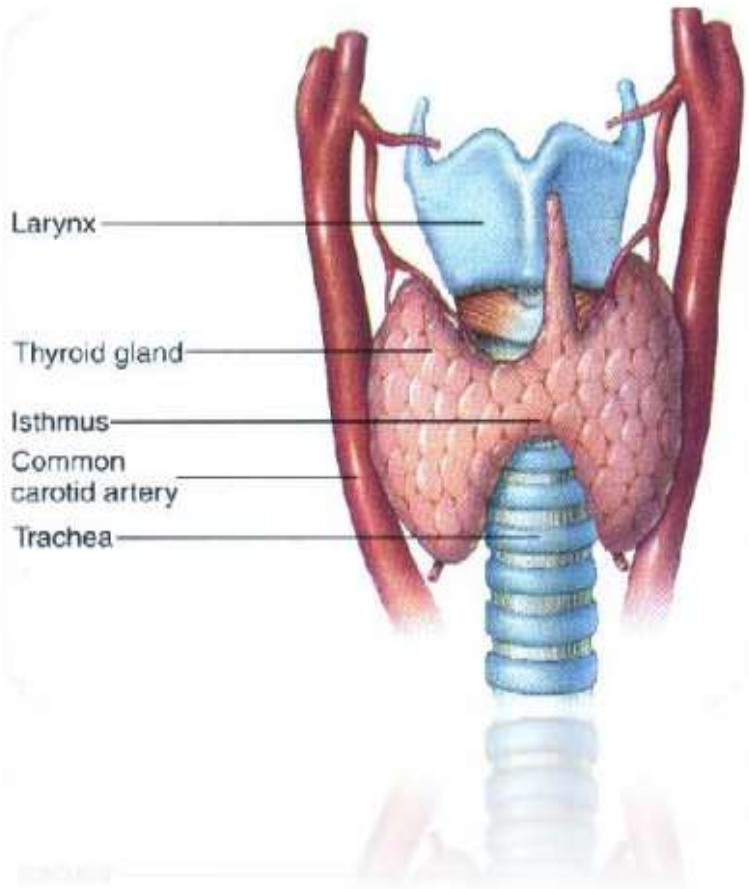
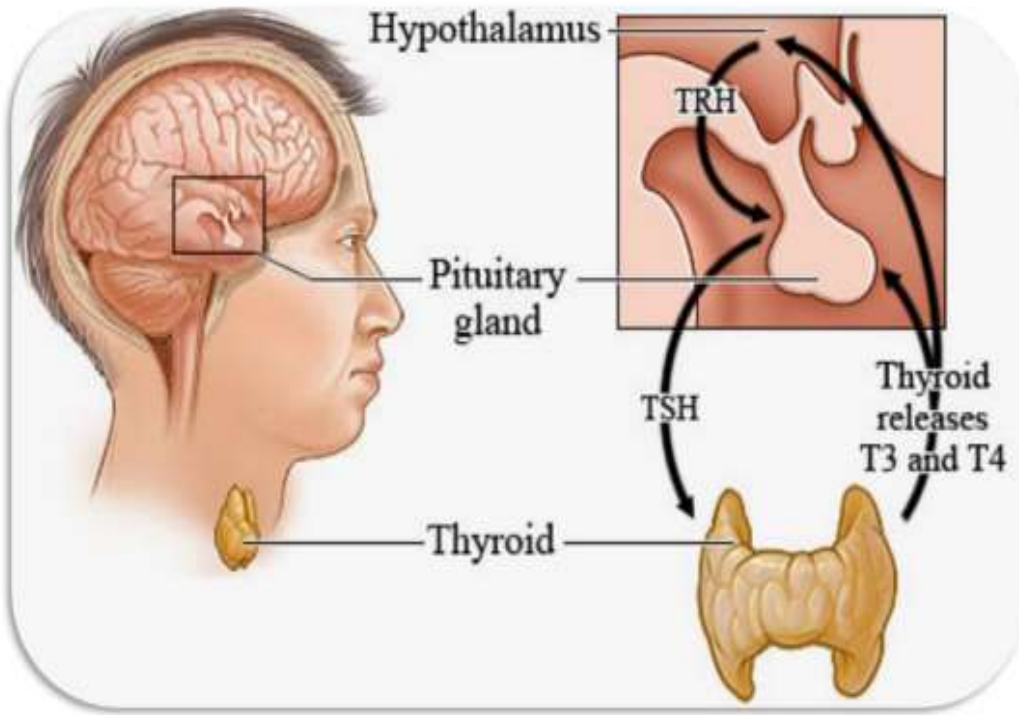
Hyperthyroid
Hypothyroid

