

Thyroid diseases

Dr. Ali Jad



Done by :

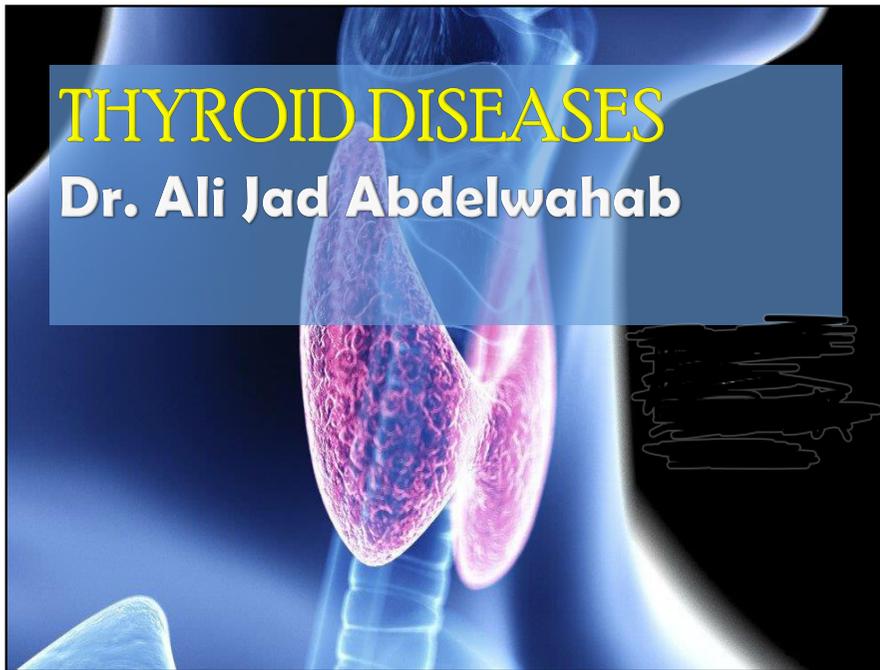
الطب والجراحة
لجنة



أساس

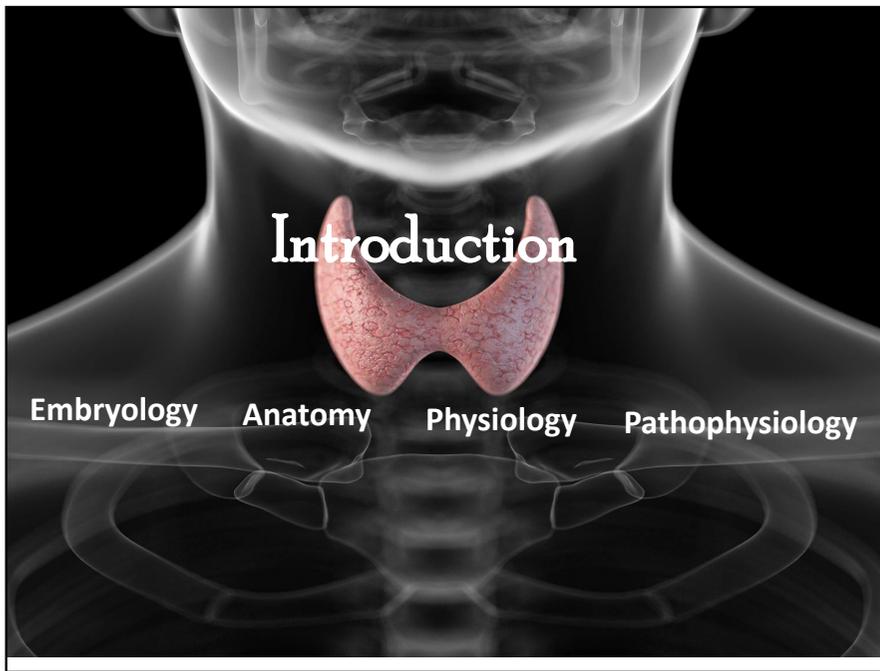
الأجل

الأفضل



Surgical Diseases of the Thyroid

Congenital
Inflammatory
Goiter
Thyroid hormones disorders
Thyroid nodule
Neoplastic



Embryology

First of the body's endocrine glands to develop around the third week (24th day) of gestation

It begins as an endodermal thickening on the floor of the median bud of the pharynx at the site of the foramen cecum on the adult tongue.

Thyroglossal duct (the endodermal thickening) passes ventral to the embryonic hyoid bone and thyroid cartilage.
Disappears by the 50th day of gestation
May persist any way in that pathway as the pyramidal lobe or thyroglossal duct cyst
most common cystic lesion in the neck
Pathology
variation of anatomy - 50% of population have pyramidal lobe.

Labels in diagram: ant. 1/3, post. 2/3, Forame Cecum, Hyoid Bar, Thyroglossal Duct Tract, Thyroid Gland, pyramidal lobe.

The developing thyroid lobes fuse with the structures that arise in the fourth pharyngeal pouch, i.e., the superior parathyroid gland and the ultimobranchial body.

C cells
مشتق من سطر 4 في البلعوم

**C cells*
موجودة بأمانه منتقاة من الغده

The lateral anlagen are neuroectodermal in origin (ultimobranchial bodies) and provide the calcitonin producing parafollicular or C cells, which thus come to lie in the superoposterior region of the gland.

