

Lectures presented

3rd year-2016-2017

The metabolic response to trauma

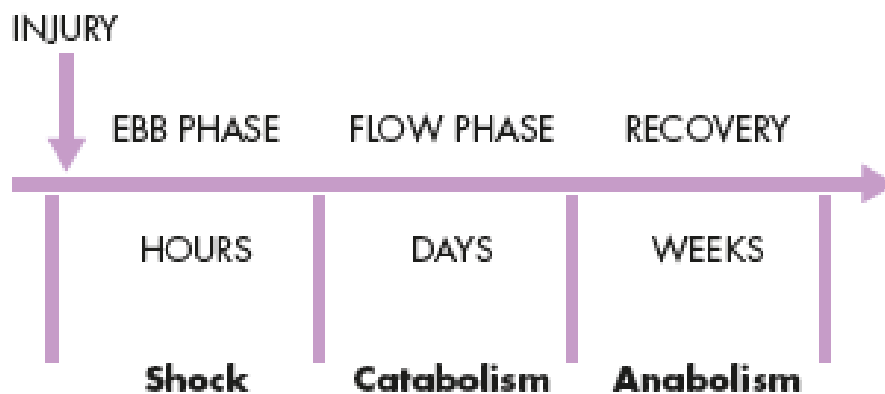
Basic concepts:

Homeostasis is a mechanism by which the internal environment of the human being is driven constant. It involves a **Signal Detector**, a **Processor** and an **Effector**. This "**Closed Loop**" is controlled by a **Negative Feedback Mechanism**.

Mediators of the SIRS or Stress Response

The 'Ebb' and 'Flow' model

The pattern of the occurrence of the previous events can be divided in to two phases; the "Ebb" and the "Flow" phase.



Catabolic Elements of the "Flow" phase of the Metabolic Stress Response

- A. **Hypermetabolism:**
- B. **Alterations in skeletal muscle protein metabolism:**
- C. **The "Acute Phase Protein Response":**
- D. **Insulin resistance:**

Changes in body composition following trauma

Avoidable factors that compound the Stress Response

- 1. Continuing haemorrhage:**
- 2. Hypothermia:**
- 3. Tissue oedema:**
- 4. Systemic inflammation and tissue underperfusion:**
- 5. Starvation:**
- 6. Immobility:**

Optimal perioperative care:

1. Modulation of the stress of the inflammation by β -blockers and epidural analgesia to reduce pain
2. Avoiding prolonged fasting
3. Avoiding early excessive saline administration (volume overload)
4. Resorting to minimal access (laparoscopic) surgery