Isbandiyah dr SpPD

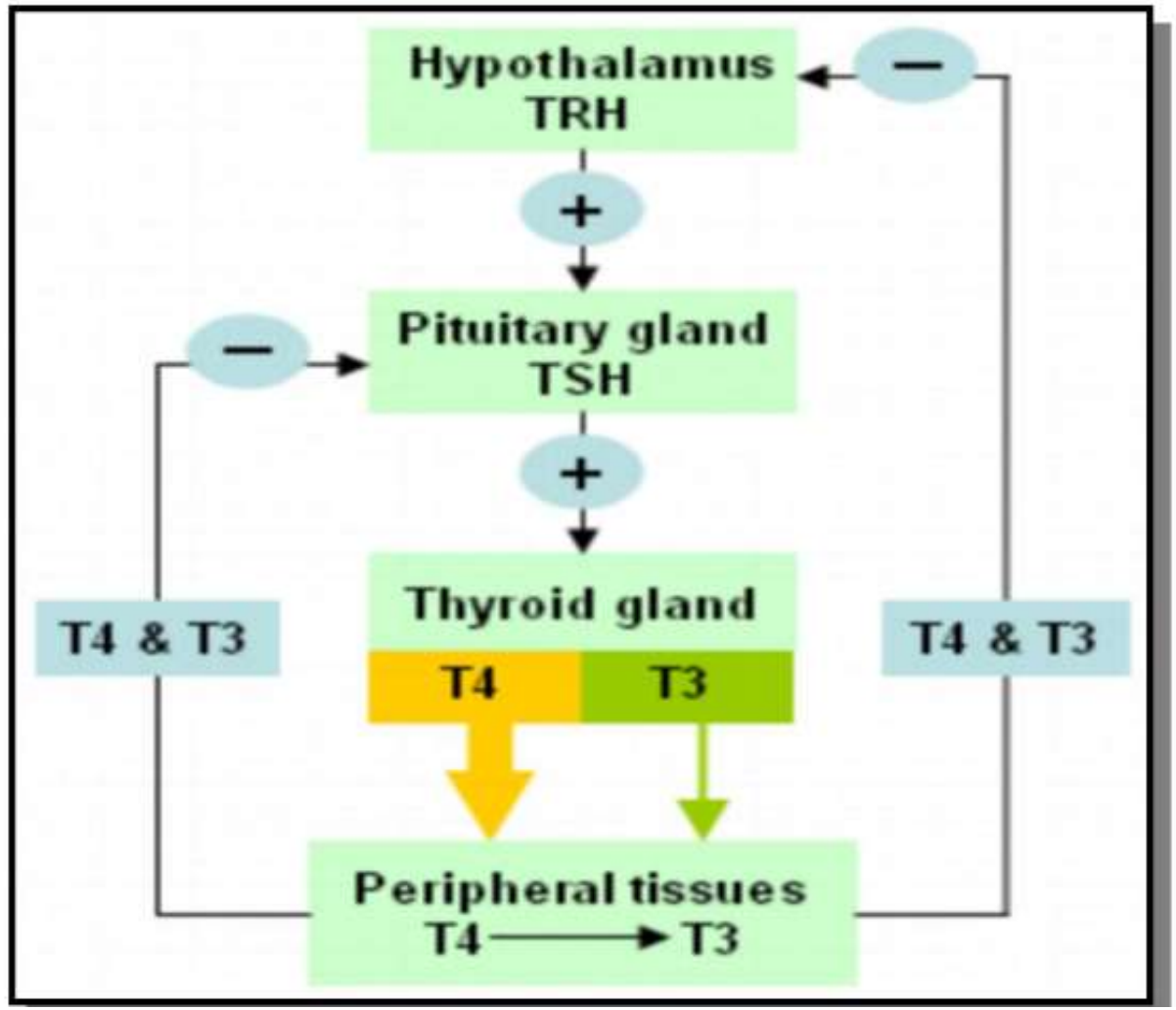
FK UMM

Thyroid glands physiology

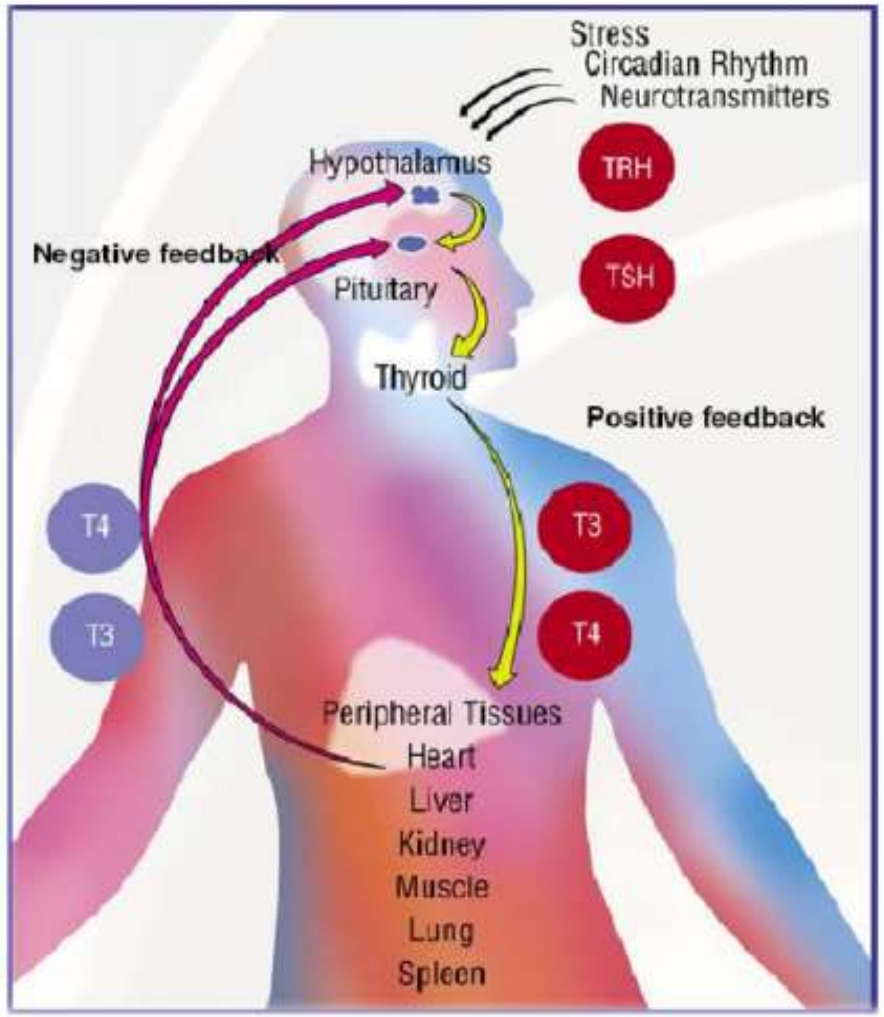




Hypothalamic-Pituitary-Thyroid Axis



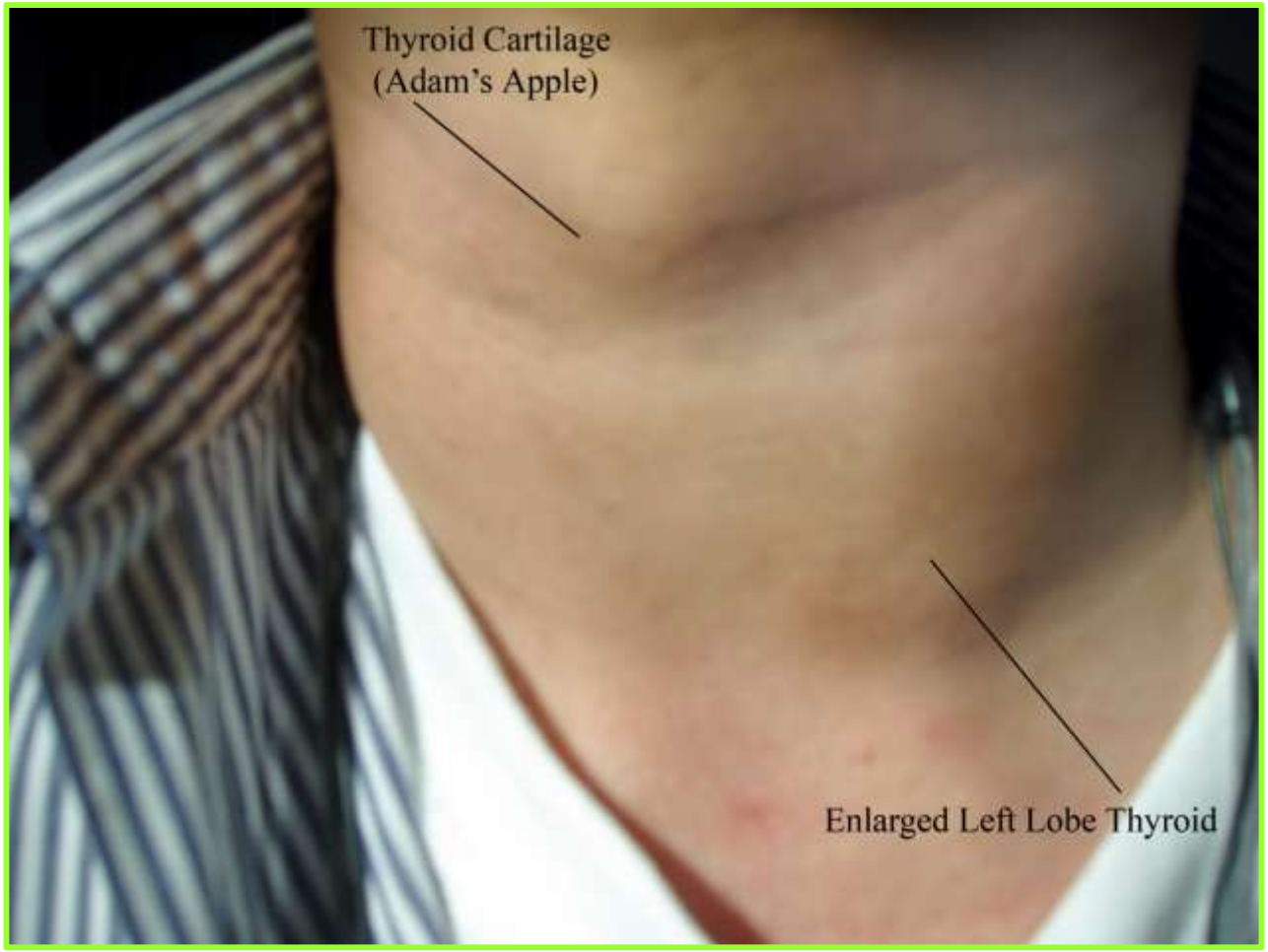
Thyroid hormone functions



- Mengatur pelepasan energi dalam otot
- Mengatur kecepatan metabolisme tubuh
- Mengatur produksi panas
- Mengatur pertumbuhan dan diferensiasi

Clinical Exam of Thyroid

Thyromegaly



Spectrum of thyroid disorder

- Thyroid dysfunction
  - Hyperthyroidism and hypothyroidism
  - Subclinical hyperthyroid and subclinical hypothyroidism
  - Emergency in thyroid dysfunction: Thyroid Crisis (Thyroid storm), Coma Myxedema
- Thyroid nodule and cancer
- Thyroid autoimmunity

Hyperthyroidism / Thyrotoxicosis

Hyperthyroidism

- refers to excess synthesis and secretion of thyroid hormones by the thyroid gland, which results in accelerated metabolism in peripheral tissues

Thyrotoxicosis

- Clinical syndrome that results when tissues are exposed to high levels of circulating thyroid hormone.

Causes of Hyperthyroidism

1. Graves Disease – Diffuse Toxic Goiter
2. Plummer's Disease – Toxic MNG
3. Toxic phase of Sub Acute Thyroiditis - SAT
4. Toxic Single Adenoma – STA
5. Pituitary Tumours – excess TSH