an organ in its earliest stage of development

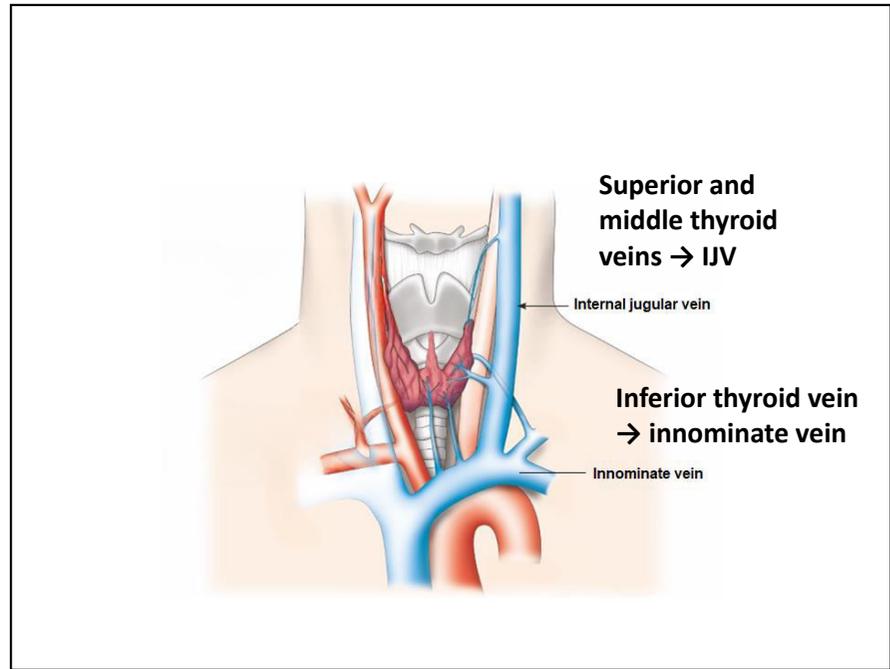
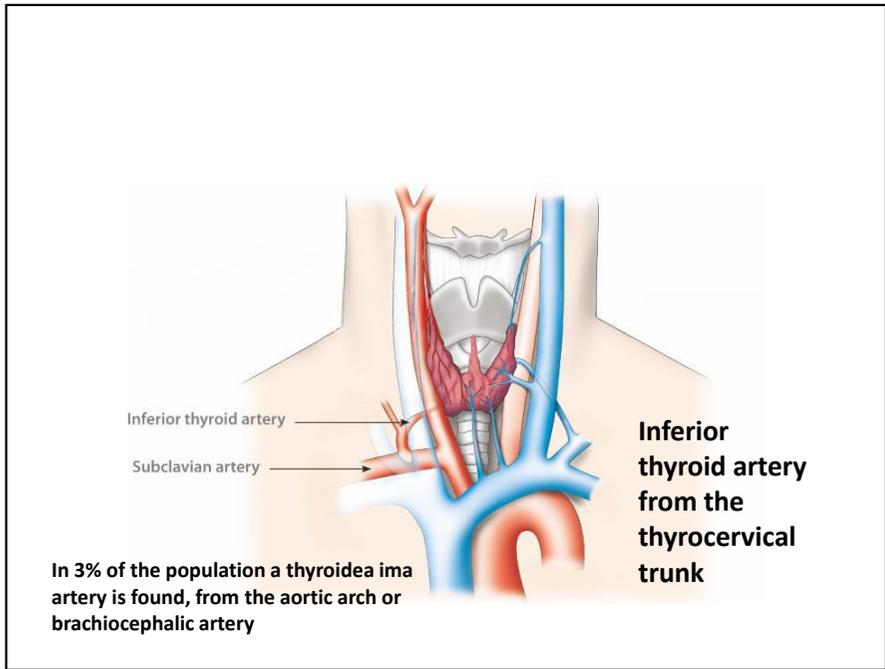
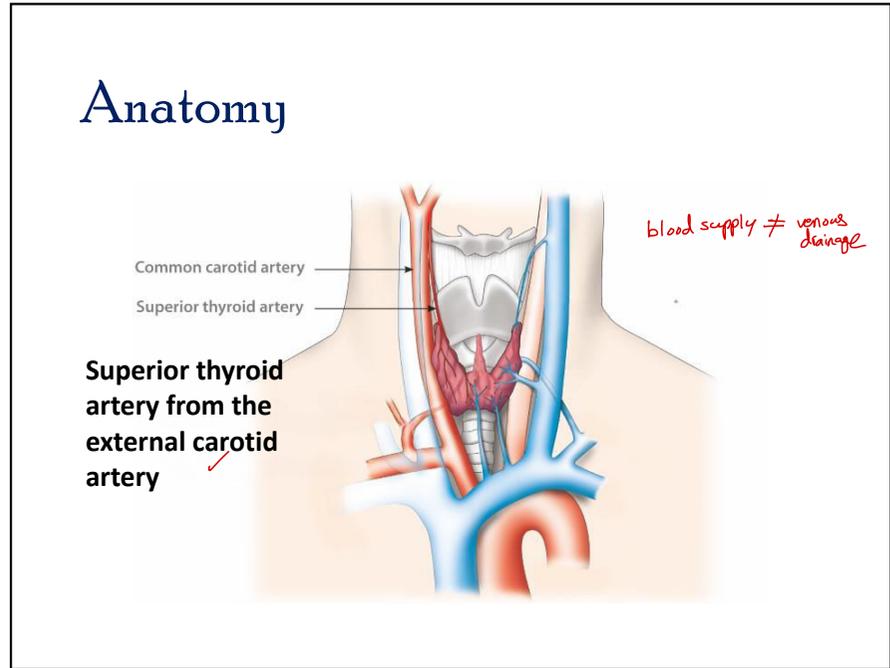
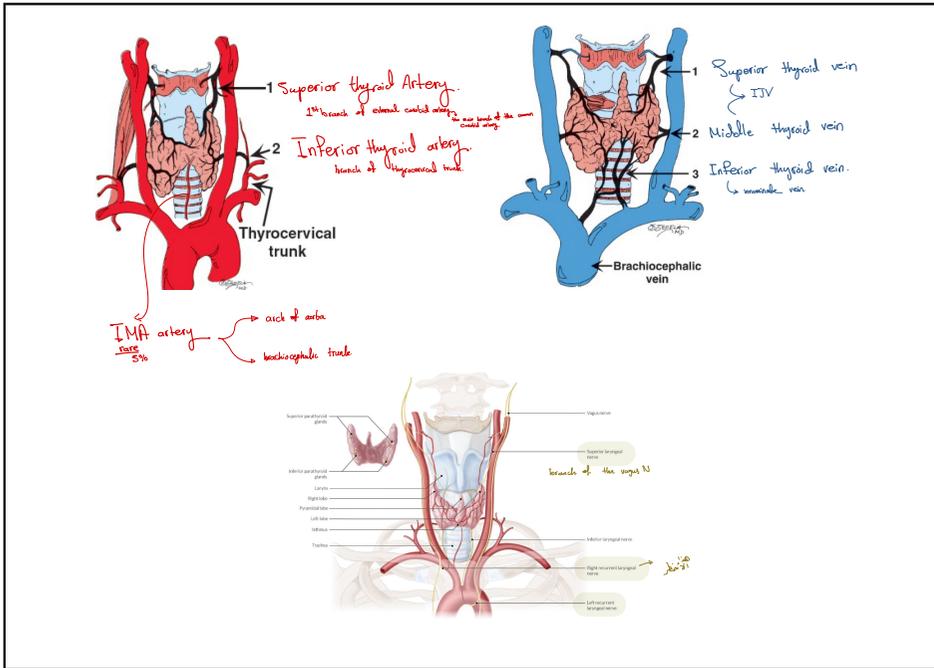
lowers Ca in serum