4th year-2016-2017

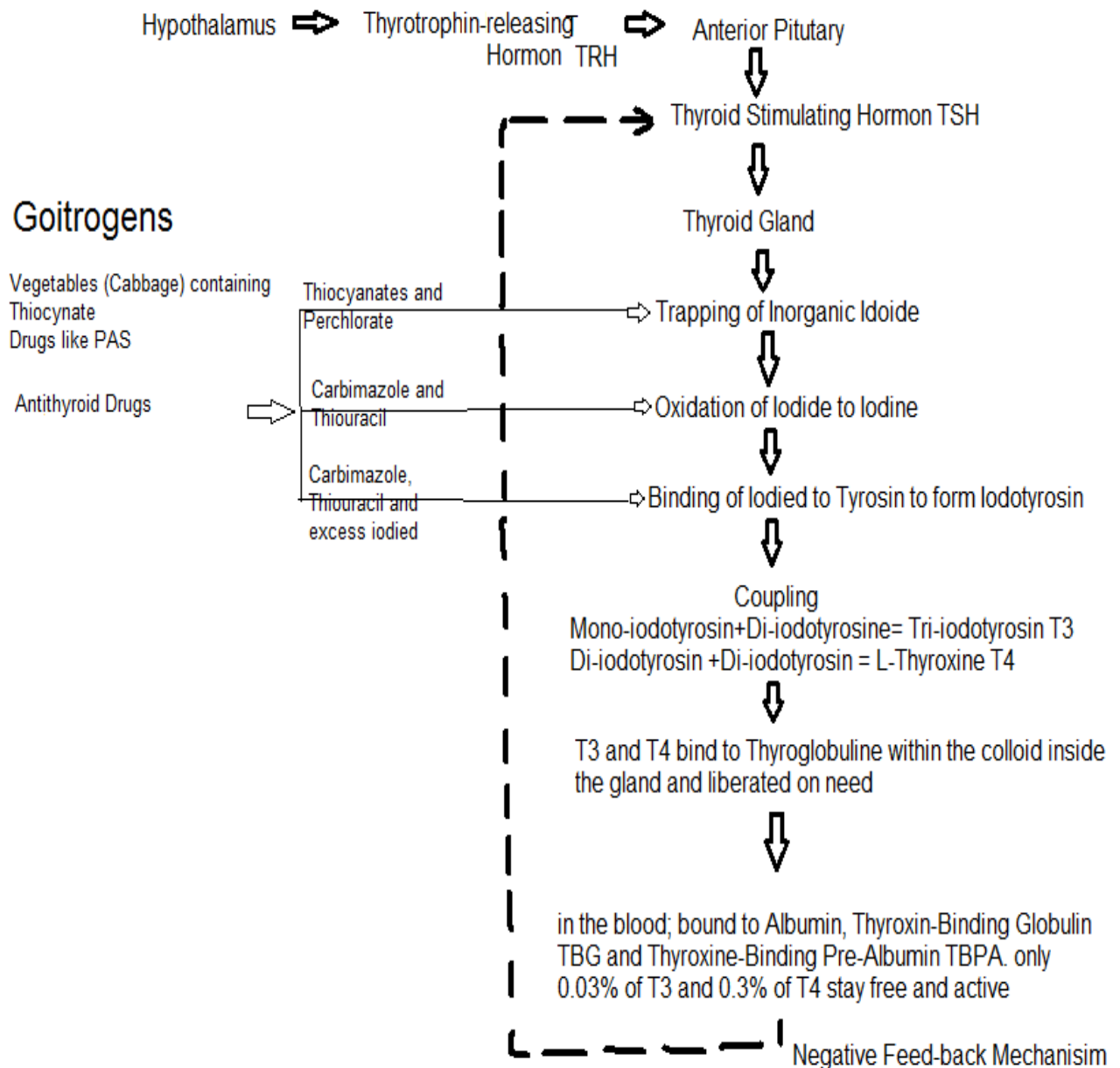
Series of 5 lectures

Notes on the Surgical Anatomy of the Thyroid Gland

Surgical Physiology of the thyroid gland

The thyroid synthesis two hormones; Tri-iodothyronin (T_3) and L-thyroxin (T_4); both are bound to the thyroglobulin within the colloid. Synthesis follows a series of steps that include trapping, oxidation, binding and coupling. When hormones are needed, they are liberated and enter the circulation; see the paragraph below.

The Pituitary-Thyroid Axis



Tests of thyroid functions

A. Thyroid hormones:

B. Thyroid Autoantibodies:

C. Thyroid imaging:

D. FNAC:

Hypothyroidism

Cretinism (Fetal or Infantile hypothyroidism)

Adult hypothyroidism

Symptoms	Signs
Tiredness	Bradycardia

Mental lethargy Cold intolerance Weight gain Constipation Menstrual disturbances Carpal-Tunnel syndrome	Cold extremities Dry skin and hair Peri-orbital puffiness Hoarse voice Bradykinesia Slow movements Delayed relaxation phase of the ankle jerk (the most useful clinical sign in diagnosis)
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Myxoedema

Dyshormonogenesis

Thyroid enlargement

Definitions:

Goitre is defined as generalised enlargement of the thyroid gland. A **single nodule** (swelling) is a discrete swelling in the thyroid with no other palpable abnormality. A **dominant nodule** (swelling) is a palpable swelling with evidence of discrete swellings elsewhere in the gland.

