Benign thyroid diseases: Hypothyroidism, thyroiditis, & simple & toxic goiter

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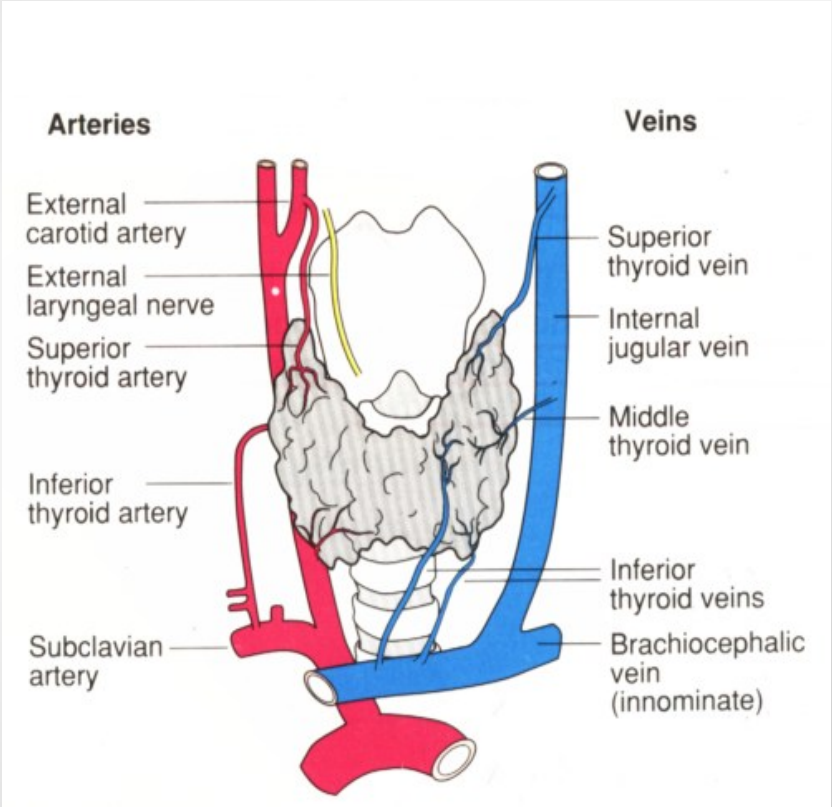
Anatomy

- Weight: 20-25 gms
- Arterial supply
  - superior thyroid arteries
  - inferior thyroid arteries
- Venous drainage
  - superior thyroid veins
  - middle thyroid veins
  - inferior thyroid veins
- Lymphatic drainage
  - pretracheal lymph nodes
  - paratracheal lymph nodes



Physiology

- Hormones
  - Thyroxin
  - Calcitonin
- Physiology
  - Trapping of iodine
  - Oxidation of iodine
  - Iodine+tyrosine → monoiodotyrosine
  - Mono+ monoiodotyrosine → di-iodotyrosine
  - Mono+ di-iodotyrosine → tri-iodotyrosine
  - Di-iodo+ di-iodotyrosine → thyroxin

Thyroid Evaluation

- TRH
- TSH
- Total T_3, T_4
- Free T_3, T_4
- RAIU
- Thyroglobulin
- Antibodies: Anti-TPO, Anti-TBG

