with typical features of lid retraction (upper & lower) and visible sclera with proptosis.

Lid lag (von Graefe's sign)



Periorbital puffiness (Enroth's sign)

Difficulty in convergence (Moebius sign)



Clinical symptoms
Cardiovascular System

- Increased cardiac output (due to increased oxygen demand and increased cardiac contractibility.
- Tachycardia persists in sleep
- Stages of thyrotoxic arrhythmias
  - Multiple extrasystoles
  - Paroxysmal atrial tachycardia
  - Paroxysmal atrial fibrillation
  - Persistent atrial fibrillation

Clinical symptoms (GI System)

- Weight loss due to increased calorigenesis
- Hyperphagia (weight gain in younger patient)
- Hyperdefecation
- Malabsorption
- Steatorrhea
- Celiac Disease (in Grave's Disease)

Neuromuscular System

- Tremors-outstretched hand and tongue
- Hyperactive tendon reflexes

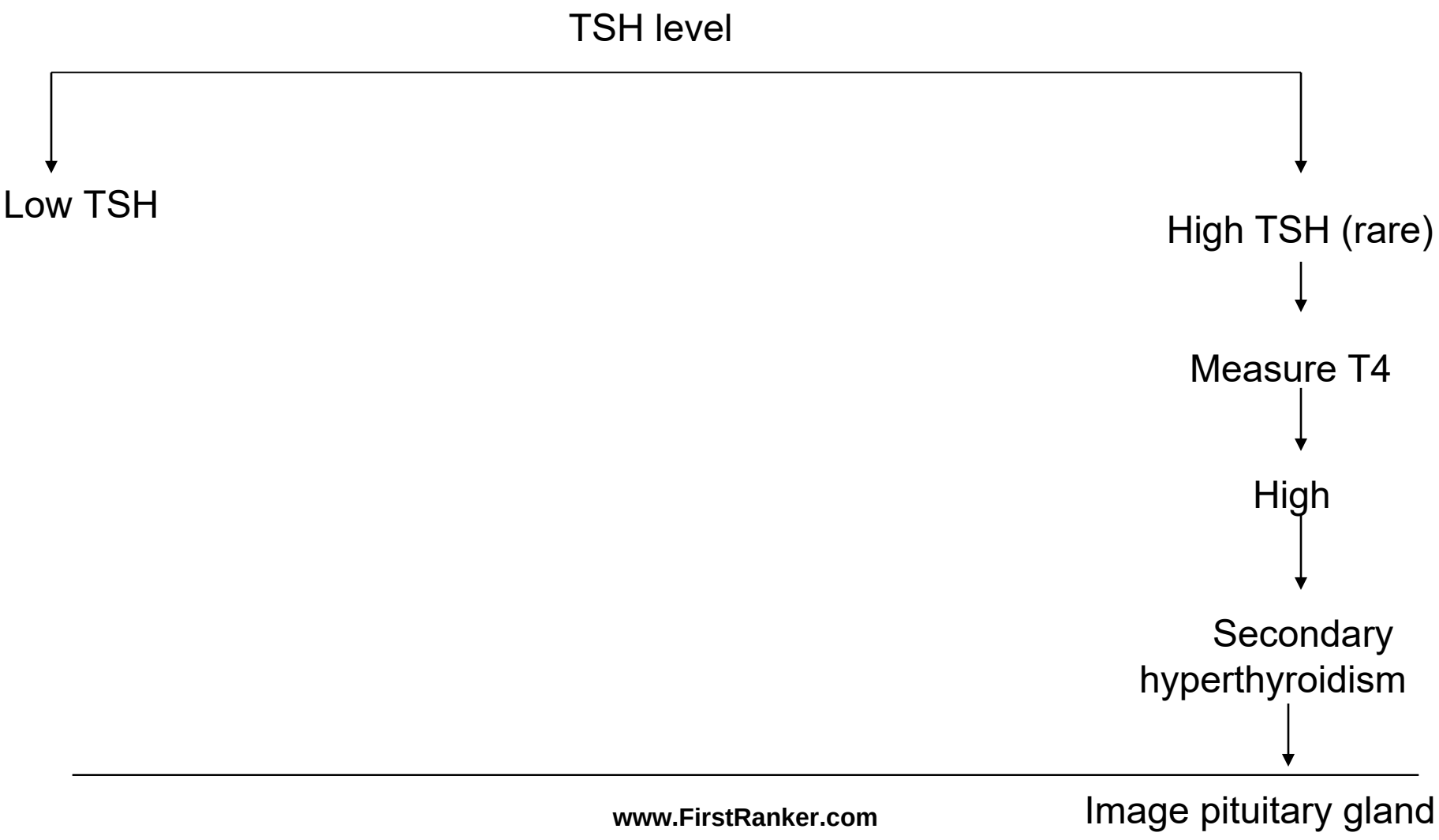
Psychiatric

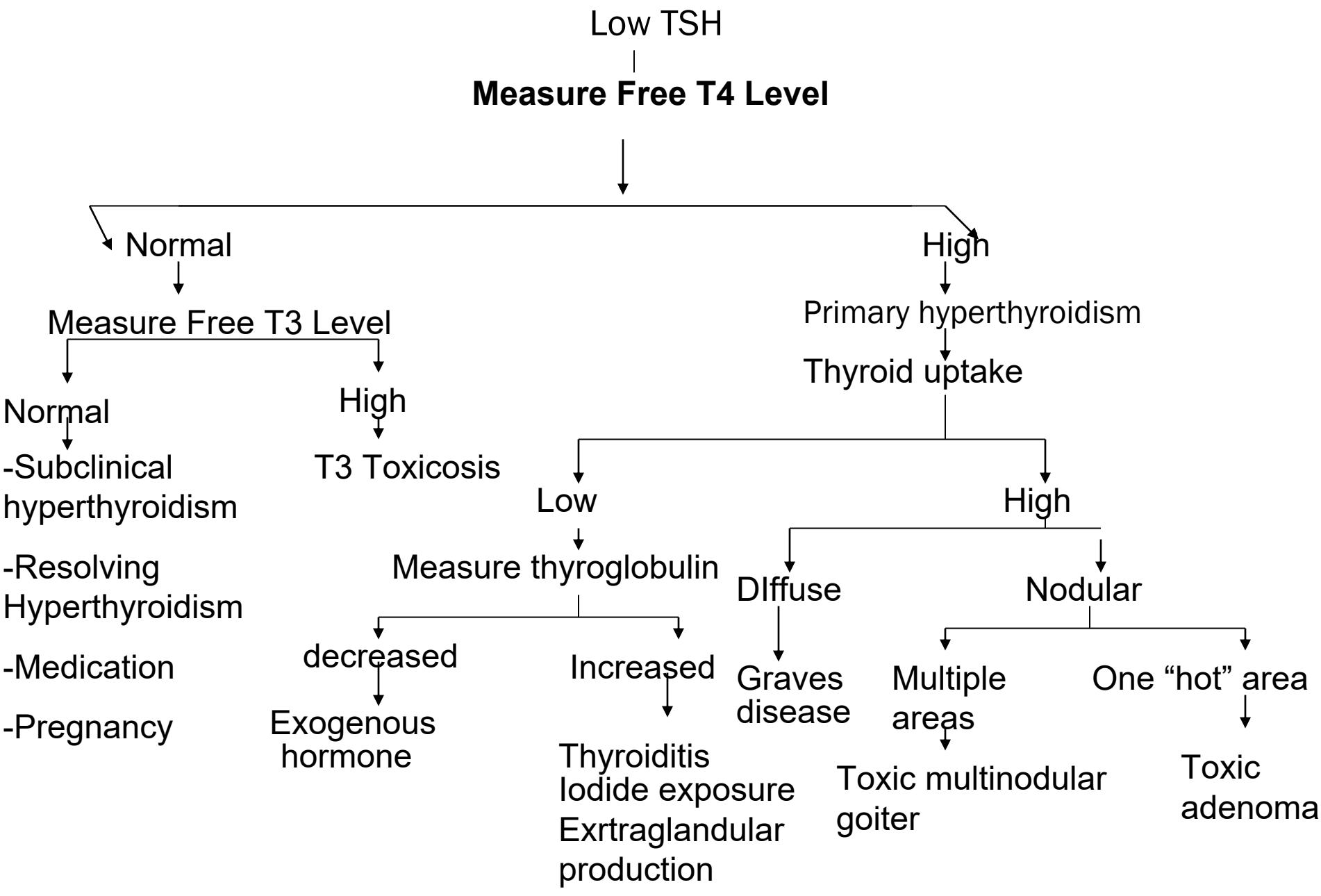
- Hyperactivity
- Emotional lability
- Anxiety
- Decreased concentration
- Insomnia

