

Thyroid gland

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Thyroid gland

Embryology

Median thyroid diverticulum (endodermal)

Floor of the pharynx

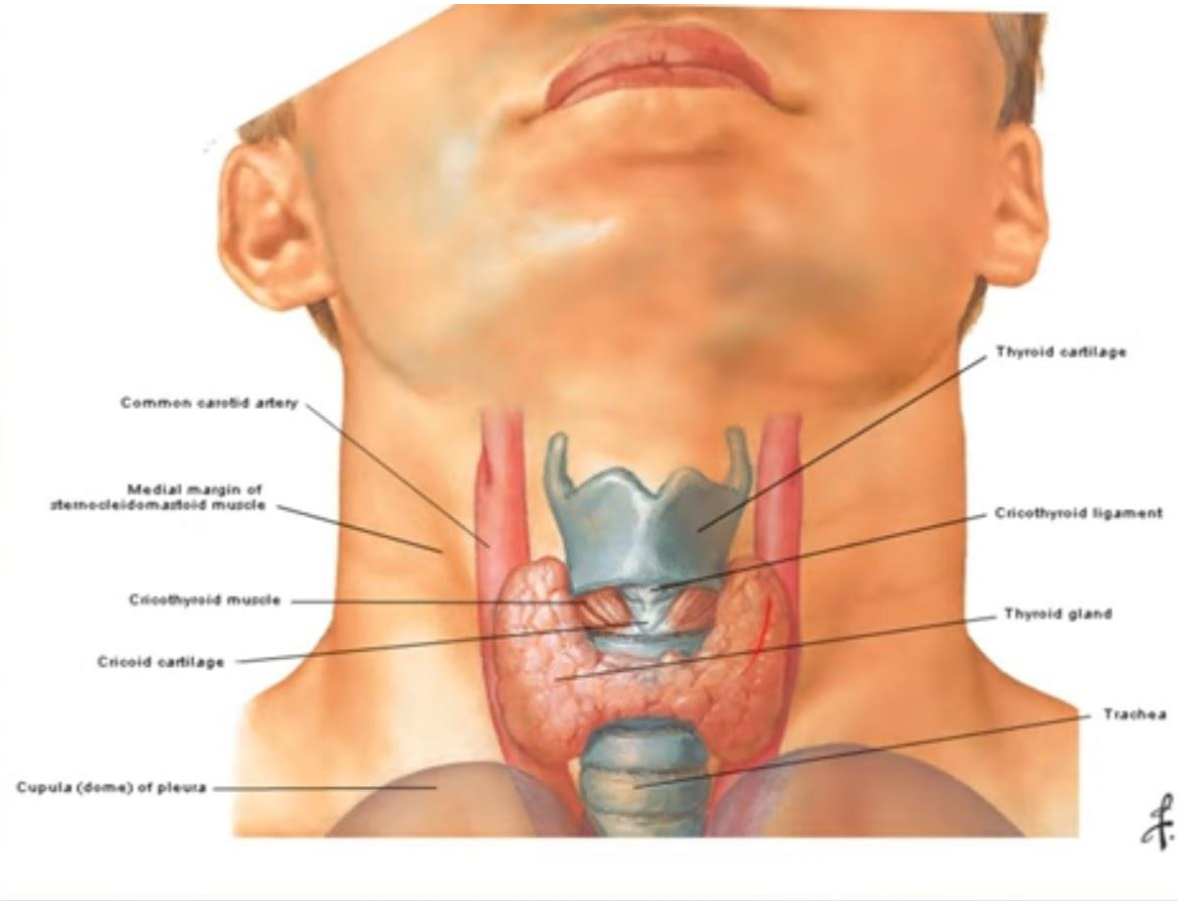
Base of the tongue

Foramen cecum.

Descend caudally (anterior)

Para follicular C cells (neural crest)





Anomalies

Pyramidal lobe

Distal end of thyroglossal tract

Left of midline 60%.

30% of people reach hyoid bone

Lingual thyroid

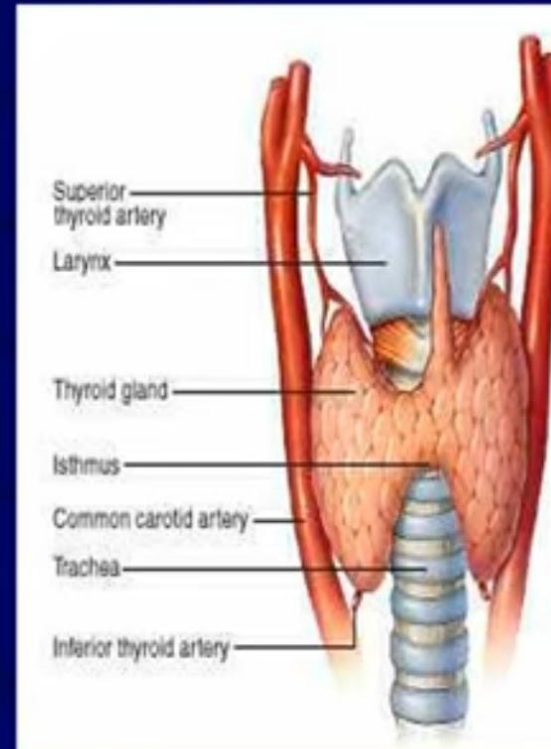
Failure of descend.

Asymptomatic posterior tongue mass.

Only functioning thyroid

Treatment is by thyroid suppression

Unilateral aberrant thyroid



Lingual thyroid



Failure of descent of thyroid gland
Posterior tongue mass.
At foramen caecum, round swelling.
M:F 1:3

Lingual thyroid



Differential Dx: Lingual Thyroid (Ectopic Thyroid)
Caution! A mass in the posterior midline might be the only thyroid in the patient's body.



Thyroglossal cyst

Remnants of thyroglossal tract.

Children and young adults 5-15 y

Midline swelling.

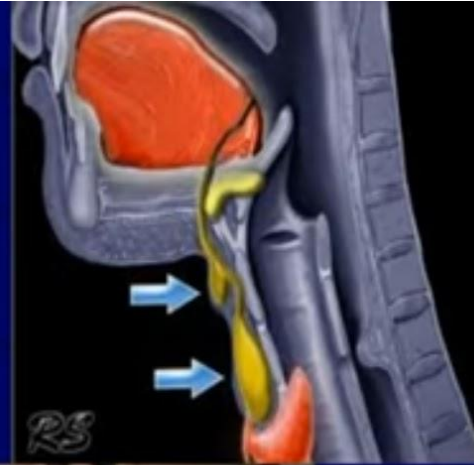
Move up and down with swallowing
and tongue protruding.

Below hyoid bone.

Infection lead to fistula.