6. Molar pregnancy & Choriocarcinoma (↑↑ βHCG)
7. Metastatic thyroid cancers (functioning)
8. Struma Ovarii (Dermoid and Ovarian tumours)

Grave's disease (diffuse toxic goiter)

The most common form of thyrotoxicosis

May occur at any age (peak 20 – 40 y.O.)

More commonly in female (5x)

Syndrome consist of one or more:

1. Thyrotoxicosis
2. Goiter
3. Ophthalmopathy (exophthalmus)
4. Dermopathy (pretibial myxedemia)

Graves Disease

- The most common cause of thyrotoxicosis (50-60%).
- Organ specific auto-immune disease
- The most important autoantibody is
  - Thyroid Stimulating Immunoglobulin (TSI) or TSA
  - TSI acts as proxy to TSH and stimulates T_4 and T_3
    - Anti thyro peroxidase (anti-TPO) antibodies
    - Anti thyro globulin (anti-TG) Anti Microsomal and other
    - Autoimmune diseases - Pernicious Anemia, T1DM
    - RA, Myasthenia Gravis, Vitiligo, Adrenal insufficiency.

Clinical features

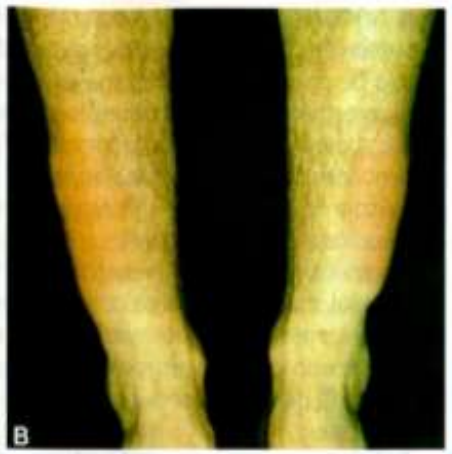
- Common manifestation: palpitation, nervousness, easy fatigability, hyperkinesia, diarrhea, excessive sweating, intolerance to heat and preference to cold.
- Marked weight loss without loss of appetite
- Thyroid enlargement
- Thyrotoxic eye signs
- Mild tachycardia
- Muscle weakness and loss of muscle mass
- Tremor

