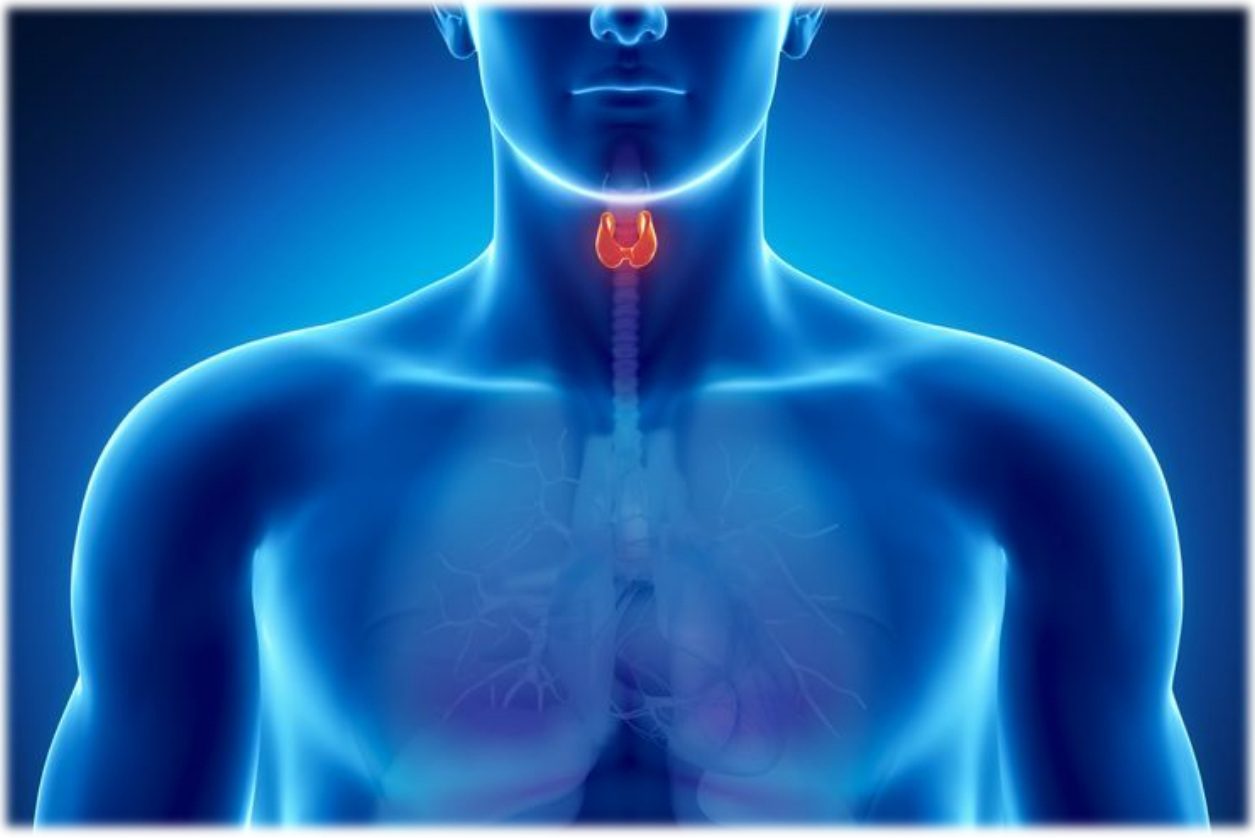
ENDOCRINE BLOCK



THYROID GLAND

Correction File

Case..
A previously healthy 30-year-old woman visits her physician complaining of a racing heart, sweating, weight loss, and tremulousness. She appears anxious, and on further questioning reports that her anxiety and restlessness have begun to cause problems at her workplace. Physical examination reveals tachycardia, moist skin, fine body hair, and bilateral bulging of her eyes. *(Exophthalmos and pretibial myxedema)*

Mention the hormone that elevates in this case? Thyroid hormone : T3 and T4

What is the most likely diagnosis? Graves disease.

What demographic group does this condition typically affect?
Graves disease occurs 8 times more frequently in women than men. the prevalence is higher in populations with a high iodine intake. the disease rarely occurs before adolescence and typically affects individuals in the 4th to 6th decades of life.

What is the pathophysiology of this condition?
It is caused by autoimmune-induced hyperthyroidism. Immunoglobulins (IgG) mimic thyroid-stimulating hormone (TSH) and activate the TSH receptor. (type II hypersensitivity), ⬆circulating level of thyroid- stimulating immunoglobulins (TSI).

What are the appropriate treatments for this condition?
1- Thyroidectomy 2- Thyroid-inhibiting medications, 3- Radioactive iodine ablation

Talk brifely about Thyroid storm & how to treat it ?
Thyroid storm is life-threatening surge of thyroid hormone in the blood that is Due to elevated catecholamines and massive hormone excess, caused by infection, trauma or long standing hyperthyrdism and present with arrhythmia, hyperthremia, vomiting & hypovolmic shock.
Treatment : Should be treated in ICU for close monitoring of vital sign
- Correct elctrolyte abnormalities (eg : Cardiac arrhythmia , Hyperthermia)
- Antiadrenergic drugs
- High-dose Propylthiouracil (PTU) is preferred because of its early onset of action (risk of severe liver injury and acute liver failure)
- Administer iodine compounds - Hydrocortisone to prevent shock.