Thyroid follicles: 8 weeks

Colloid formation: 11 weeks

Thyroxin production: 20 weeks

*لو الطفل اتولد وما عنده Thyroxin بدو عنده
 delay of development.
 كانت عقاب ليمتلكه تداركه*



Sternocleido-mastoid muscle
Sternohyoid muscle
Sternothyroid muscle
Pyramidal lobe

Internal branch superior laryngeal nerve
External branch superior laryngeal nerve
Vagal nerve
Recurrent nerve

opera same

Superior laryngeal nerve :
Close to Superior thyroid artery .
Most common nerve injured with thyroidectomy → easy voice fatigability .
Internal sensory and external motor branches

Sternocleido-mastoid muscle
Sternohyoid muscle
Sternothyroid muscle
Pyramidal lobe

Internal branch superior laryngeal nerve
External branch superior laryngeal nerve
Vagal nerve
Recurrent nerve

Recurrent laryngeal nerve :

- Posterior and medial to thyroid lobes in the tracheoesophageal groove
- **Motor function** for vocal cord abduction and adduction except the cricothyroid muscle
- Injury → Asymptomatic Hoarseness if unilateral
- Bilateral → airway obstruction, profound aspiration

هذا أخطر

tracheostomy كما على الصورة

**الخطورة انه ما يكون recurrent يكون direct*

External jugular node
Sternocleido-mastoid m.
Spinal accessory n.
Jugulodigastric node
Deep lateral nodes
Intercalated node
Transverse cervical chain of nodes
Supra-clavicular nodes

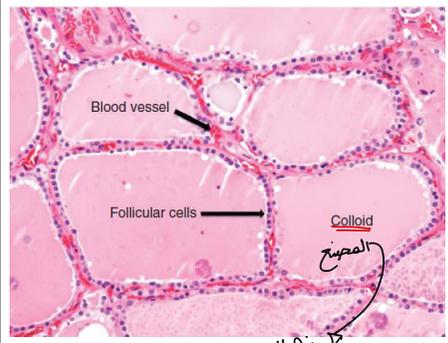
Parotid
Mandibular & submandibular nodes
Digastric n.
Submental node
Hyoid
Internal jugular chain of nodes
Strap muscle
Superior thyroid nodes
Anterior superficial cervical nodes

Submandibular gland
Digastic muscle
Mylohyoid muscle
Hyoid bone
Omohyoid muscle
Cricoid cartilage
Right common carotid artery
Manubrium

Internal carotid artery
Internal jugular vein
Internal carotid artery
Sternocleidomastoid muscle
Trapezius muscle
Anterior scalene muscle
Internal jugular vein
Left common carotid artery

Injury > Asymptomatic Hoarseness if (Unilateral)
airway Obstruction ... Profound Aspiration (BILATERAL)

Physiology

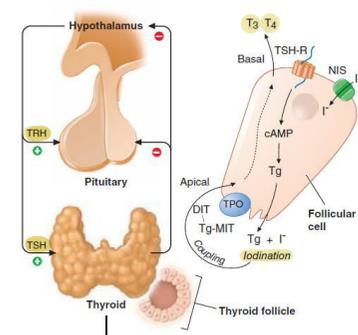


- 10-20g .
- The functioning unit is the **lobule**, which consists of **24-40 follicles**.

TSH stimulates the follicular cells -
 • Hyper trophy plasma vascularily

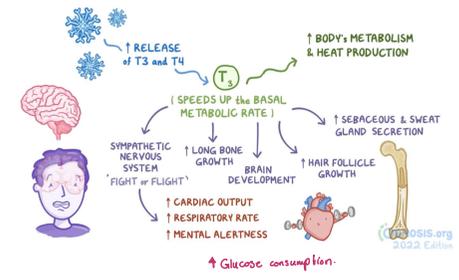
Thyroglobulin precursor

Double Feedback.



- Hypothalamus (TRH) → Pituitary (TSH) → Thyroid (T3, T4)
- Negative feedback

↑ TSH → ↑ T3, T4 → ↓ TSH (negative feedback)
 ↑ TSH → ↑ T3, T4 → ↑ TSH - pituitary problem



MCR

Only free T3 and free T4 are active (protein bound not active)

Most T3 (from T4>T3 conversion in periphery) by deiodinase

T4:T3 serum ratio 20:1

T3 more active (4X)

Thyroid binding globulin: transport majority of T3 and T4 in blood stream

Thyroglobulin: stores T3 and T4 in colloid.

T4
T3

Tumor marker

Pathophysiology

Goiter (ماء متكاثر بالغدة) • Enlargement of the thyroid gland

Hyperthyroidism (زيادة في الغدة) • Hyperactivity in the entire or part of the thyroid

Thyrotoxicosis (زيادة في كل أجزاء الغدة، مع بعض الظواهر خاصة عند المرضيات) • The clinical condition due to high T3 and T4 in extra thyroidal tissue without regard to origin

most common cause ⇒ Hyperthyroidism

The Diagnosis of Thyroid Disease

Triple Assessment

Clinical

History
Physical exam

breast & ^{thyroid} diseases

TSH

US with or without FNA

Fine needle aspiration.

History

Neck Mass

- Obstructive symptoms (dysphagia, dyspnea, dysphonia)
- Disfiguring
- Eye symptoms

impairment of voice production

Hypothyroidism

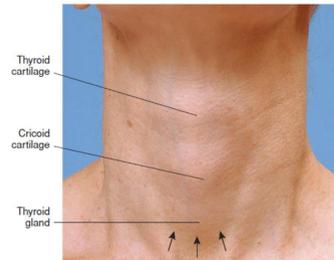
- Slow speech and action
- Fatigue
- Cold intolerance
- Constipation

Hyperthyroidism

- Irritability
- Insomnia
- Palpitations
- Heat intolerance
- Diarrhea

* dysphonia with Grave's disease patients

Physical Examination



Give the patient a glass of water and ask them to take a sip and then swallow. The thyroid rises (with the trachea) on swallowing.

Physical Examination

Palpate the thyroid by placing your hands gently on the front of the neck with your index fingers just touching, while standing behind the patient



Cricoid cartilage



Suprasternal notch

Palpate for cervical lymphadenopathy

Physical Examination



Percuss the manubrium to assess for dullness due to retrosternal extension of goitre.



Auscultate with your stethoscope for a thyroid bruit. A thyroid bruit (sometimes associated with a palpable thrill) indicates abnormally high blood flow and is most commonly associated with Graves' disease.

