Solitary Thyroid Nodule

Done by: Mouniah Nawaiseh
Rana Emran
Aya Alefeshat
Dana Salameen

Supervised by: Dr.Mohammad Nofal

{Mohammad Nofal Notes}

- Thyrotoxicosis may occur with hypothyrodosim → eg!- Hashimoto Disease
- most comon cause of enlarged goiter is → ↑TSH (Not iodine deffenicy ,Note:- iodine Deffeniy also cause goiter)
- ↓ Deep tendon Refler (hyporeflexia) is pathognomonaic For hypothyrodism
- most comon cause of Billateral or unilateral exophthalmos is Graves Disease
- indication for Total Thyrodectomy → 1) Nodule more than 4cm
  2) Nodule cross The midline
- Thyroglosal cyst its consintal Disorder can Appeer at any Time from Birth until 10 yrs old child
- why we Do surgery (Excesion it By sistrunk procedure) For Thyrogosal cyst ?? Bcz it carry Risk of 1) ↑Risk of papillary Ca
  2) fistula
  3) infection
- if it was hypoechoic , cold , Irregulae margin and large size → suggest malignant
- most solitary Nodule Are → Follicular Adenoma {Carcinoma go Adenoma يا ولاد}

Indications for Surgery

1- As therapy for patients with thyrotoxicosis .
2-To treat benign and malignant thyroid tumors .
3- for suspicious cyst and toxic adenoma
4- To relive pressure symptoms such as (dyspnea ,Dysphagia) .
5-Cosmetic purpose.
6-To establish a definitive diagnosis of a mass in the thyroid gland , especially when cytological results are indeterminate

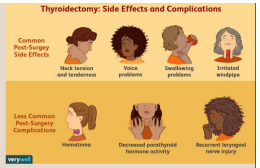
In patients with low risk factors & Benign nodules : - Lobectomy + isthmusectomy .

In patients with high risk factors & Benign nodules : - Near-total or Total thyroidectomy .

In Patients with Malignant nodules : - Near-total or Total thyroidectomy .

In Patients with Medullary thyroid Carcinoma : - Total thyroidectomy + cervical clearance (central and bilateral LNs) .

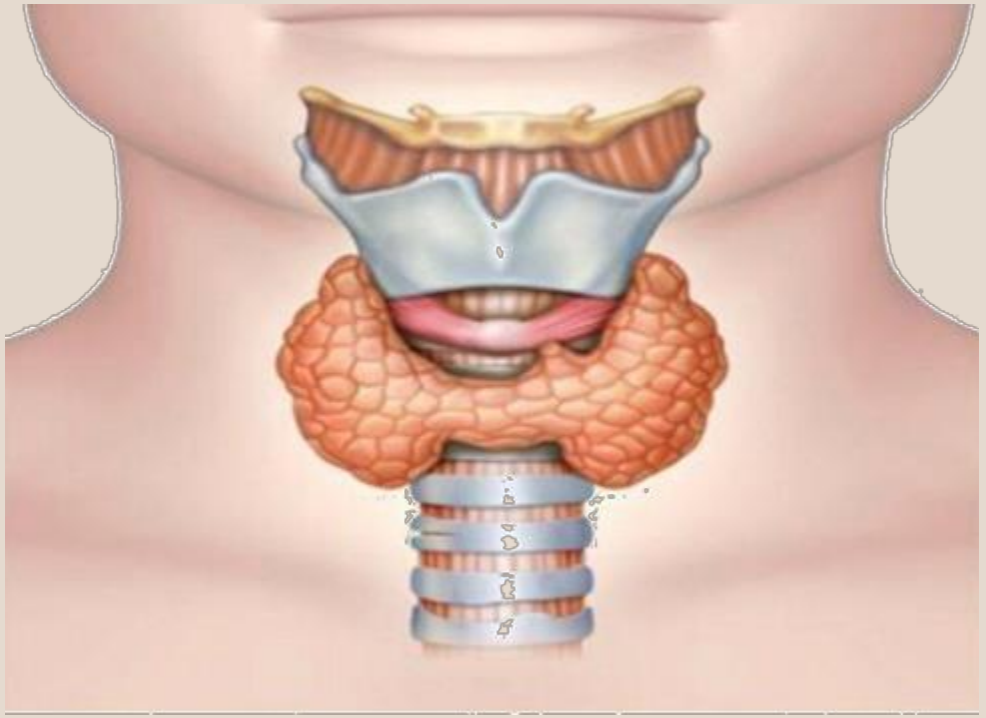
Complications of Thyroid Surgery



1- hemorrhage
2- damage to the external branch of the superior laryngeal nerve.
3-Damage to the recurrent laryngeal nerve.
4-hypothyroidism. (within 2-3weeks)
5-hypoparathyroidism.
6-respiratory obstruction
7- thyroid crisis (in surgery or immediately after it)

THYROID GLAND

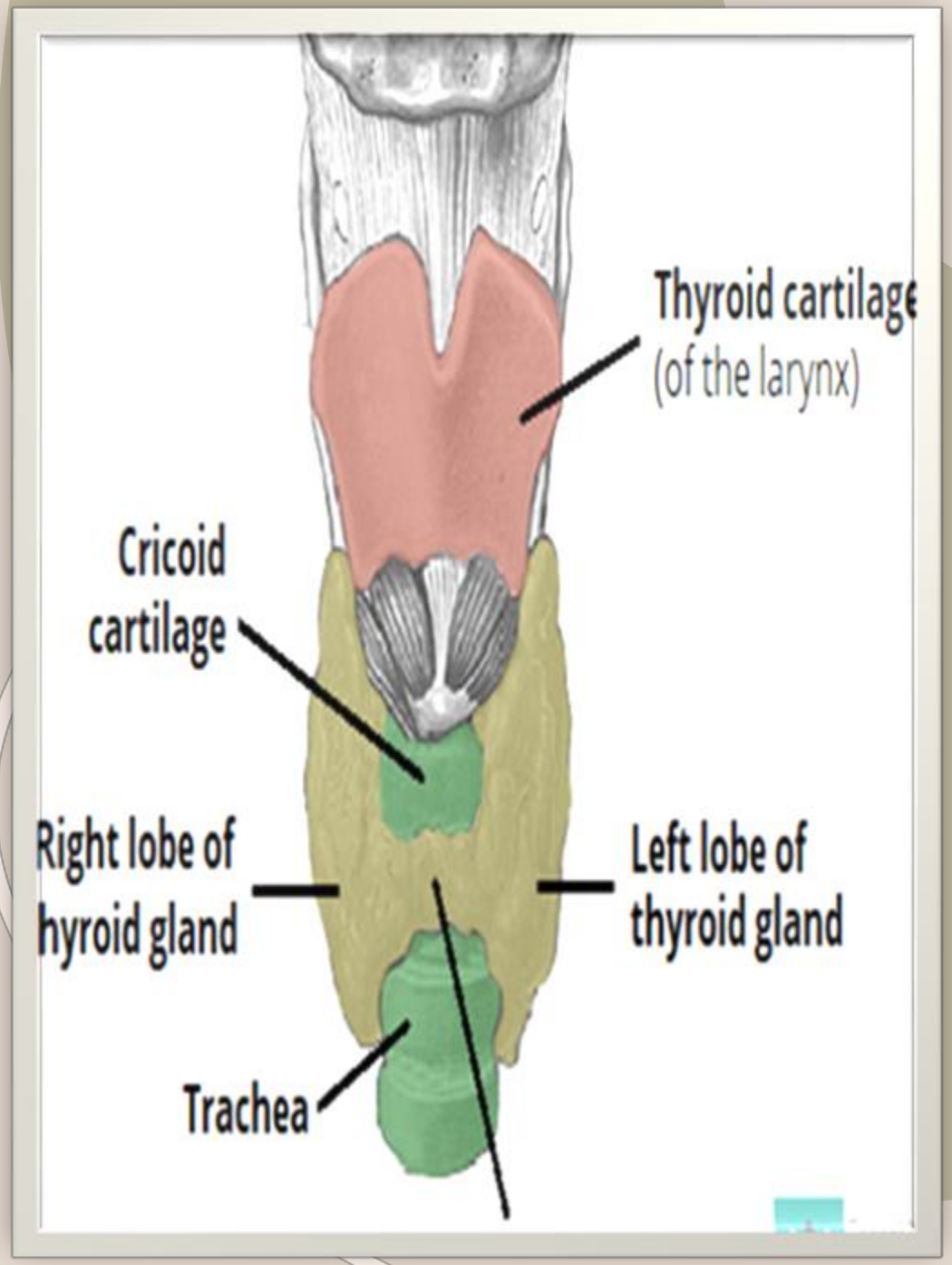
THE *THYROID GLAND* IS AN ENDOCRINE STRUCTURE LOCATED IN THE NECK. IT PLAYS A KEY ROLE IN REGULATION THE METABOLIC RATE OF THE BODY.



ANATOMY

- The thyroid gland is located in the anterior neck and spans the C5-T1 vertebrae. It consists of two lobes (left and right), which are connected by a central isthmus anteriorly – this produces a butterfly-shape appearance.

  The lobes of the thyroid gland are wrapped around the cricoid cartilage and superior rings of the trachea.



- **Arterial Supply**

  ⁎ **The arterial supply to the thyroid gland is via two main arteries:**

  • Superior thyroid artery – arises as the first branch of the external carotid artery.

  • Inferior thyroid artery – arises from the thyrocervical trunk (a branch of the subclavian artery

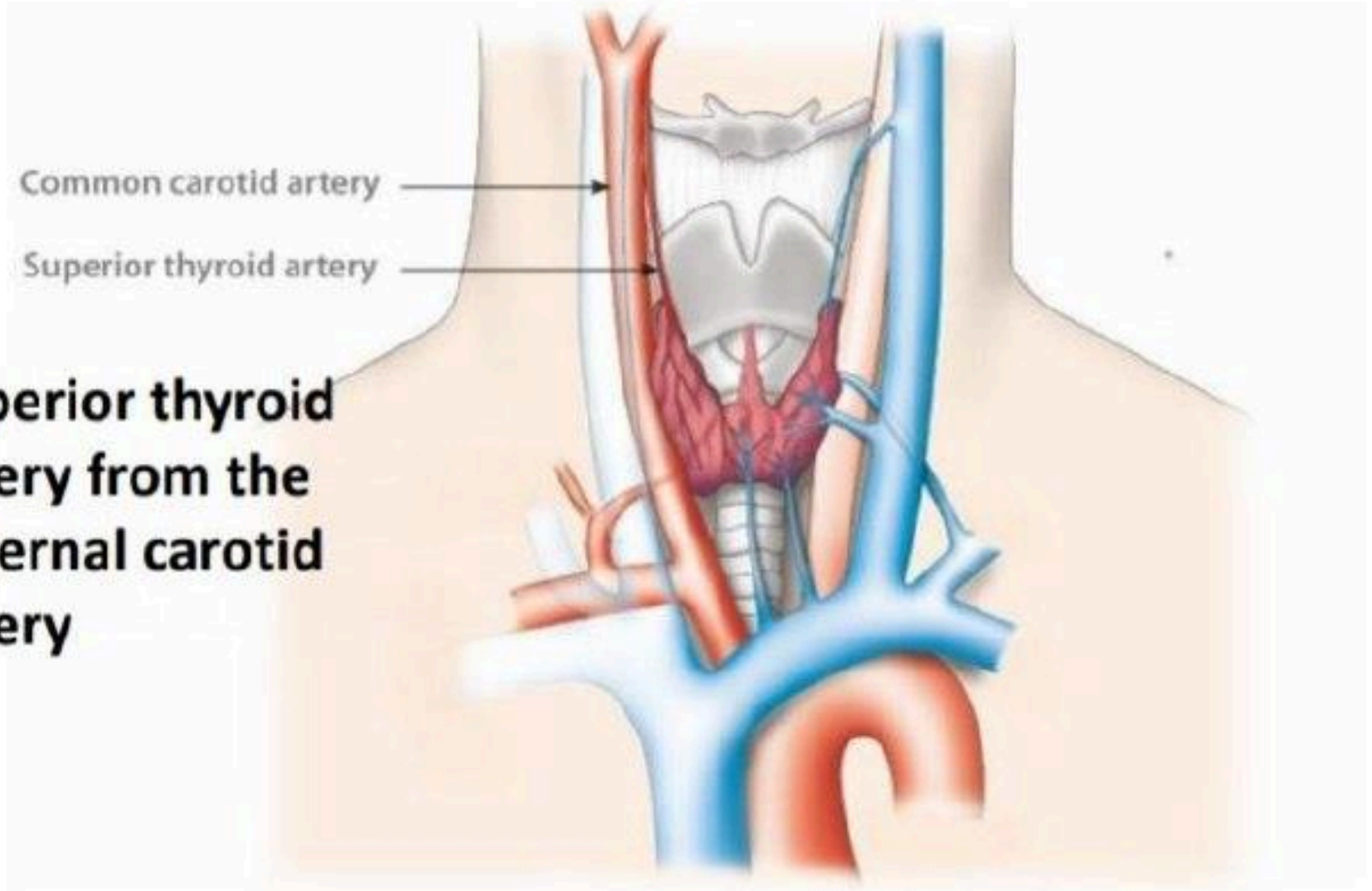
  • In a small proportion of people (around 3%) there is an additional artery present – the thyroid ima artery. It arises from the brachiocephalic trunk and supplies the anterior surface and isthmus of the thyroid gland.