What do yoy think about level of calcium, chlosterol and glucose in blood after elevation of this hormone ?
hyperthyroidism causes hypercalcemia, hypocholesterolemia and hyperglycemia

How can the hyperthyrodism cause hyperglycemia ?
1- ⬆ gluconeogenesis 2- ⬆glycogenlysis 3- ⬆ GI absorbtion

Mention the arterial supply and venous dranige of thyroid gland ?
Arteries : thyroid ima , superior and inferior thyroid arteries
Veins : superior, middle and inferior thyroid veins

How to diagnose this disease ? ⬆ free T3 and T4 , & ⬇ TSH

Case..

52-year-old woman presents to the clinic with several months' history of generalized weakness, cold intolerance, & weight gain. Physical examination reveals alopecia, a thick & beefy tongue, myxedema, & delayed deep tendon reflexes. Her heart rate is 55/min and her blood pressure is 100/70 mm Hg. She is not taking any medications. Relevant laboratory findings are as follows: Free thyroxine (T4): 4.5 pmol/L (normal: 10.3–35 pmol/L) Thyroid-stimulating hormone (TSH): 31 μU/mL (normal: 0.8–2 μU/mL) Cholesterol: 230 mg/dL

Mention the 3 diffrential diagnosis of this case ?
1- Hashimato thyroditis 2- thyroid carcinoma 3- Iodine deficiency
What is the appropriate treatment for this condition ? Levothyroxine (synthetic T4 hormone).
Mention 4 other symptoms that can be found in this patient?
1-Poor appetite 2-consitipation 3- Dry skin 4- Loss of libido

If the patient was newborn and has the same disease. mention the possible complication if the patient wasn't treated and 3 symptoms of that disease ?(congenital hypothyroidism)
critinism (mental retardation, short stature,umblical hernia ,Protruding tongue.) .Changes are irreversible unless treatment is given early. the causes :
o Congenital lack of thyroid gland (congenital cretinism).
oGenetic deficiency leading to failure to produce hormone.
o Iodine lack in the diet (endemic cretinism).

Mention 3 congential anomlies of thyroid gland ?
1-Ectopic thyroid tissue or gland 2-Thyroglossal cyst 3-Presistence of thyroglossal duct

Mention 3 stimulatory factors and 3 inhibtory factors of thyroid hormone ?
stimulatory: 1- TSH 2- Thyroid stimulating immunoglobin 3- ⬆TBG levels (pregnancy)
inhibtory: 1- Iodide deficiency 2- anti-hyperthyrodism drugs 3- ⬇in TBG levels
4-Deiodinase deficiency 5-Excessive I- intake (Wolff-chaikoff effect)

Case..

As part of Federal Aviation Administration requirements, a 55-year-old pilot presents for a complete checkup. Upon examination of the patient's neck, the physician notes a firm nodule in the right upper lobe of the thyroid that remains fixed with swallowing. Ultrasound-guided fine-needle aspiration (FNA) reveals ground-glass cytoplasm, inclusion bodies, and calcifications.

Mention the diagnosis, 3 risk factors and the features if was taken biopsy from the patient ?
Diagnosis: Papillary thyroid cancer.
Risk factors : 1- female gender 2- prior radiation exposure 3- family history 4- Hashimato thyroditis
Features : The combination of "ground-glass" cytoplasm, "Orphan Annie" inclusion bodies, prominent nuclei with clefts and grooves, and calcified psammoma bodies point to the diagnosis.

How does TH secretion is regulated?
Regulated by the hypothalamic-pituitary axis → TRH(A tripeptide released from paraventricular nuclei) → TSH Glycoprotein has Trophic effect

What are the actions of TSH?

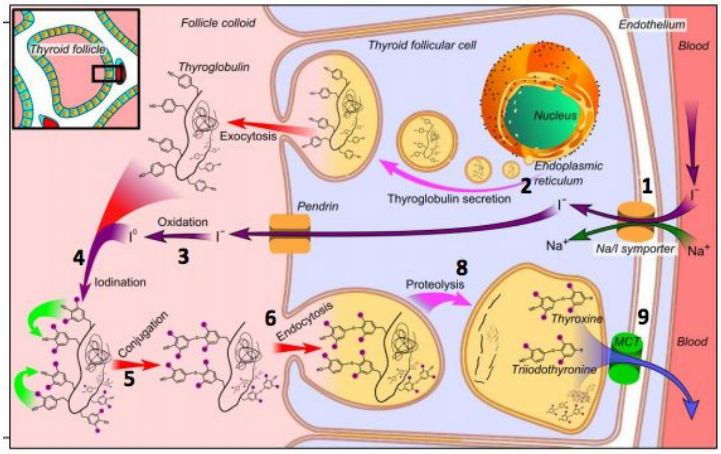
⬆ proteolysis of the thyroglobulin.	⬆pump activity.	⬆Iodination of tyrosine.	⬆coupling reaction.