Physical Examination

Supraclavicular LNs



Pemberton's sign

SVC obstruction due to retrosternal extension of thyroid.



used to evaluate venous obstruction in patients with goiters

Physical Examination

Graves' disease



Pretibial myxedema



Physical Examination

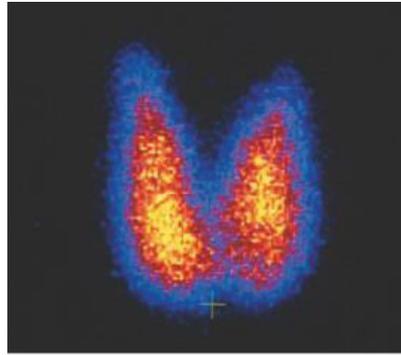
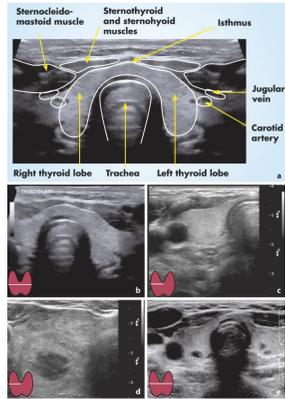
Exophthalmos/ Lid retraction



Proptosis/chemosis

swelling of the eye surface membranes because of accumulation of fluid





Imaging



① Developmental Abnormalities of the Thyroid



FNAB

The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC)

- Nondiagnostic
- Benign
- Atypia of undetermined significance
- Follicular neoplasm
- Suspicious for malignancy
- Malignant

حلالا غير
المشكوك
مستط طبيعية رلا سطح غير



هذا لا مجرد دونه ومع

Mini-OSCE

Thyroglossal Duct Cyst

The most common congenital cervical anomalies

80% are found in juxtaposition to the hyoid bone



- Usually asymptomatic but occasionally become infected by oral bacteria



Diagnosis ^{→ clinically}

- A 1- to 2-cm, smooth, well-defined midline neck mass that moves upward with protrusion of the tongue
- Routine thyroid imaging is not necessary

excision مباشرة

Treatment

- The “Sistrunk operation,” which consists of en bloc cystectomy and excision of the central hyoid bone to minimize recurrence

need GA.

Lingual Thyroid

fail to descend and remain located in the posterior aspect of the tongue

respiratory and swallowing difficulties and hemorrhage.

Diagnosis is confirmed by radionuclide scanning

Treatment with thyroxine or radioactive iodine

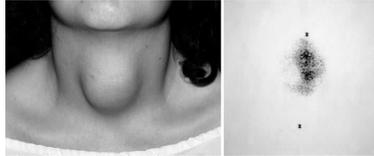
لا تفكر بالجراحة أبدًا
المنطقة خطيرة.



Ectopic Thyroid

can be located at any point along the line of the thyroglossal tract

may be the only thyroid tissue present



② Thyroiditis



Thyroiditis

- Hashimoto's thyroiditis (autoimmune) *• abs against thyroid peroxidase*
- Subacute thyroiditis (de Quervain's thyroiditis, viral) *serology -ve, bacteriology -ve, * self-limiting*
- Acute suppurative thyroiditis (bacterial)
- Riedel's thyroiditis (scar)

Liver cirrhosis ١١٥٪
 • diagnosis with biopsy
 • treatment with thyroxin replacement

due to infectious disease

*hyperthyroidism بيد اذ
 hypothyroid ← بعد الجراحة*

• diagnosis → sample of blood

Goiter

*تخزين الغدة الدرقية
 أماكن جبلية
 No iodine*



Goiter ← severe hyper ← vascularity, plastic trophy
 ↳ toxic dose of T₃ & T₄
 ♀ > ♂
 ↳ Latin word ⇒ throat

* commonest goiter

Simple

Causes:-
 relative iodine ↓

- endemic → absolute ↓
 افاقه بمرتبة البحر
- sporadic → relative ↓
 pregnancy, menarche...

Goiterogenic substances T₃, T₄ فتح تكوين

Dietary → cabbage cauliflower, ↑ (Cl⁻, F⁻, G)

Drugs

Genetic defects ⇒ **Pendred's syndrome** ↓ thyroid peroxidase

- ↳ Goiter
- ↳ Deafness
- ↳ mutism

↓ dehalogenase.

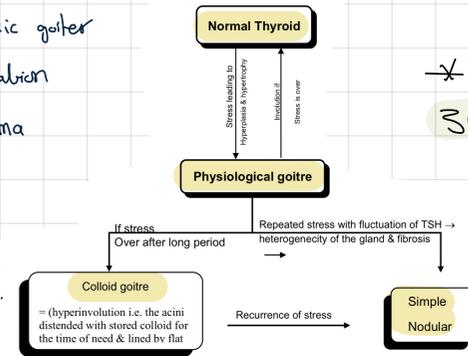
① **physiological or diffuse hyperplastic** (10-20)
 ♀ > ♂
 → menarche C/P
 → Puberty uniform, small, smooth, soft, diffuse
 → Pregnancy goiter with normal thyroid function.
 → lactation * treatments only medical.

② **colloid** (20-30)
 ♀ > ♂
 prolonged iodine ↓ → try to store more colloid for time of need.
 diffuse, symmetrical, smooth, soft or firm moderate or large goiter.

③ **Simple nodular** (30-40) Variable.
 most of nodules → colloid pale brown gelatinous
 → cellular solid.
 Hge, fibrous
 nodular, firm, asymmetrical & irregular * euthyroid.

complications:-
 - Painless neck swelling
 - diagnosed accidentally
 - sudden enlargement & pain (due to hge)

- 2ry toxic goiter
- calcification
- carcinoma
- cyst.
- Hge
- retrasternal extension.



* Indication for surgery
 SC ↔ cosmetic compression complications.

Thyrotoxicosis.

vs

Hyperthyroidism

↑ Thyroid Hormones in blood due to thyroid source
 ↓ extrathyroidal source.

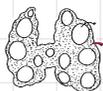
↑ Thyroid Hormones in blood due to thyroid hyperfunction.