- Venous Drainage

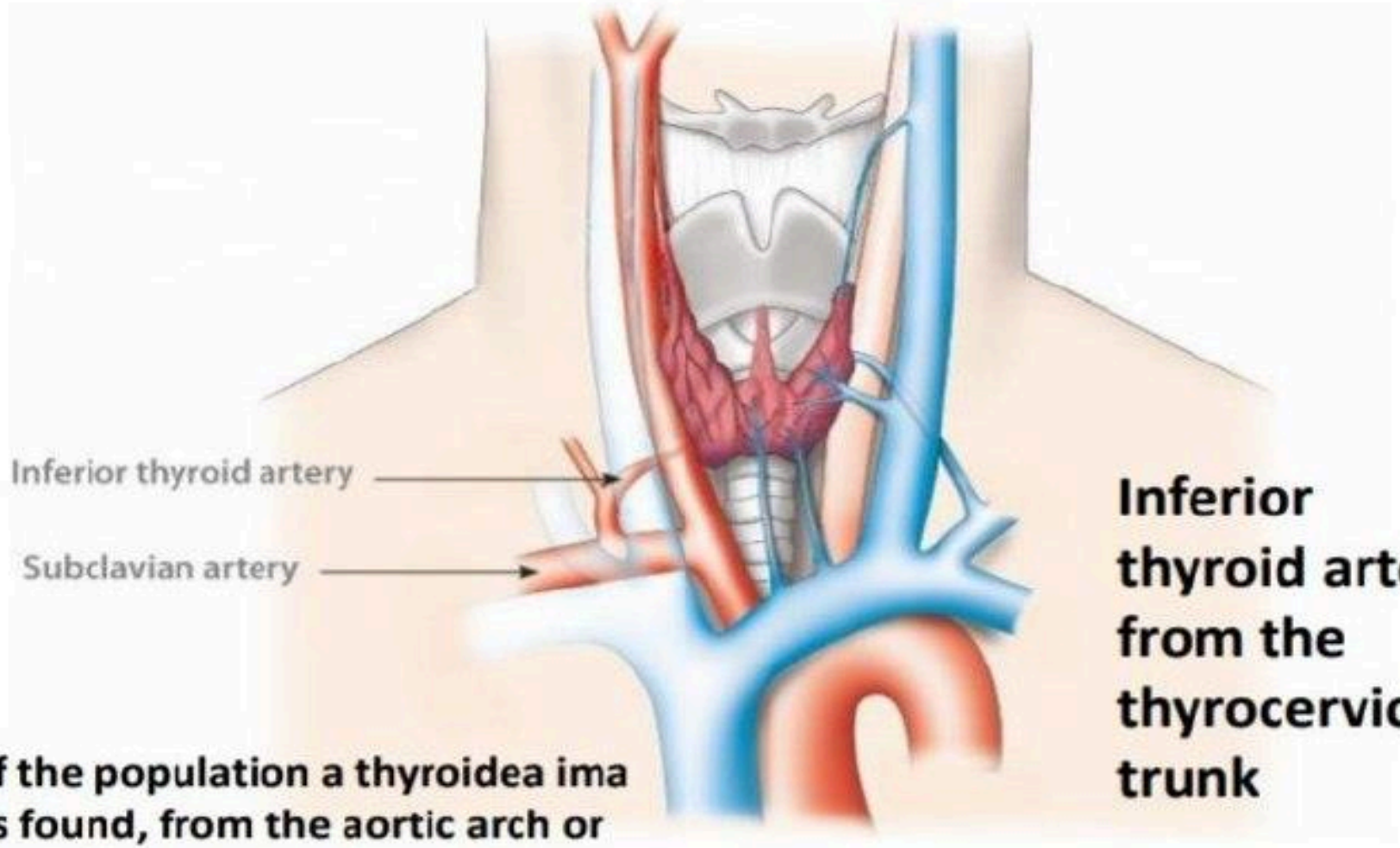
- Venous drainage is carried by the superior, middle, and inferior thyroid veins, which form a venous plexus around the thyroid gland.
- The superior and middle veins drain into the internal jugular vein and the inferior empties into the brachiocephalic vein

- Innervation

- The thyroid gland is innervated by branches derived from the sympathetic trunk.
- These nerves do not control the secretory function of the gland – the release of thyroid hormones is regulated by the pituitary gland