Thyroid Evaluation

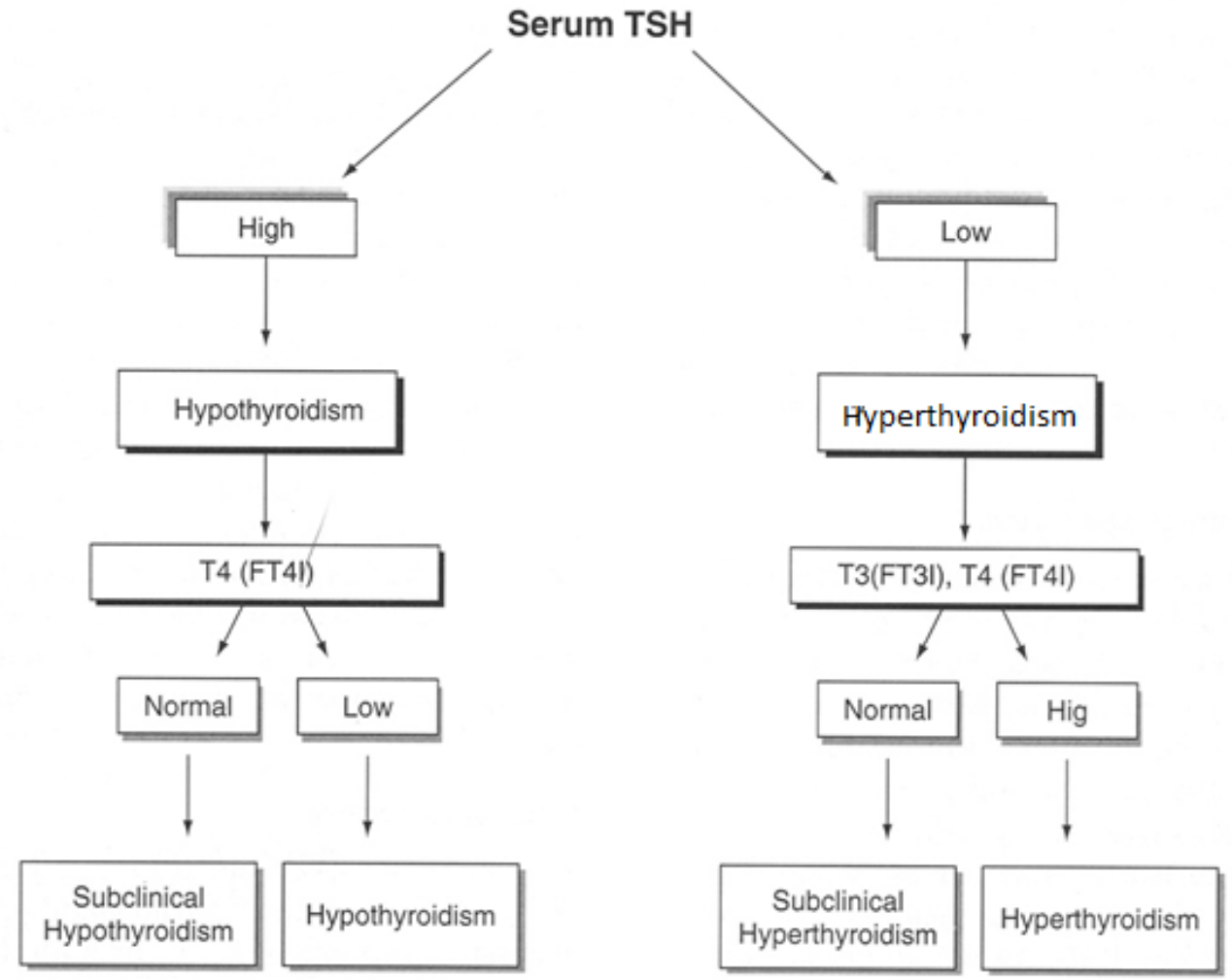
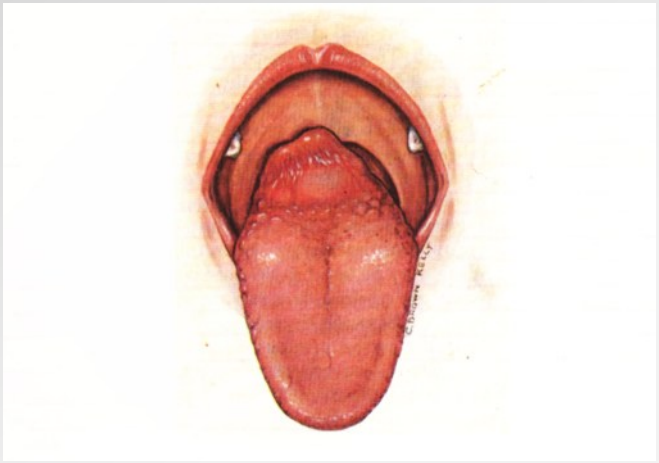


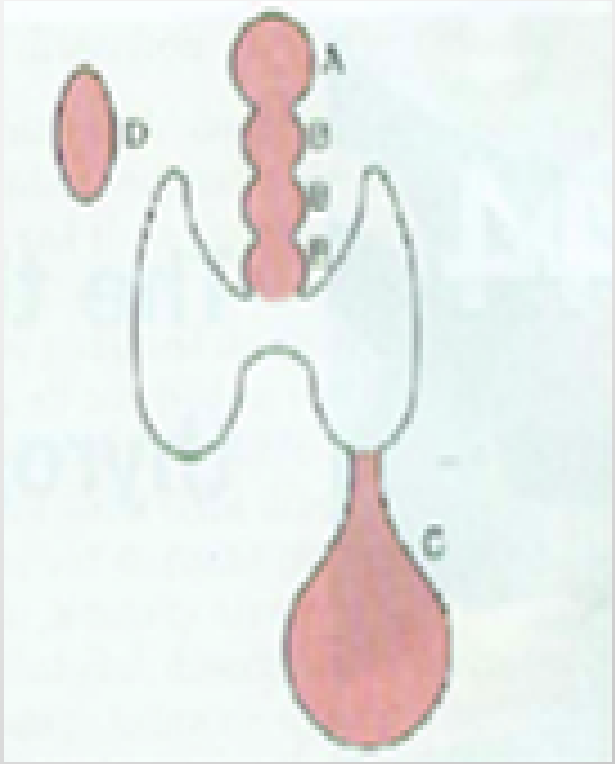
Figure 118-2. Algorithm for using the TSH level in the evaluation of thyroid function.

Anomalies

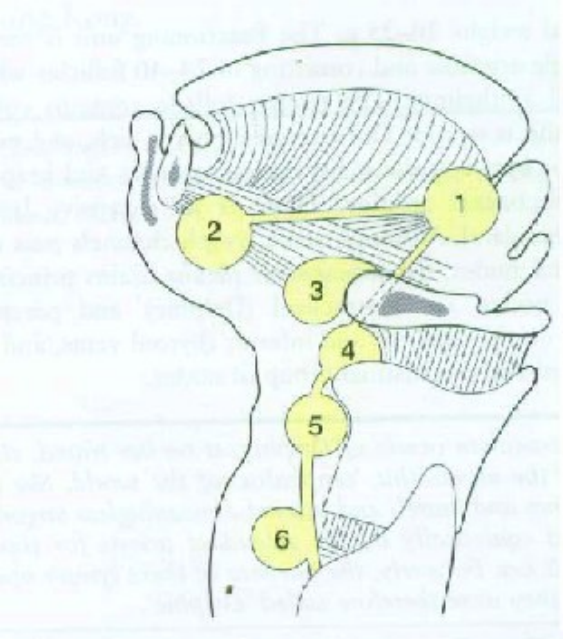
- Median ectopic thyroid
- Lateral aberrant thyroid
- Struma ovarii