② Rare Causes 5%

- early stages of subacute thyroiditis Hashimoto's disease
- Thyrotoxicosis factitia (exogenous L-Thyroxine)
- Neonatal thyrotoxicosis (subacute spontaneously within 3-4 weeks)
- Jod basedow thyrotoxicosis (when large doses of iodine given to hyperplastic nodular goiter. It is usually temporary (not fetal brain metabolism))
- Functioning thyroid carcinoma mets.
- TSH secreting pituitary tumor (all cases of thyrotoxicosis are associated with low TSH level except this cause)
- Ovarian or placental tumors (ectopic hormone production)

① Toxic goiter

- 1ry 75%
 - = Diffuse toxic goiter = exophthalmos goiter (bulging eyes) = Graves' disease
- 2ry 15%
 - = toxic nodular goiter = plummer's disease

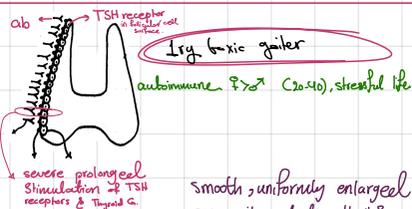


treatment: only surgical (subtotal thyroidectomy)
 the inter-nodular tissue is the site of hyperactivity.
 Dry to simple nodular goiter

Solitary toxic nodule. 5%

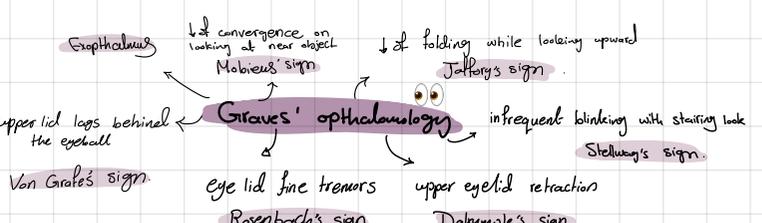
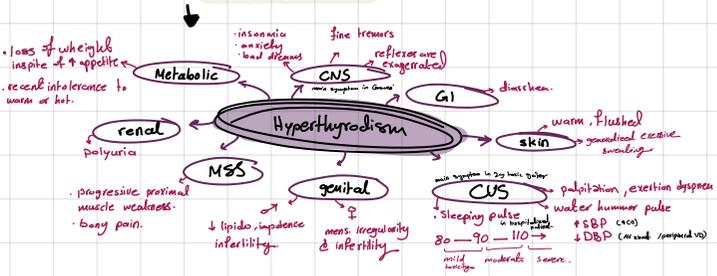


Single active autonomous nodule.
 Hemithyroidectomy to remove overactive tissues



smooth, uniformly enlarged, expansile pulsation, thrill & machinery bruit

manifestations

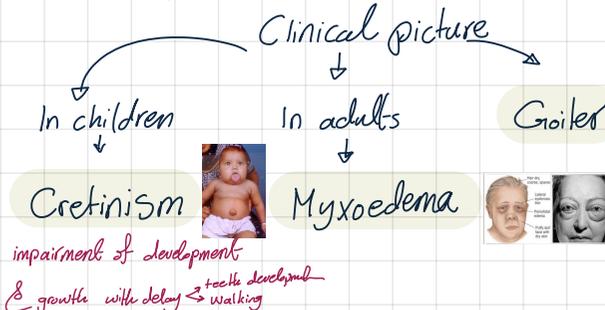


Hypothyroidism

↓ Thyroid Hormones in blood due to thyroid hypofunction.

- Complications ⇒
- coronary thrombosis.
 - Comae
 - Carpal tunnel syndrome

↑ TSH ↓ T₃, T₄

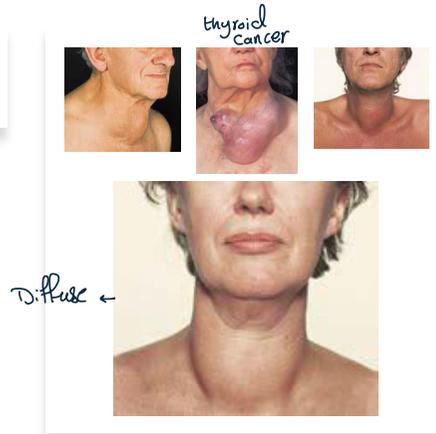


	Primary thyrotoxicosis	Secondary thyrotoxicosis
1. Age	Usually in young below 40 years.	Usually above 40 years.
2. Onset	Usually rapid & occurs on top of normal gland.	Usually insidious & occurs on top of nodular goiter.
3. Course	Simultaneous appearance of goiter & thyrotoxicosis.	Goiter appears many years before thyrotoxicosis.
4. Severity	Remissions & exacerbations	No remissions.
5. Metabolic & C.N.S.	Usually severe	Usually mild or moderate.
7. C.V.S.	More Marked & usually main presentations.	Less marked.
8. Eye signs	Less marked (young age)	More marked (old age)
9. Thyroid	Common, all eye signs are present & exophthalmos is true.	Rare, limited eye signs & exophthalmos is apparent.
10. Autoimmunity	◆ Remissions & exacerbations	◆ No remissions.
11. Thyroid dermopathy & achropachy	◆ Usually severe	◆ Usually mild or moderate.
	◆ More Marked & usually main presentations.	◆ Less marked.
	◆ Less marked (young age)	◆ More marked (old age)
	◆ Common, all eye signs are present & exophthalmos is true.	◆ Rare, limited eye signs & exophthalmos is apparent.
	◆ smooth and diffuse goiter.	◆ Nodular & irregular goiter.
	◆ Severe	◆ Mild or moderate.
	◆ Occur only in Graves' disease.	◆ Not occur.

Findings	Hypothyroidism	Hyperthyroidism
Metabolic	Intolerance to cold Weight gain Decreased appetite	Intolerance to heat Weight loss Increased appetite
Neuropsychiatric	Excessive fatigue	Irritability, restlessness
Periorbital findings	Periorbital edema (due to generalized myxoedema)	Periorbital edema, lid lag, and exophthalmos (in Graves ophthalmopathy)
Cardiovascular	Bradycardia, decreased cardiac output	Tachycardia, palpitations, hypertension
Skin	Cold, dry	Warm, moist
Gastrointestinal	Constipation	Hyperdefecation
Musculoskeletal	Cramps	Osteopathy
Edema	Generalized myxoedema (initially pretibial)	Pretibial myxoedema (in Graves disease)
Myopathy	Proximal	
Reproduction	♀ Menstrual disorders ♂ Decreased libido, infertility	
Hair	Hair loss	

Goiter

- Diffuse goiter: the entire gland is symmetrically enlarged
- Nodular goiter: are one or more distinct lumps can be distinguished from the rest of the gland