Specific to Graves Disease

1. Diffuse painless and firm enlargement of thyroid gland
2. Thyroid bruit is audible with the bell of stethoscope
3. Ophthalmopathy – Eye manifestations – 50% of cases
   - Sand in eyes, periorbital edema, conjunctival edema (chemosis), poor lid closure, extraocular muscle dysfunction, diplopia, pain on eye movements and proptosis.
4. Dermoacropathy – Skin/limb manifestations – 20% of cases
   - Deposition of glycosamino glycans in the dermis of the lower leg – non pitting edema, associated with erythema and thickening of the skin, without pain or pruritus - called (pre tibial myxedema)

Features of Grave's disease

Opthalmopathy in Grave's disease: lid retraction, periorbital edema, conjuctival injection and proptosis



Thyroid dermopathy over the lateral aspect of the shins

Thyroid acropachy

Harrison's Principles of Internal Medicine, 17th ed. p. 2235 Harrison's Principl

Thyroid Ophthalmopathy

Proptosis

Lid lag

Thyroid Dermopathy

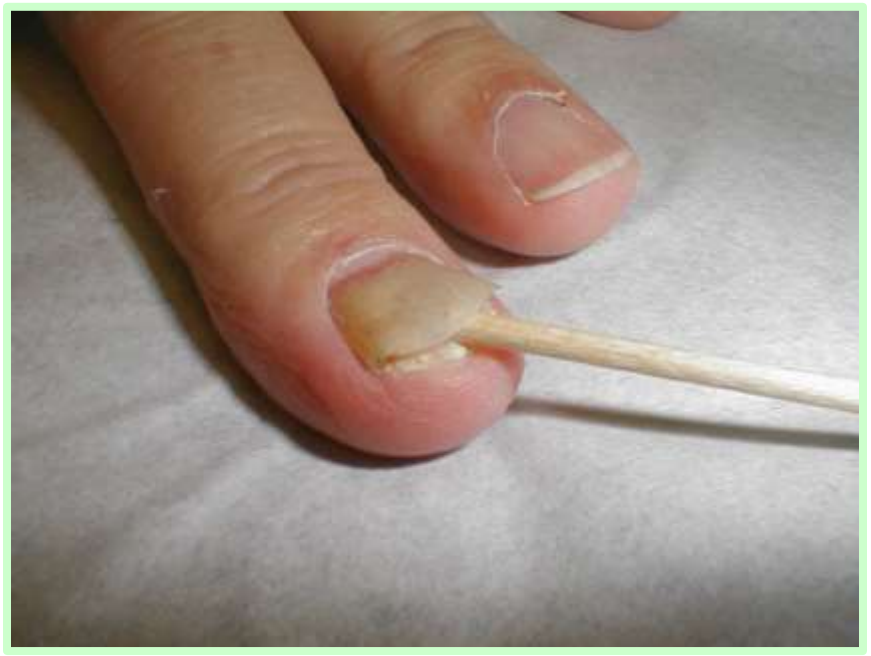
Pink and skin coloured papules, plaques on the shin

Thyroid Acropathy

Clubbing and

Osteoarthropathy

Onycholysis

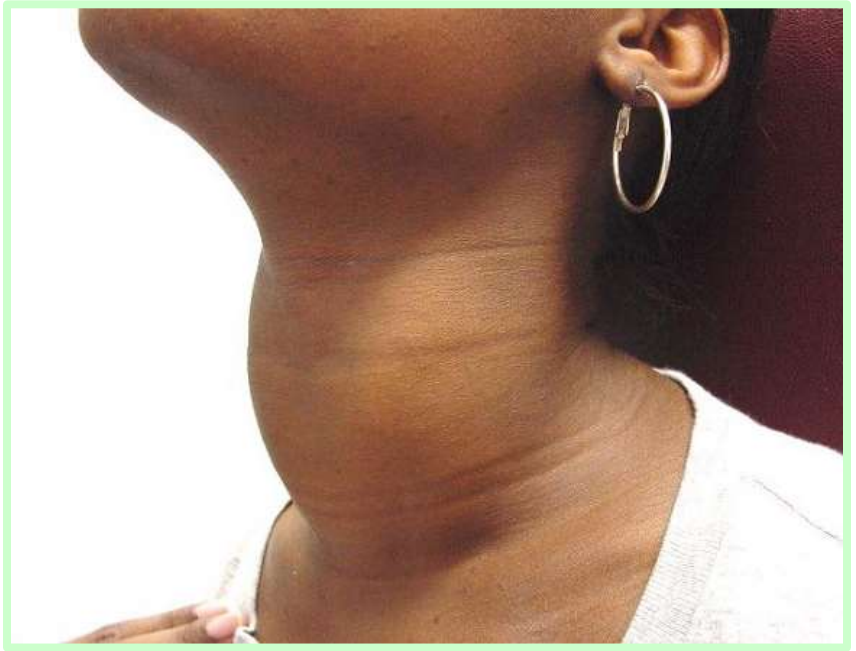


Toxic Multinodular Goiter (TMG)

- TMG is the next most common hyperthyroidism - 20%
- More common in elderly individuals – long standing goiter
- Milder manifestations (apathetic hyperthyroidism)
- Mild elevation of FT_4 and FT_3
- Progresses slowly over time
- Clinically multiple firm nodules (called Plummer's disease)

MNG and Graves

Huge Toxic MNG



Diffuse Graves Thyroid

Toxic Multinodular Goiter (TMG)

Sub Acute Thyroiditis (SAT)

- SAT is the next most common hyperthyroidism – 15%
- T_4 and T_3 are extremely elevated in this condition
- Immune destruction of thyroid due to viral infection
- Thyroid gland is painful and tender on palpation
- Treatment is NSAIDs and Corticosteroids

Toxic Single Adenoma (TSA)

- TSA is a single hyper functioning follicular thyroid adenoma.
- Benign monoclonal tumor that usually is larger than 2.5 cm
- It is the cause in 5% of patients who are thyrotoxic
- TSH is suppressed by excess of thyroxines