Malignant changes? Papillary
carcinoma 1 %

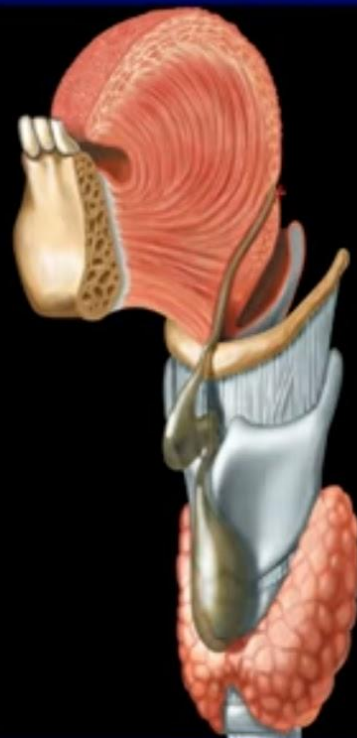
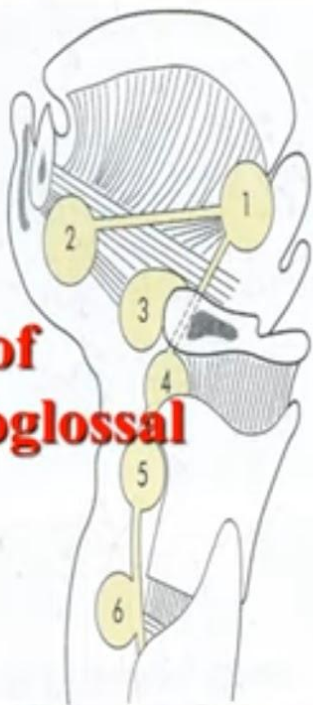
Sistrunk's operation



Thyroglossal cyst

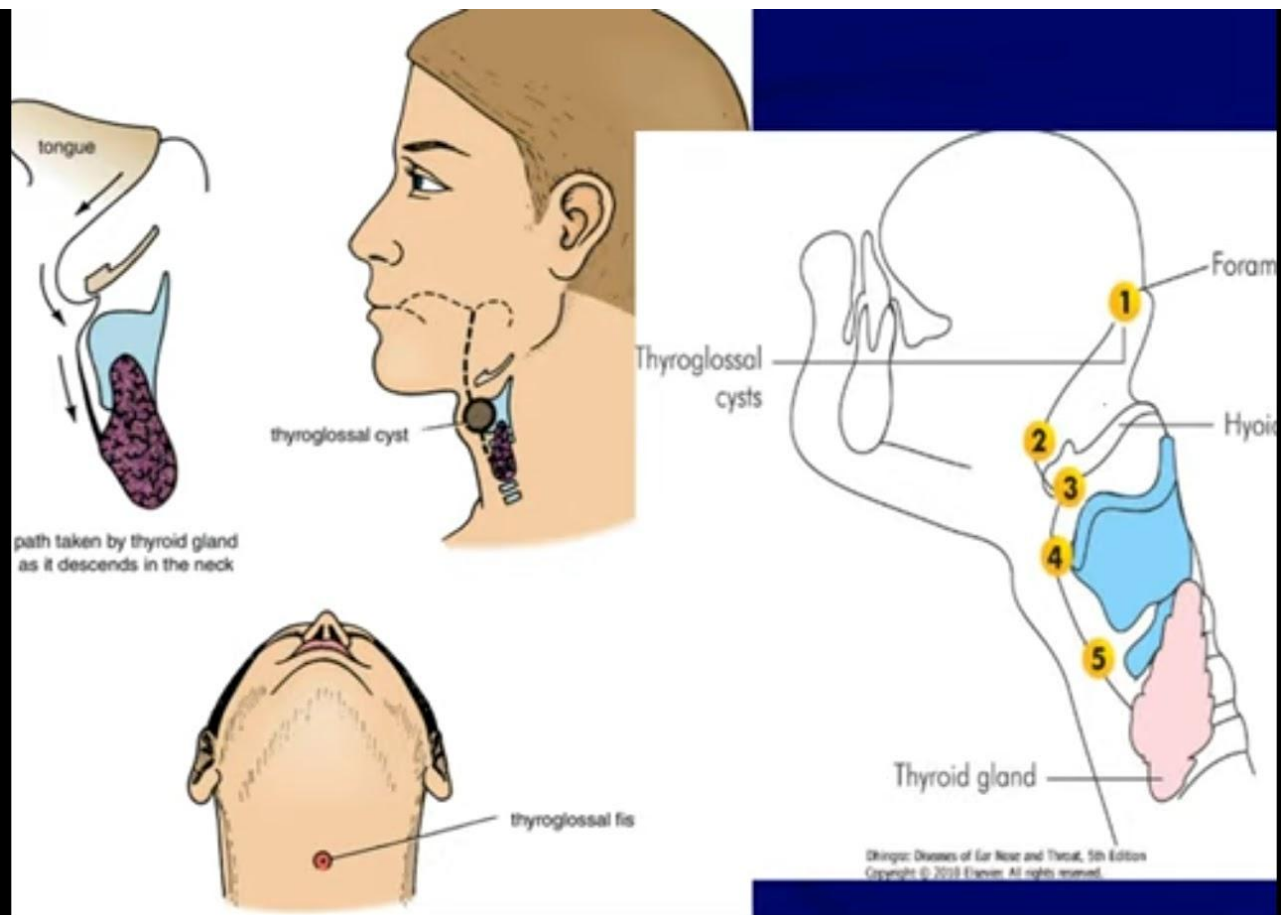


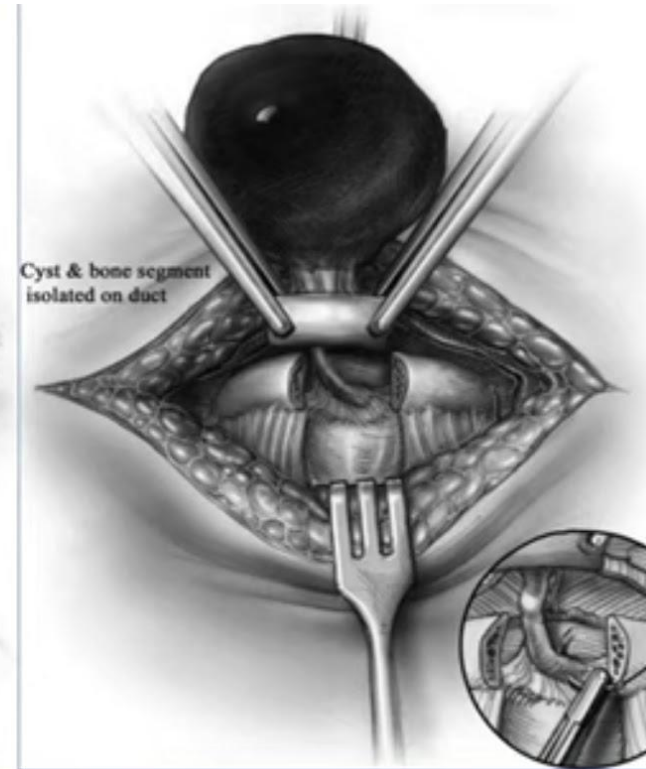
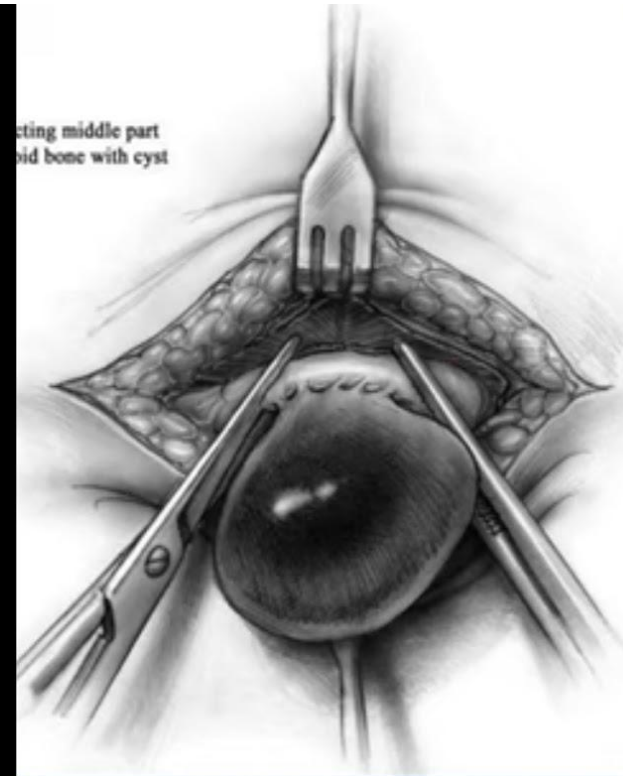
**Sites of
Thyroglossal
cysts**