Thyroid Hormone Action :
TSH + receptor → activation of adenylyl cyclase via Gs protein→⬆cAMP → activation of protein kinase→ multiple phosphorylation → secretion & thyroid growth.

MYXEDEMA COMA
The treatment of choice is loading dose of levothyroxine (1st line of treatment)
I.V. hydrocortisone may be used in case of adrenal and pituitary insufficiency.

List the steps of thyroid hormone synthesis.

1- Iodide pump or iodide trap.(active transport stimulated by TSH) in the basal membrane
2- Thyroglobulin formation & transport. (glycoprotein , tyrosine , rER & Golgi apparatus) Each molecule contains Tyrosine amino acids
3- Oxidation of iodide to iodine.It is located in or attached to the apical membrane.
4- Organification of thyroglobulin; binding of Iodine with Thyroglobulin. Iodination of tyrosine, to form MIT and DIT.
5- Coupling reaction; DIT+DIT = T4 , DIT+MIT = T3. stored in colloid.
Step 3, 4, and 5 are done by peroxidase enzyme.
6- Endocytosis of thyroglobulin.
7- Fusion of lysosomes with the vesicles. in colloid.
8- Hydrolysis of peptide bond to release DIT, MIT, T3 and T4 by proteases.
9- Deiodination of DIT and MIT by Thyroid Deiodinases.
10- Delivary of T4 and T3 to systemic circulation.



You may want to support you answer with a simple diagram

Describe the levels of thyroid hormone in circulation in case of liver failure and pregnancy and it subsequent effect.

- Hepatic failure: ⬇ TBG → ⬆ free T3/T4 → Inhibition of thyroid hormone secretion by(-)feed back.
- Pregnancy: ⬆ estrogen → ⬆ TBG→ ⬇ free T3/T4→stimulation of thyroid hormone secretion.

List the steps of T4 and T3 release to the tissues.

1- T4 and T3 readily diffuse through the cell membrane.
2- Stored in targeted tissue.
3- T4 deionized to T3 by idoinase.
4- In nucleus, T3 mainly binds to thyroid hormone receptor.
5- Influence transcription of genes

Synthesis of Thyroid hormones has three unique features:

- Contains large amount of iodine, which is supplied by diet.
- Synthesis is partially intracellular and partially extracellular.
- Thyroxine (T4) is the major product 90% while triiodothyronine (T3) is 10%.Are Bound to Plasma Proteins thyroxine binding globulin (TBG).& released to the tissue cells slowly.. Other hormones secreted by Thyroid gland: Reverse T3 (RT3) 1 and Calcitonin.

Talk brifely about wolf -chaikoff effect and its effects on Thyroid hormone ?

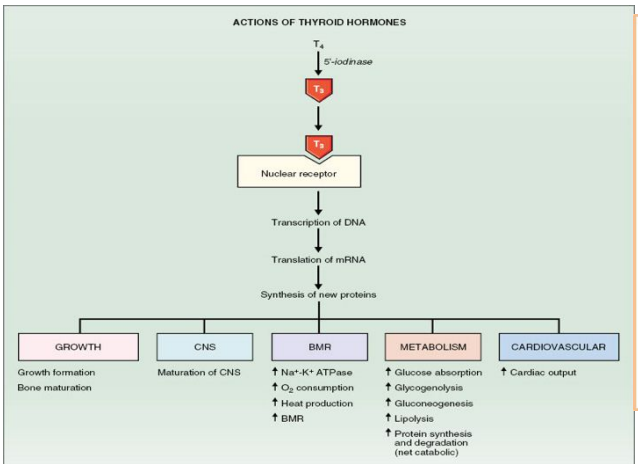
Wolf -chaokoff effect is autoregulatory phenomenon that inhibts organificatiion, formation and releasing thyroid hormone into blood stream which is secondary to elevated levels of circulating iodide

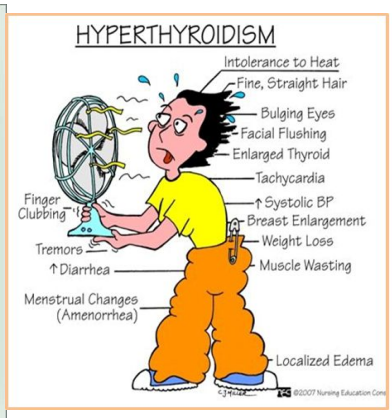
Thyroid Hormone Action :

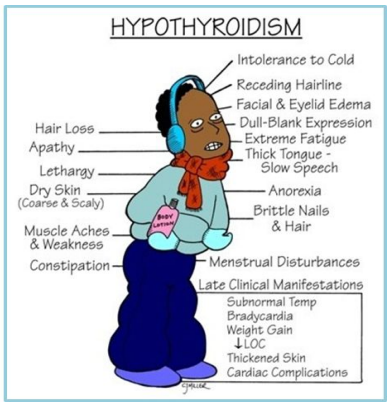
Metabolism		
Carbohydrates	**Fats**	**Proteins**
⬆glucose uptake by the cells. ⬆ glycogenolysis. ⬆ gluconeogenesis. ⬆ rate of absorption from the GIT.	⬆lipolysis. ⬆oxidation of free fatty acids. ⬇plasma cholesterol by ⬆ loss in feces	Overall effect is catabolic leading to ⬇in muscle mass
Basal Metabolic Rate (BMR): Is the energy requirement under basal condition (mental and physical rest 12-18 hours after a meal).		