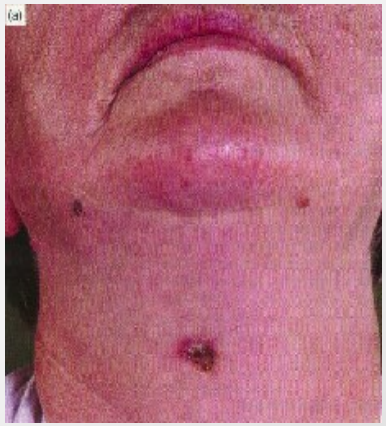
Lingual thyroid

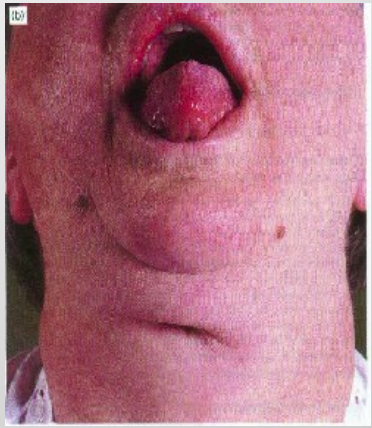


- Thyroglossal cyst



- Thyroglossal Fistula





Hypothyroidism

Etiology

- Autoimmune thyroiditis
  - Primary myxodema
  - Hashimoto's disease
- Iatrogenic
  - Post thyroidectomy
  - Post radiation
  - Drug induced
- Dyshormonogenesis
- Goitrogens
- Thyroid agenesis
- Cretinism

Types

- Primary – Thyroid gland failure
- Secondary – Pituitary failure
- Tertiary – Hypothalamic failure
- Peripheral resistance

Clinical features

- Symptoms
  - Tiredness
  - Mental lethargy
  - Cold intolerance
  - Increase in weight
  - Constipation
  - Menstrual disturbances
  - Carpal tunnel syndrome
- Signs
  - Bradycardia
  - Cold extremities
  - Dry skin
  - Periorbital puffiness
  - Bradykinesis
  - Decreased relaxation phase of ankle jerk

Diagnosis

- Thyroid function tests
  - Low FT_4, High TSH (Primary, check for antibodies)
  - Low FT_4, Low TSH (Secondary or Tertiary, TRH stimulation test, MRI)
- High serum titers of antithyroid antibodies are characteristic of autoimmune disease.

Treatment

- Oral **levothyroxin** (T_4), 0.10-0.20 mg, as a single daily dose
  - Caution is required in the elderly or those with cardiac disease, starting at 0.05 mg daily and cautiously increased.
- If a rapid response is required, **tri-iodothyronine** (20 mg three times a day) may be used.

GOITRE

Classification

- Simple
  - Diffuse
  - Multinodular
- Toxic
  - Diffuse
  - Toxic nodule
  - Toxic multinodular
- Neoplastic
  - Benign
  - Malignant
- Inflammatory
  - Autoimmune
  - Granulomatous
  - Fibrosing
  - Infective

SIMPLE GOITRE

Definition

- An enlargement of the thyroid gland not associated with inflammation or cancer.

Causes

- When the thyroid gland is unable to meet the metabolic demands;
  - Endemic (colloid) goiters are usually caused by inadequate dietary intake of iodine
  - Sporadic goiters are caused by swallowing of large amounts of certain foods or drugs

Risk factors

- Female gender, over 40 years old, inadequate dietary intake of iodine, residence in an endemic area, ingestion of large amounts of goitrogenic foods or drugs, and a family history of goiters.

Prevention

- Use of iodized table salt prevents endemic goiter.
- Limiting goitrogenic foods and drugs prevents sporadic goiter.

Clinical features

- Neck lump: thyroid enlargement varying from a single small nodule to massive enlargement
- Dyspnea or wheezing from compression of the trachea (rare)
- Dysphagia from compression of the esophagus
- Neck vein distention and dizziness when the arms are raised above the head (Pemberton's)

Investigations

- **Thyroid function test**
  - thyroid scan (normal or increased radioactive iodine uptake)
  - Ultrasound of thyroid
  - TSH → high or normal
  - T4 → low or normal
  - Urinary excretion of iodine → low
  - Antithyroid microsomal antibody

Treatment

- Hormone replacement allows for recovery of the thyroid gland.
- Small doses of iodine will treat iodine deficiency.
- Eliminating or reducing goiter producing foods or drugs is indicated for sporadic goiter.
- A large goiter that is unresponsive to medical management, or restricts swallowing and breathing, may require partial removal of the gland (subtotal thyroidectomy).

Treatment options (no compressive symptoms)

- US follow-up to monitor for progression
- **Thyroid suppression therapy**
  - May be used for progressive growth
  - May reduce gland volume up to 50%
  - Goiter regrowth occurs rapidly following therapy cessation
- **Surgery**
  - Suspicious neck lymphadenopathy
  - History of radiation to the cervical region
  - Rapid enlargement of nodules
  - Papillary histology
  - Microfollicular histology (?)

Treatment options (compressive symptoms)

- **RAI ablation**
  - Volume reduction 33 - 66% in 80% of patients
  - Improvement of dysphagia or dyspnea in 70 - 90%

  - Post RAI hypothyroidism 60% in 8 years
  - Post RAI Graves' disease 10%
  - Post RAI lifetime cancer risk 1.6%

- **Surgery**
  - Most commonly recommended treatment for healthy individuals

Course & prognosis

- The outcome is good with treatment.
- Simple goiters may disappear spontaneously, or may become large, or may progress to a toxic nodular goiter.
  - Occasionally a person may develop hyperthyroidism with a nodular goiter after receiving excess iodine therapy.
- More frequently, hypothyroidism develops.
- Thyroid malignancy.