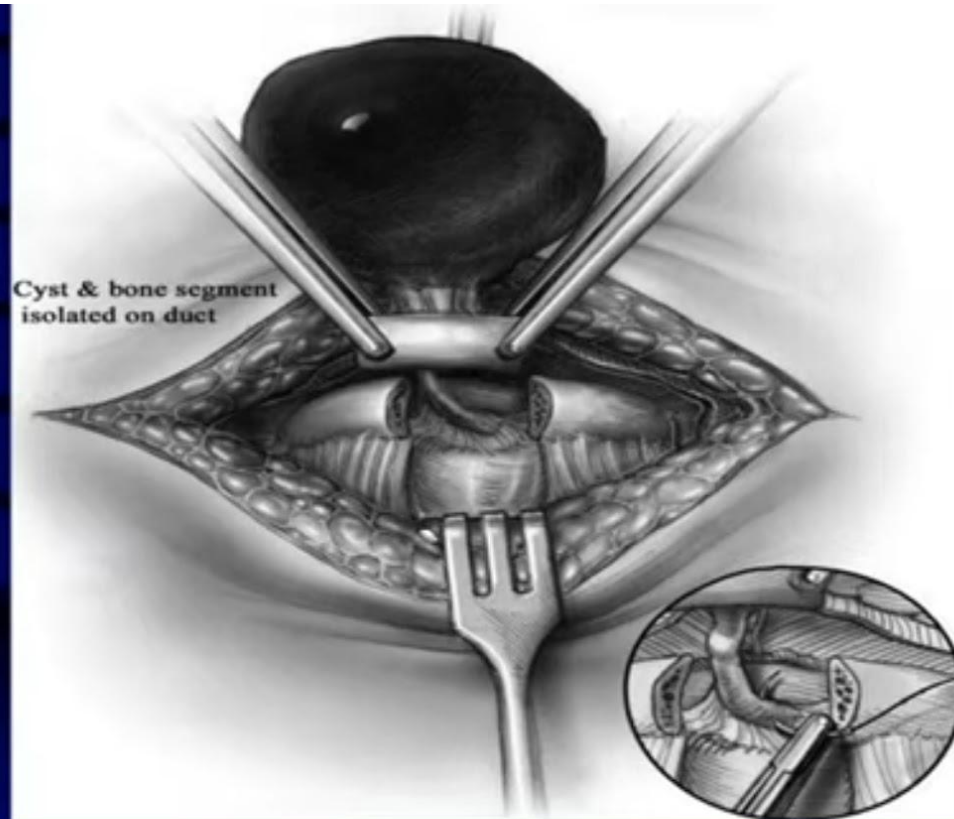
Thyroglossal cyst







Sistrunk's operation



Sistrunk's operation II

Lateral Aberrant Thyroid



Anatomy of thyroid gland

Weight is 20 gm.