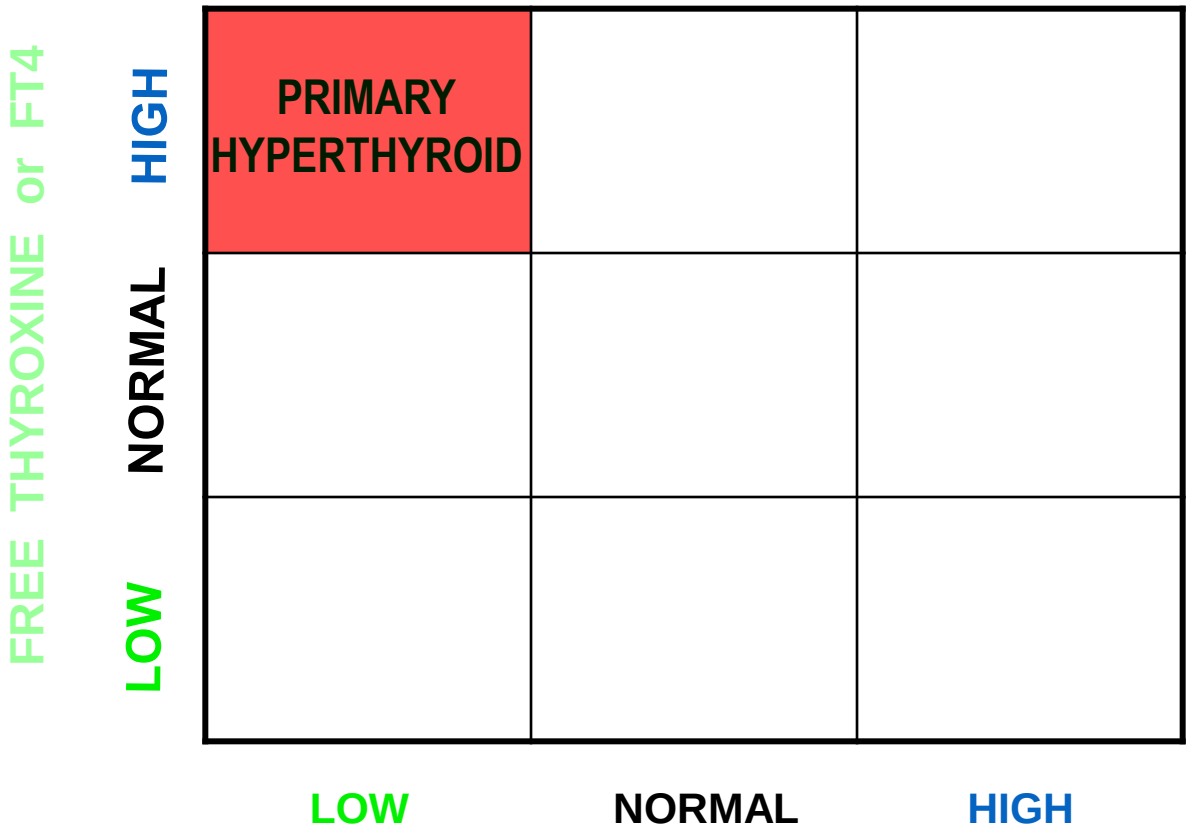
Symptoms

1. Nervousness
2. Anxiety
3. Increased perspiration
4. Heat intolerance
5. Tremor
6. Hyperactivity
7. Palpitations
8. Weight loss despite increased appetite
9. Reduction in menstrual flow or oligo-menorrhea

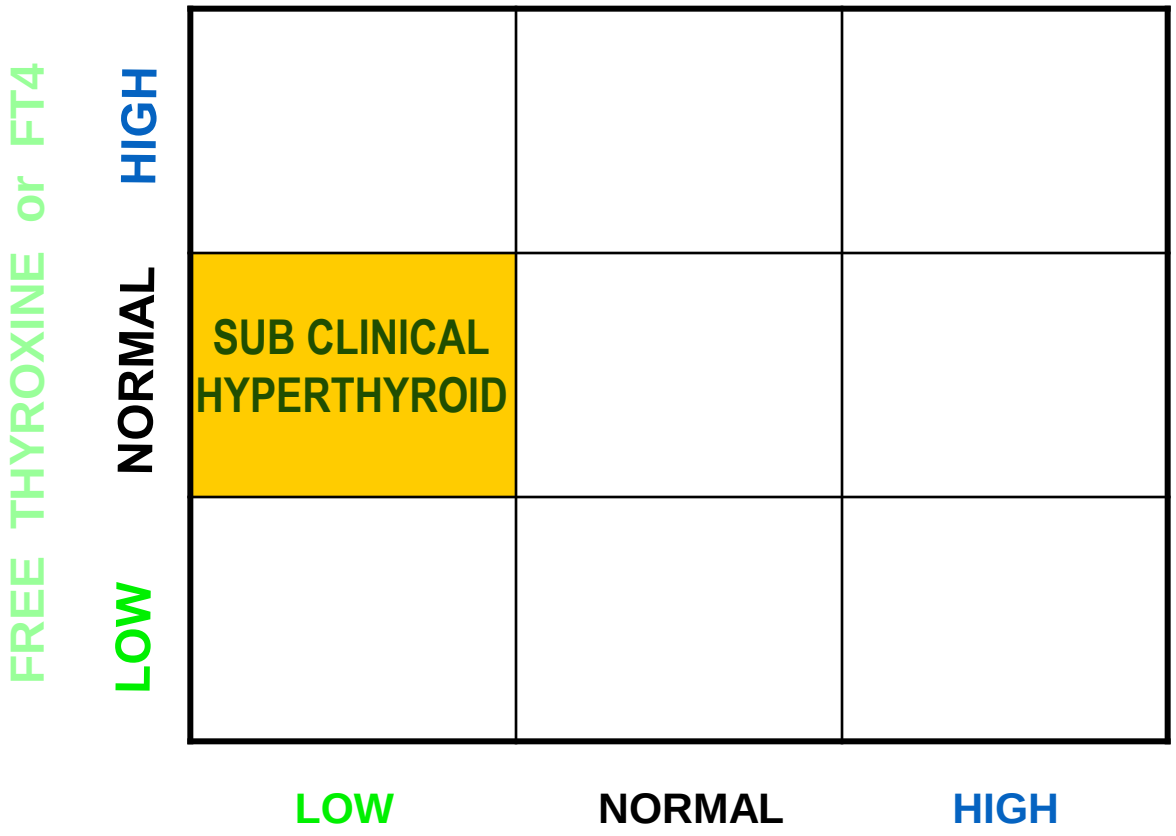
Signs

1. Hyperactivity, Hyper kinesis
2. Sinus tachycardia or atrial arrhythmia, AF, CHF
3. Systolic hypertension, wide pulse pressure
4. Warm, moist, soft and smooth skin- warm handshake
5. Excessive perspiration, palmar erythema, Onycholysis
6. Lid lag (sympathetic over activity)
7. Fine tremor
8. Large muscle weakness, Diarrhea, Gynecomastia