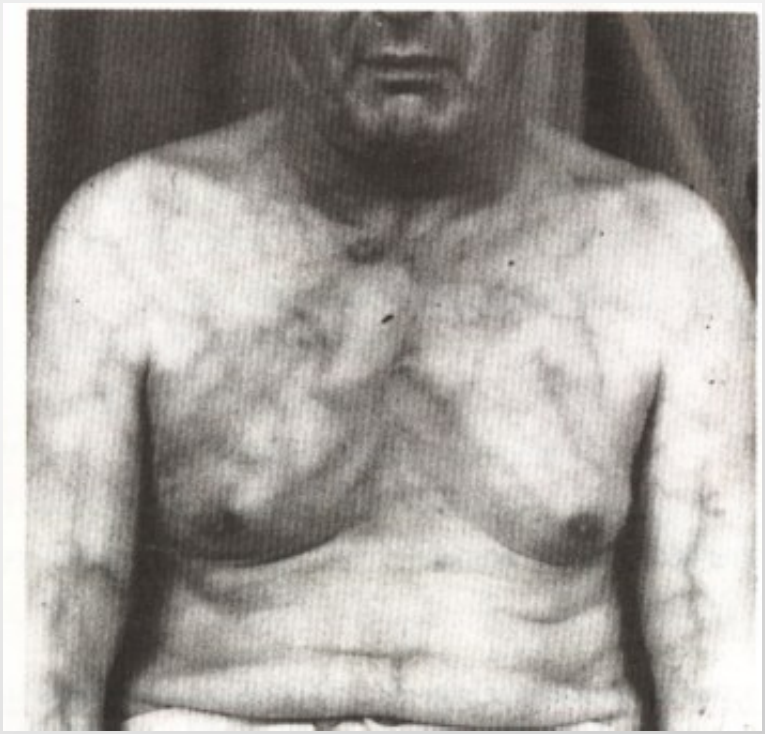
Cancer screening in non-toxic MNG

- Longstanding MNG has a risk of malignancy identical to solitary nodules (<5%)
- MNG with nodules < 1.5 cm may be followed clinically
- MNG with non-functioning nodules > 4cm should be excised
  - Incidence of cancer (up to 40%)
- FNA in MNG
  - Sensitivity 85 - 95%
  - Specificity 95%
  - Negative FNA can be followed with annual US
  - Insufficient FNA's should be repeated
  - Incoclusive FNA or papillary cytology warrants excision
- Hyperfunctioning nodules may mimic follicular neoplasm on FNA