Effects of Thyroid Hormone on Various Systems of the Body:

System	Effect
CVS	-Indirectly potentiating the effect of catecholamine in the circulation: Activation of β-adrenergic receptors. -Directly induction of: myocardial β-adrenergic receptors, sarcoplasmic reticulum, Ca+2 ATPase & Myosin. Will cause ⬆ heart rate & stroke volume (⬆cardiac output) ⬇peripheral resistance. End result is ⬆delivery of oxygenated blood to the tissues.
CNS	- In peri-natal period: TH are essential for maturation of the CNS. ⬇of hormones secretion → irreversible mental retardation. - In adults: ⬆in thyroid hormone secretion: Hyperexcitability & Irritability. ⬇in thyroid hormones secretion: Slow movement , Impaired memory , ⬇Mental capacity.
Respiratory	⬆ventilation rate ⬆dissociation of O_2 from Hb by ⬆RBC 2,3-DPG (2,3 diphosphoglycerate).
ANS	Produced action of catecholamines via β-adrenergic receptors including: ⬆BMR. ⬆heat production. ⬆heart rate. ⬆stroke volume. i.e. β-blocker (propranolol) is used in treatment of hyperthyroidism.
GIT	- ⬆appetite thus food intake, ⬆digestive juices secretion & GIT motility. -Excess TH secretion → Diarrhea but Lack of TH secretion → Constipation
Skeletal (Bones)	- Promote: bone formation, ossification, fusion of bone plate and bone maturation.







Hyperthyroidism	Hypothyroidism
Over activity of the thyroid gland. o Women : men ratio (8:1). o Activity of gland ⬆ secretion & size	Under activity of the thyroid gland o More in woman (30- 60 years).
Graves' disease: 95% most common cause of hyperthyroidism	**Inherited abnormalities of thyroid hormone synthesis:** 1-Peroxidase defect. 2-Iodide trapping defect. 3-Thyroglobulin defect.
Thyroid Gland Tumor: benignis more common than malignant. History of head & neck irradiation & family history.	**Endemic Colloid Goiter:** before table salt. ⬇ iodide → ⬇ hormone formation → ⬆ TSH→ ⬆ Thyroglobulin ⬆ size
Exogenous T3 and T4 –rarely –	**Idiopathic Nontoxic Colloid Goiter:** - I in take is normal. thyroiditis : Inflammation → ⬆ cell damage → ⬇ hormone secretion → ⬆ TSH → ⬆ of activity of normal cells → ⬆ size
Excess TSH secretion: 1-Diseases of the hypothalamus (TRH). 2-Diseases of the pituitary (TSH).	**Gland destruction (surgery).** **Pituitary diseases or tumor.** **Hypothalamus diseases or tumor**
Diagnosis/Symptoms	
Goiter1 in 95%. o Skin: Smooth, warm and moist -Heat intolerance, night sweating. o Musculoskeletal: Muscle atrophy. o Neurological: tremor, enhanced reflexes and irritability. o CVS ⬆ heart rate & stroke volume, arrhythmias & hypertension. o weight loss & diarrhea. o ⬆ glomerular filtration rate. o Exophthalmos: anxious staring expression & protrusion of eye balls. o Menstrual cycle disturbance.	o Skin: dry skin. & cold intolerance. o Musculoskeletal: ⬆ muscle bulk. ⬇ in skeletal growth, muscle sluggishness & slow relaxation after contraction o Neurological:slow movement, impaired memory & ⬇ mental capacity o Cardiovascular: ⬇ blood volume, heart rate & stroke volume. o ⬆ weight & constipation. o ⬇ glomerular filtration rate. o Myxoedema: An edematous appearance through out body o Loss of libido. o Menstrual cycle disturbance.
Investigations	
o ⬆ Serum T3, T4 o Serum TSH:In 1ry ⬇ TSH/In 2ry ⬆ TSH.	⬇ Serum T3,T4 o Serum TSH:In ⬆ 1ry TSH./ In 2ry ⬇ TSH.