Types of Goiter

Hypothyroid Goiter

- Endemic Goiter: due to iodine deficiency
- Hashimoto's Thyroiditis

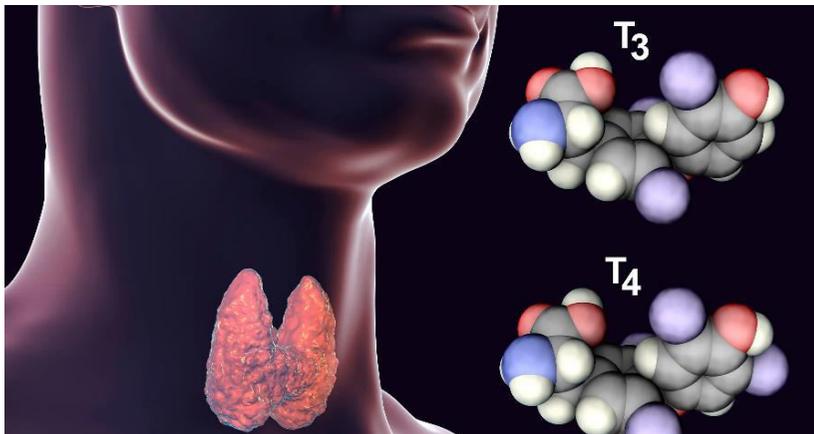
Euthyroid Goiter

- Euthyroid Diffuse Goiters
- Euthyroid Multinodular Goiters

Thyrotoxic Goiters

- Graves' Disease
- Toxic Multinodular Goiter (TMNG)

Thyroid Hormones Disorders



Definitions

Thyrotoxicosis

- The clinical condition that covers symptoms following high concentrations of the thyroid hormones, T_4 and T_3 , in extrathyroidal tissues, but without regard to the origin of these elevated hormone concentrations

Hyperthyroidism

- Hyperactivity in the entire or part of the thyroid that results in synthesis and release of thyroid hormones in excess of that required by the body to maintain euthyroidism

Hyperthyroidism is the main cause of thyrotoxicosis

Causes of Thyrotoxicosis

Primary Hyperthyroidism	Thyrotoxicosis Without Hyperthyroidism	Secondary Hyperthyroidism
<ul style="list-style-type: none"> Graves' disease Toxic multinodular goiter Toxic adenoma Functioning thyroid carcinoma metastases Activating mutation of the TSH receptor Activating mutation of $GS\alpha$ (McCune-Albright syndrome) Struma ovarii Drugs: <u>iodine excess</u> (Jod-Basedow phenomenon) 	<ul style="list-style-type: none"> Subacute thyroiditis Silent thyroiditis Other causes of thyroid destruction: amiodarone, radiation, infarction of adenoma Ingestion of excess thyroid hormone (thyrotoxicosis factitia) or thyroid tissue 	<ul style="list-style-type: none"> TSH-secreting pituitary adenoma Thyroid hormone resistance syndrome Chorionic gonadotropin-secreting tumors Gestational thyrotoxicosis

How? Use radioactive iodine uptake **RAIU**

Differential Diagnosis of Hyperthyroidism

Increased Hormone Synthesis (Increased RAIU)

Release of Preformed Hormone (Decreased RAIU)

Graves' disease (diffuse toxic goiter)

Toxic multinodular goiter

Toxic adenoma

Drug induced—amiodarone, iodine

Thyroid cancer

Struma ovarii

Hydatidiform mole

TSH-secreting pituitary adenoma

- Thyroiditis—acute phase of Hashimoto's thyroiditis, subacute thyroiditis

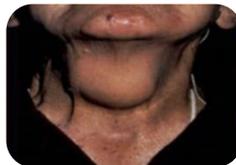
- Factitious (iatrogenic) thyrotoxicosis

- "Hamburger thyrotoxicosis"

Hyperthyroidism The Most Common Causes



Graves' disease (diffuse toxic goiter)



Toxic adenoma



Toxic multinodular goiter

Clinical Picture

Symptoms

Hyperactivity, irritability, dysphoria

Heat intolerance and sweating

Palpitations

Fatigue and weakness

Weight loss with increased appetite

Diarrhea

Polyuria

Oligomenorrhea, loss of libido

Signs

- Tachycardia; atrial fibrillation in the elderly

- Tremor

- Goiter

- Warm, moist skin

- Muscle weakness, proximal myopathy

- Lid retraction or lag

- Gynecomastia

Plus, ophthalmopathy and dermopathy specific for Graves' disease

Differentiation

History

- P/E

Radionuclide scan

- Thyroid ultrasound

→ autoimmune
B-cells produces abs against
thyroid prns.

Graves' disease

- Diffusely enlarged, soft gland
- Homogeneous increased radionuclide uptake
- No nodules

Toxic adenoma

benign

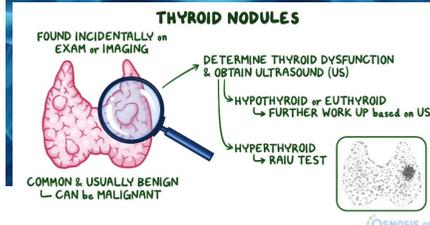
- Solitary nodule
- Increased uptake against a background of suppressed uptake in the remaining thyroid

Toxic multinodular goiter

- Diffusely multinodular gland
- Heterogeneous radionuclide uptake
- Multiple nodules of varying sizes on ultrasonography

Thyroid Nodule

نودول
Not a disease



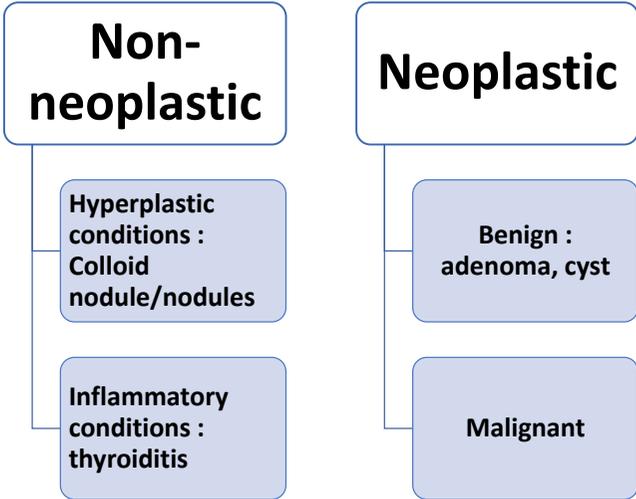
Thyroid Nodule

Not a pathological entity in themselves but are clinical manifestations of a wide range of thyroid diseases.

Classified as multiple or solitary lumps

- The most common lump in the thyroid comprises a dominant part of a **multinodular goiter**
- More common in females
- Found in about 5% of the general population.
- Thyroid cancer accounts for 4 to 6.5% of all thyroid nodules.