RETROSTERNAN GOITRE

Classification

- Substernal
- Intrathoracic
- Plunging

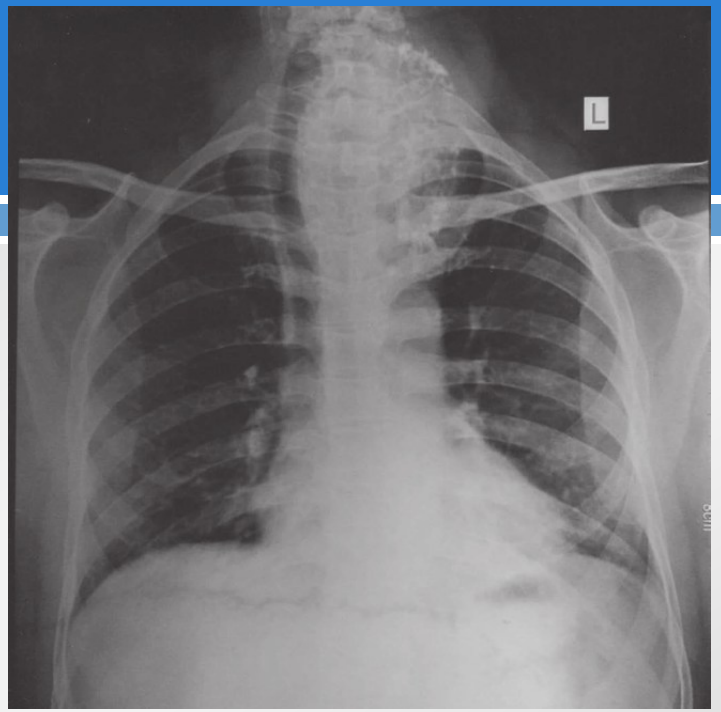


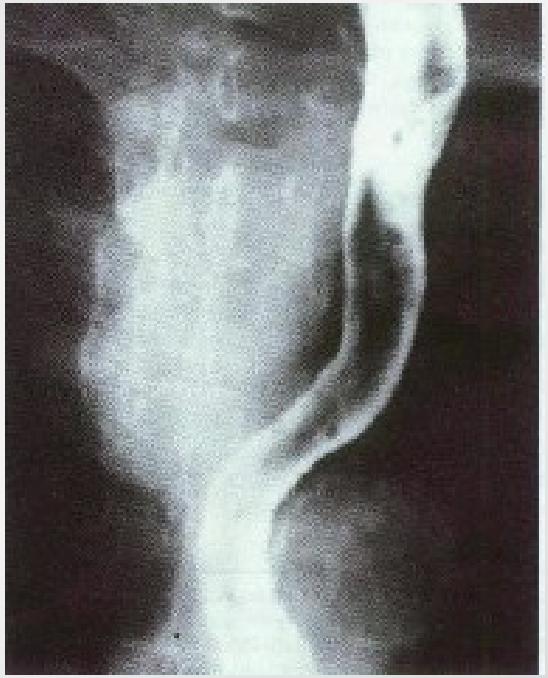
Clinical features

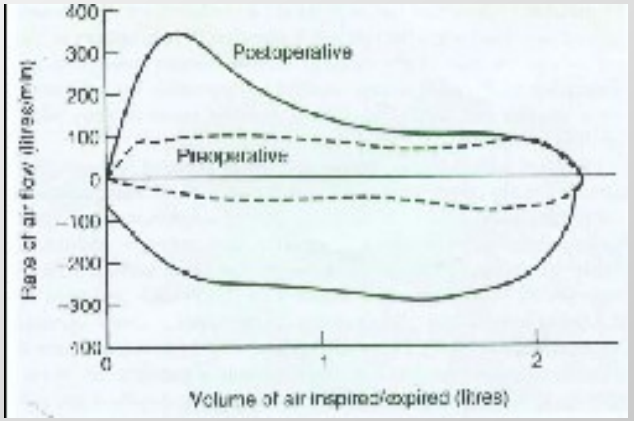
- Dyspnea
- Dysphagia
- Recurrent nerve palsy
- Engorgement of neck veins

Diagnosis

- Plain radiograph of the chest
- Radiograph of thoracic inlet
- Pulmonary function test
- CT scan







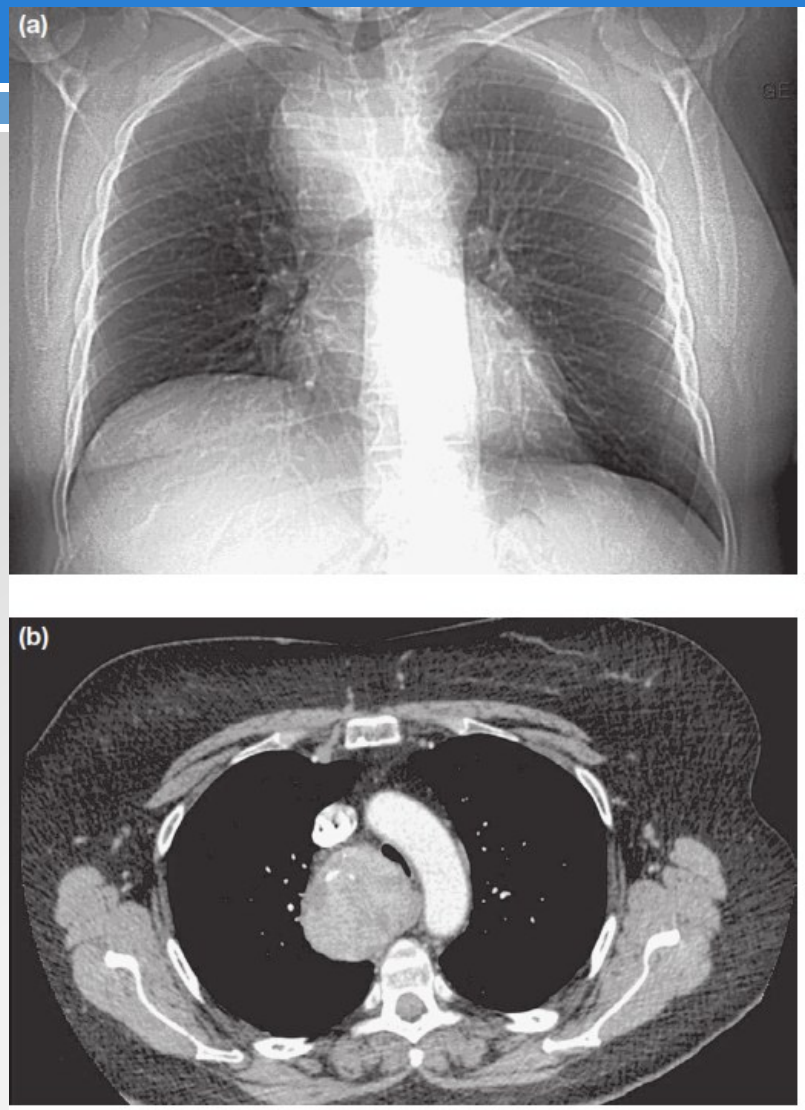


Figure 55.7 **(a)** Scout film showing retrosternal goitre. **(b)** Axial computed tomography (CT) section showing goitre extending to below the aortic arch with tracheal compression. **(c)** Coronal CT section showing goitre extending to the tracheal bifurcation. **(d)** Sagittal CT section showing goitre filling the posterior mediastinum.

Treatment

- Unwise to treat a retrosternal goiter with antithyroid drugs or radioiodine as these may enlarge the goitre
- **Resection** can almost always be carried out

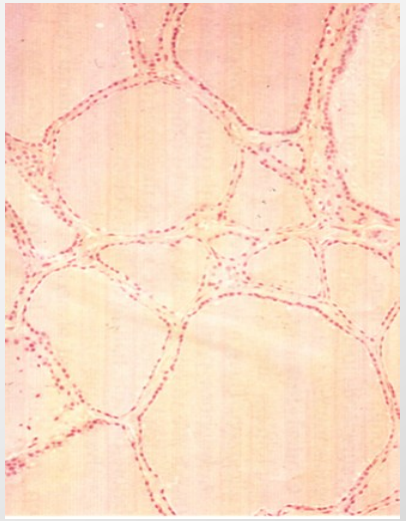
Hyperthyroidism

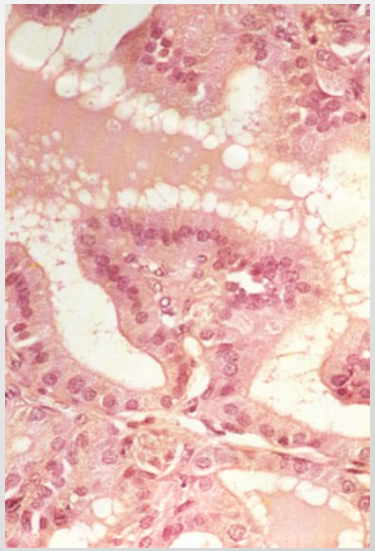
Definition

- A disease associated with overactivity of the thyroid gland (hyperthyroidism).