Which disease there wiil auto antibodies against peroxidase?
Hashimoto's thyroiditis

List one disease causes hypo- and one disease cause hyperthyroidism?
-hypo→ hashimoto's disease hyper→ graves disease

What is the HLA II types that have a protective and predisposing effect to Hashimoto's?
predisposing factor→ DR4 protective factor→ DR13

What can we see under microscopy in pateint with hashimoto's disease?
Intense lymphocytic infelteration

In hashimoto's thiroiditis the antibodies affect a number of thyroid proteins, list 2 of them?
Thyroglobin and thyroid peroxidase

What is the HLA II types that have a protective and predisposing effect to graves disease?
predisposing factor→ DR3 protective factor→ DR7

Which type of hypersensitivity reaction is insulin dependant diabetes mellitus?
Type IV hypersensitivity reaction

What is the major autoantigen in seen in addison's disease ?
21-hydroxylase

what are the susceptibility genes associated with addison's disease?
HLA-DR3 and/or DR4

Mention 3 factors help in pathogenesis of DM type 1 ?
1- Genatic susceptibility (HLA-DQ alleles)
2- Autoimmunity
3- Enviromental factors such as coxsackie virus

Talk brifely about the possible pathogenesis of DM type 1 ?
The most likely scenario is that viruses cause mild beta cell injury, which is followed by an autoimmune reaction against altered beta cells in persons with HLA-linked susceptibility.

Mention the possible pathogenisis in addison disease?
1- T-cell mediated injury is likely to be central to pathgenisis
2-Adrenal autoantibodies may have a pathogenic role , as yet unclear, or could arise secondary to T-cell tissue damage

What are the parts of the deep fascia or deep cervical fascia of the neck? which one covers the thyroid
1- Investing layer. 2- Pretracheal layer & it covers the thyroid 3- Prevertebral layer.

What is the posterior relation of isthmus? It over lies the 2nd 3rd & 4th tracheal rings

What is the extension of thyroid gland ? The apex reaches up to the oblique line of thyroid cartilage & Its base lies at the level of 4th or 5th tracheal rings.

What is the name of the muscle that connect the pyramidal lobe with hyoid bone ? and where does it originated from ?
Levator glandulae thyroideae , it's originated from fibrosed & obliterated thyroglossal duct .

What are there in the posterior border of the thyroid gland ?
Superior & inferior parathyroid glands (anastomosis between superior & inferior thyroid arteries).

Where does the head and neck develop from ? and mention its layers.
The head & neck region develops from the pharyngeal apparatus.
1- Pharyngeal arches 2- Pharyngeal pouches.
3- Pharyngeal grooves or clefts. 4- Pharyngeal membranes.

head & neck regions divided into 6 cubical masses called the 6 pharyngeal or branchial arches.

Mention the name of the core of arches ? Mesoderm
By which embryological layer does the external arch cover & Internal ? and mention the name of the space between 2 arches ? External : Ectoderm . Cleft or groove. Internal : Endoderm . Pouch

Where does the thyroid gland develop?when does the thyroid start to develop?
from the endoderm of the floor of the primitive pharynx (Thyroid primordium).
By the 24th day after fertilisation

Where does the pyramidal lobe originate ? The upper end of duct persists in the dorsum of the tongue as? Thyroglossal duct . foramen cecum

The possible locations of thyroglossal duct cysts:
1- A thyroglossal duct sinus 2-lingual & cervical thyroglossal duct cysts.
3-Most of thyroglossal duct cysts are located just inferior to hyoid bone

How many pouches in parathyroid glands development?
There are 4 pairs of pharyngeal pouches , 5th pair of pouches is absent or rudimentary The dorsal part of the 3rd pouch develops into inferior parathyroid bud, while the dorsal part of the 4th pouch develops into the superior parathyroid bud by :the 6th week
The ventral part of 3rd pouch gives: the thymus gland primordium

High ligation of the superior thyroid artery during thyroidectomy places external laryngeal nerve at risk of injury, what will happen if it injured?The lesion of recurrent laryngeal nerve lead to ? will cause horsiness of voice . impaired breathing & speech.

List the sequences of the development of thyroid gland
1-As the tongue grows, the developing thyroid gland descends downward in the neck. It descends anterior to the developing hyoid bone & laryngeal cartilages.
2-The thyroid is connected to the developing tongue by a narrow tube, called the thyroglossal duct
3-At first the thyroid primordium is hollow, but soon it becomes solid & divided into 2 lobes and an isthmus.
4-By 7th week (50th day) the gland takes its final shape & position, and the thyroglossal duct begins to fibroses and degenerates.

THYROID GLAND

Arterial supply	**Superior thyroid** a branch from the external carotid A	**Thyroidea ima** If present, it arises from aortic arch or from brachiocephalic A	**Inferior thyroid** From the thyrocervical trunk of 1st part of subclavian A
	descends with the external laryngeal nerve Its lesion will cause horsiness of voice	The triangle is bounded: 1-laterally→common carotid A 2-medially→ trachea 3-superiorly→ thyroid lobe.	The recurrent laryngeal nerve crosses either in front or behind it This nerve can be found , in a triangle [1] Its lesion may results in impaired breathing & speech.
Venous drainge	1-Superior thyroid vein → internal jugular vein	2- Middle thyroid vein → internal jugular vein	3- Inferior thyroid vein → left brachiocephalic vein
Lymph nodes	Deep cervical.	paratracheal lymph nodes.	
Relation	Anterolaterally (4S)	Posteriorly (or posterolaterally)	Medially
	1. Sternothyroid. 2. Sternohyoid. 3. Superior belly of omohyoid 4. Sternomastoid.	Carotid sheath&its contents vagus nerve, common"internal" carotid A, internal jugular vein&deep cervical lymph nodes	Above : Larynx&pharynx Below : Trachea , oesophagus &recurrent laryngeal nerve in between. cricothyroid muscle & external laryngeal nerve.