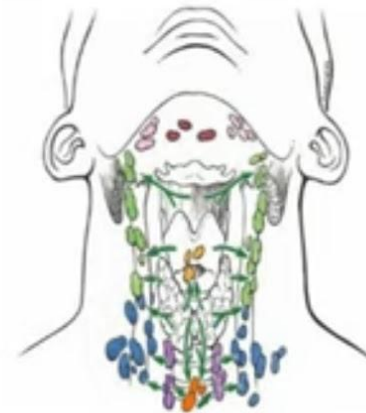
Arterial blood supply

Venous drainage

Lymphatic drainage,

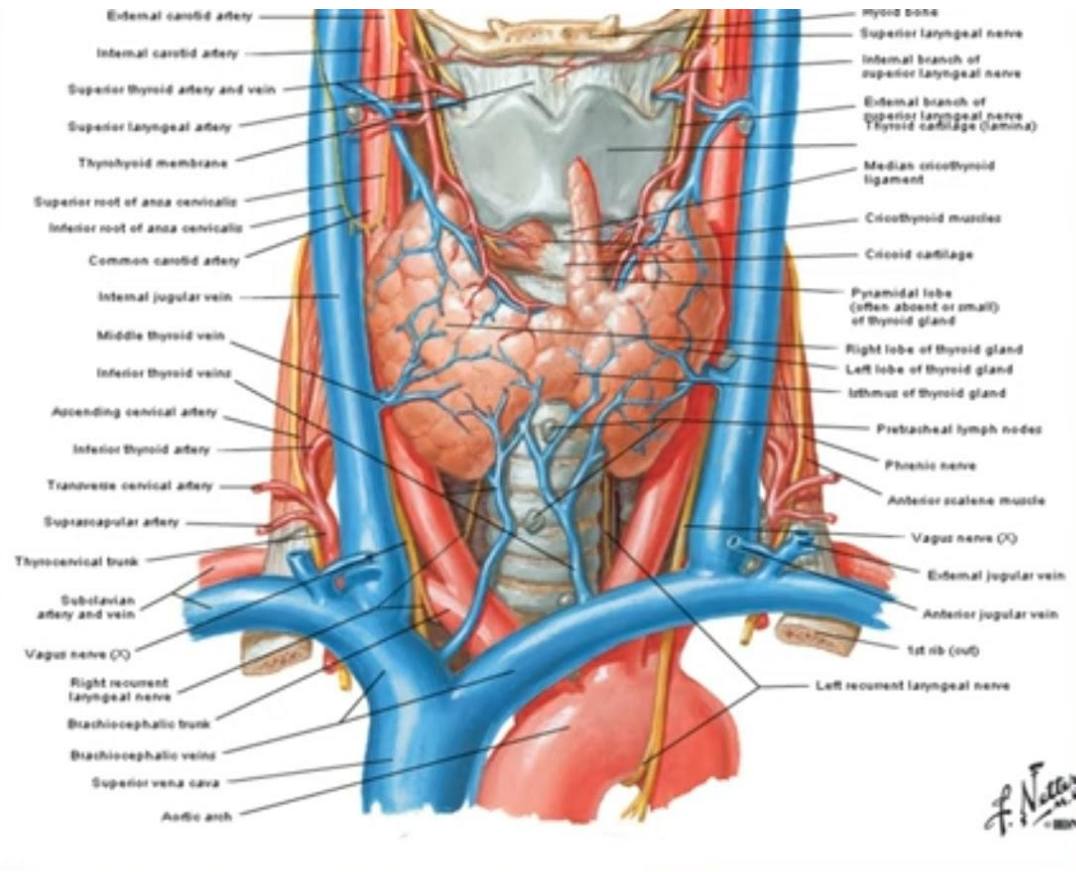
Nerves related to thyroid

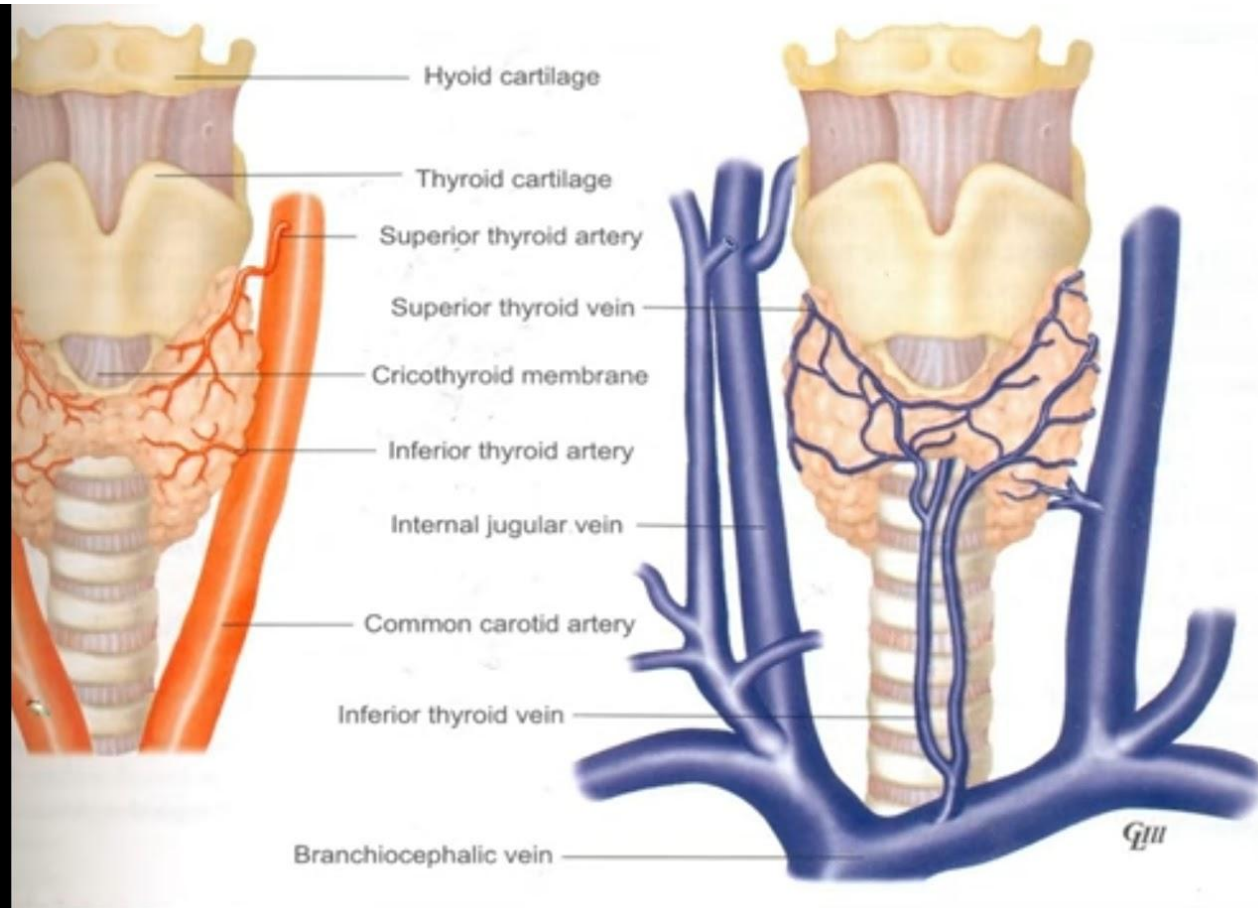
Pretracheal fascia

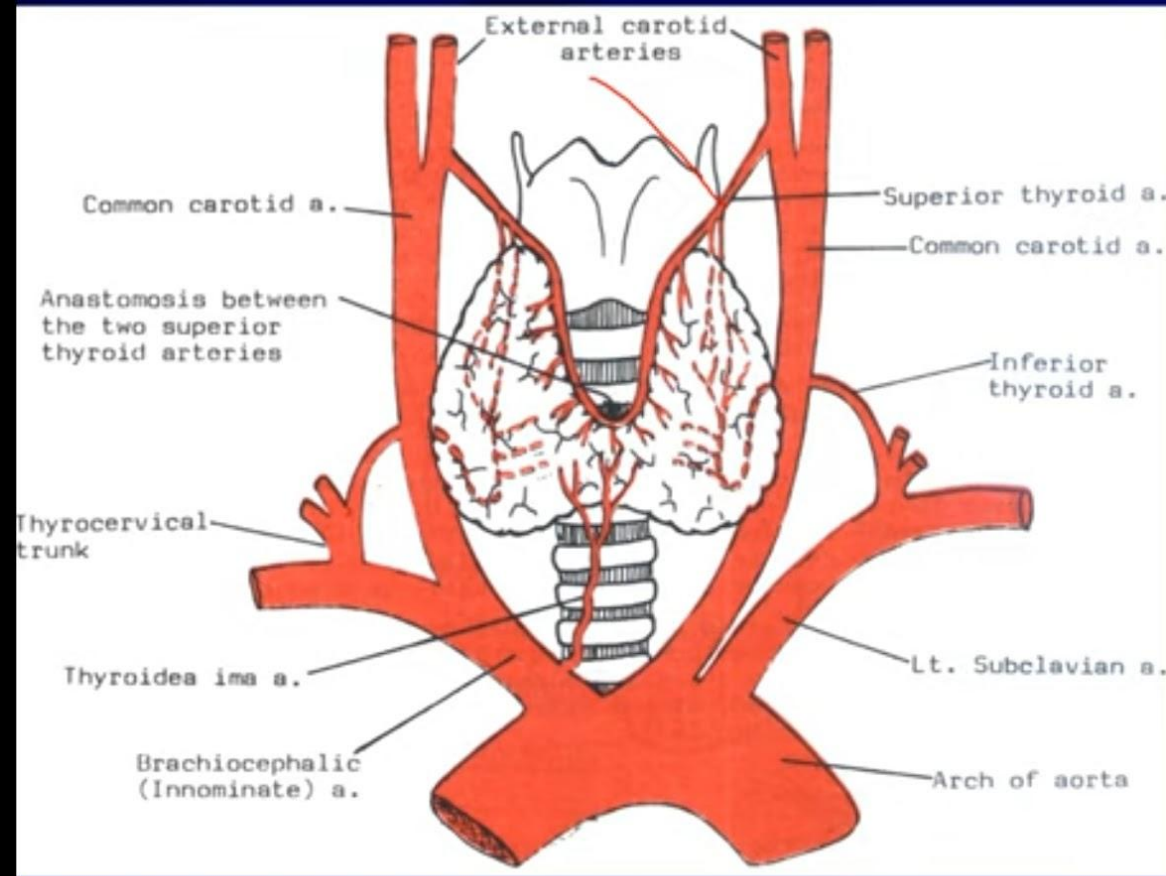


Superior deep cervical	Prelaryngeal
Inferior deep cervical	Paratracheal
Submental	Pretracheal
Submandibular	