Clinical types:

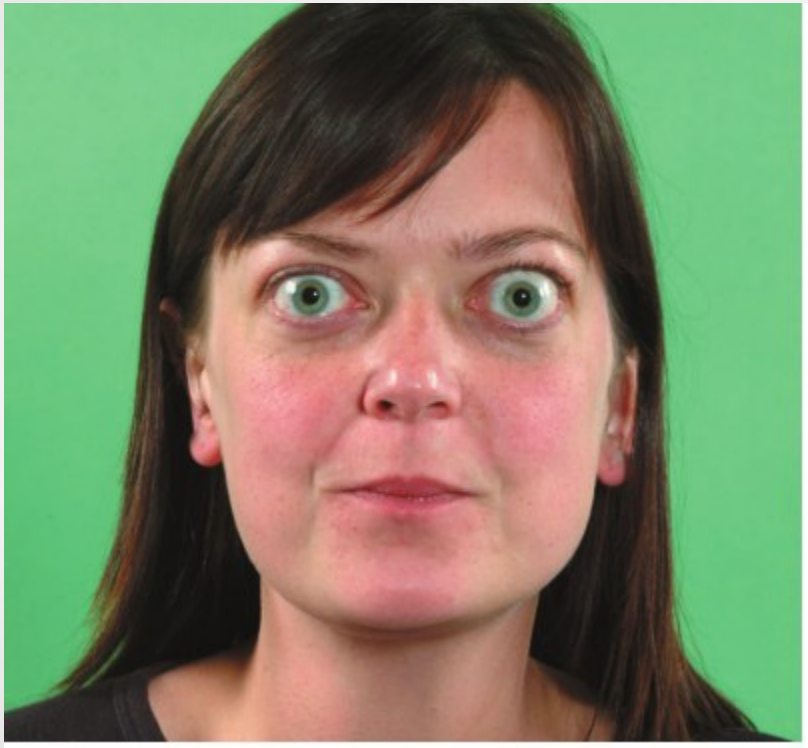
- Diffuse toxic goitre (Graves' disease)
- Toxic nodular goitre (Plummer's disease)
- Toxic nodule





Diffuse toxic goitre (Graves' disease, primary thyrotoxicosis)

- A diffuse vascular goitre appearing at the same time as the hyperthyroidism.
- Usually in the younger woman and frequently associated with eye signs.
- The whole of the functioning thyroid tissue is involved
- The hypertrophy and hyperplasia are due to abnormal thyroid-stimulating antibodies (TsAb).



Toxic nodular goitre (secondary thyrotoxicosis)

- A simple nodular goitre is present for a long time before the hyperthyroidism.
- Usually in the middle-aged or elderly .
- Very infrequently associated with eye signs.
- In many cases, the nodules are inactive, and it is the internodular thyroid tissue that is overactive.

Toxic nodule

- This is a solitary overactive nodule, which may be part of a generalized nodularity or a true toxic adenoma.
- It is autonomous and its hypertrophy and hyperplasia are not due to TsAb.
- Because TSH secretion is suppressed by the high level of circulating thyroid hormones, the normal thyroid tissue surrounding the nodule is itself suppressed and inactive.

Clinical features:

- **Symptoms**
  - Tiredness
  - Emotional lability
  - Heat intolerance
  - Weight loss
  - Excessive appetite
  - Palpitations
- **Signs**
  - Tachycardia
  - Hot, moist palms
  - Exophthalmos
  - Lid lag/retraction
  - Agitation
  - Thyroid goitre & bruit

- **CVS manifestations**
  - Tachycardia which persists during sleep.
  - Cardiac arrhythmias are superimposed on the sinus tachycardia
  - Stages of thyrotoxic arrhythmias are:
    - Multiple extrasystoles
    - Paroxysmal atrial tachycardia
    - Paroxysmal atrial fibrillation
    - Persistent atrial fibrillation, not responsive to digoxin.

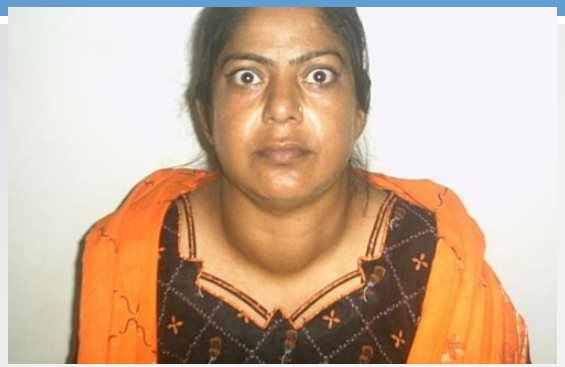
Myopathy

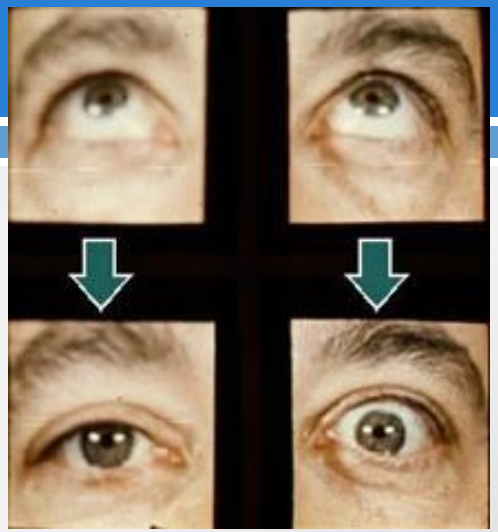
- Weakness of the proximal limb muscles is commonly found.
- Severe muscular weakness (thyrotoxic myopathy) resembling myasthenia gravis occurs occasionally.
- Recovery proceeds as hyperthyroidism is controlled.