PARATHYROID GLAND

Arterial supply	superior thyroid A	inferior thyroid A no Thyroidea Ima A
Venous drainge	Superior thyroid vein	middle &inferior thyroid veins.
Lymph nodes	Deep cervical	paratracheal lymph nodes.
Nerve supply	superior & middle cervical sympathetic ganglia (vasomotor)	
Location	2 superior parathyroid has a constant position at the middle of the post.border of the gland.	2 inferior parathyroid usually at the level of the inferior pole. They lie within the thyroid tissue or sometimes outside the facial capsule.

Case..

A 50 year old housewife complains of progressive weight gain of 20 pounds in 1 year, fatigue, slight memory loss, slow speech, dry skin, constipation, and cold intolerance.
Laboratory studies: CBC and differential WBC are normal. The serum T4 concentration is 3.8 ug/dl, (N: 4.5-12) the serum TSH is 23.0(N:0.2-3.5) uU/ml, and the serum cholesterol is 255 mg/dl (N: <200).

What is the likely diagnosis? Primary hypothyroidism (Failure of thyroid gland)

What are the most likely causes? Autoimmune thyroid disease (Hashimoto's thyroiditis), Radioactive iodine therapy for hyperthyroidism, Thyroidectomy

Thyroid hormones include (T4 , T3, and rT3) are synthesised by:

1- iodination 2- coupling 3- attaching to thyroglobulin protein

Thyroxine (T4) is coverted to:

1-Ttri-iodothyronine (T3) by Deiodination which is catatalyzed by deiodinase enzymes; its also more biologicaly active than T4.

Note, T4 is mostly secreted by thyroid gland, and T3 by Peripheral tissues (liver, kidney,...)

2- rT3 (reverse T3); the inactive form of T4.

Since Thyroxine (T4) is lipophilic it is transported in plasma as protein-bound by:

- Thyroxin Binding globulin (TBG)-bound (70%),
- Albumin-bound (25%)
- Transthyretin (prealbumin)-bound (5%).

Note, the unbound (free) form of T4 and T3 are biologically active (less than 1%)

Functions of the thyroid hormone:

production of body heat

1- maturation of all body tissues
2-thermogenesis and metabolic regulation
3- stimulates the metabolic rate
4-Affects the rate of protein, carbohydrate & lipid metabolism

hypothyroidism may lead to:

1- if congenital; brain damage
2- in children; Delayed skeletal maturation and puberty
3- high serum cholestrol ; due to down regulation of LDL receptors,& fail in sterol excretion

hypothalamus TRH → ⬆Pitutary glandTSH → ⬆Thyroid glandT4, T3 → When ⬆causes negative feedback → ⬇Pitutary gland&hypothalamus

Measurment of (TSH,T4, T3, and antibodies) for Thyroid Function Tests:

- TSH: indicates the thyroid status, sensitive (1st line) (may take 8 w to adjust after treatment)
- T4:Indicates thyroid status, monitors thyroid treatment.
- T3:Rise in T3 is independent of T4, in patients only T3 rises, identification of thyrotoxicosis
- Antibodies: Diagnosis and monitoring of autoimmune thyroid disease (Hashimoto's thyroiditis), Diagnosis of Graves' disease

Thermogenesis is of two types:

- Obligatory: Basic heat production due to basal metabolic rate

- Facultative: On-demand extra heat production from metabolic activity in brown adipose tissue (BAT), skeletal muscle, etc.

In BAT, the facultative thermogenesis is stimulated by sympathetic nervous system in response to cold temperature

Sites of thyroid hormone regulation of metabolism

1- Hypothalamus-Pituitary-Thyroid Axis

In response to feedback regulation, nutrition status and stress levelà regulation of TRH, TSH, and T4 release and central conversion of T4 toT3

2- Brown adipose tissue

In response to sympathetic nervous system and bile acids → ↑ D2 → ↑ T3 → ↑UCP1 & thermogenesis and ↓body weight

3- White adipose tissue

In response to sympathetic nervous system → ↑ T3 → ↑ lipolysis & ↓ body fat

4- Liver

In response to ↑ lipolysis in WAT à effect on cholesterol and lipid metabolism and synthesis and release of bile acid

5- Muscle

In response T4 and to bile acid → ↑ D2 & ↑ local T3 → ↑ energy expenditure

6- Pancreas

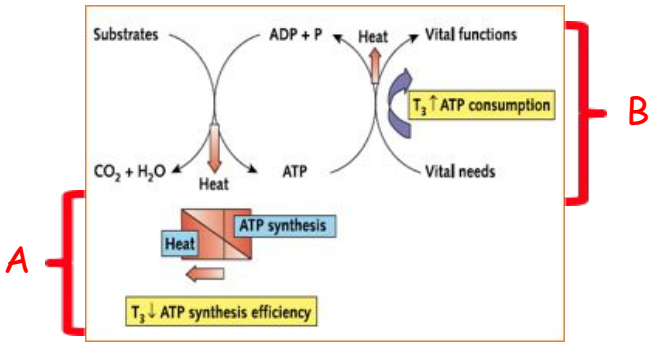
In response T4 → ↑ local T3 → effect on β cell function & proliferation

The Mechanisms by which Thyroid Hormone Regulates Thermogenesis

A-The energy released from substrate oxidation is captured in ATP

B-The energy is then transferred from ATP to provide energy for biological processes

- A fraction of the energy is lost as heat without ATP production/consumption
- Thyroid hormone increases heat production by:
- Increasing ATP utilization / Reducing the thermodynamic efficiency of ATP synthesis.