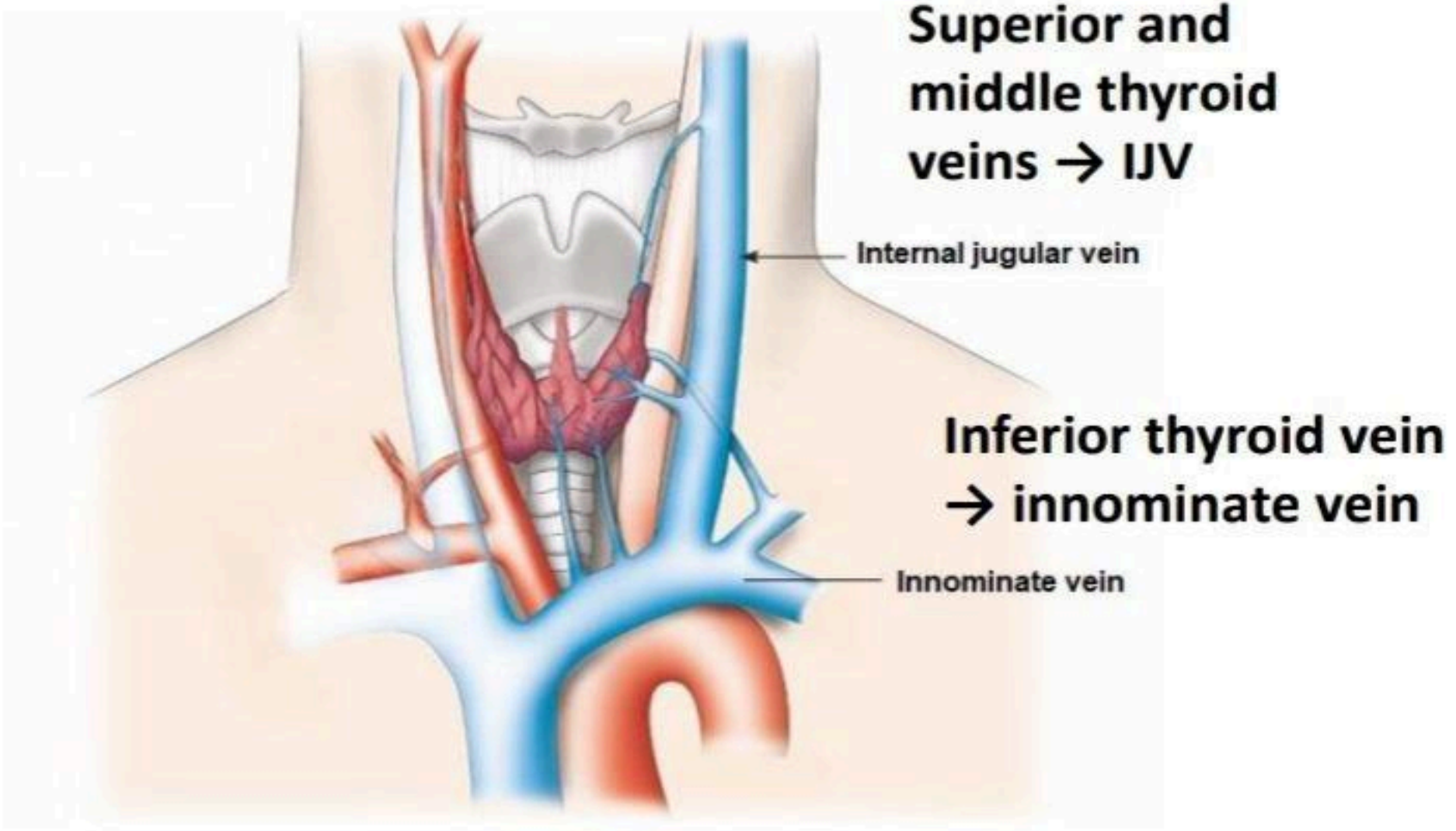


Superior thyroid artery from the external carotid artery

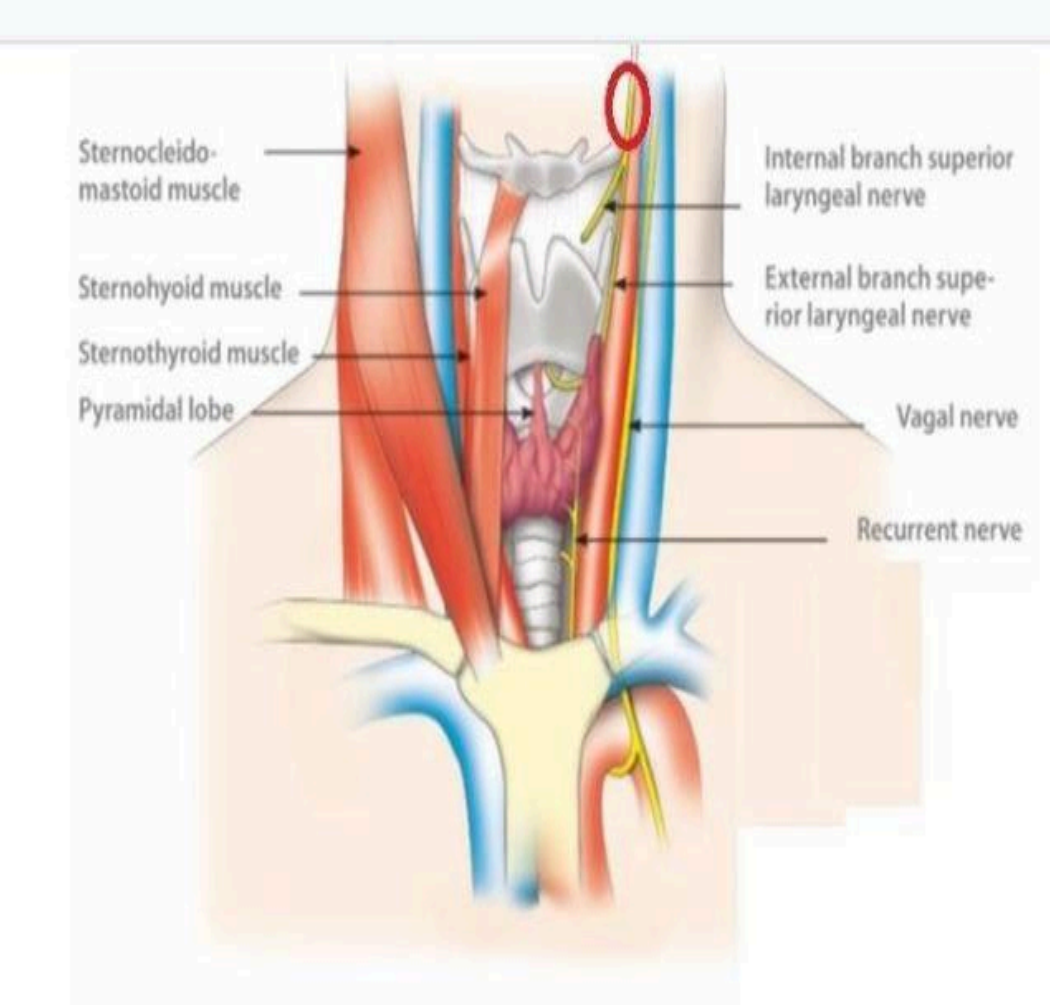


Inferior thyroid artery from the thyrocervical trunk

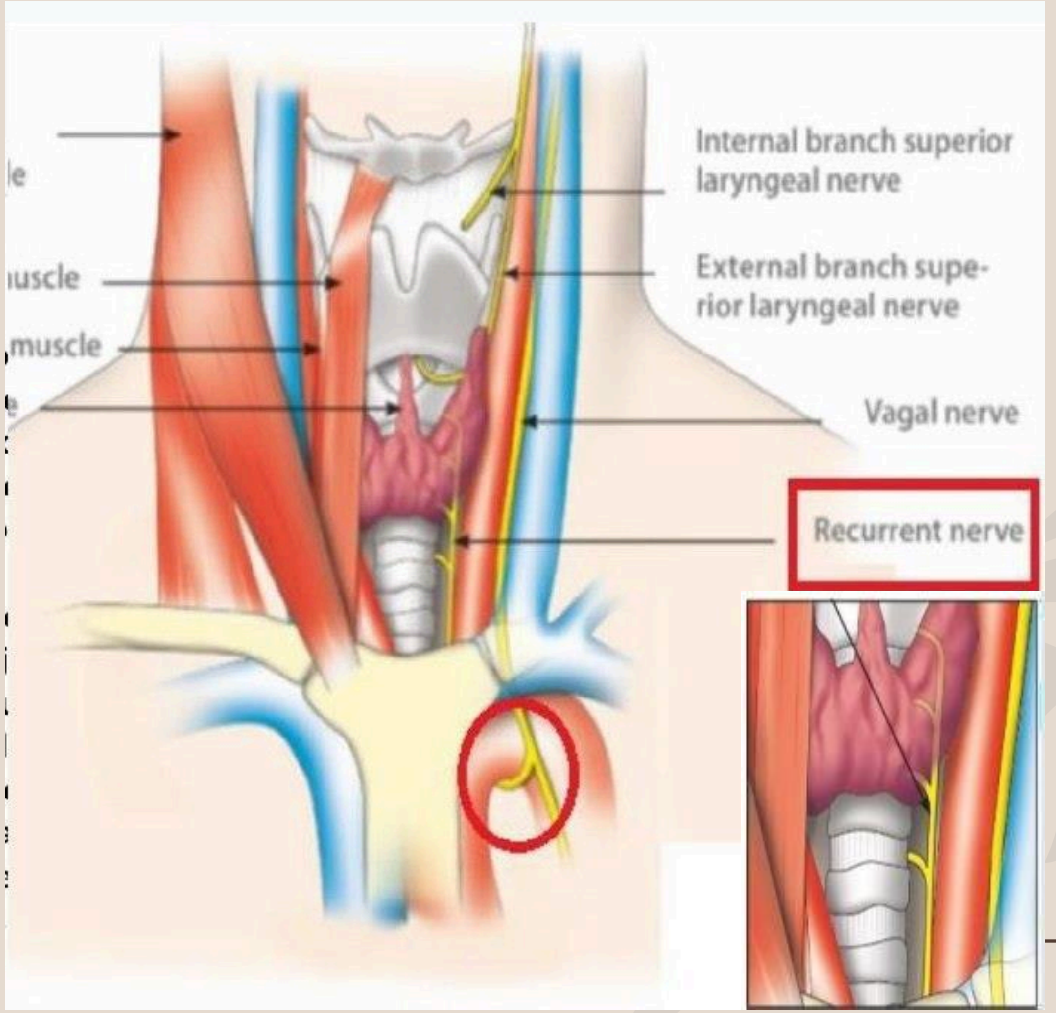
In 3% of the population a thyroidea ima artery is found, from the aortic arch or brachiocephalic artery


Superior and middle thyroid veins → IJV
Internal jugular vein
Inferior thyroid vein → innominate vein
Innominate vein

Superior laryngeal nerve (external branch)

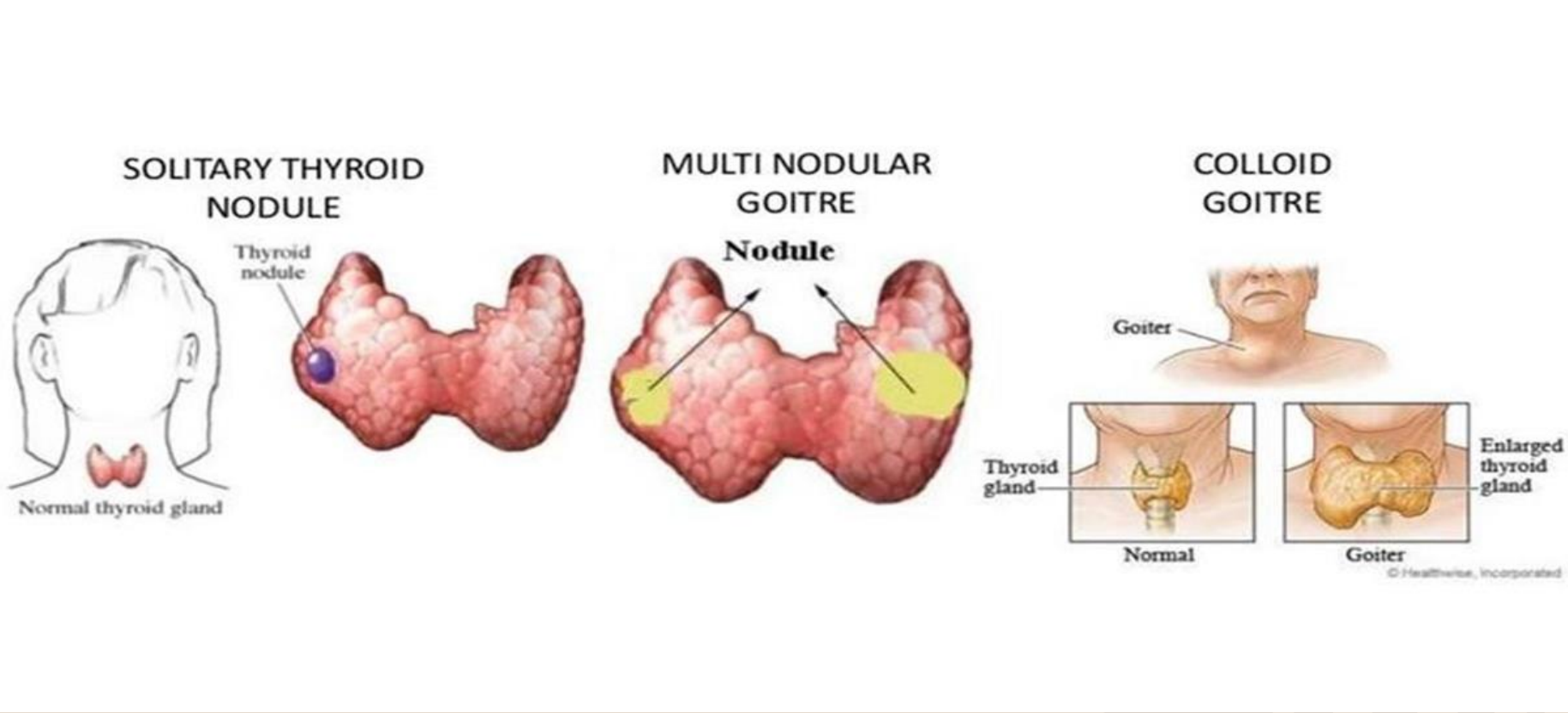


Recurrent laryngeal nerve



Solitary Thyroid Nodule

A discrete lesion/nodule, within the thyroid, that is palpably and/or radiologically distinct from the surrounding thyroid parenchyma.



- Thyroid nodules are common, with up to 8% of the adult population having palpable nodules. With the use of ultrasound, up to 10 times more nodules are likely to be detected.
- They are found in **4%–8%** of adults by **palpation** and in **13%–67%** when **ultrasound** detection is used. In **autopsy** studies, they have a prevalence of approximately 50% .(so thyroid nodules are common problem).
- The prevalence of thyroid nodules increases with age and women have a higher prevalence than men.
- The primary aim in investigating a thyroid nodule is to exclude the possibility of malignancy, which occurs in about 5%of nodules.
- Thyroid nodule is considered as cold, warm, or hot. Cold thyroid nodule does not produce any hormone. Similarly thyroid nodule is considered warm or hot depending on amount of thyroid hormone secreted by thyroid tissue forming adenoma.

CLINICAL EVALUATION:

- As with all assessments, a thorough history and examination is required in patients who present with a thyroid nodule.
- Most nodules are **asymptomatic** and are often discovered **incidentally** by the patient or their primary medical practitioner when being examined for another problem.
- With the increasing use of diagnostic imaging, thyroid nodules are not infrequently detected as an incidental finding on ultrasounds and computed tomography (CT) scanning.

HISTORY AND EXAMINATION

- Regardless of the way in which thyroid nodules are discovered, a detailed patient history is requisite.
- Information that needs to be ascertained includes:
  - the presence of symptoms,
  - a change in nodule size, → Rapid change suggest Anaplastic Thyroid carcinoma (worest ca and most Aggresive in Thyroid)
  - previous head/neck radiation exposure, → papillary Carcinoma Risk
  - a family history of thyroid or endocrine diseases. → MEN 2 (Medullary Thyroid carcinoma) RET proto oncogen on chromosome 10 mutation

HISTORY AND EXAMINATION

- The patient may report a history of **pain**, which may follow **hemorrhage** into a colloid nodule, or a sudden increase in the size of a neck lump, which would raise concern of malignancy.
  ↳ Anaplastic Ca scenario
- **Voice change or hoarseness** may also be a progressive symptom associated with an invasive tumor. Symptoms of **dysphagia, coughing, choking,** and **dyspnea** should be asked about.
- Exposure of the thyroid gland to ionizing radiation is known to contribute to a higher incidence of both benign and malignant thyroid nodules, with malignancy rates in a palpable nodule in a previously irradiated thyroid in the range of 20%–50%

papillary Ca scenario

HISTORY AND EXAMINATION

- Clinical examination of the thyroid should focus on whether the nodule is **solitary** or dominant in a multinodular goiter.
- The characteristics of the nodule, including **size, consistency** (e.g., soft, firm, woody, or hard), and **involvement with adjacent structures**, should also be defined.
- Examination of the cervical lymph nodes, should also be performed.

Size
Shape
Consistancy (Hard or not)
Fixed or Not
surrounding Area

COMMON SOLITARY THYROID CONDITION

- Simple goiter
  - Nodular goiter
  - Diffuse hyper plastic goiter
- Thyroid cyst
- Autonomous toxic nodule
- Granulomatous thyroiditis DeQuervain Thyroditis
- Follicular adenoma cannot be distinguished from follicular ca By FNA
- Malignant solitary nodule

- **simple goiter (nontoxic):** is an anatomical enlargement of the thyroid gland. It can be related with thyroid dysfunction or have normal thyroid function.

- Etiology of simple goiter:

Most common cause of goiter

1) THEY MAY ARISE AS A RESULT OF TSH STIMULATION OF THE THYROID GLAND, WHICH OCCURS AS A RESULT OF:

INAPPROPRIATE SECRETION FROM A MICROADENOMA IN ANT PITUITARY (RARE) ✓ A CHRONIC LOW LEVEL OF THYROID HORMONES

2) ENDEMIC GOITER CAN DEVELOP AS A RESULT OF A LACK OF IODINE IN THE DIET

3) SPORADIC GOITERS ARE COMMONLY CAUSED BY DEFECTIVE HORMONE SYNTHESIS

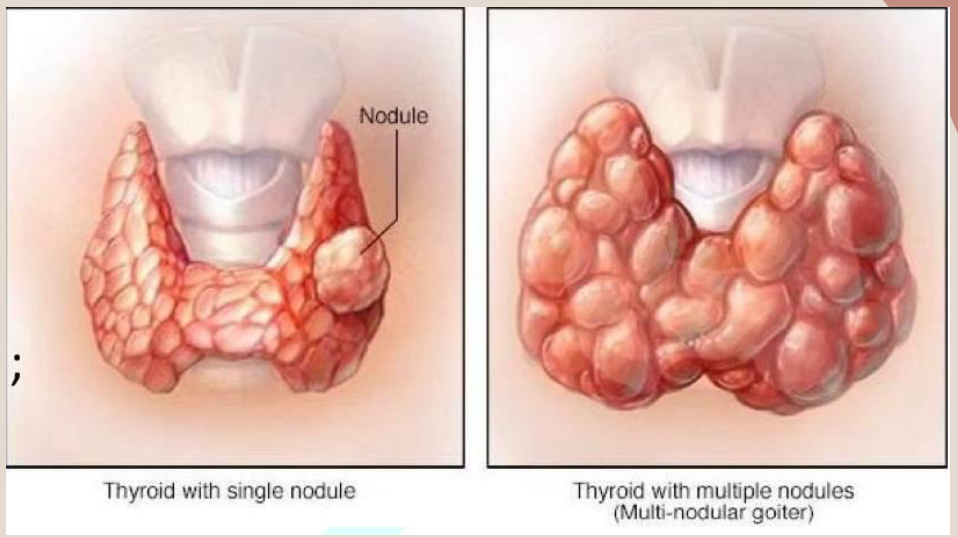
Nodular goiter:•

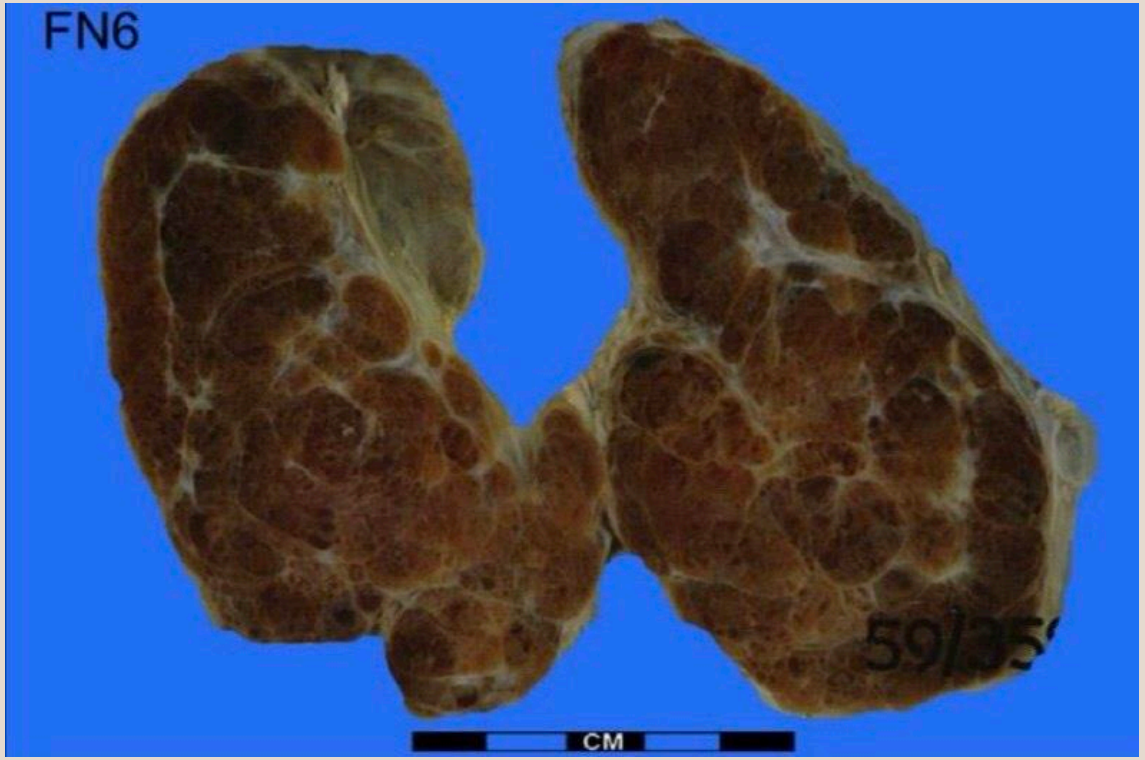
Only one macroscopic nodule is occasionally found, but microscopic changes are present throughout the gland; this is one type of clinically solitary nodule.