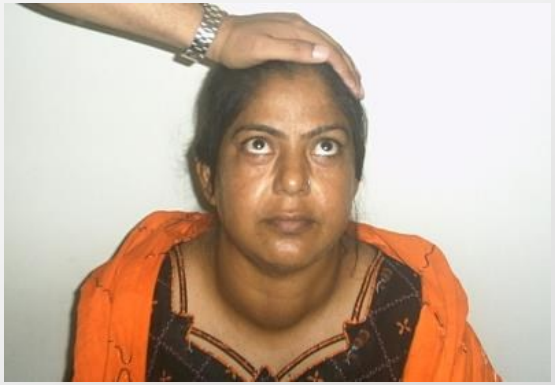
- **Eye signs**
  - Some degree of exophthalmos is common.
    - True exophthalmos is a proptosis of the eye, caused by infiltration of the retrobulbar tissues with fluid and round cells.
  - Varying degree of retraction or spasm of the upper eyelid.
    - Lid spasm occurs because the levator palpebrae superioris muscle is partly innervated by sympathetic fibres.
    - Widening of the palpebral fissure so that the sclera is seen clearly above the upper margin of the iris and cornea (Stellwag's).

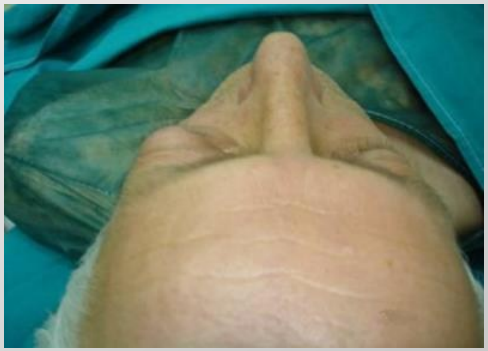
EYE SIGNS

- Lid retraction & lid lag
  - Stellwag's (Dalrymple's) sign
  - Von Graefe's sign
- Exophthalmos
  - Naffziger's test
  - Joffroy's sign
- Ophthalmoplegia
  - Inability to look up & out
  - Moebius's sign
- Malignant exophthalmos
  - Chemosis
  - Corneal ulcer
  - Impaired color vision









Diagnosis of Thyrotoxicosis

- Most cases are readily diagnosed clinically.
- **Thyroid function evaluation**
  - TSH, T4, T3
  - Overt hyperthyroidism (TSH low, T3/T4 high)
  - Subclinical hyperthyroidism (TSH low, T3/T4 normal)
  - T3 Thyrotoxicosis high free T3.
- A **thyroid scan** is essential in the diagnosis of an autonomous toxic nodule.
- FNA evaluation is not indicated in hyperthyroid nodules due to low incidence of malignancy. FNA of hyperthyroid nodules can mimic follicular neoplasms

Treatment of thyrotoxicosis

Medical Treatment

- **Antithyroid drugs**
  - Those in common use are carbimazole and propylthiouracil.
    - Initially, 10 mg of carbimazole is given 3-4 times a day, and there is a latent interval of 7-14 days before any clinical improvement is apparent.
    - When the patient becomes euthyroid, a maintenance dose of 5 mg 2-3 times a day is given for another 12-18 months.
- **Beta blockers** (eg propranolol, nadolol).
- **Iodides**, which reduces the vascularity of thyroid, should only be used as immediate preoperative preparation in the 10 days before surgery.

- **Advantages of antithyroid drugs**
  - No surgery and no use of radioactive materials.
- **Disadvantages**
  - Treatment is prolonged and the failure rate is at least 50%.
  - Some goitres enlarge and become very vascular during treatment even if thyroxin is given at the same time.
  - Very rarely, there is a dangerous drug reaction, e.g. agranulocytosis or aplastic anaemia.

Surgery

- In diffuse toxic goitre and toxic nodular goitre with overactive internodular tissue, surgery cures by reducing the mass of overactive tissue.
- In the autonomous toxic nodule, and in toxic nodular goitre with overactive autonomous toxic nodules, surgery cures by removing all of the overactive thyroid tissue.

- **Advantages of surgery**
  - The goitre is removed
  - Cure is rapid & cure rate is high if surgery has been adequate.
- **Disadvantages**
  - Recurrence of Thyrotoxicosis occurs in approx. 5%.
  - Every operation carries a morbidity .
  - Postoperative thyroid insufficiency occurs in 20-45%.
  - Long term follow-up is highly desirable.
  - Parathyroid insufficiency: this may be permanent in less than 0.5%.

Radioiodine

Radioiodine destroys thyroid cells as in thyroidectomy.

- **Advantages**
  - No surgery
  - No prolonged drug therapy.
- **Disadvantages**
  - There is a high and progressive incidence of thyroid insufficiency which may reach 75-80% after 10 years.
    - This is due to sublethal damage to those cells not actually destroyed by the initial treatment and this eventually causes failure of cellular reproduction.
  - Indefinite follow-up is essential.