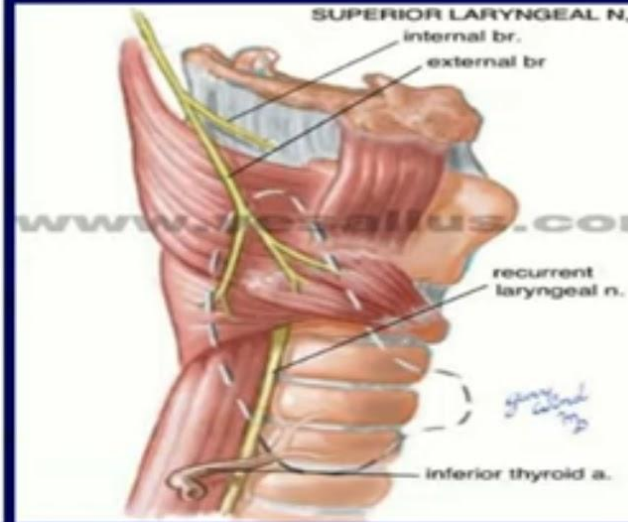
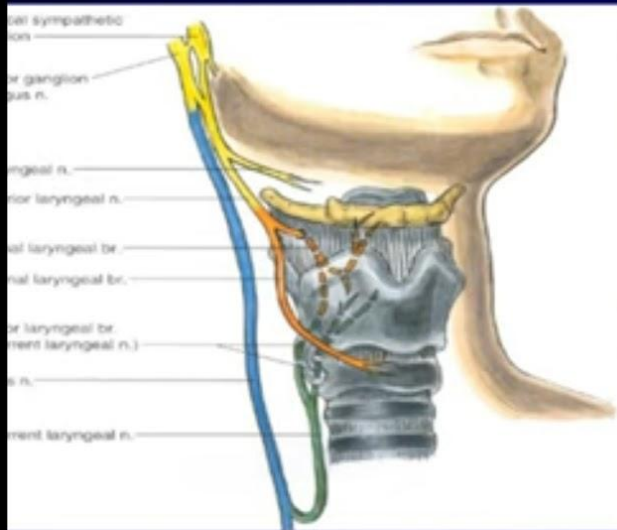
Lymphatic drainage of the thyroid gland. The arrows indicate the direction of the





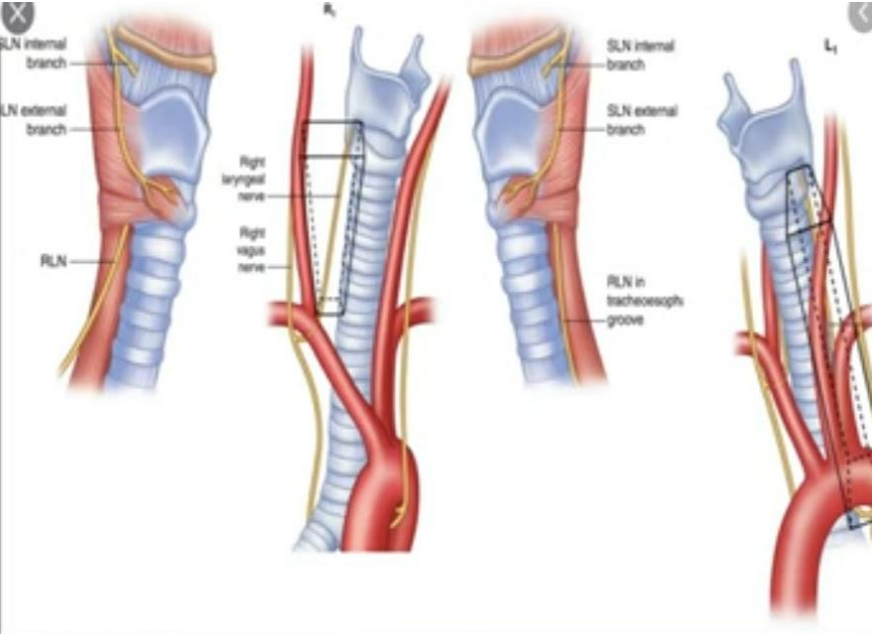
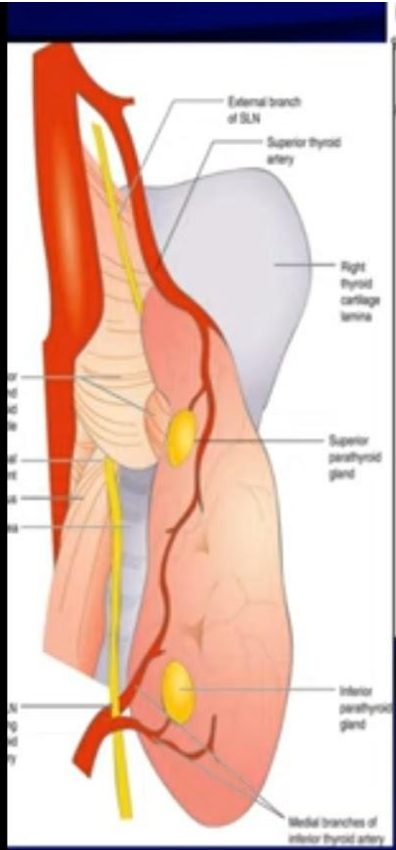


Nerves related to thyroid

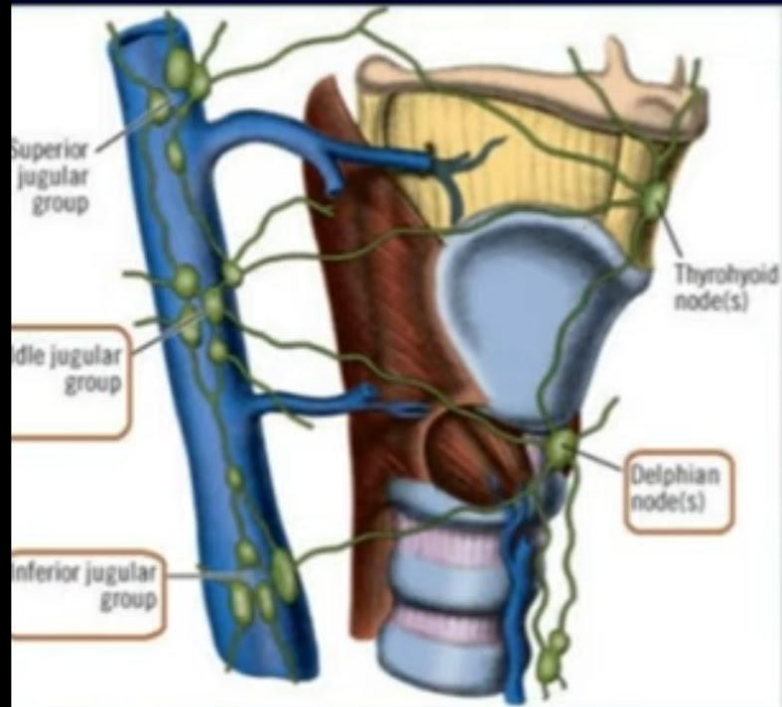


Superior laryngeal nerve: divides into large ILN and small ELN

Recurrent laryngeal nerve:



Lymph drainage



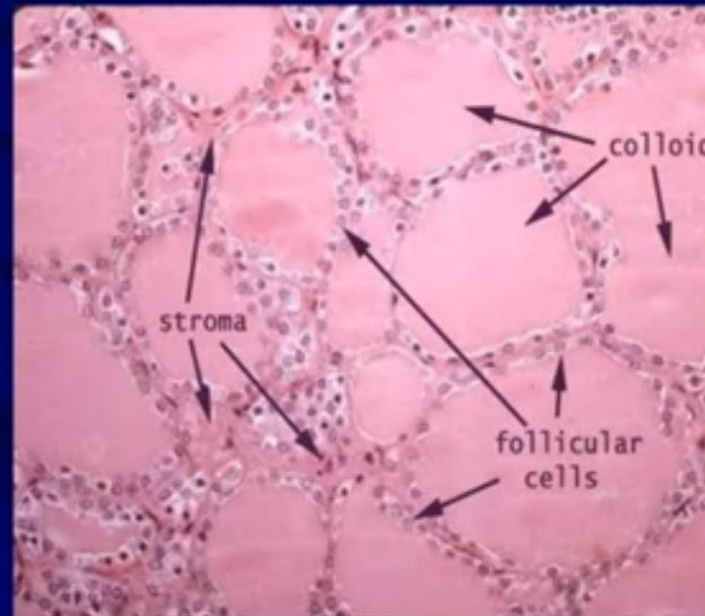
1. Level III & IV nodes
2. Level VI nodes
3. Level VII nodes

Thyroid histology

Lobule: Is the functioning unit of thyroid supplied by a single arteriole.

Each lobule is made of 10-24 follicles lined by cuboidal epithelium.

Follicle : Contains the colloid material where thyroglobulin is stored .



Physiology of thyroid hormones

Tri-iodothyronine T₃ ,Tetra-iodothyronine (Thyroxine) T₄ are formed by :

Iodide trapping

Oxidation of iodide to iodine.

Binding of iodine to tyrosine.

$\text{MIT} + \text{MIT} = \text{DIT}$

$\text{DIT} + \text{MIT} = \text{T}_3 \text{ TIT}$

$\text{DIT} + \text{DIT} = \text{T}_4$

Calcitonin = parafollicular C cells.



Thyroid hormones

T4, T3.

Bound to TBG, TBPA.

TSH (0-5U l) single most sensitive test of thyroid function

T3

80 % from T4

0.3 %

Half life one day

Act within hours

T4

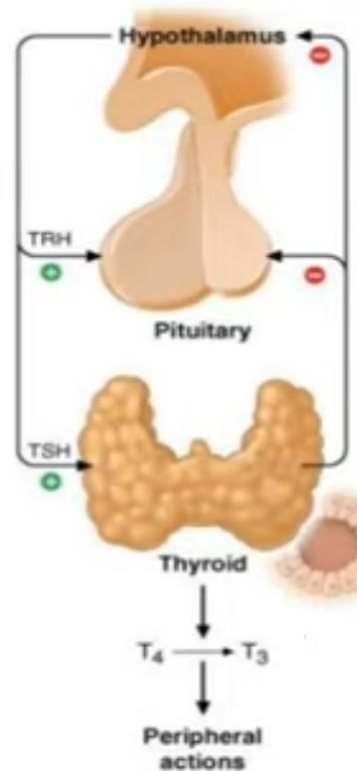
Less active(pro-hormone)

0.03 %

Half life one week

Act within two weeks

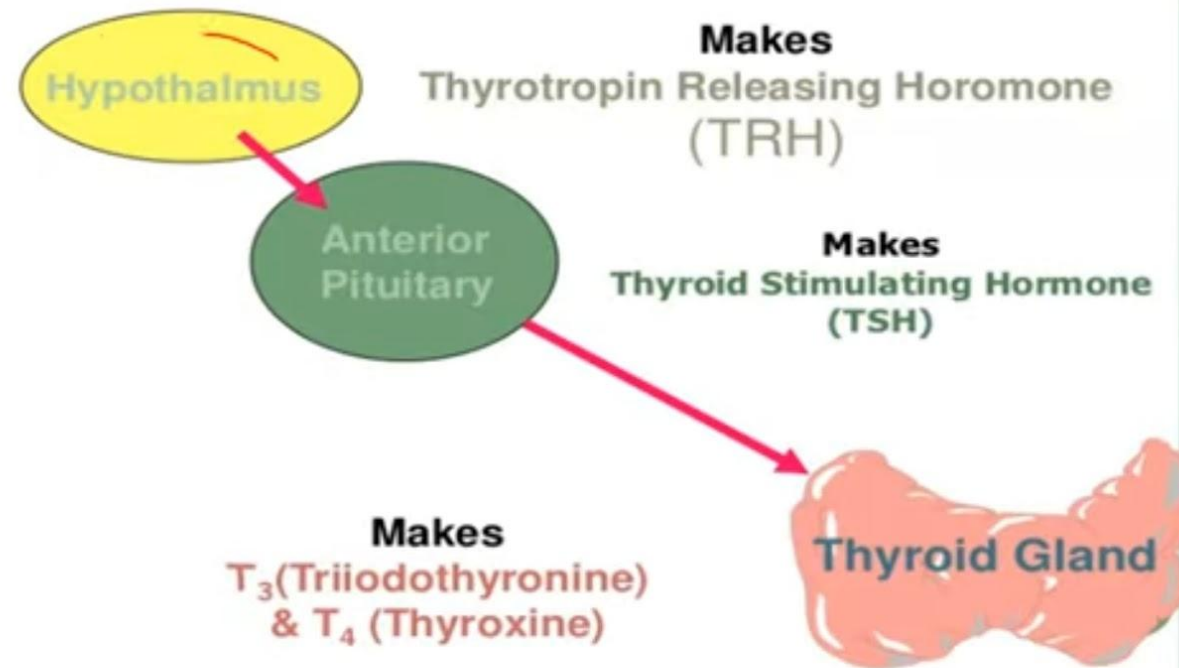
N.B 80% of thyroid hormone produced by thyroid G is T4



- Thyroid hormones T_4 and T_3 feed back to inhibit hypothalamic production of thyrotropin-releasing hormone (TRH) and pituitary production of thyroid-stimulating hormone (TSH).

- TSH stimulates thyroid gland production of T_4 and T_3

THYROID PHYSIOLOGY



Thyroid antibodies

Thyroglobulin

Found in graves' disease.

Used as tumor marker to detect recurrence and metastasis for DTC after thyroid suppression .

Thyroid peroxidase (thyroid microsomal antigen) TPC

TSH receptor antibody.