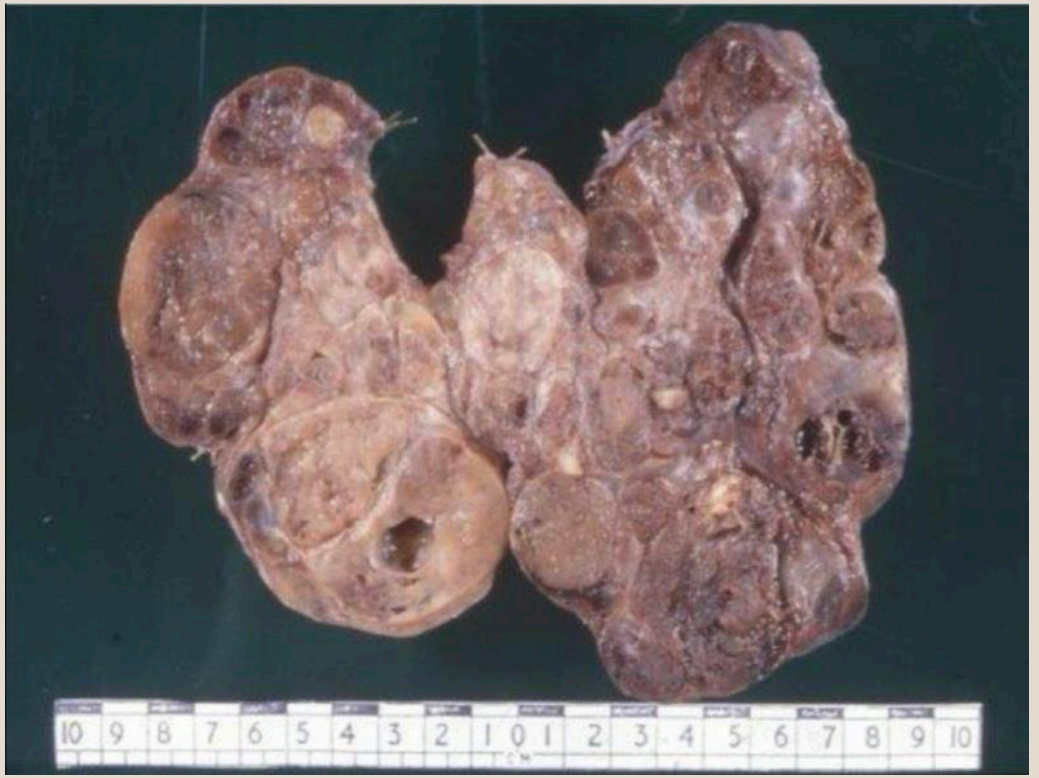
➢ Nodules can be colloid or cellular, and cystic degeneration and hemorrhage, as well as subsequent calcification, are common.

➢ Nodules appear early in endemic goiter and later (between 20 and 30 years) in sporadic goiter, although the patient may be unaware of the goiter until his or her late 40s or 50s.•

More common in female than in the male

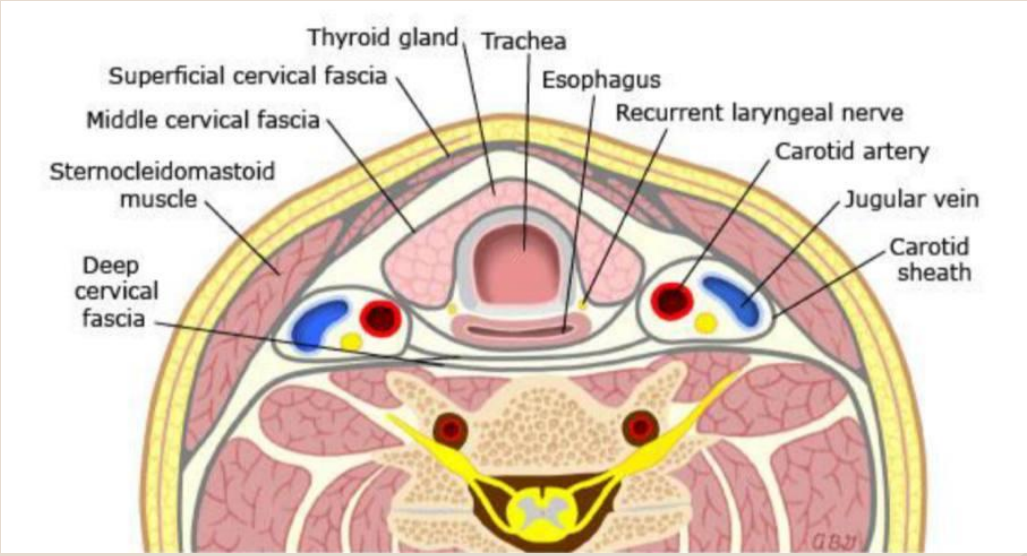



FN6
CM



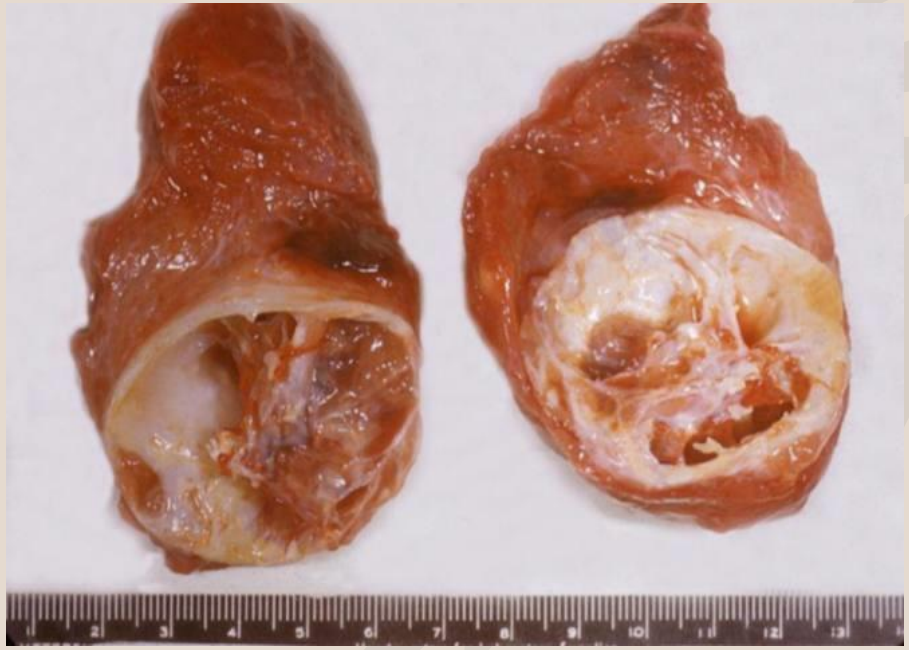
Symptoms بتشكي انو رقبتها نافخة

1. Cosmetic deformity: the patient's main complaint is usually the cosmetic deformity or some respiratory obstruction.
2. Sudden enlargement: with the appearance of pain and tenderness usually results from hemorrhage into a nodule.



Complication of goiter !!

1. Tracheal obstruction by compression
2. Secondary thyrotoxicosis: may occur in up to 30% of cases.
3. Malignancy: Occasionally follicular carcinoma may develop 3%.
4. Cyst formation.
5. Calcification; may occur in longstanding cases.

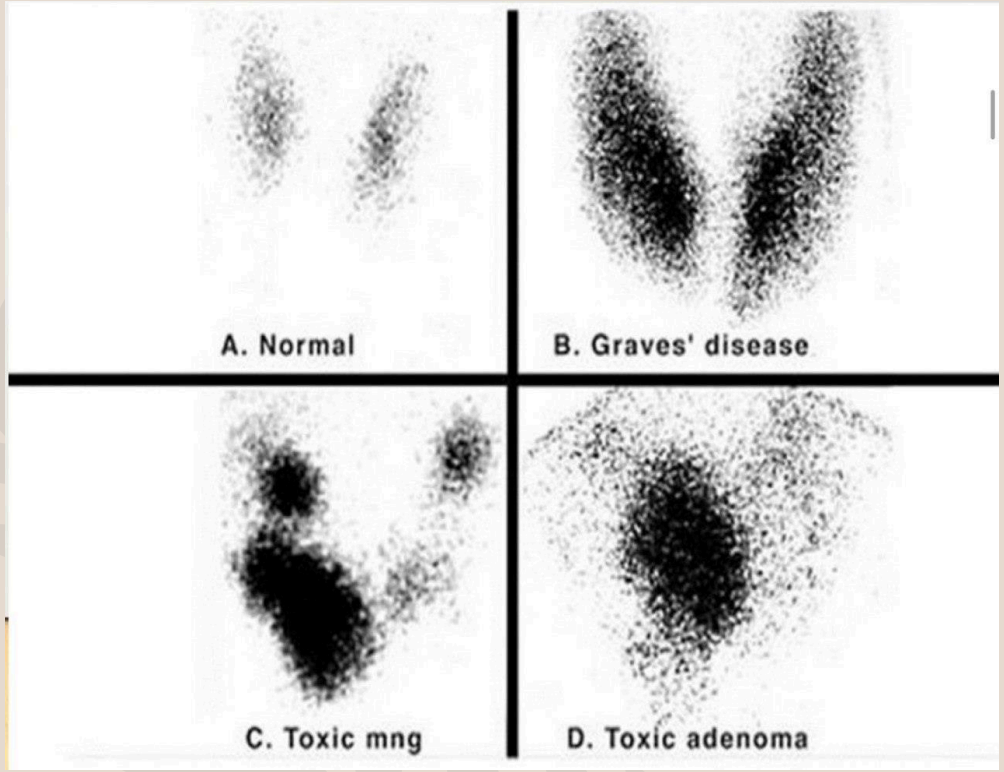


Autonomous toxic noduleToxicity is due to a solitary, hyperactive, autonomous nodule. results in excessive thyroid hormone production from a single nodule in the thyroid gland. The excess thyroid hormone production can no longer be controlled by the body thereby resulting in hyperthyroidism.Pathology: Hyperplasia of the acini with high columnar epithelium.

Pathology: Hyperplasia of the acini with high columnar epithelium.

History: Hyperthyroid symptoms

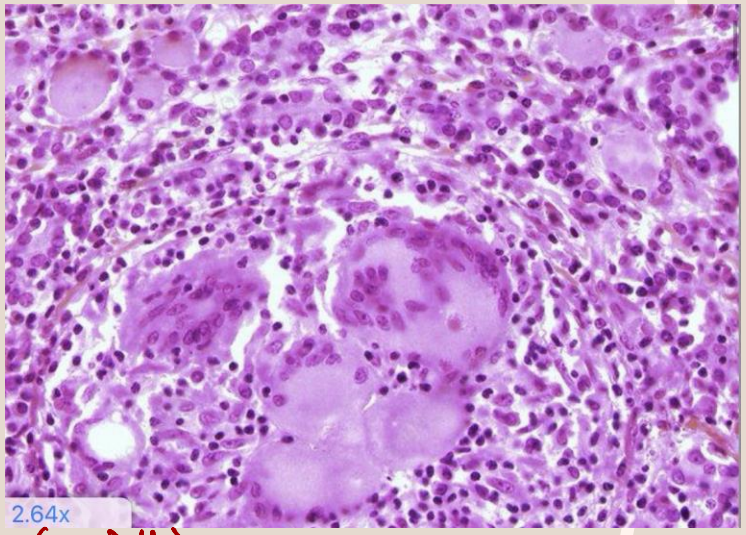
Physical examination: Soft to firm, painless and bruit might be heard.