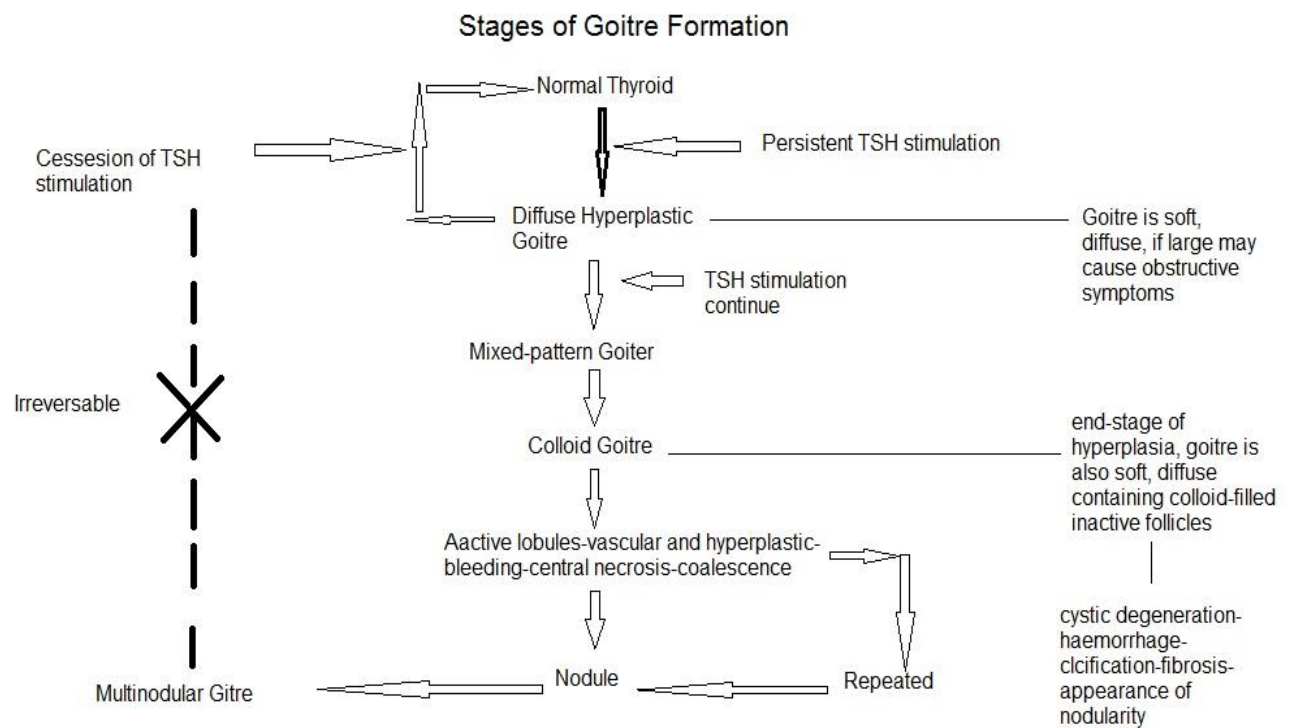
Classification of thyroid swellings:

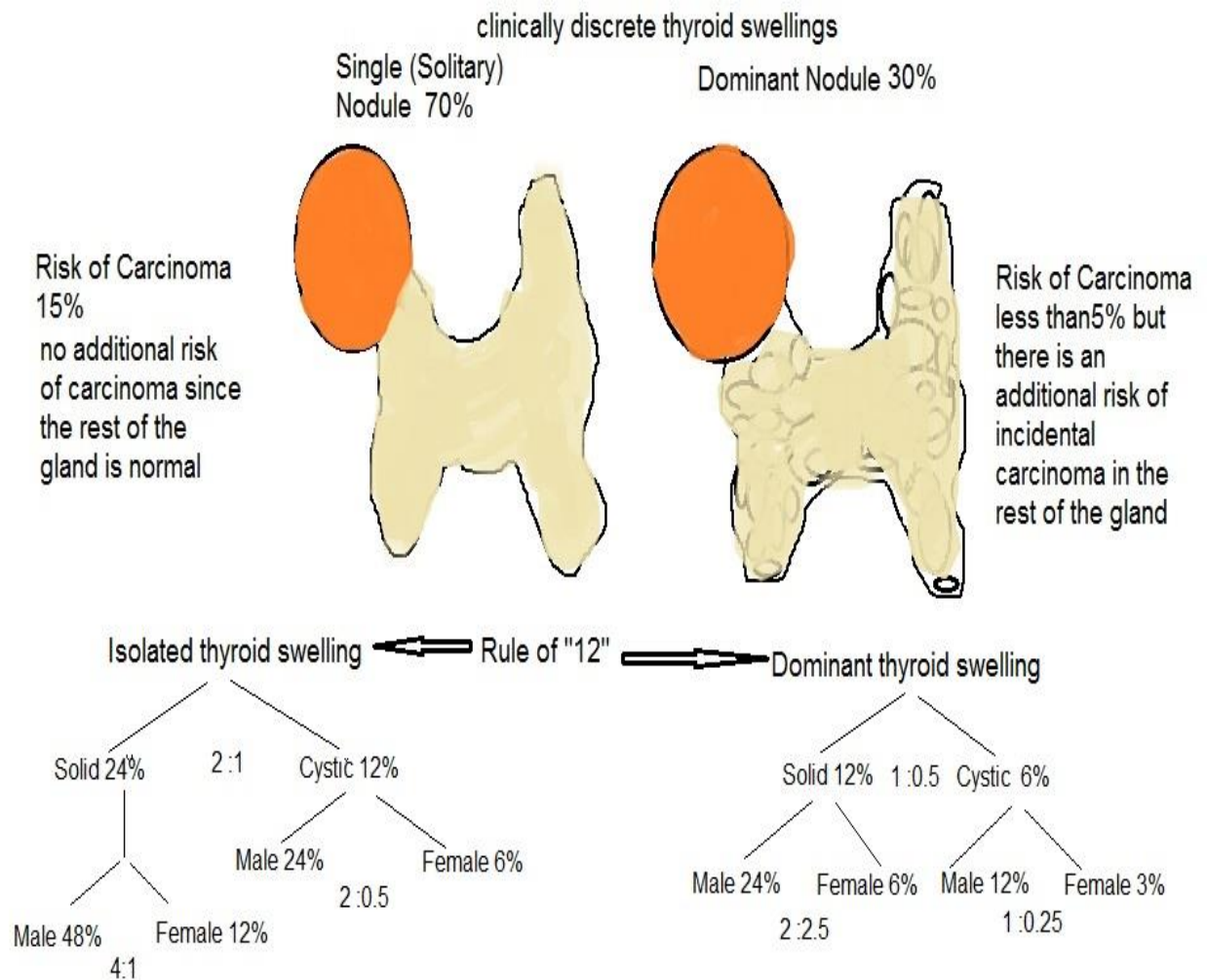
- A. **Simple goitre**; can be diffuse hyperplastic or multinodular. It can be physiological, pubertal or occurring due to pregnancy
- B. **Toxic goitre**; can be diffuse (Grave's disease, multinodular or a toxic adenoma)
- C. **Neoplastic**; benign or malignant
- D. **Inflammatory**:
 1. Autoimmune – chronic lymphocytic thyroiditis (Hashimoto's disease)
 2. Granulomatous-De Quervain's thyroiditis
 3. Fibrosing- Riedel's thyroiditis
 4. Infective- acute (bacterial or viral), chronic (TB or syphilis)
 5. Amyloidosis

Simple Goitre

Endemic	Non-Endemic (Sporadic)
<ol style="list-style-type: none"> 1. Start at childhood and progress to puberty 2. Usually there is negative family history of goitre 3. Nodularity appears early 4. Usually caused by chronic low dietary Iodine causing persistent TSH stimulation 	<ol style="list-style-type: none"> 1. Appears usually in adults 2. Usually there is a positive family history 3. Nodularity appears late 4. The etiology is Dyshormonogenesis

N.B: daily requirement of Iodine is 0.1-0.15 mg. Iodine is deficient either in water or in food or in both. There may also be failure of intestinal absorption of Iodine.





Thyroid cysts

Indications for operation in thyroid swellings:

- A. Clinical suspicion of malignancy based on:
 1. Age (children and elderly)
 2. Male sex
 3. Hardness
 4. Fixity
 5. RLN involvement
 6. Associated Cervical lymphadenopathy
 7. Recurrent cyst
- B. Diagnosis of malignancy based on FNAC result (Thy3-5)
- C. Toxic adenoma
- D. Pressure symptoms

Selection of the surgical procedure takes in consideration the followings:

1. Diagnosis if known preoperatively
2. Risk of thyroid failure (severe hypothyroidism)
3. Risk of RLN injury
4. Risk of recurrence after surgery
5. Grave's disease
6. MNG
7. Differentiated thyroid cancer
8. Risk of Hypoparathyroidism (parathyroid injury)

Definitions of thyroid procedures:

Total thyroidectomy = bilateral total lobectomy + isthmusectomy

E. Cosmetic reasons F. Patient preferences	<p>Subtotal thyroidectomy = bilateral subtotal lobectomy (max. 8 gm left on each side) + isthmusectomy</p> <p>Near-total thyroidectomy = total lobectomy on one side + subtotal lobectomy on the other side + isthmusectomy (Dunhill procedure)</p> <p>Lobectomy = total one lobe resection + isthmusectomy</p>
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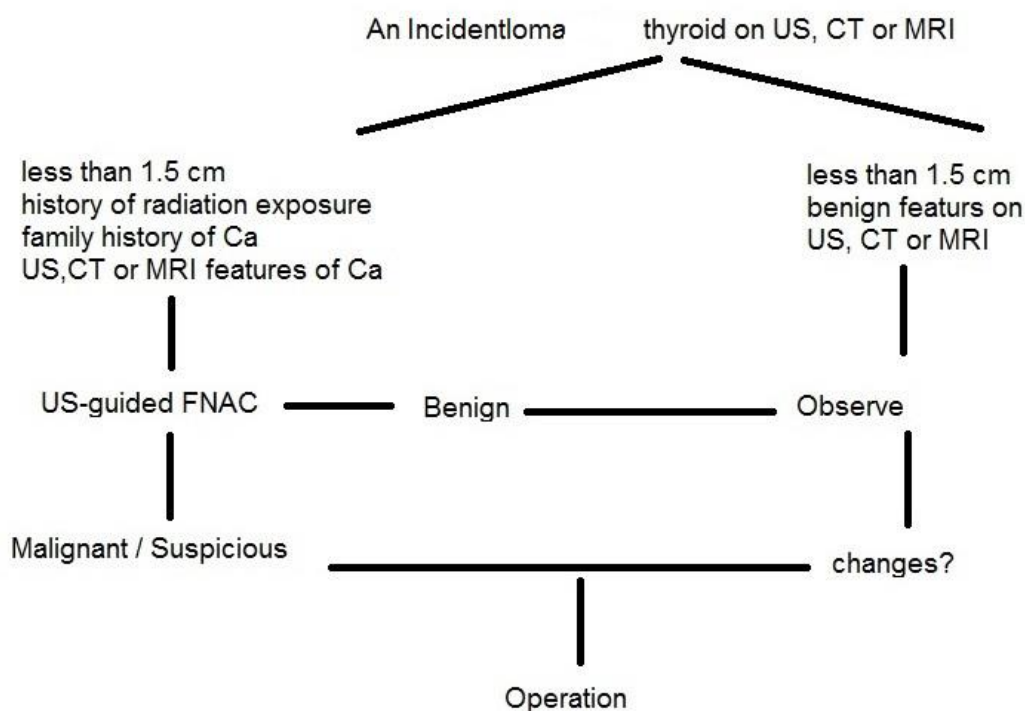
Comparison between total and subtotal thyroidectomy

Criteria	Total thyroidectomy	Subtotal thyroidectomy
Control of toxicity (for Grave's disease)	Immediate	Immediate
Return to euthyroid state	Immediate	Variable up to 2 weeks
Risk of recurrence	None	Lifelong up to 5%
Risk of thyroid failure	100%	Lifelong and reach 100% at 30 years
Risk of permanent Hypoparathyroidism	5%	1%
Need for follow up	Minimal	Lifelong

N.B: risk of recurrence and thyroid failure is a function of the proportion of the total weight of the gland (small versus large gland). Large remnant of a small gland increase risk of recurrence with lower risk of thyroid failure. Small remnant of a large gland carries lower risk of recurrence but higher risk of thyroid failure.

The Retrosternal Goitre

Thyroid Incidentaloma



Hyperthyroidism

Comparison between Primary and Secondary Thyrotoxicosis

Primary thyrotoxicosis	Secondary Thyrotoxicosis
Clinical form; Diffuse Toxic Goitre (Grave's Disease)	Toxic Multinodular Goitre; usually a simple nodular goitre is present for a long time A toxic nodule
More common in young females 20-40 years	More common in middle aged and elderly females
Onset is abrupt with remission and exacerbations	Onset is insidious and progressive if not treated
The Goitre is diffuse; vascular; large or small, firm or soft with palpable thrill and audible bruit	The Goitre is usually multinodular, often large, firm and no palpable thrill or audible bruit (less vascular)
Hyperthyroidism state is usually severe	Hyperthyroidism characteristically is NOT severe
In addition to lid lag and lid spasm; Signs NOT attributed to hyperthyroidism (Orbital Proptosis, Ophthalmoplagia and Pretibial Myxoedema) may occur	Signs NOT attributed to hyperthyroidism (Orbital Proptosis, Ophthalmoplagia and Pretibial Myxoedema) are very rare but lid lag and lid spasm are common
50% of patients have positive family history of autoimmune endocrine disorders	Usually negative family history of autoimmune endocrine disorders
Tachycardia persisting during sleep is common but cardiac arrhythmia and failure is not a feature	Cardiac arrhythmias superimposed on the sinus tachycardia is common with the progression of the disease (multiple extrasystoles → paroxysmal atrial tachycardia → paroxysmal atrial fibrillations → persistent atrial fibrillation not responding to digoxin therapy)
Usually thyroid autoantibodies (TSH-Rab) positive binding to TSH receptors site inducing a prolonged effect	Usually thyroid autoantibodies (TSH-Rab) negative
Histologically; hyperplasia and hypertrophy involve the whole thyroid tissue	Histologically; the nodules are inactive and the internodular tissue that is overactive