Nine Square Approach



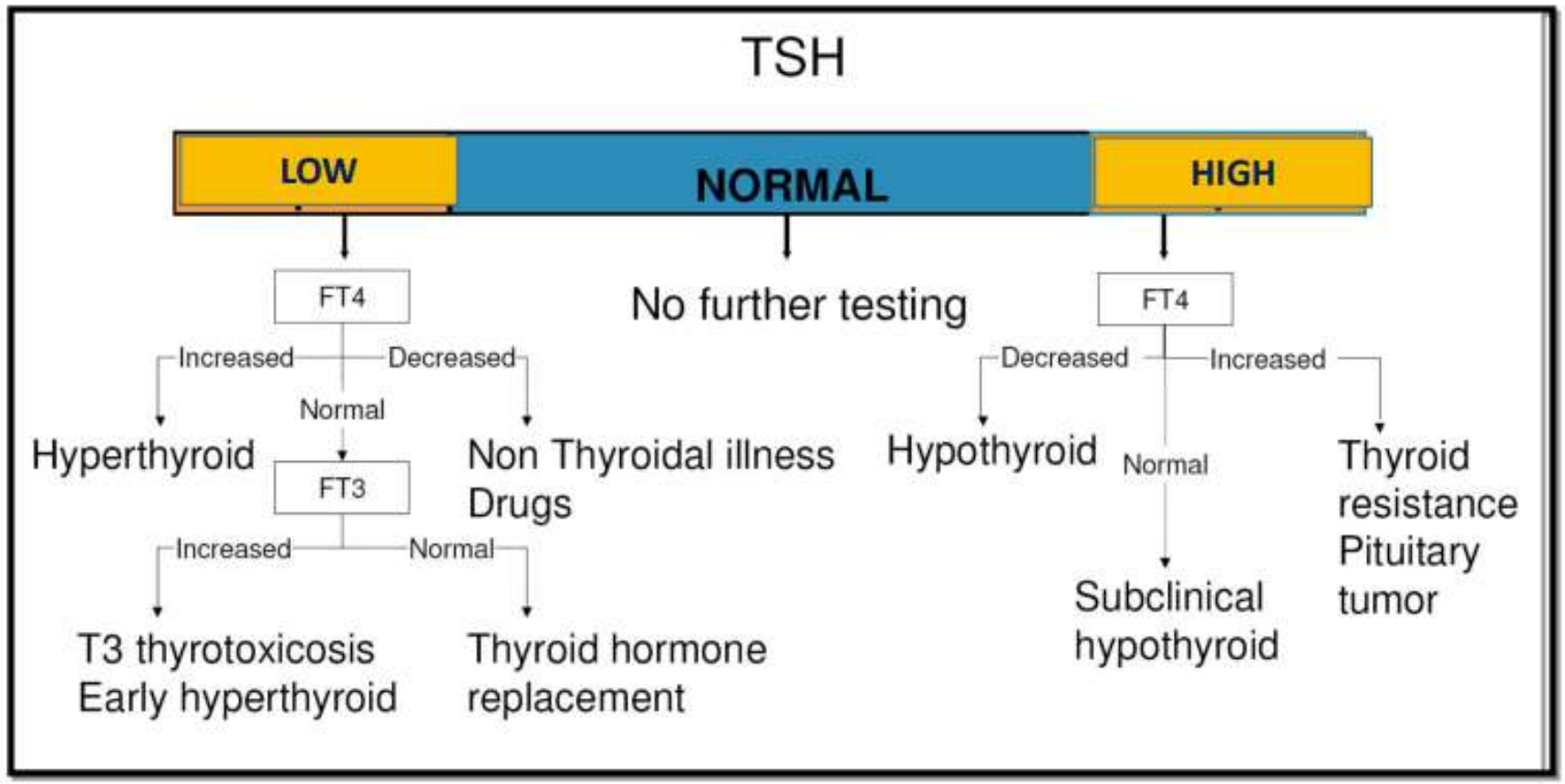
Nine Square Approach



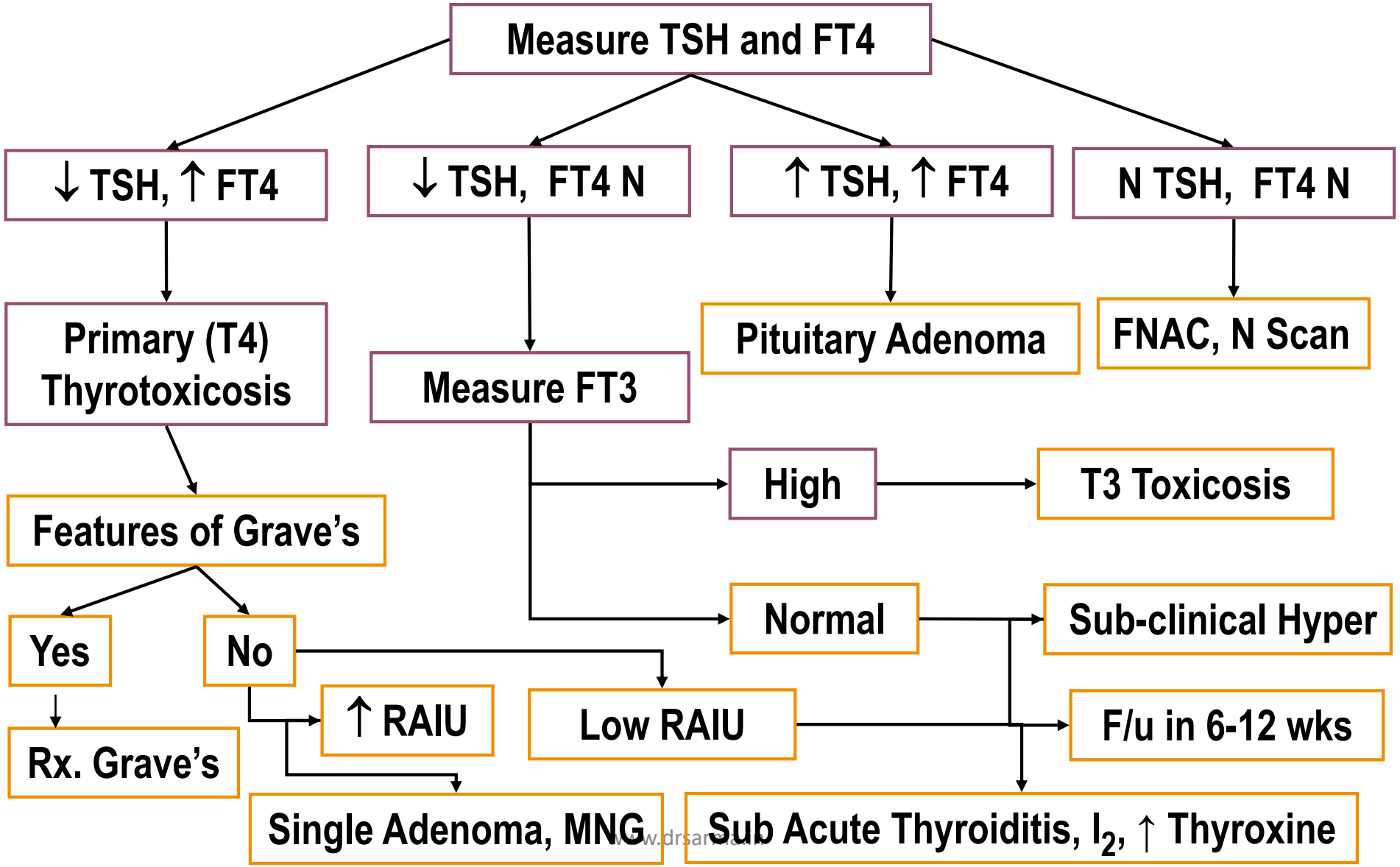
Diagnosis

1. Typical clinical presentation
2. Markedly suppressed TSH (<0.05 µIU/mL)
3. Elevated FT_4 and FT_3 (Markedly in Graves)
4. Thyroid antibodies – by Elisa – anti-TPO, TSI
5. ECG to demonstrate cardiac manifestations
6. Nuclear Scintigraphy to differentiate the causes

Diagnosa Kelainan Tiroid – Tiroid Tes



Algorithm for Hyperthyroidism



Treatment Options

1. Symptom relief medications
2. Anti Thyroid Drugs – ATD
   - Methimazole, Carbimazole
   - Propylthiouracil (PTU)
3. Radio Active Iodine treatment – RAI Rx.
4. Thyroidectomy – Subtotal or Total
5. NSAIDs and Corticosteroids – for SAT

Symptom Relief

1. Rehydration is the first step
2. β – blockers to decrease the sympathetic excess
   - Propranalol, Atenelol, Metoprolol
3. Rate limiting CCBs if β – blockers contraindicated
4. Treatment of CHF, Arrhythmias
5. Calcium supplementation
6. SSKI or Lugol solution for ↓ vascularity of the gland

How long to give ATD ?

- Reduction of thyroid hormones takes 2-8 weeks
- Check TSH and FT_4 every 4 to 6 weeks
- In Graves, many go into remission after 12-18 months
- In such pts ATD may be discontinued and followed up
- 40% experience recurrence in 1 yr. Re treat for 3 yrs.
- Treatment is not life long. Graves seldom needs surgery