Muscle Weakness

- Proximal muscle weakness in 50% pts.
- Decreased muscle mass and strength
- May take up to six months after euthyroid state to gain strength
- Myesthenia Gravis, especially in Grave's disease.

Thyroid function test





Treatment

- Goal: To correct hyper-metabaolic state with least side effects and lowest incidence of hypothyroidism.

- Treatment depends upon
  - -Cause and severity of disease
  - -Patients age
  - -Goiter size
  - -Comorbid condition
  - -Treatment desired

Options

- Anti-thyroid drugs
- Radioactive iodine
- Surgery
- Beta-blocker and iodides are adjuncts to above treatment

Anti-thyroid Drugs

- They interfere with uptake and organification of iodine—suppress thyroid hormone levels
- Two agents:
  -Carbimazole
  -PTU (Propylthiauracil)

Anti-thyroid Drugs

- Short term therapy: Prepare patients for RAI/ Surgery
- Medium term therapy: For remission in Graves Disease
- Relapse more common in
  -smokers
  -elevated TS antibodies at end of therapy

Anti-thyroid Drugs

Carbimazole

Drug of choice for non-pregnant patients because of :

- Dose 20 mg/day
- Low cost
- Lower incidence of side effects
- Can be given in conjunction with beta-blocker
- Beta-blockers can be tapered off after 4-8 weeks of therapy

Anti-thyroid Drugs

PTU

- Preferred for pregnant patients
- Carbimazole is associated with genetic abnormalities like aplasia cutis

  Dose 100 mg t.i.d

  Inhibit peripheral deiodination of T_4 to T_3

  Breast feeding is not contraindicated

Anti-thyroid Drugs

Complications

- Agranulocytosis up to 0.5% cases
  - High with PTU
  - Advised to stop drug if they develop sudden fever or sore throat
- Hepatitis
- Skin rashes
- Lupus like syndromes

Beta Blockers

- Prompt relief of adrenergic symptoms
- Propranolol widely used
- Start with 10-20 mg q6h
- Increase progressively until symptoms are controlled
- Most cases 80-320 mg qd is sufficient
- CCB can be used if beta blocker not tolerated or contraindicated

Iodides

Iodide blocks peripheral conversion of T4 to T3 and inhibits hormone release.

These are used as adjunct therapy

- Before emergency non-thyroid surgery
- Beta blockers cannot curtail symptoms
- Decrease vascularity before surgery for Grave's disease

Radioactive Iodine

Treatment of choice for Grave's disease and toxic nodular goiter

- Inexpensive
- Highly effective
- Easy to administer
- Safe
- Dose depends on estimated weight of gland
- Higher dose increases success rate but higher chance of hypothyroidism

Radioactive Iodine

- Higher dose is favored in older patient
- Dose individualization is difficult
- Arbitrary dosage of 200-600 MBq
- Effective for both Graves Disease and Toxic MNG
- Transient thyroiditis is side effect

Surgery

- Radioactive iodine has replaced surgery for Tx of hyperthyroidism

- Indications:
  - Large Toxic MNG
  - Large Diffuse Toxic Goitre
  - Toxic adenoma
  - Childhood Graves' Disease
  - Thyrotoxicosis in pregnancy

New Treatment

- Minimally invasive subtotal thyroidectomy

- Embolization of thyroid arteries

- Plasmapheresis

- Percutaneous ethanol injection into toxic nodule

- L-Carnitine supplementation may improve symptoms and may prevent bone loss