Mechanism of action of uncoupling proteins (UCPs):

Example: UCP1 is present in the **inner mitochondrial membrane** of BAT. **Other UCPs are ubiquitous**

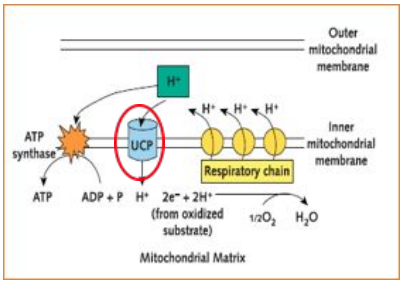
The energy released in the oxidation of substrates in the mitochondria → proton gradient

⬇

The energy accumulated in this gradient is used the ATP Synthase to produce ATP i.e. oxidation is coupled to phosphorylation

⬇

UCPs reduce the proton gradient, bypassing the ATP synthase → exothermic movement of protons down the gradient → heat (because oxidation is uncoupled to phosphorylation)



What are the drugs that may used in the treatment in patients with hyperthyroidism?
1.Antithyroid drugs 2.Iodides 3.Radioactive iodine 4.Beta blockers 5.Surgery

Thioamides are a group of antithyroid drugs, Mention their mechanisms of action.
Inhibit synthesis of thyroid hormones by inhibiting peroxidase enzyme.

Propylithiouracil have additional actions that other than Thioamides. What is it?
Blocking the conversion of T4 to T3 in peripheral tissues.

You want to prescribe a long acting antithyroid, what will be your choice? Methimazole

Which one of the Thioamides is recommended in pregnancy? Propylithiouracil

Enumerate the adverse effects of Thioimades.
1.Skin reactions (Macular) 2.Arthrlagia 3.Agranulocytosis
4. ANCA positive vasculitis & Immunoallergic hepatitis (Propylithiouracil)

Skin rash, hypersalivation, oral ulcers, metallic taste and bad taste. Those symptoms mainly indicates?
Iodine toxicity (Iodism symptoms) not used in pregnancy

What is the mechanism of action of radioactive iodine?
Accumulates in thyroid gland&destroys parenchymal cells, producing a long-term ⬇ in thyroid hormones.

List the disadvantages of radioactive iodine.
1.High incidence delayed hypothyroidism. 2.Large doses have cytotoxic actions.
3.May cause genetic damage. 4.May cause leukemia and neoplasia

Beta blockers are used to relief the adrenergic symptoms, what is the beta blocking agent that should be avoided in asthmatic patient? Propranolol . you can use Atenolol Or Metoprolol

Which of the thyroid preparations when overdosed in children will accelerate bone maturation?
Levothyroxine *(remember this drug is the drug of choice in the tretament of hypothyrodism)*

List the adverse effects of the drug mentioned in previous question when overdosed in adults?
1.Arrhythmias 2.Tremors 3.Heat-intolerance 4.Muscle pain 5.Weight loss

Which of the thyroid preparations that should be avoided in and cardiac patients?
Liothyronine(*while in levothyroxine we should reduce the dose and increase it every two week)*

Which of the thyroid preparations requires multiple daily doses?
Liothyronine (*so that is why this drug is not recommended for routine therapy*)

What makes Liotrix different from other thyroid preparations? Mention the limitations of this product?
It is a combination of synthetic T4 and T3. 1- High cost , 2- lack of therapeutic rationale

Why IV Liothyronine should be used in caution in case of myxedema coma?
Because it may provoke cardiotoxicity

Why should you increase the dose 20% to 30% in the management of hypothyroidism in a pregnant lady?
1.Elevated TBG induced by estrogen
2.Early development of fetal brain which requires thyroxine.

Charactristics of a solitary thyroid nodule:

Single nodule, mostly localized & benign, palpable, 4 x female > male.

note, nodules uptakeing radioactive iodine (hot nodules) : benign

Tumors of the thyroid gland:

1- Adenomas : A-Benign, discrete, solitary masses, painless

B- the halmark of the disease is presence of of intact well formed fibrous capsule encircling the tumor.(no vascular and capular invasion)

C-Careful evaluation of the integrity of the capsule is critical in distinguishing follicular adenomas from follicular carcinomas, which demonstrate capsular and/or vascular invasion