- MNG and Toxic Adenoma will not get cured by ATD.
- For them ATD is not the best. Treat with RAI.

Radio Active Iodine (RAI Rx.)

- In women who are not pregnant
- In cases of Toxic MNG and TSA
- Graves disease not remitting with ATD
- RAI Rx is the best treatment of hyperthyroidism in adults
- The effect is less rapid than ATD or Thyroidectomy
- It is effective, safe, and does not require hospitalization.
- Given orally as a single dose in a capsule or liquid form.
- Very few adverse effects as no other tissue absorbs RAI

Radio Active Iodine (RAI Rx.)

- I^{123} is used for Nuclear Scintigraphy (Dx.)
- I^{131} is given for RAI Rx. (6 to 8 milliCuries)
- Goal is to make the patient hypothyroid
- No effects such as Thyroid Ca or other malignancies
- Never given for children and pregnant/ lactating women
- Not recommended with patients of severe Ophthalmopathy
- Not advisable in chronic smokers

Surgical Treatment

- Subtotal Thyroidectomy, Total Thyroidectomy
- Hemi Thyroidectomy with contra-lateral subtotal
- ATD and RAI Rx are very efficacious and easy – so
- Surgical treatment is reserved for MNG with
  1. Severe hyperthyroidism in children
  2. Pregnant women who can't tolerate ATD
  3. Large goiters with severe Ophthalmopathy
  4. Large MNGs with pressure symptoms
  5. Who require quick normalization of thyroid function