Symptoms	Signs
<ol style="list-style-type: none"> 1. Tiredness 2. Emotional liability 3. Heat intolerance 4. Weight loss 5. palpitations 	<ol style="list-style-type: none"> 1. Tachycardia 2. Hot moist palms 3. Exophthalmos 4. Lid lag/ lid retraction 5. Agitation 6. Goitre; thrill and bruit 7. Myopathy (proximal muscle)

	weakness is common; severe muscular weakness {thyrotoxic myopathy} is occasional. Myopathy recover with control of thyrotoxicosis)
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Toxic Nodule

Comparison between different modes of treatment for thyrotoxicosis

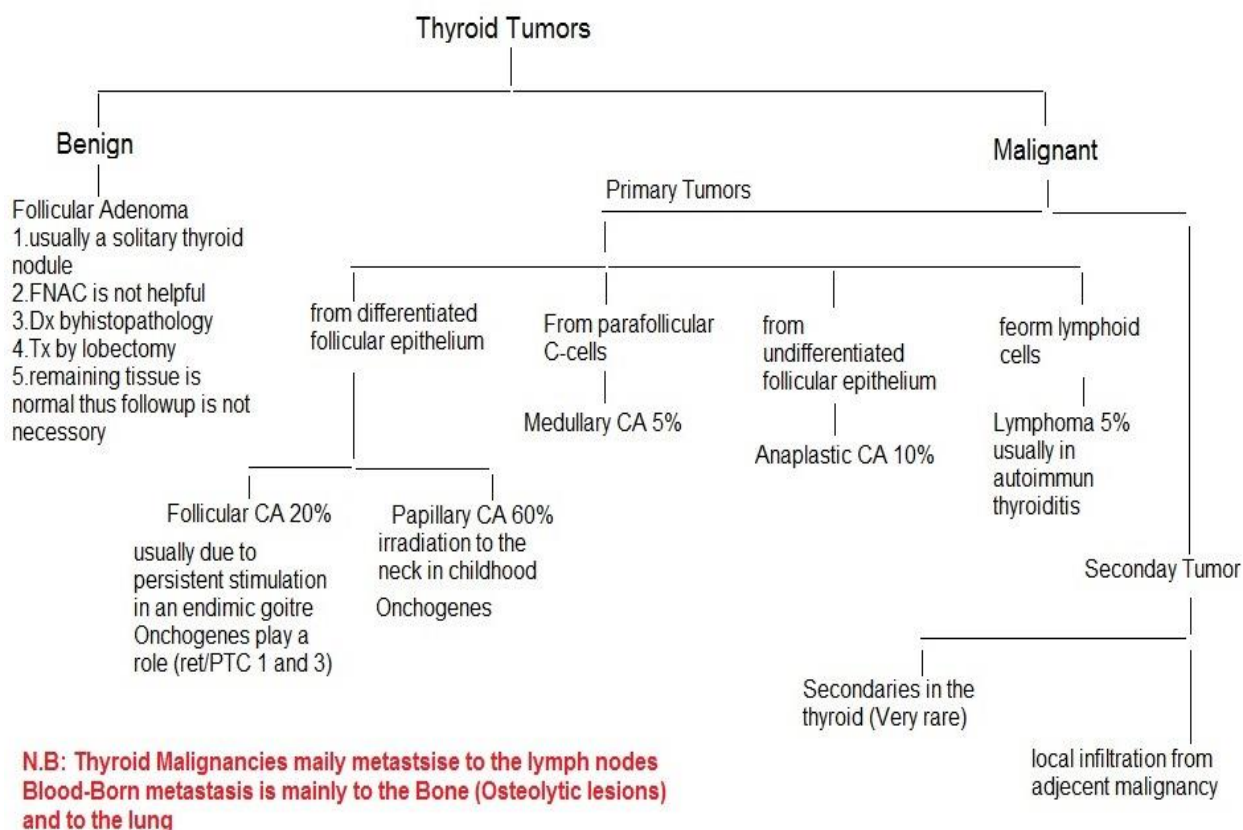
Features	Antithyroid drugs	Surgery	Radioactive Iodine
Principle action	Interfere with synthesis of thyroid hormones	Reduce or remove the mass of overactive thyroid tissue	Destroy thyroid cells thus reduce the mass of overactive thyroid tissue
Advantages	Obviate the need for surgery or radioactive material	1.Cosmetic; goitre is removed 2.Cure is rapid 3.High cure rate 4.Good compliance	1.No surgery 2.No prolonged drug therapy 3.Reliable compliance
Disadvantages	1.Treatment is prolonged 2.High failure rate ≈50% 3.Poor responders (limited efficacy) in: a. Large gland b. Severe thyrotoxicosis c. High level TSH-Rab 4.increase in size and vascularity of some goiters during therapy 5.dangerous drug reactions (Agranulocytosis and aplastic anaemia) 6. cannot cure a toxic nodule 7.Problems in compliance	1.Different degrees of thyroid failure proportional to the mass of thyroid remnant 2. the need for lifelong replacement with near total and total thyroidectomy 3. recurrence; although low and proportional to the mass of thyroid left 4. risk of permanent Hypoparathyroidism <5% 5.Risk of RLN injury 6.possibility of poor scar result in young patient 7.unfit patient	1.cumbersome (isotope facilities and patient isolation) 2.avoidance of pregnant patient 3.physical contact is prohibited during therapy 4.precussions in children 5.thyroid failure is dose related 6.response is slow 7. eye signs may be aggravated during treatment
Choice of therapy	Antithyroid drugs	Surgery	Radioactive Iodine
For Diffuse Toxic Goitre	Reliable initial treatment	1.Large diffuse Toxic Goitre in pregnant patient 2.patient refuse radiation therapy	Relapse after antithyroid therapy for small Diffuse Toxic Goitre