Choice of therapeutic agent

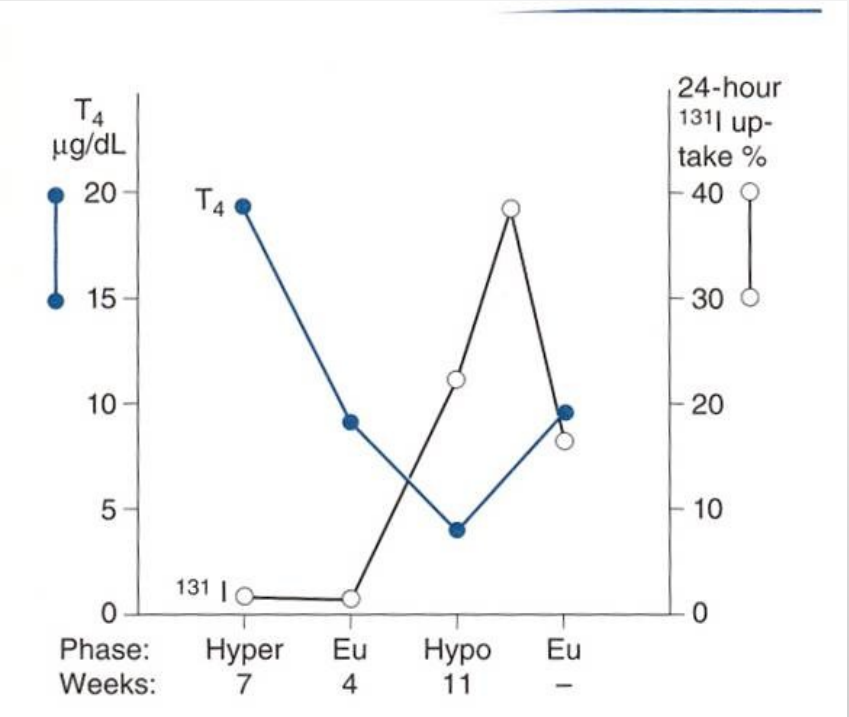
- Diffuse toxic goitre
  - Over 45: radioiodine.
  - Under 45:
    - surgery for the large goitre,
    - antithyroid drugs for the small goitre.
    - Radioiodine is being increasingly used in younger patients, particularly when their families are complete.
- Toxic nodular goitre
  - Surgery
    - Toxic nodular goitre does not respond as well or as rapidly to radioiodine or antithyroid drugs as does a diffuse toxic goitre, and the goitre itself is often large and uncomfortable and enlarges still further with antithyroid drugs.
- Toxic nodule
  - Surgery or radioiodine
    - Resection is easy, certain and without morbidity.
    - Radioiodine is a good alternative over the age of 45 because the suppressed thyroid tissue does not take up iodine and there is thus no risk of delayed thyroid insufficiency.
- Recurrent Thyrotoxicosis after surgery
  - In general radioiodine, but antithyroid drugs may be used in young women intending to have children.
  - Further surgery has no place
- Failure of previous treatment with antithyroid drugs or radioiodine.
  - Surgery

Hashimoto's (Chronic, Lymphocytic) Thyroiditis

- Most common cause of hypothyroidism
- Due to antibodies to TPO, TBG
- Commonly presents in females 30-50 yrs.
- Usually painless diffuse goitre (hypothyroidism); sometimes, acute hyperthyroidism (5%).
- Lab values
  - High TSH, Low T_4
  - Anti-TPO Ab, Anti-TBG Ab
- Treatment
  - Levothyroxine, if hypothyroid.
  - Triiodothyronine, for myxedema coma.
  - Surgery for compression or pain.

Subacute (DeQuervain's, Granulomatous) Thyroiditis

- Most common cause of painful thyroiditis
- Often follows a URI
- FNA may reveal multinuleated giant cells or granulomatous change.
- Course
  1. Pain and thyrotoxicosis (3-6 weeks)
  2. Asymptomatic euthyroidism
  3. Hypothyroid period (weeks to months)
  4. Recovery (complete in 95% after 4-6 months)



- Diagnosis
  - Elevated ESR
  - Anemia (normochromic, normocytic)
  - Low TSH, T4 is high normal or slightly raised, Absent anti-TPO/TBG
  - Low RAI uptake

- Treatment
  - NSAID's and salicylates.
  - Oral steroids in severe cases
  - Beta blockers for symptoms of hyperthyroidism, Iopanoic acid for severe symptoms
  - PTU not indicated since excess hormone results from leak (not hyperfunction).
  - Symptoms can recur requiring repeat treatment

Acute Thyroiditis

Causes

- 68% Bacterial (S. aureus, S. pyogenes)
- 15% Fungal
- 9% Mycobacterial

- May occur secondary to
  - Pyriform sinus fistulae
  - Pharyngeal space infections
  - Persistent Thyroglossal remnants
  - Thyroid surgery wound infections (rare)

Diagnosis

- Warm, tender, enlarged thyroid
- FNA to drain abscess, obtain culture
- RAIU normal (versus decreased in DeQuervain's)
- CT or US

Treatment

- IV Antibiotics
  - Nafcillin / Gentamycin or Rocephin for empiric therapy
- Search for pyriform fistulae (Ba swallow, endoscopy)
- High mortality without prompt treatment
- Recovery is usually complete

Riedel's Thyroiditis

- Rare disease involving fibrosis of the thyroid gland

- Diagnosis
  - Thyroid antibodies are present in 2/3
  - Painless "woody" goiter
  - Open biopsy often needed to diagnose
  - Associated with focal sclerosis syndromes (retroperitoneal, mediastinal, retroorbital, and sclerosing cholangitis)

- Treatment
  - Resection for compressive symptoms
  - Chemotherapy with Tamoxifen, Methotrexate, or steroids may be effective
  - Thyroid hormone only for symptoms of hypothyroidism

The End!