Preoperative Preparation

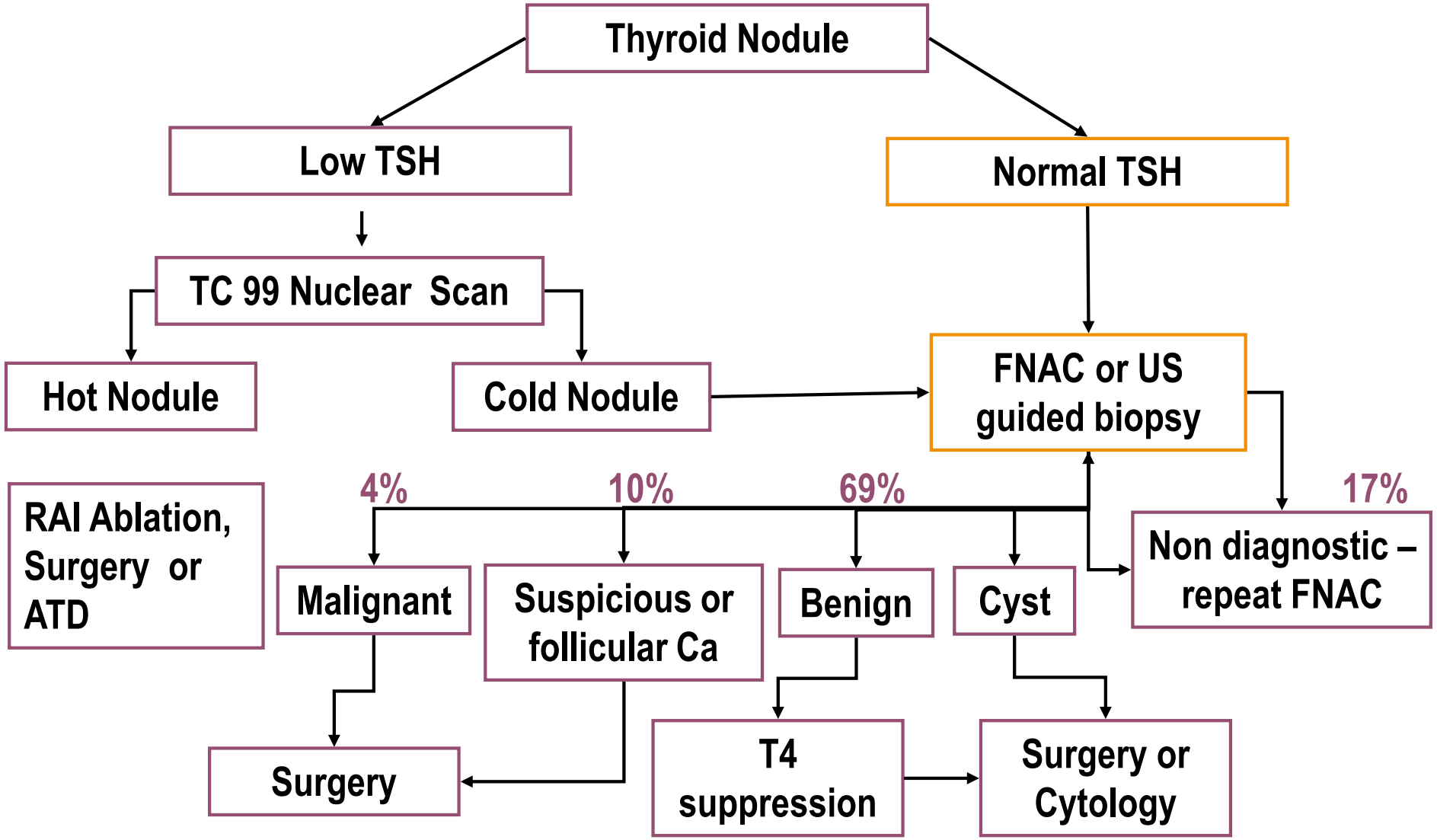
- ATD to reduce hyper function before surgery
- βeta blockers to titrate pulse rate to 80/min
- KI 1 to 2 drops bid for 14 days
- This will reduce thyroid blood flow
- And there by reduce peri operative bleeding
- Recurrent laryngeal nerve damage
- Hypo parathyroidism are complications

Summary of Hyperthyroidism

Hyperthyroidism	Age	%	Enlarged	Pain	RAIU	Treatment
Graves (TSI Ab eye, dermo, bruit)	20 - 40	60%	Diffuse	None	↑↑	ATD – 18 m
Toxic MNG	> 50	20%	Lumpy	Pressure	↑	RAI, Surgery
Single Adenoma	35 - 50	5%	Single	None	±	RAI, ATD
S Acute Thyroiditis	Any age	15%	None	Yes	↓↓	NSAID, Ster.

TSH is markedly low, FT4 is elevated

Algorithm for Thyroid Nodule



Hypothyroidism

Hypothyroidism

- Clinical syndrome resulting from a deficiency of thyroid hormone, which is in turn results in a generalized slowing down of metabolic processes.
- The most common disorders of thyroid function
- Most often caused by a disorder of the thyroid gland that leads to a decrease in thyroidal production and secretion of T4 (thyroxin) and T3 (triiodothyronine) (in which case it is referred to as primary hypothryoidism)

Pathogenesis of hypothyroidism

- Thyroid hormone deficiency affects every tissue – the symptoms are multiple.
- Characteristic finding: the accumulation of glycosaminoglycans – mostly hyaluronic acid – in interstitial tissues (skin, heart muscle, and striated muscle) with increased of capillary permeability to albumin account for interstitial edema.

  This is due to decreased destruction

  (not excessive production of glycosaminoglycan.

Causes of hypothyrodism

- Primary hypothyroidism (thyroid failure)
- Central hypothyroidism
  - Secondary (to pituitary TSH deficit)
    - i.e. Pituitary adenoma, pituitary ablative therapy, pituitary destruction
  - Tertiary (due to hypothalamic deficiency of TRH) - rare
- Peripheral resistance to the action of thyroid hormones
- Transient hypothyroidism

Causes of Hypothyroidism

- Autoimmune hypothyroidism (Hashimoto's, atrophic thyroiditis)
- Iatrogenic (I_{123}treatment, thyroidectomy, external irradiation of the neck)
- Drugs: iodine excess, lithium, antithyroid drugs, etc
- Iodine deficiency
- Infiltrative disorders of the thyroid: amyloidosis, sarcoidosis,haemochromatosis, scleroderma

Signs and symptoms of hypothyroidism in adults

Signs and symptoms of hypothyroidism tend to be more subtle than those of hyperthyroidism

- Dry skin
- Cold sensitivity
- Fatigue
- Muscle cramps
- Voice changes
- Constipation are among the most common.

Fig. Facial appearance in hypothyroidism
Note: puffy face, puffy eyes and thickened, pale skin

Harrison's Principles of Internal Medicine, 17th ed. p. 2231

Hypothyroidism Signs

- Dry skin, cool extremities
- Puffy face, hands and feet
- Delayed tendon reflex relaxation
- Carpal tunnel syndrome
- Bradycardia
- Diffuse alopecia
- Serous cavity effusions

Diagnosis

- Primary hypothyroidism
  - Low serum FT4 or FT4I, elevated serum TSH
  - Serum T3 variable, maybe normal
  - Thyroid autoantibodies (hashimoto's thyroiditis)
- Secondary
  - Low serum FT4 or FT4I, but serum TSH not elevated
  - Absence TSH response to TRH (partial or intact response indicates pituitary deficiency)

Further test and assessment (imaging)

- Assessment of thyroid iodine metabolism and biosynthetic activity
- Thyroid imaging
  - Radionucleid imaging
  - Thyroid ultrasonography
- Thyroid biopsy

Treatment of Hypothyroidism

- Levothyroxine
  - If no residual thyroid function 1.5 µg/kg/day
  - Patients under age 60, without cardiac disease can be started on 50 – 100 µg/day. Dose adjusted according to TSH levels
  - In elderly especially those with CAD the starting dose should be much less (12.5 – 25 µg/day)