Tumor markers

Thyroglobulin.

Calcitonin.

CEA.

Thyroid isotope scanning

Use I 123 ,Tc 99.

Hot, cold and warm nodules .

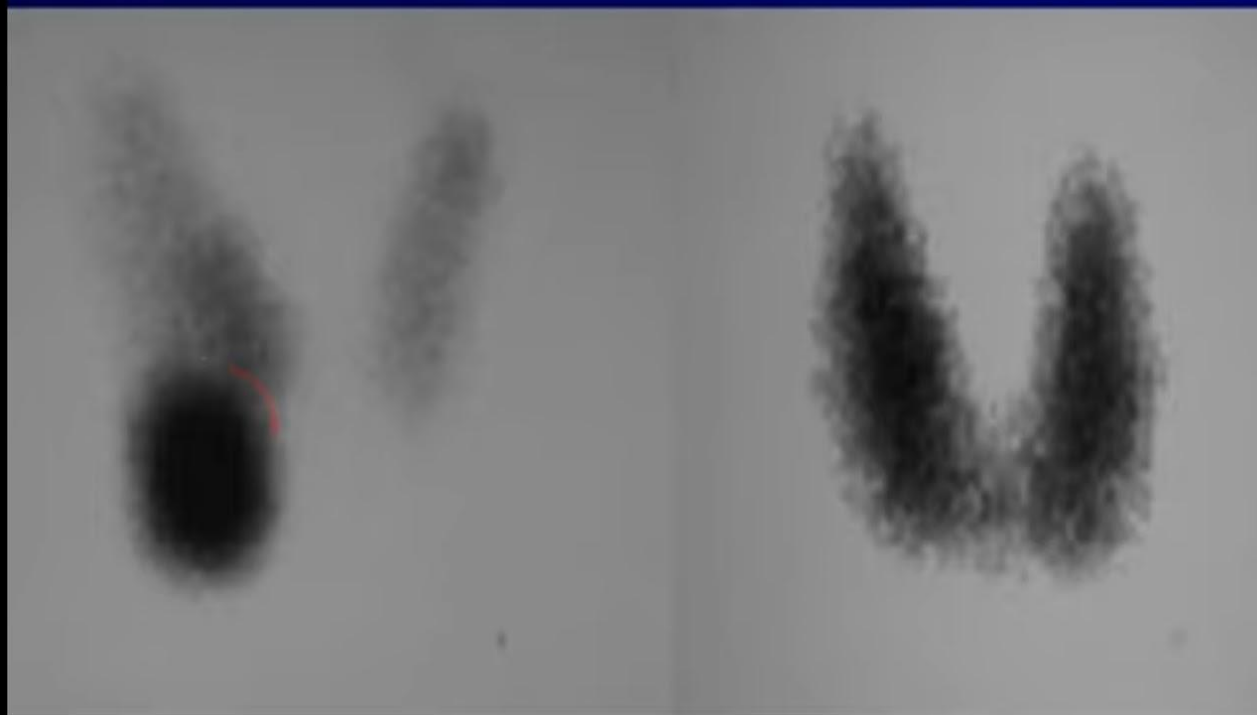
Use in solitary toxic nodule .

Locate ectopic thyroid tissue .

Identify incomplete surgical resection .

Localize metastasis .

Thyroid isotope scanning



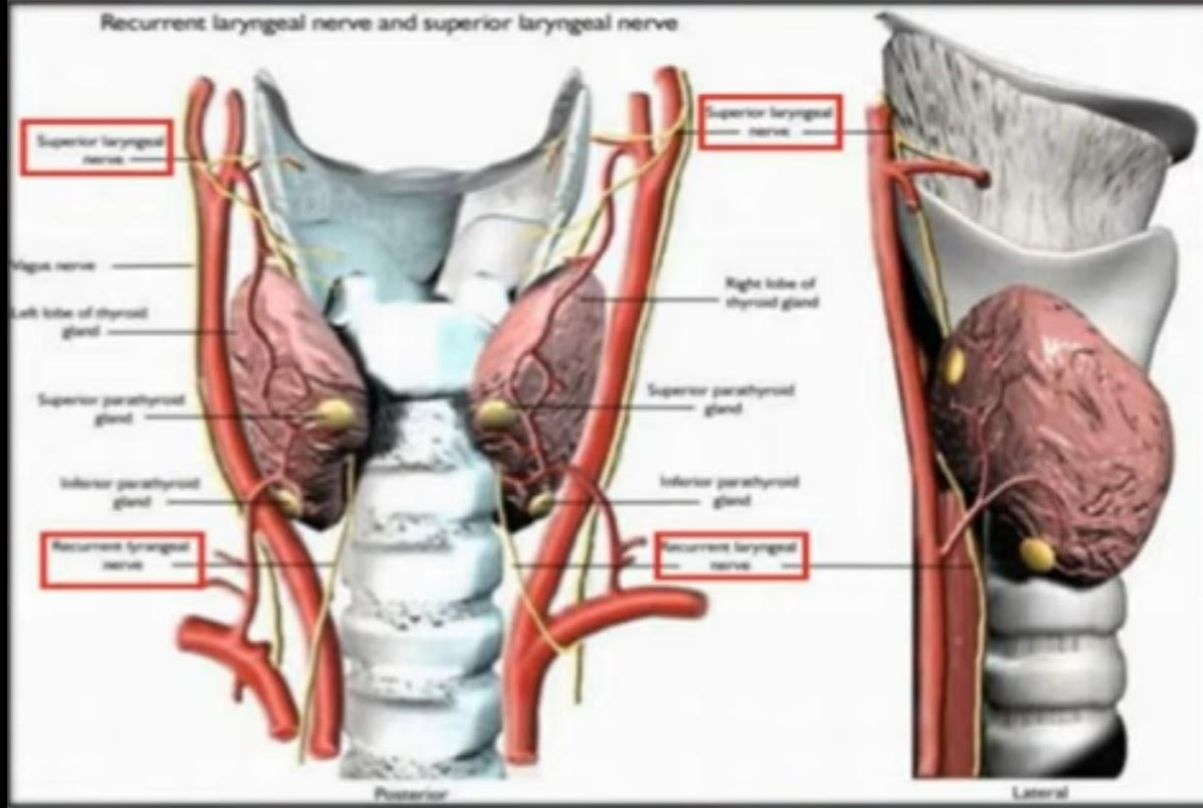
• **Cold nodule**



Hot nodule



Recurrent laryngeal nerve and superior laryngeal nerve



Ultrasonography

Solid or cystic

Single or multiple.

Large nodule , Micro calcification , Hypo echoic , Border irregularity, Taller than wide Hypervascular.

CT scan and MRI scan.

Fine needle aspiration cytology(FNA) all nodule above 1-2 cm depends on US criteria .

Follicular neoplasm ?

Vascular, capsular invasion .

70% benign,5% malignant ,15% suspicious .

Sensitivity is 83%.

Specificity is 92% .

Symptoms of thyroid disease

Symptoms related to the Lump in the Neck

Pressure symptoms

Dyspnea

Dysphagia

Hoarseness of voice

Dilated veins in neck
and face.