Granulomatous thyroiditis

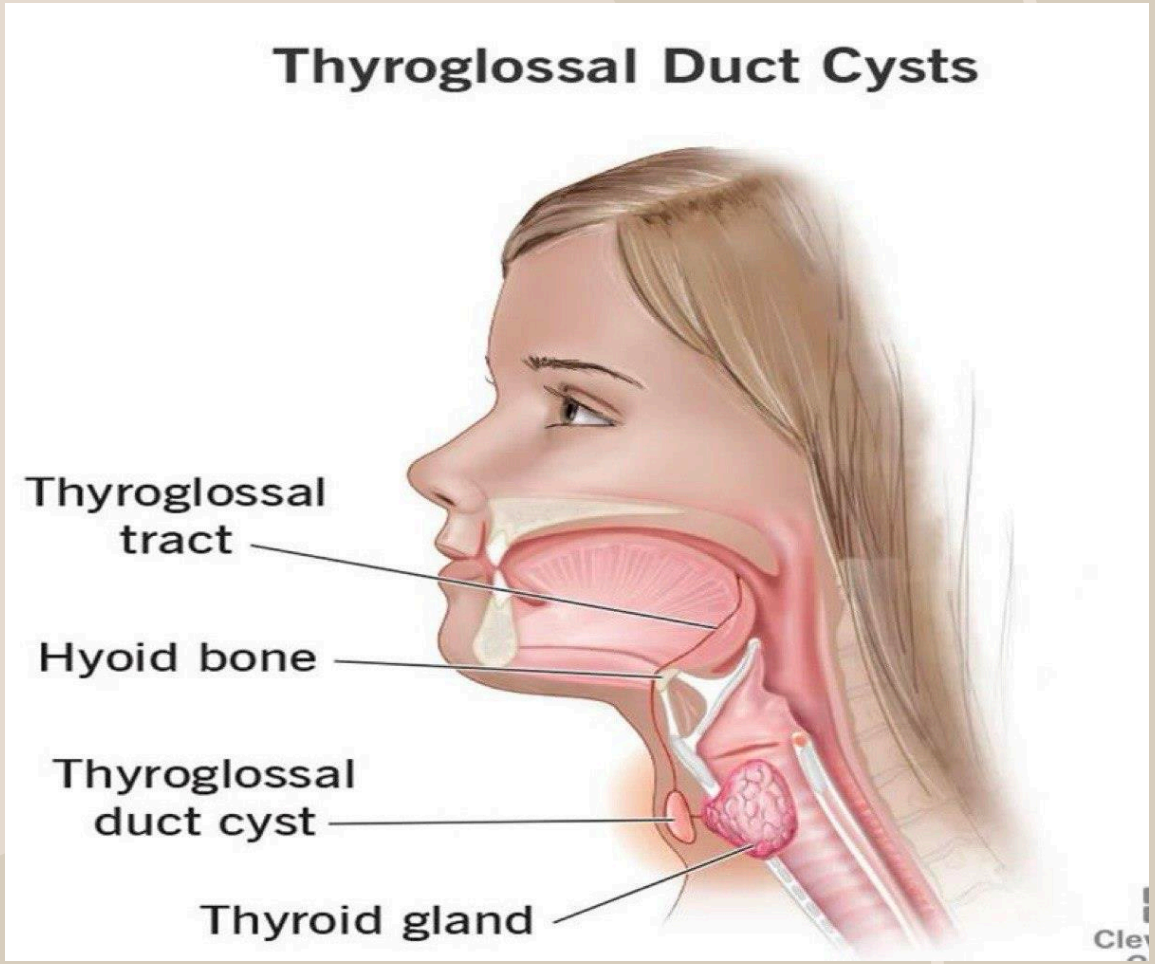
- Also called "Subacute thyroiditis" DeQuervain Thyroditis (Due to viral infection mostly)

- Subacute granulomatous thyroiditis is a self-limited inflammation of the thyroid gland. It is associated with a triphasic clinical course that lasts for a few weeks to many months, characterized by transient thyrotoxicosis, hypothyroidism, and then a return to normal thyroid function in >90% of patients. ithink its worng consequnce ☹!! MyOpinion → :- Tranisient Hyperthyroid state → euthyroid → hypothyroid → euthyroid
The initial thyrotoxic phase is associated with thyroid pain, high serum thyroid hormone levels with a low radioiodine uptake, elevated ESR, elevated CRP, and a systemic illness similar to influenza, with fever, myalgia, and malaise. ↑ESR/↑CRP/painful/ tenderness / on Neeeleee → show low iodine uptake (ex)



THYROGLOSSAL CYST:

- IN THE EMBRYO, THE THYROID GLAND BEGINS DEVELOPMENT NEAR THE BASE OF THE TONGUE – IN AN AREA KNOWN AS THE FORAMEN CECUM. IT DESCENDS DURING DEVELOPMENT AND REACHES ITS DESTINATION IN THE ANTERIOR NECK BY WEEK 7.



- it Desends from fromen cecum
  Anterior or within or posterior to hyoid Bone
- Based on Bootcamp it says most commonly Desends Anterior to hyoid Bone
- But some Doctor in Basheer Told Me most commonly Desend within hyoid Bone

Thyroglossal duct cysts can affect children and adults, but most cysts are found in children aged 10 and younger. These cysts are almost always benign — less than 1% of all thyroglossal duct cysts become cancerous. Adults are more likely than children to develop TDC cancer. Thyroglossal duct cysts are treated with surgery. Once removed, most thyroglossal cysts don't come back

- **Most thyroglossal duct cysts don't cause serious medical problems. There are exceptions, though, including:**
- Very rarely, cysts become cancerous.
- Some cysts cause dysphagia (problems swallowing food or liquid.)
- Cysts can become infected. An infected cyst can hurt.
- Thyroglossal cysts remain in place until they're removed with surgery

Ask p.t To protude His Tounge To examine it

- Why we Do surgery for it ??
  it Have Risk of transformation to papillary Thyroid Ca as we know so we Treat it By surgery
- Once it Removed it Neve Come Back
- May cause infection if it was large Cause Bacterial overgrowth on That Area

Treatment may include:

- Antibiotic medication (to treat the infection)
- Surgical removal of the cyst and the thyroglossal duct, called the Sistrunk procedure → Note :- sistrunk procedure is Remove Cyst + Central part of Hyoid Bone + surrounding Tissue of Tract

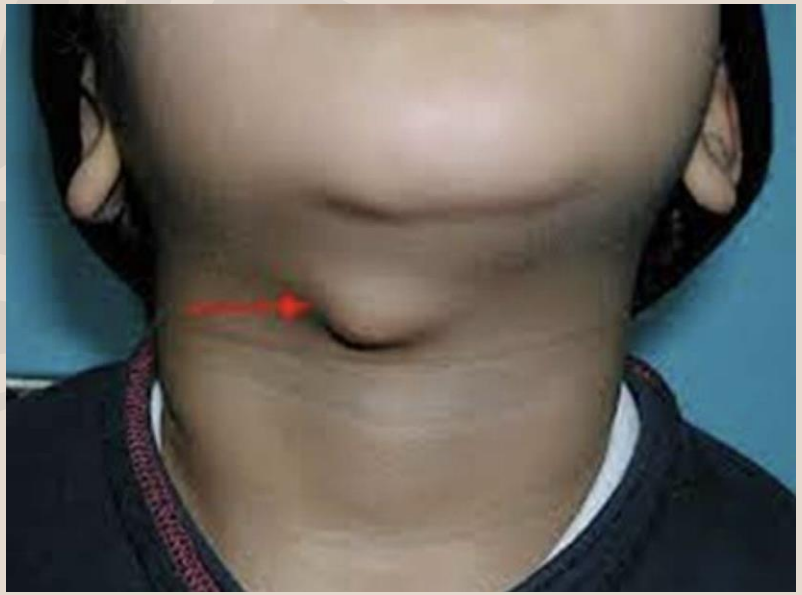
From Bootcamp + Basheer Doctors

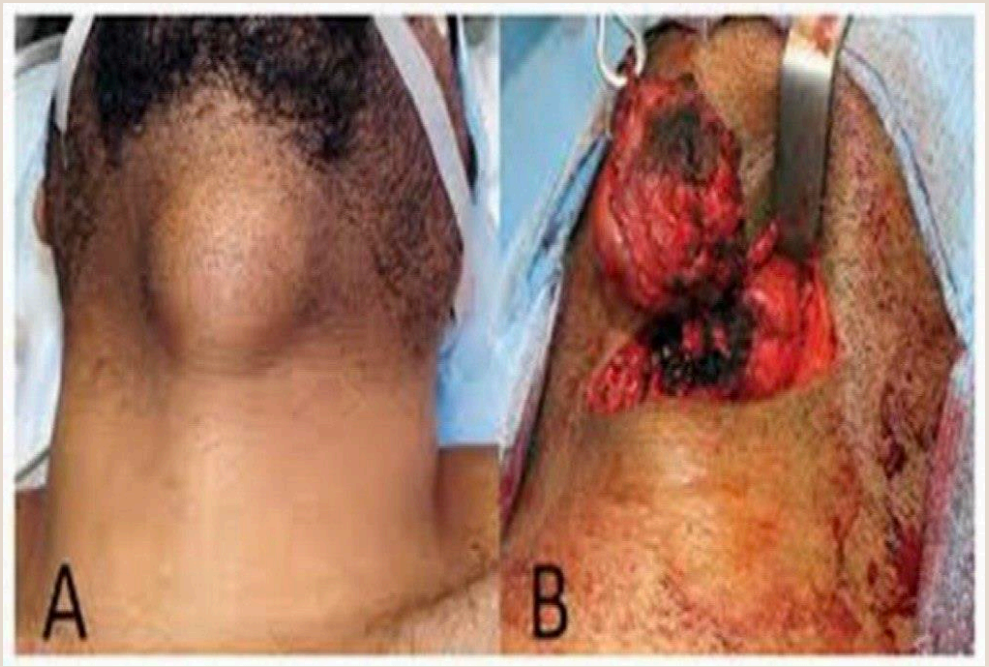
Symptoms:

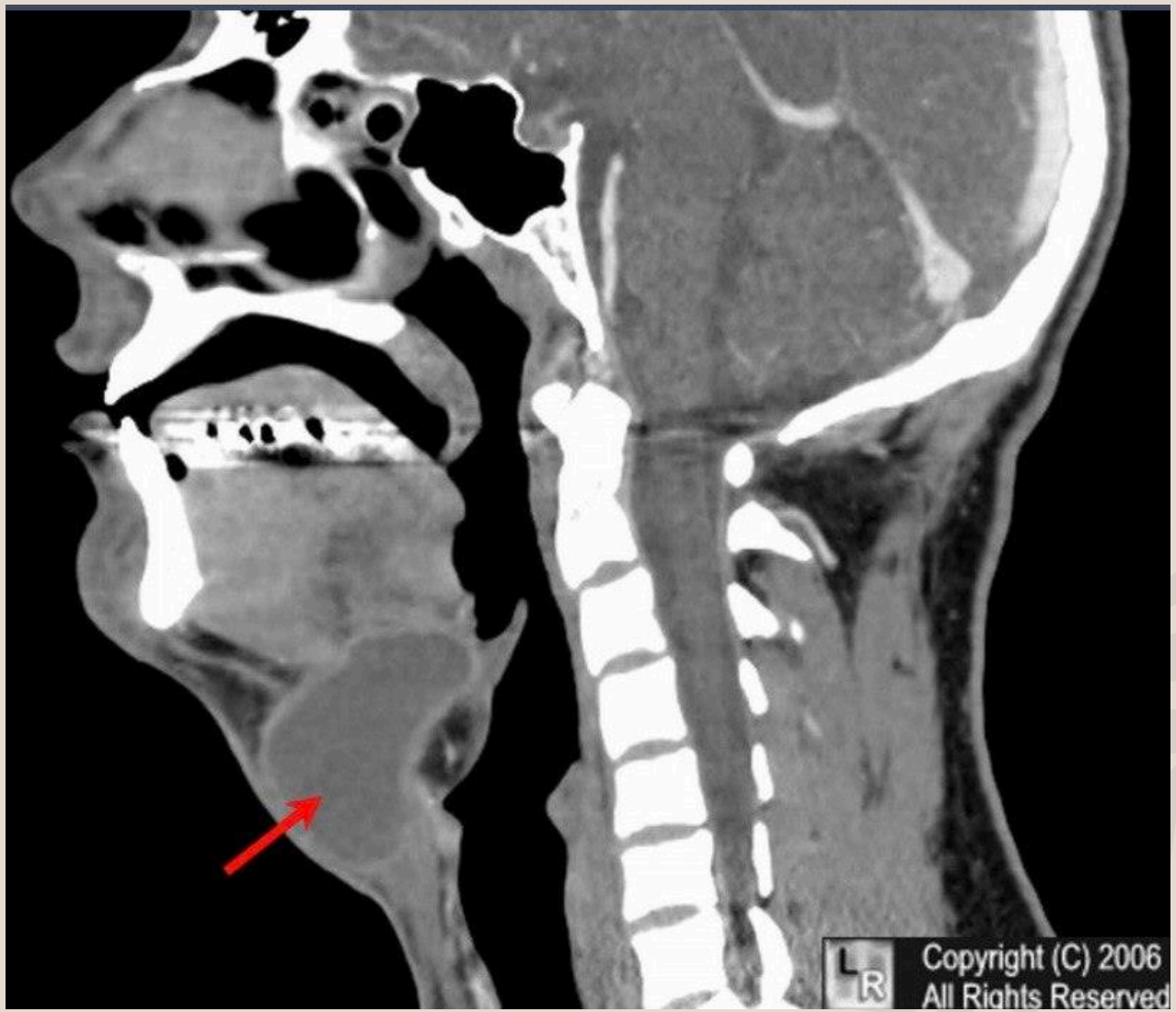
- A small, soft, round mass in the center front of the neck
- Tenderness, redness, and swelling of the mass, if infected
- A small opening in the skin near the mass, with drainage of mucus from the cyst18
- Difficulty swallowing or breathing
- Thyroglossal duct cysts can be felt through your skin. If you touch the cyst, it may feel soft, smooth and round, like a tiny ball of cookie dough
- These cysts can swell and hurt if you or your child develops an upper respiratory tract infection that spreads to the cyst
- Thyroglossal duct cysts can rupture, oozing fluid through your or your child's skin
- These cysts can make it hard to swallow food or liquids.