Classification ~ clinical and histopathological



Risk Factors For Thyroid Cancer in a Nodule

History of head and neck irradiation, including total-body irradiation for bone marrow transplant and brain radiation for childhood leukemia

Exposure to ionizing radiation from fallout in childhood or adolescence

Age <20 or >65 years

Increased nodule size (>4 cm)

New or enlarging neck mass

Male gender

Vocal cord paralysis, hoarse voice

Nodule fixed to adjacent structures

Family history of thyroid cancer, MEN 2, or other genetic syndromes associated with thyroid malignancy (e.g., Cowden's syndrome, familial polyposis, Carney complex)

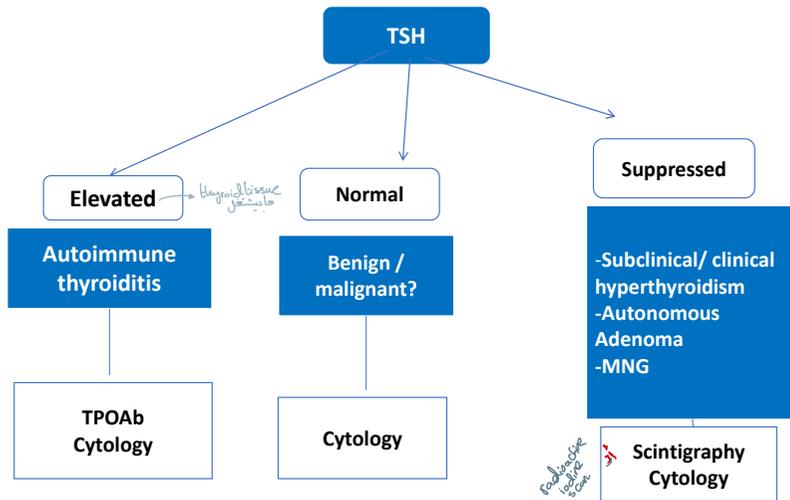
المرضى يتذكروا أكثر من مرضية بوجودهم Multiple cancer

multiple endocrine neoplasia

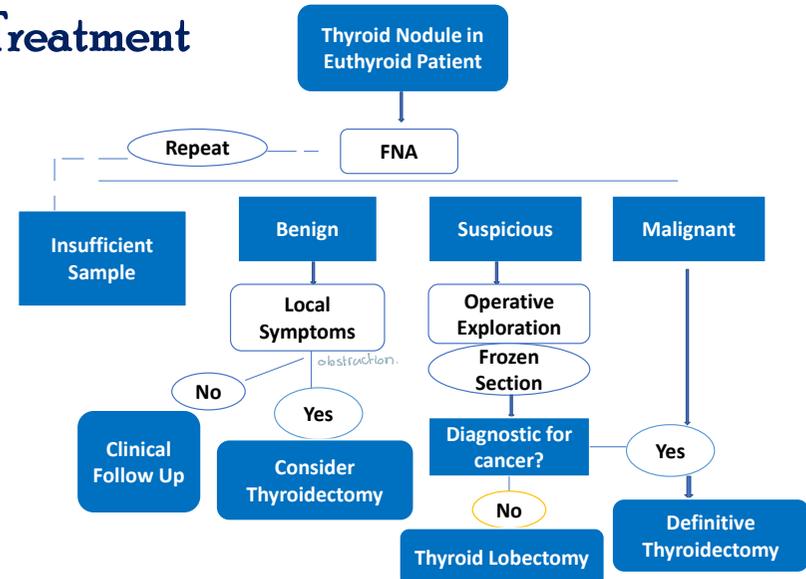
Extrathyroidal extension

Lateral cervical lymphadenopathy

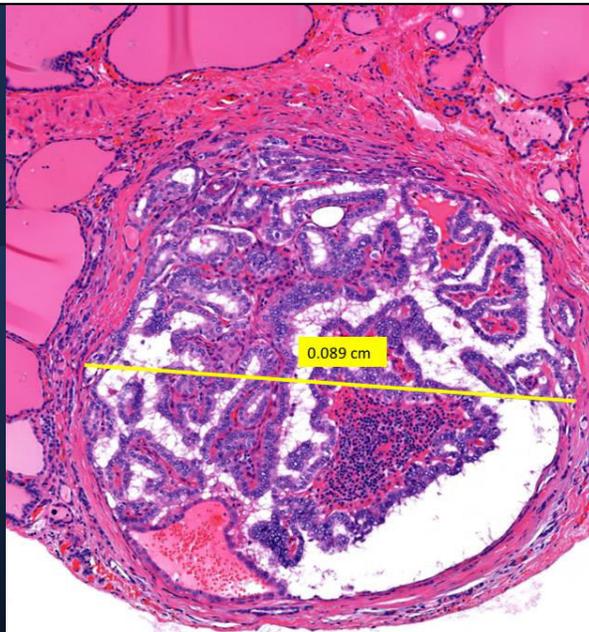
Investigation



Treatment



Thyroid Cancer



Structural and cellular features of papillary thyroid carcinoma, but measuring < 1 cm in diameter

Epidemiology

- One of the most common malignant endocrine tumors
- Annual incidence of about 4/100,000

♀ > ♂

- Is 2–4 times more common in women than in men.
- However, the probability that a solitary palpable lump in the thyroid is malignant is higher in men.