		3. patient with progressive eye signs	
For Toxic Nodular Goiter	Poor choice	Treatment of choice	Poor choice
For a Toxic Nodule	No place; useless	Treatment of choice	A good alternative for patient > 45 years
For recurrent thyrotoxicosis after surgery	Poor choice	Has little place	Treatment of choice
Failure of antithyroid or ¹²³I therapy	No place	Best choice	Ablation ¹²³ I therapy is an alternative to surgery
In pregnancy	Possible BUT Risk of hypothyroid goitre in the born baby	Possible BUT Danger of abortion	Absolutely contraindicated
Children and adolescents	Best choice until late teen	Poor initial choice but good choice after teen	Relatively contraindicated
In the thyrocardiacs; severe secondary thyrotoxicosis	Before or after radioactive iodine therapy and continued for 6 weeks	Poor choice	Treatment of choice
Thyrotoxicosis associated with diffuse or focal thyroiditis	Best choice	If antithyroid therapy failed	If antithyroid therapy failed

Notes:

1. *Antithyroid drugs include Carbimazol and propylthiouracil, the β -adrenergic (Propranolol and Nadolol), and the Iodides*
2. *The β -adrenergic block the cardiovascular effect of elevated thyroxine. The β -Adrenergic blockers act on the target organs and not the gland to abolish the symptoms. Propranolol also inhibits peripheral conversion of T_4 to T_3 . Nadolol is longer in action than Propranolol*
3. *Iodides reduce the vascularity of the gland and Lugol's iodine solution is only indicated as immediate preoperative preparation 10 days before surgery*
4. *Dose of Carbimazol is 10 mg t.d.s or q.d.s for 7-14 days then a maintenance dose of 5 mg for 6-24 months*
5. *"Block and Replacement" therapy may be used; a high inhibitory blocking dose of antithyroid drug along with Eltroxine replacement 100-150 μ g/day*

Surgery for thyrotoxicosis**Postoperative complications**



Differentiated thyroid cancer

Comparison between papillary and follicular carcinoma

	Papillary	Follicular
Age and sex incidence	Young females	Middle age females
Background history	Irradiation to the neck in childhood Oncogenes?	Long standing multinodular goitre Oncogenes?
Clinical presentation	Solitary or dominant thyroid nodule Incidental on histopathology Cervical lymphadenopathy alone	Recent changes in a longstanding MNG
Pathology	Gross: usually not encapsulated Microscopically: papillary projections; Psammoma bodies and characteristic epithelial cells with pale empty (Orphan-Annie-eyed) nuclei Multicentric growth is common	Gross: often encapsulated Microscopically; follicular cells with capsular invasion (contrast with follicular adenoma) Multicentric growth is rare
Metastasis	Cervical LN; common Blood-born unusual only if growth extend extrathyroidal	Cervical LN; uncommon Blood-born metastasis common to the bone and lung
Special variety of the tumor	The occult or micro-papillary carcinoma: Constitute 1/3 of cases	The malignant Hürthel cell tumor; a variant of follicular carcinoma in which oxyphil