once it was centrally Nodule you Think of Thyroglossal cyst
Not Brachial cyst or Dermoid cyst (presents laterally from midline
↳ found on Ant Border of SCM (الجهة الامامية)

Thyroglossal cyst

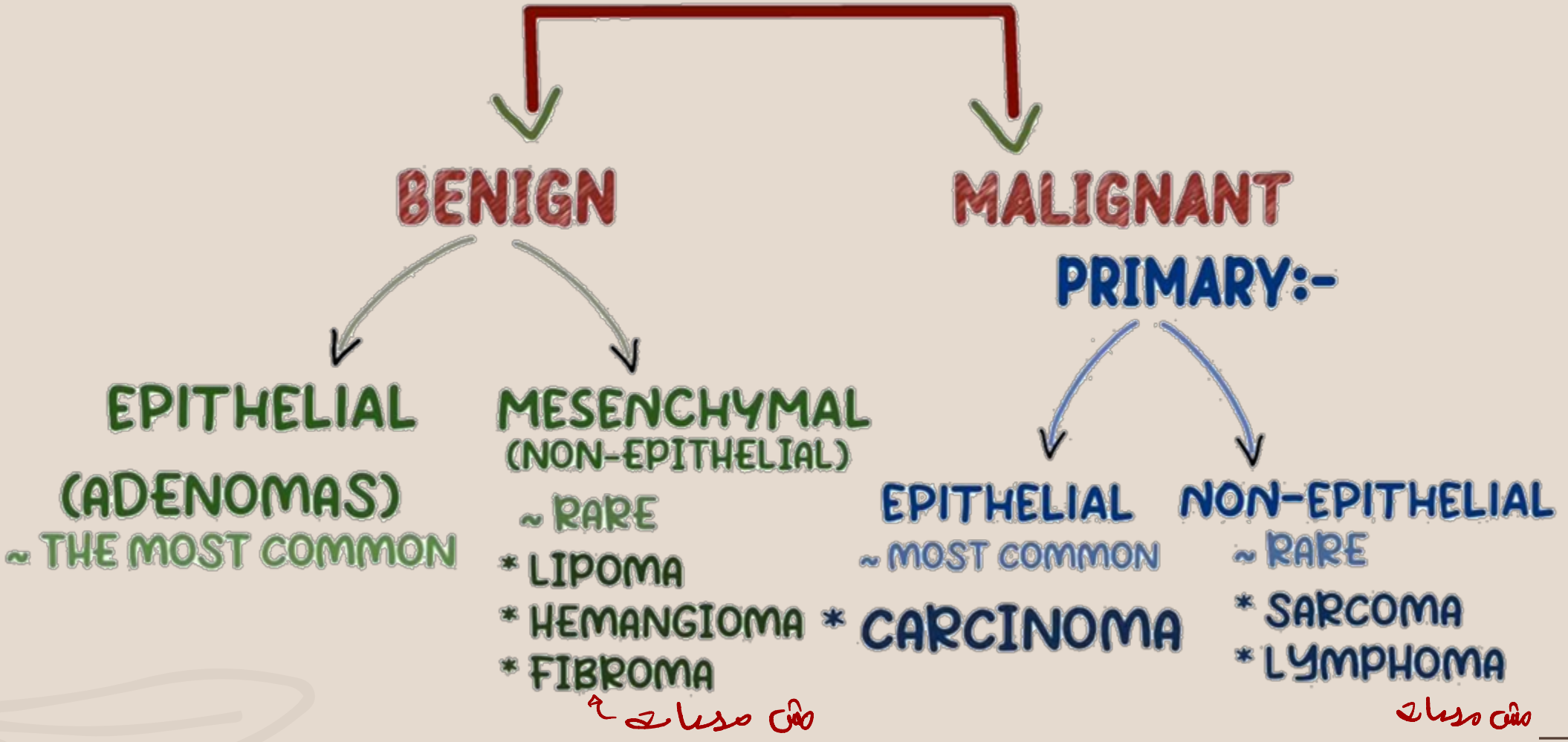






NEOPLASM

THYROID TUMORS

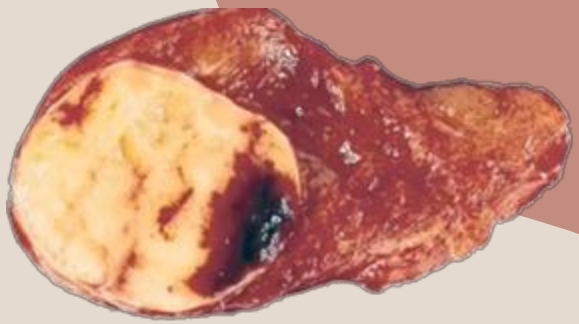


Fortunately, most solitary nodules of the thyroid prove to be either *follicular adenomas* or *localized, non-neoplastic conditions* (e.g., a dominant nodule in multinodular goiter, simple cysts, or foci of thyroiditis).

➢ *Carcinomas of the thyroid*, by contrast, are uncommon, accounting for much less than 1% of solitary thyroid nodules

THYROID ADENOMA

~ THE MOST COMMON THYROID NEOPLASM
~ FOLLICULAR EPITHELIUM
~ INCREASING WITH AGE



* TYPICALLY DISCRETE
* SOLITARY, SPHERICAL
* ENCAPSULATED
* WELL DEMARCATED

* MOSTLY NON FUNCTIONAL

HOT THYROID NODULE
~ UPTAKE RADIOACTIVE IODINE

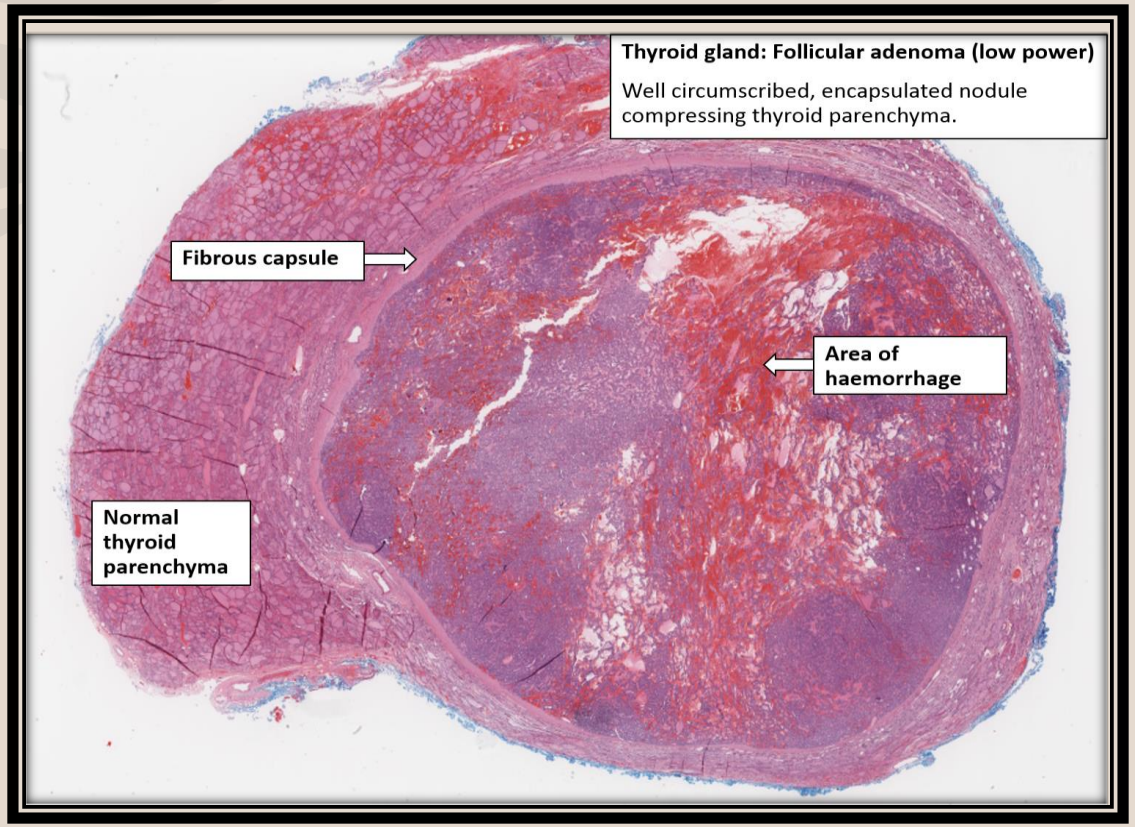
THYROTOXICOSIS
~ TOXIC OR PLUMMER ADENOMAS
INDEPENDENT OF TSH

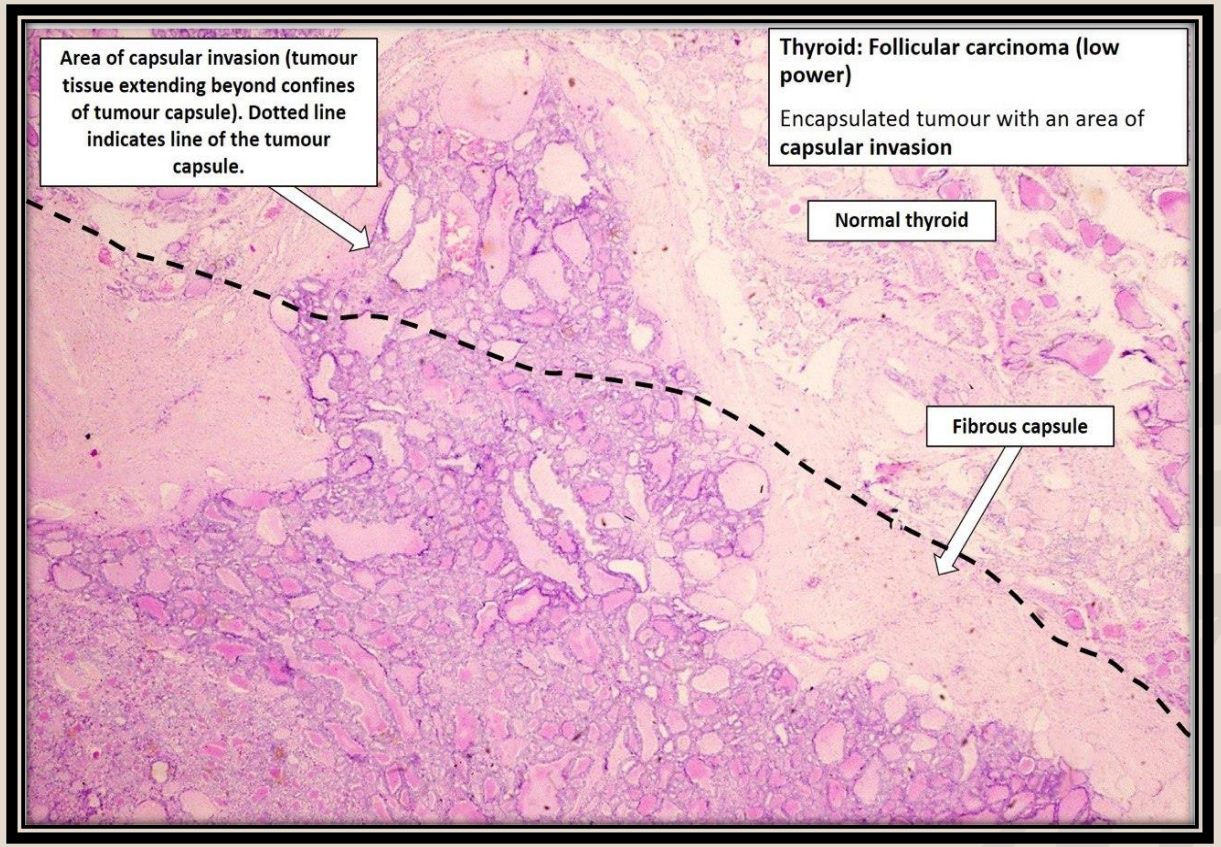
THYROID AUTONOMY

CUT SECTION:-

~ COMPRESSION
~ COLOR
GREY-WHITE to RED-BROWN
(COLLOID, CELLULARITY)
~ CALCIFICATION
~ CYSTIC CHANGES
~ AREAS OF HEMORRHAGE
~ FIBROSIS

follicular adenoma vs follicular carcinoma





Follicular adenoma :no infiltration of capsule and no infiltration of vascular and lymphatic vesseles unlike follicular carcinoma

- FNA is Not Able to Distinguish from Follicular Adenoma from Solicular Carcinoma
- so Diagnosis of Follicular Adenoma only After whole Tumor Ecsion Then sent it to pathologist

(الدكتور مرت فاتح رقبة حتشيل التيومر مش نوخد قطعة وبعدين نوديه للمعمل بعدين تفتح رقبة مرة تانية بعد ما عرفت اذا هي Adenoma و Carcinoma ، فاد اسمة غباء)

The diagnosis of follicular adenoma can only be made after the entire tumor is removed and sent to a pathologist for examination. When viewed under the microscope, the cells in a follicular adenoma can look very similar to the cells in a type of thyroid cancer called follicular carcinoma.