Risk Factors

Well-documented risk factors

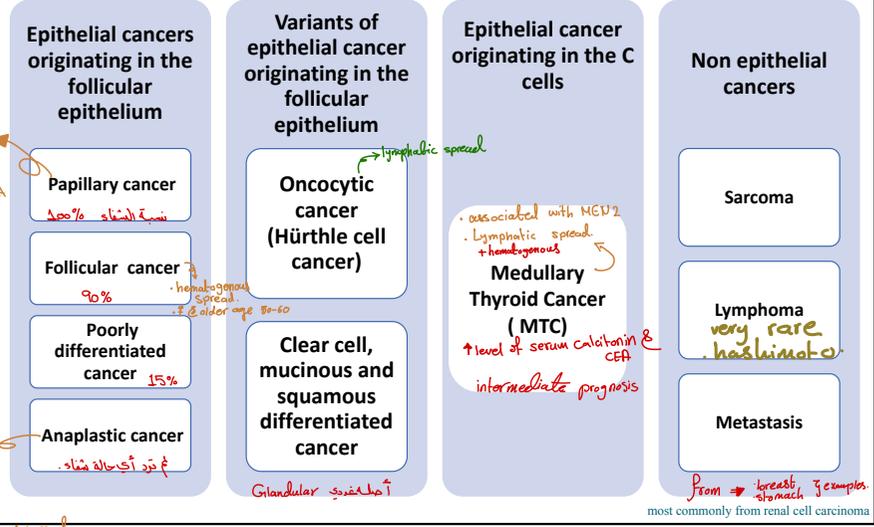
- Heredity
- Radiation exposure

Less well-documented RF

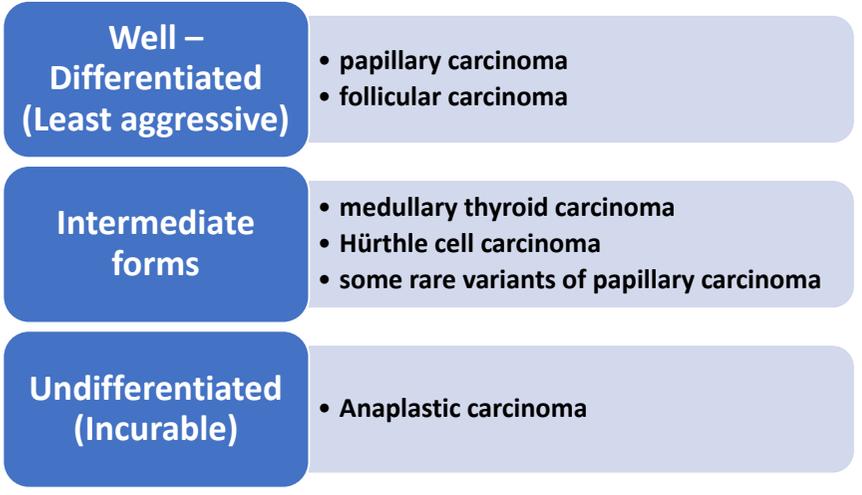
- Iodine intake
- Graves' disease
- Thyroiditis
- Pregnancy and other hormonal conditions

Types

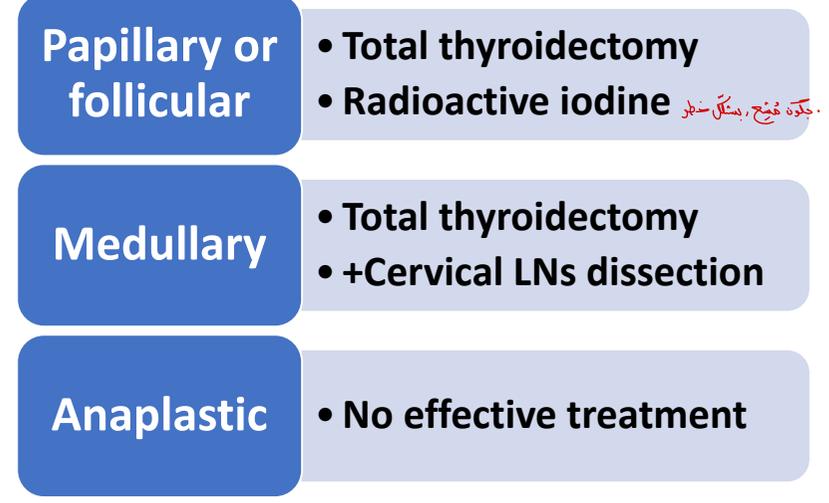
Ionizing radiation (particularly during childhood)
 • Most common thyroid CA
 • spread by lymphatics
 • About 50% found to have psammoma bodies
 • Thyroglobulin is a tumor marker
 • associated with TP53
 • Lymphatic & hematogenous spread



Classification according to clinical aggressiveness



Treatment



THANK YOU



*Best thyroid cancer prognosis: **Papillary**

*Wrong about follicular cancer: **it presents at older age in relation to papillary**

*Long standing goiter leads to? **anaplastic thyroid cancer**

*A patient with treated lymphoma with radiotherapy presented with firm irregular midline neck mass : **it is malignant lesion due to radiation exposure but the choice was Malignant goiter**

*A 34-year-old woman comes to the clinic because of fatigue, generalized weakness, and palpitations. Medical history is significant for hyperthyroidism and mild ophthalmopathy caused by Graves's disease. Before initiating therapy, the patient wants to know what she can expect in the future. In advising her about the prognosis, which of the following is the wrong statement?
Grave's ophthalmopathy will resolve as thyroid hormone secretion is lowered

which of the following is the most accurate statement? Select one:
b. The thyroid will continue to increase in size with any nonsurgical treatment
c. Malignant degeneration of the thyroid gland is a common complication
d. Untreated patients are at increased risk for cardiac arrhythmias
e. Grave's ophthalmopathy will resolve as thyroid hormone secretion is lowered

*Radio active iodine is part in treatment of which of the following thyroid conditions
Select one:
a. anaplastic carcinoma
b. medullary carcinoma
c. hashimoto thyroiditis
d. papillary carcinoma
e. lymphoma

*Which of the following is not true about the arterial supply of the Thyroid:
Select one:
a. The superior thyroid arises from the external carotid.
b. The inferior thyroid arises from the thyrocervical trunk.
c. The middle thyroid arises from the external carotid.
d. The thyroid ima artery arises from the brachiocephalic trunk.
e. The thyroid ima present in 10 % of population.

Bethesda system diagnostic categories for reporting thyroid cytopathology

Bethesda class	Diagnostic category	Cancer risk
I	Nondiagnostic (unsatisfactory)	5 to 10%
II	Benign	0 to 3%
III	Atypia of undetermined significance (AUS) or follicular lesion of undetermined significance (FLUS)	10 to 30%
IV	Follicular neoplasm (or suspicious for follicular neoplasm)	25 to 40%
V	Suspicious for malignancy	50 to 75%
VI	Malignant	97 to 99%

Data from: Cibas ES, Ali SZ. The 2017 Bethesda system for reporting thyroid cytopathology. *Thyroid* 2017; 27: 1341.

The most dangerous complication after thyroid surgery is:

- a. Hypoparathyroid tetany
- b. Hypothyroidism
- c. Respiratory obstruction**
- d. Hoarseness of voice
- e. Recurrence

*The dietary element necessary for the formation of thyroid hormones is:

- A. Iron
- B. Iodine**
- C. Copper
- D. Magnesium
- E. Sodium

*The malignant thyroid tumor that occurs in young ages, spreads mainly by lymphatics and has good prognosis is:

- A. Papillary carcinoma**
- B. Medullary carcinoma
- C. Follicular carcinoma
- D. Lymphosarcoma
- E. Anaplastic carcinoma

*Which thyroid condition is associated with MEN2: **Medullary carcinoma**

*A solitary thyroid nodule in a 35 year-old euthyroid woman with a goiter is likely to be: **Simple thyroid nodule**

A 15-years-old patient presented with a painless rounded midline swelling of the anterior aspect of the neck that moves with deglutition and protrusion of the tongue is mostly having:

- A. Sublingual dermoid
- B. Cystic hygroma
- C. Thyro-glossal cyst**
- D. Solitary nodule of the thyroid isthmus
- E. Submental lymph node