	<p>Tumor foci <1 cm</p> <p>Mostly subclinical; majority do not progress to clinical form</p> <p>Small percentage may present as metastasis to cervical LNs or as pulmonary metastasis with no clinical thyroid swelling</p> <p>May be incidentally discovered on histopathology of resected thyroid</p>	cells predominate
Prognosis	<p>Generally very good and Dependent on:</p> <ol style="list-style-type: none"> 1. Age at diagnosis 2. Size of the tumor 3. Presence of metastasis 4. Histological evidence of extra-thyroidal spread 5. Completeness of excision 6. Excellent for the occult variety 	<p>Good and Dependent on:</p> <ol style="list-style-type: none"> 1. Age at diagnosis 2. Size of the tumor 3. Presence of metastasis 4. Histological evidence of capsular transgression 5. Completeness of excision 6. Poor for the Hürthel cell variety

Thyroiditis

Comparison between different types of thyroiditis

	Chronic Lymphocytic (Autoimmune) thyroiditis (Hashimoto's Disease)	Granulomatous subacute (De Quervain's) thyroiditis	Riedel's thyroiditis
Nature of the condition	Autoimmune	Infective-viral	? collagen disorder
Age, sex incidence	Commonly menopausal females but also in middle age	Commonly middle age females	More common in elderly females
General incidence	common	Not very common	Rare condition
Onset	Insidious and asymptomatic or sudden and painful	Acute or subacute onset	Insidious and take a chronic course
Presentation	Usually goitre; diffuse or MNG. There may be a dominant nodule. There may be no goitre	Pain in the neck, fever, malaise and a firm, irregular enlargement of one or both lobes. 30% asymptomatic with a small unilateral or bilateral goitre	Early- unilateral or bilateral small, hard and fixed goitre Late- evidence of tracheal or RLN involvement
Thyroid status	Early- euthyroid or subclinical	In subacute cases- usually euthyroid or	Usually a subclinical or

	hypothyroid Late- frank thyroid failure (myxoedema)	hypothyroid In acute cases- early mild hyperthyroid state	clinical hypothyroid state
Thyroid antibodies	Positive and high titer	Negative	Negative
Inflammatory markers in the blood	Negative	raised	negative
¹²³I-scan	Normal or diffusely low uptake. There may be a cold nodule	Diffusely low	No uptake (cold scan)
Possible associations	Papillary carcinoma and malignant lymphoma	No specific association	Retroperitoneal or mediastinal fibrosis
Family history	Positive for autoimmune conditions in 85% of cases	Negative	Negative
Thyroid function tests	Variable (significant if biochemical hypothyroidism)	Serum T ₄ may be high normal	Biochemical evidence of hypothyroidism
Progression	Insidious and progressive with an end-stage of myxoedema without goitre	Self-limiting with subsidence of goitre	Progressive with infiltration of adjacent structure and frank hypothyroid state
Histopathology	Intense lymphocytic plasma cell infiltration with acinar destruction and fibrosis	Predominant infiltration with inflammatory cells	Replacement by cellular fibrous tissue with evidence of capsular destruction and infiltration of adjacent structures
Differential diagnosis	MNG, papillary carcinoma, follicular carcinoma and malignant lymphoma	Acute or subacute bacterial thyroiditis and thyroid abscess	Anaplastic carcinoma of the thyroid
FNAC	Appropriate but difficult when follicular ca or lymphoma is suspected	Confirm the diagnosis	Nonspecific and tissue diagnosis is essential- Tru-cut or excisional biopsy (usually isthmusectomy)
Principle of treatment	Thyroid replacement	For symptomatic cases; oral steroid	High-dose steroid therapy, Tamoxifen

	therapy If goiter increase in size; steroid therapy is indicated For large goitres; thyroidectomy may be indicated	therapy in tapering dose If hypothyroidism occur; then thyroid replacement therapy	and thyroid replacement therapy
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