The only difference between a follicular adenoma and a follicular carcinoma is that all the abnormal cells in a follicular adenoma are separated from the normal thyroid gland by a thin tissue barrier called a tumor capsulec

❖ Clinical presentation:

1. painless nodules, often discovered during a routine physical examination.
2. Larger masses may produce local symptoms of obstruction
3. persons with toxic adenomas can present with features of thyrotoxicosis

. ❖Management:

Are removed surgically to exclude malignancy, are of an excellent prognosis as the neither recur nor metastasize

Thyroid gland tumors

Cancer of the thyroid gland

1. **Papillary Thyroid Carcinoma:** It is the most common type, accounting for about 80% of thyroid cancers. It typically affects young women and has a favorable prognosis
   - Ass with Neck and Head Radiation Expoure
   - pathology!- psomoma Bodies
   - • RET/PTC rearrn
   - • BRAF mutation
2. **Follicular Thyroid Carcinoma:** It accounts for approximately 10-15% of thyroid cancers and is more common in areas with iodine deficiency. It has a higher risk of distant metastasis compared to papillary carcinoma.
   - • Hematogenous spread
   - • FNA Not Able to distigish it from Adenoma
   - • RAS mutation and PAX8 - PPARγ translocation
3. **Medullary Thyroid Carcinoma:** It arises from parafollicular C-cells and accounts for about 5-8% of thyroid cancers. It is associated with elevated serum calcitonin levels and can be sporadic or hereditary. Ass with MEN 2 / pathology shows → Polygonal cell on Amyloid stroma
4. **Anaplastic Thyroid Carcinoma:** It is a rare and aggressive form of thyroid cancer, accounting for less than 2% of cases. It typically affects older individuals and has a poor prognosis. Tp 53 mutation / Rapid enlarged Mass

Tx!- All Treated By Thyrodectomy

Findings that raise suspicion for malignancy :

1. Hx of previous irradiation
2. Young and elderly patients
3. Family hx of MEN2
4. Recent onset and rapid growth
5. Painless, hard, irregular nodule with limited mobility
6. Local invasion or lymphatic or blood -borne metastases

Case Scenario

60-year-old female ***presents with a*** *painless* ***neck mass and*** *hoarseness*. ***Thyroid ultrasound reveals a solid, hypoechoic nodule with irregular margins and microcalcifications.*** *Serum calcitonin* ***levels are elevated, and genetic testing reveals a germline mutation in the*** *RET proto-oncogene.*

Suggest Medullary carcinoma

What is the most appropriate next step in management for this patient?

A) Observation with serial ultrasound examinations

B) Total thyroidectomy with central neck dissection

C) Radioactive iodine therapy → هاد علاج Graves

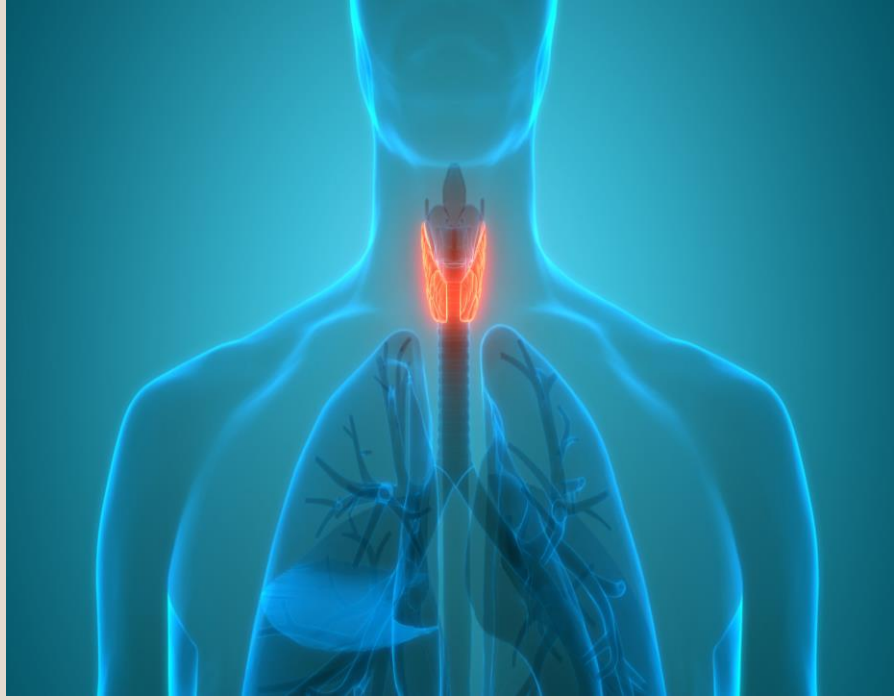
Note :- اذا كان عنده Exophthalmos ما بعطي الـ Iodine Therapy ليش ؟؟ التبريد طويل لكن بتلاقو التبريد في Surgical Recall

D) Palliative chemotherapy → لا علاج الـ Thyroid CA هو Surgery

الكيد لا خطير انت عرفت انو CA

Investigations…

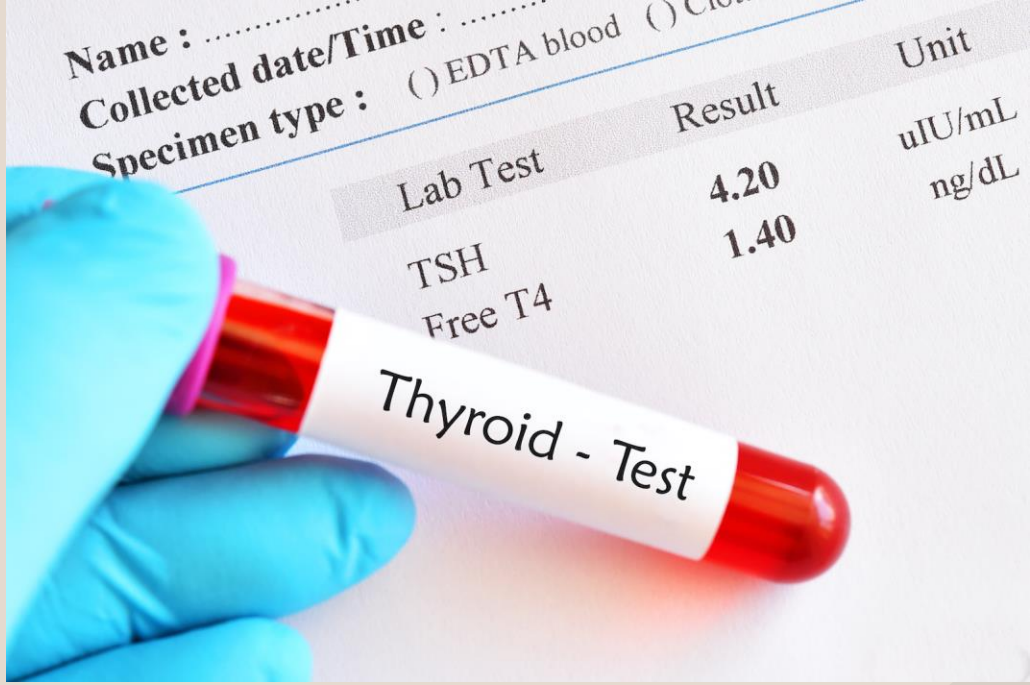
Investigation of thyroid



1- THYROID FUNCTION TEST (TFT)
2-RADIOISOTOPS SCAN
3-ULTRASOUND
4- FINE NEEDLE ASPIRATION BIOPSY (FNA)

Thyroid function tests:

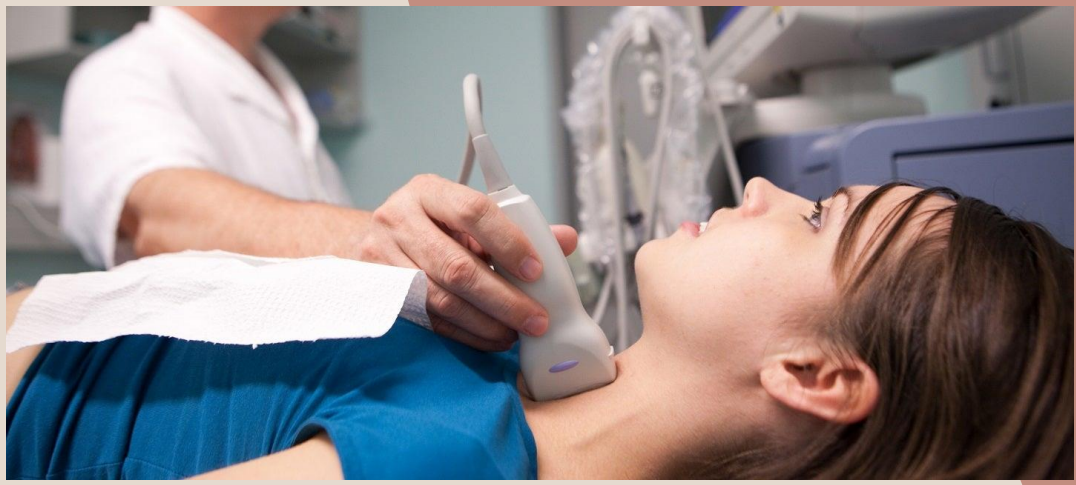
will direct further approach and should precede consideration of imaging studies and FNA biopsy. Most patients with thyroid nodules are euthyroid. Patients with a low TSH level (toxic nodules) should be considered for radioisotope scan. Patient with high TSH level check for hashimoto's disease antibodies (anti TPO)



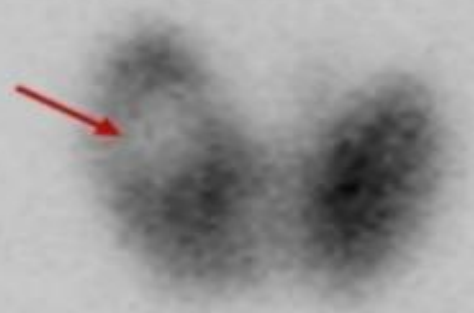
Anti TPO + Anti TTG → Hashimoto (HLA-DR3)

Anti TSH → Graves

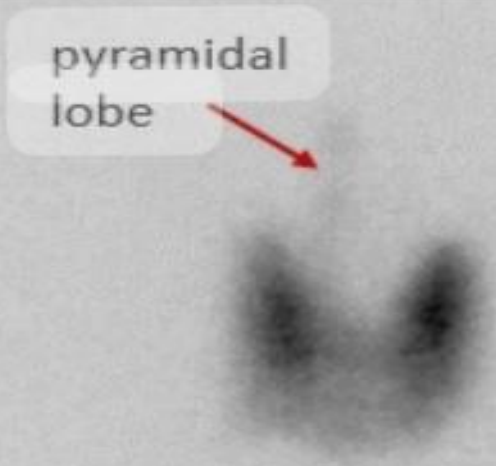
What is A Thyroid Scan ?