2- Carcinoma

	a)Papillary carcinoma	*b)Follicular carcinoma*	*c)Medullary carcinoma*	*D)Anaplastic carcinoma*
%	(> 85% of cases)	5% to 15%	(5% of cases)	lethal >5%
Age	25-50 Y	40-60 Y		
Cell affected	folicular cells		euroendocrine neoplasms derived from the parafollicular cells, or C cells, of the thyroid	folicular cells
Gene Mutation	solitary or multifocal lesion. mutation RET or NTRK1	RAS & PAX8/PPARY gene	(msotly 70% sporadic) MEN syndrome	P53 mutation
Risk factor	ionizing radiation	areas with dietary iodine deficiency	(msotly 70% sporadic) & some Familial	papillary carcinoma.
Morphology	Gross (Papillary structures), Orphan Annie nuclei, Psammoma bodies, Pseudoinclusions and Grooved nuclei	-Minimally invasive (well encapsulated)10 Y survival rate 90% -Widely invase 10 Y survival less than 50%	Polygonal to spindle cells, Amyloid deposition, Bilaterality,Multicentricity, Necrosis, hemorrhage	Undifferentiated melignant tumors of the thyroid follicular epithelium. Highly malignant(rapidly growing mass) and metastasized widely.
Clinicly	most present asympyomayic 2-good prognosis(because slowiy growing tumor) first manifestation may be a mass in a cervical lymph node		secrete high levels of clacitonin that leads to hypocalcemia. use 1-Congo red for amyloid 2-immunohistochemistry stain for clacitonin	Highly malignant(rapidly growing mass) and metastasized widely. D-Morphology =Large, pleomorphicgiant cells, including occasional osteoclast-like multinucleate giant cells, spindle cells with a sarcomatous appearance, mixed spindle & giant cells,small cells

E)Lymphoma of the thyroid

A-Can occur either primary or secondary.

B- Hashimato's thyroditis can aslo pridispose to lymphoma

HYPERTHYROIDISM

- GRAVES DISEASE: Most common cause of hyperthyroidism

Clinical features include

1. Hyperthyroidism
2. Diffuse goiter-Constant TSH stimulation leads to thyroid hyperplasia & hypertrophy.

i. Fibroblasts behind the orbit and overlying the shin express the TSH receptor.

ii. TSH activation results in glycosaminoglycan (chondroitin sulfate & hyaluronic acid} buildup, inflammation, fibrosis, & edema leading to exophthalmos and pretibial myxedema.

3.Irregular follicles with scalloped colloid & chronic inflammation are seen on histology

Hypothyroidism

I.CRETINISM

A. Hypothyroidism in neonates and infants

B. Characterized by mental retardation, short stature with skeletal abnormalities, coarse facial features, enlarged tongue, and umbilical hernia

I. Thyroid hormone is required for normal brain and skeletal development.

C. Causes include maternal hypothyroidism during early pregnancy, thyroid agenesis, dyshormonogenetic goiter, and iodine deficiency.

1. Dyshormonogenetic goiter is due to a congenital defect in thyroid hormone production; most commonly involves thyroid peroxidase

II. MYXEDEMA

A. Hypothyroidism in older children or adults

B. Clinical features are based on decreased basal metabolic rate and decreased sympathetic nervous system activity.

C. Most common causes are iodine deficiency and Hashimoto thyroiditis; other causes include drugs (e.g., lithium) and surgical removal or radioablation of the thyroid.

III.HASHIMOTO THYROIDITIS

Most common cause of hypothyroidism in regions where iodine levels are adequate

Clinical features

I. Initially may present as hyperthyroidism (due to follicle damage)

2. Progresses to hypothyroidism; (decreased T4 and increased TSH)

3. Antithyroglobulin and antimicrosomal antibodies are often present (sign of thyroid damage).

- Chronic inflammation with germinal centers and Hurthle cells (eosinophilic metaplasia of cells that line follicles) is seen on histology.

- Increased risk for B-cell (marginal zone) lymphoma; presents as an enlarging thyroid gland late in disease course

	Hyperthyroidism	Hypothyroidism
Symptoms	Hyperactivity, irritability	Difficulty concentrating, poor memory
	Heat intolerance, sweating	Cold intolerance
	Palpitations	Dyspnea
	Fatigue, weakness	Fatigue, weakness
	Diarrhea	Constipation
	Polyuria	Hair loss, dry skin
	Oligomenorrhea, loss of libido	Menorrhagia
	Weight loss	Weight gain, poor appetite
		Paresthesias
		Impaired hearing, hoarse voice
Signs	Tachycardia	Bradycardia
	Tremor	Delayed tendon reflex relaxation
	Goiter	Peripheral edema
	Warm, moist skin	Dry, coarse skin
	Proximal muscle weakness	Puffy face, hands, and feet (myxedema)
	Lid retraction, lid lag	Diffuse alopecia
	Gynecomastia	Carpal tunnel syndrome

THANK YOU FOR CHECKING OUR TEAM..

DONE BY :

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- Omar alrahbenni
- Sarah Alsalman
- Nouf Alharbi
- Ahmed Alsaleh
- Nawaf alfawzan.
- Abdulrahman Alkaff

Why do you call it a thyroid problem when it's been giving me an excuse for the 20 pounds I gained this year?