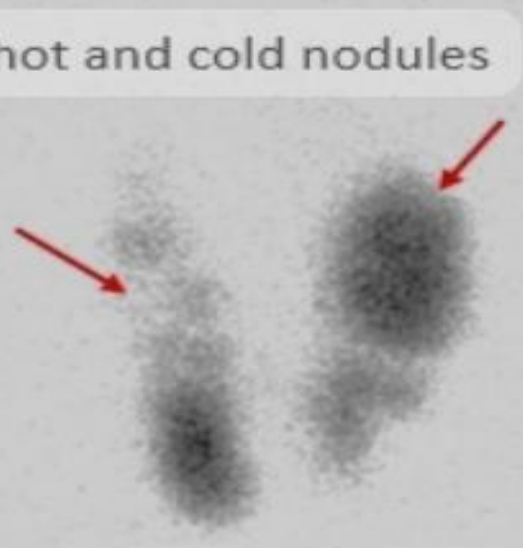
The uptake of radioactive iodine is used as a substitute for thyroid tissue uptake thyroid scan does not involve surgery and is painless It is used to help evaluate the structure and function of the thyroid whole body radioactive iodine scan is used to evaluate the distribution of metastatic thyroid tissue in the body



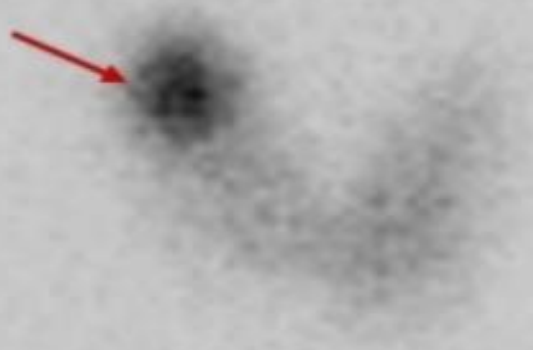
COLD NODULE



GRAVE DISEASE

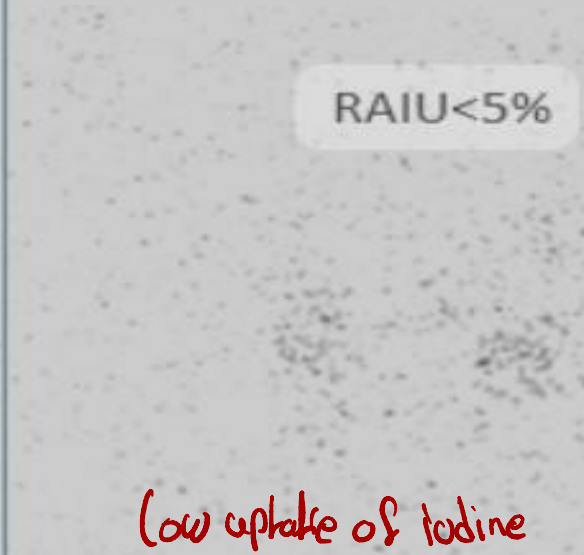


TOXIC MULTINODULAR



HOT NODULE

AUTONOMOUS NODULE



Low uptake of Iodine نزولي

THYROIDITIS

Ultrasonography

is helpful for detecting no palpable thyroid nodules, differentiating solid from cystic nodules, identifying adjacent lymphadenopathy and differentiating single from multiple nodule .

Fine needle aspiration biopsy

Fine needle aspiration biopsy test of choice for initial evaluation of a thyroid nodule – often combined with ultrasound guidance for better diagnostic utility
This is the only test that can reliable differentiate between benign and malignant nodule and Has a sensitivity of 95% and a specificity of 95% have 5% false negative , and should follow up with periodic FNA if thyroid nodularity persists
FNA IS RELIABLE for all cancer except follicular complications : Local discomfort, Hematomas, Infection

Surgery…

Indications for Surgery

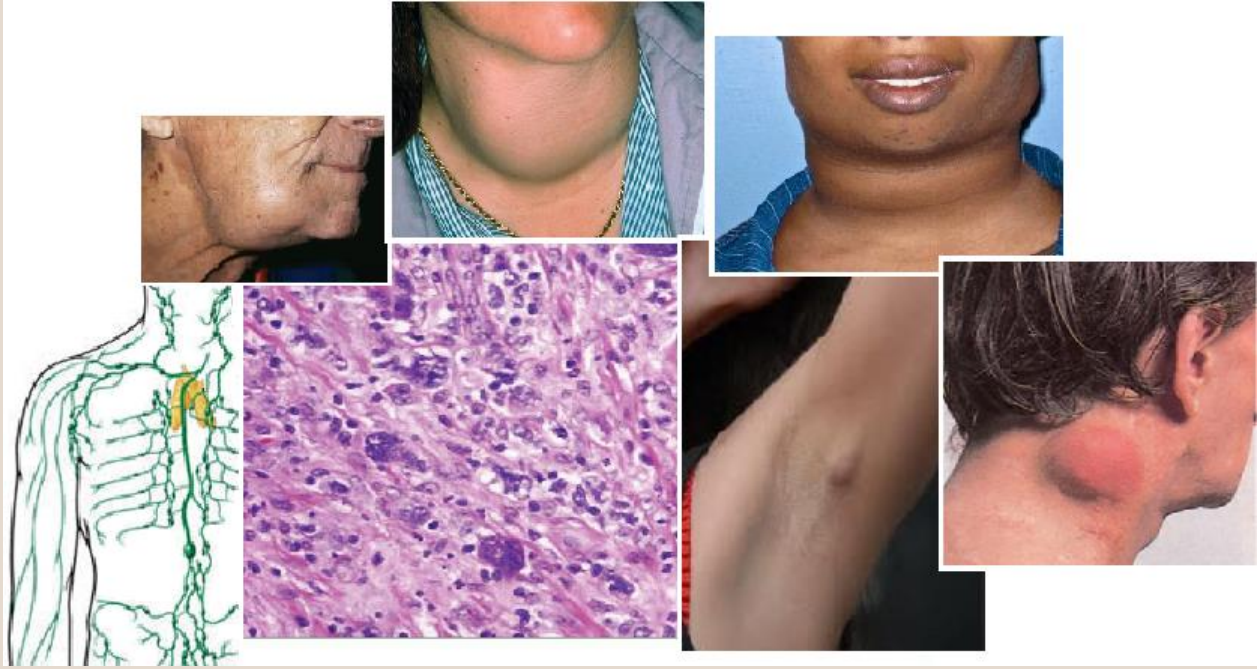
1- As therapy for patients with thyrotoxicosis .
2-To treat benign and malignant thyroid tumors .
3- for suspicious cyst and toxic adenoma
4- To relive pressure symptoms such as (dyspnea ,Dysphagia) .
5-Cosmetic purpose.
6-To establish a definitive diagnosis of a mass in the thyroid gland , especially when cytological results are indeterminate

In patients with low risk factors & Benign nodules : - Lobectomy + isthmusectomy .

In patients with high risk factors & Benign nodules : - Near-total or Total thyroidectomy .

In Patients with Malignant nodules : - Near-total or Total thyroidectomy .

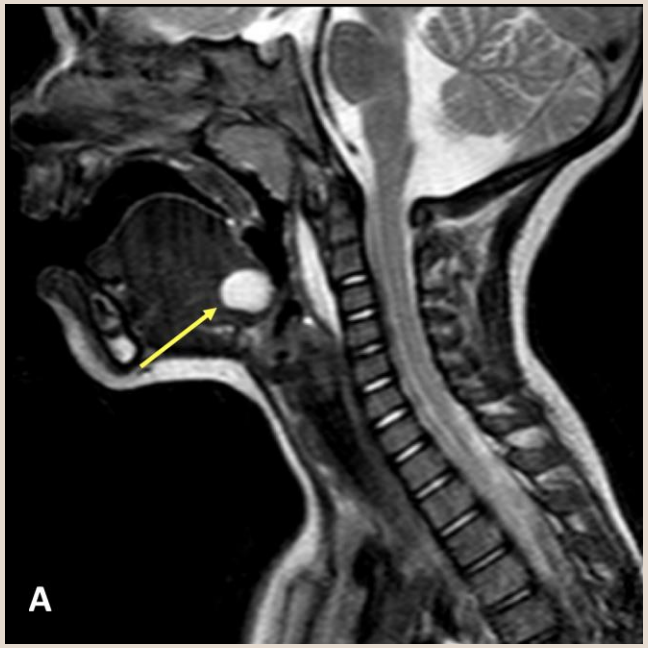
In Patients with Medullary thyroid Carcinoma : - Total thyroidectomy + cervical clearance (central and bilateral LNs) .

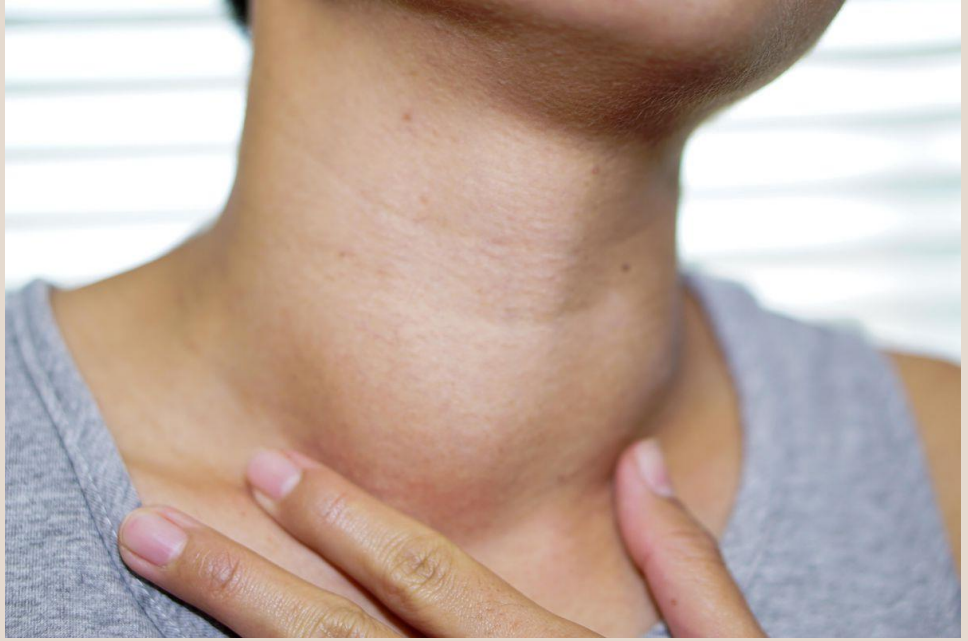


In Patients with Malignant lymphoma :

-if it is confined to the thyroid alone, it may be treated by thyroid lobectomy with subsequent adjuvant radiotherapy and chemotherapy; otherwise it is treated by chemoradiation alone.

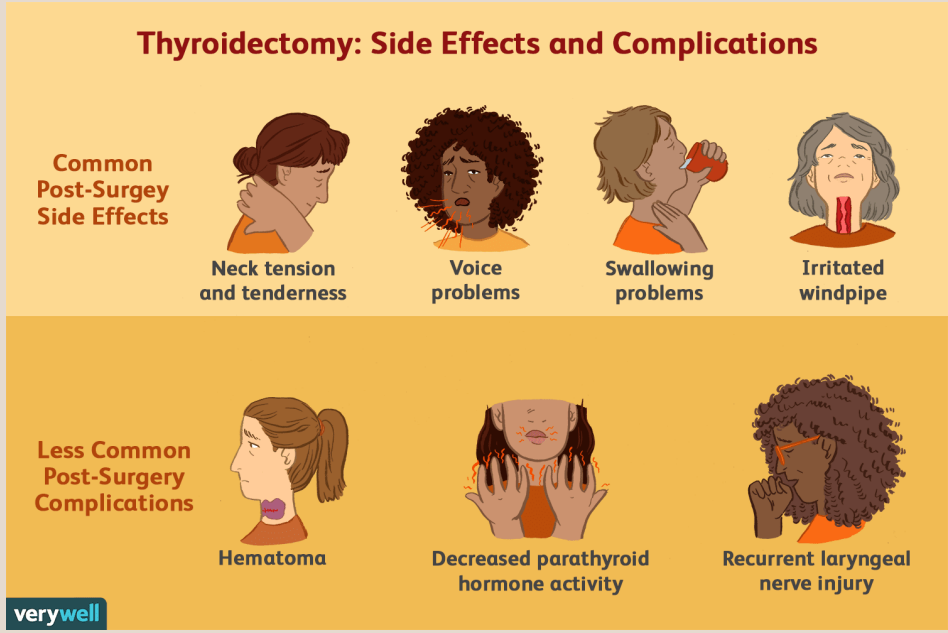
Cyst :





Aspirate and follow up every 3 months .Recurrent cyst after 3 attempts of aspiration ,Large cyst >3-4cm and complex cysts with solid and cystic components : unilateral thyroid lobectomy.

Complications of Thyroid Surgery



1- hemorrhage
2- damage to the external branch of the superior laryngeal nerve.
3-Damage to the recurrent laryngeal nerve.
4-hypothyroidism. (within 2-3weeks)
5-hypoparathyroidism.
6-respiratory obstruction
7- thyroid crisis (in surgery or immediately after it)

Thank you!

Reference

Bailey & Love's
Macleod's Clinical Examination
Thyroid and Parathyroid Surgery" by David J. Terris and Gregory W. Randolph
American Thyroid Association (ATA)