Pain related to thyroid gland

Painless Except

Rapid increase in size.

Acute and sub acute , hashimoto's thyroiditis .

Anaplastic carcinoma.

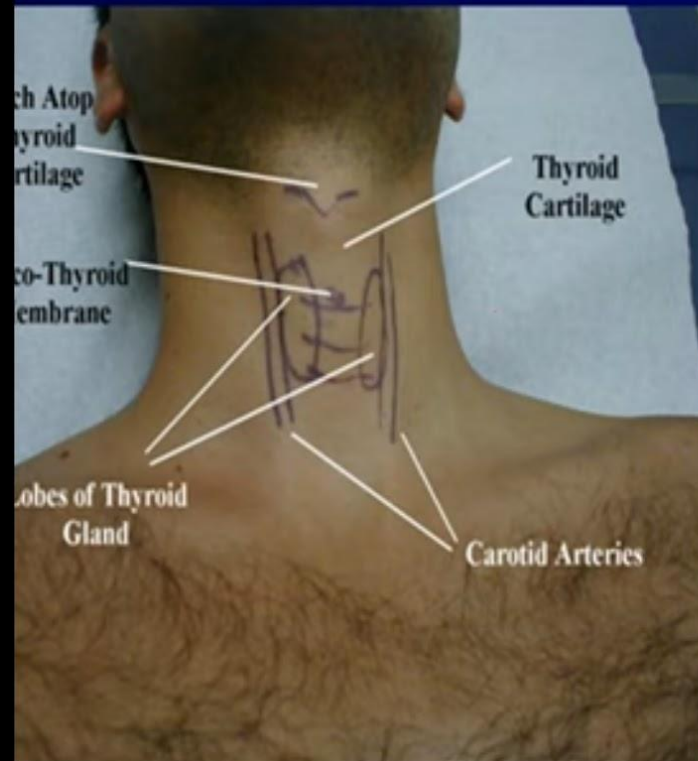
Symptoms of Endocrine Dysfunction

- **Nervous symptoms.**
- **Cardiovascular symptoms.**
- **Metabolic symptoms.**
- **GIT symptoms.**

Symptoms of metastasis

- Lung
- Bone
- Liver

Surface anatomy



Goiter: Enlargement of thyroid

Classification goiter

Simple goiter	Diffuse hyperplastic nodular
Toxic goiter	Graves' disease Toxic nodular Toxic nodule
Neoplastic goiter	Benign Malignant
Thyroiditis	De Quervains' Hashimotos' Riedels'
Miscellaneous	TB, Actinomycosis Amyloidosis

Goiter: Swelling in the neck from thyroid enlargement

CLASSIFICATION OF GOITER

NON TOXIC

- DIFFUSE
- MULTINODULAR
- NODULE
- RECURRENT

TOXIC

- DIFFUSE
- MULTINODULAR
- NODULE
- RECURRENT

NEOPLASM

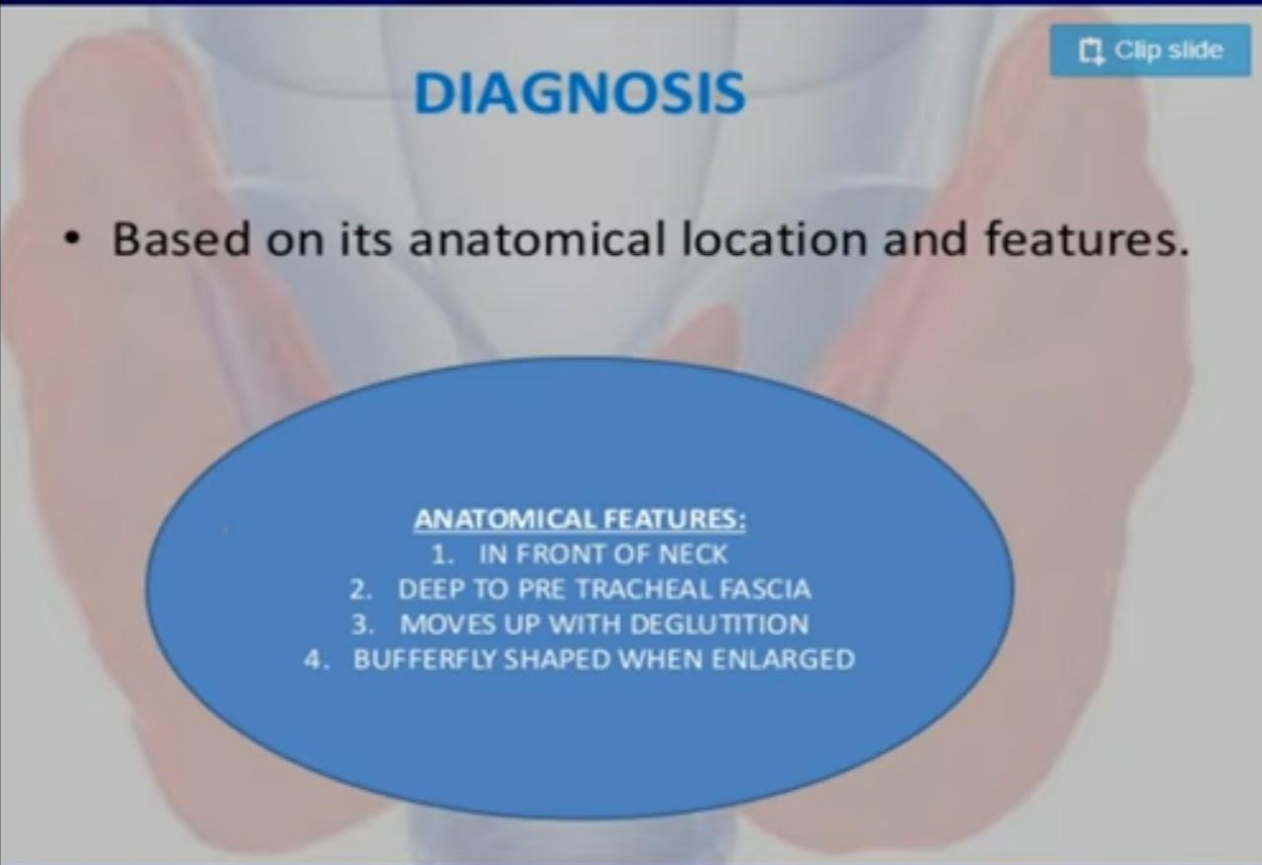
- PAPILLARY
- MEDULLARY
- FOLLICULAR
- ANAPLASTIC

INFLAMMATORY

- REIDEL'S
- HASHIMOTO
- DE QUERVAIN

RARE

- INFECTIONS
- AMYLOIDOSIS
- CYST
- ABSCESS



DIAGNOSIS

Clip slide

- Based on its anatomical location and features.

ANATOMICAL FEATURES:

1. IN FRONT OF NECK
2. DEEP TO PRE TRACHEAL FASCIA
3. MOVES UP WITH DEGLUTITION
4. BUTTERFLY SHAPED WHEN ENLARGED

Thyroid nodule

Asymptomatic, 60% are Benign Colloid Nodule.

Rapid enlargement

Hemorrhage into it.

Malignant nodule.

Malignant change 5 -15 %.

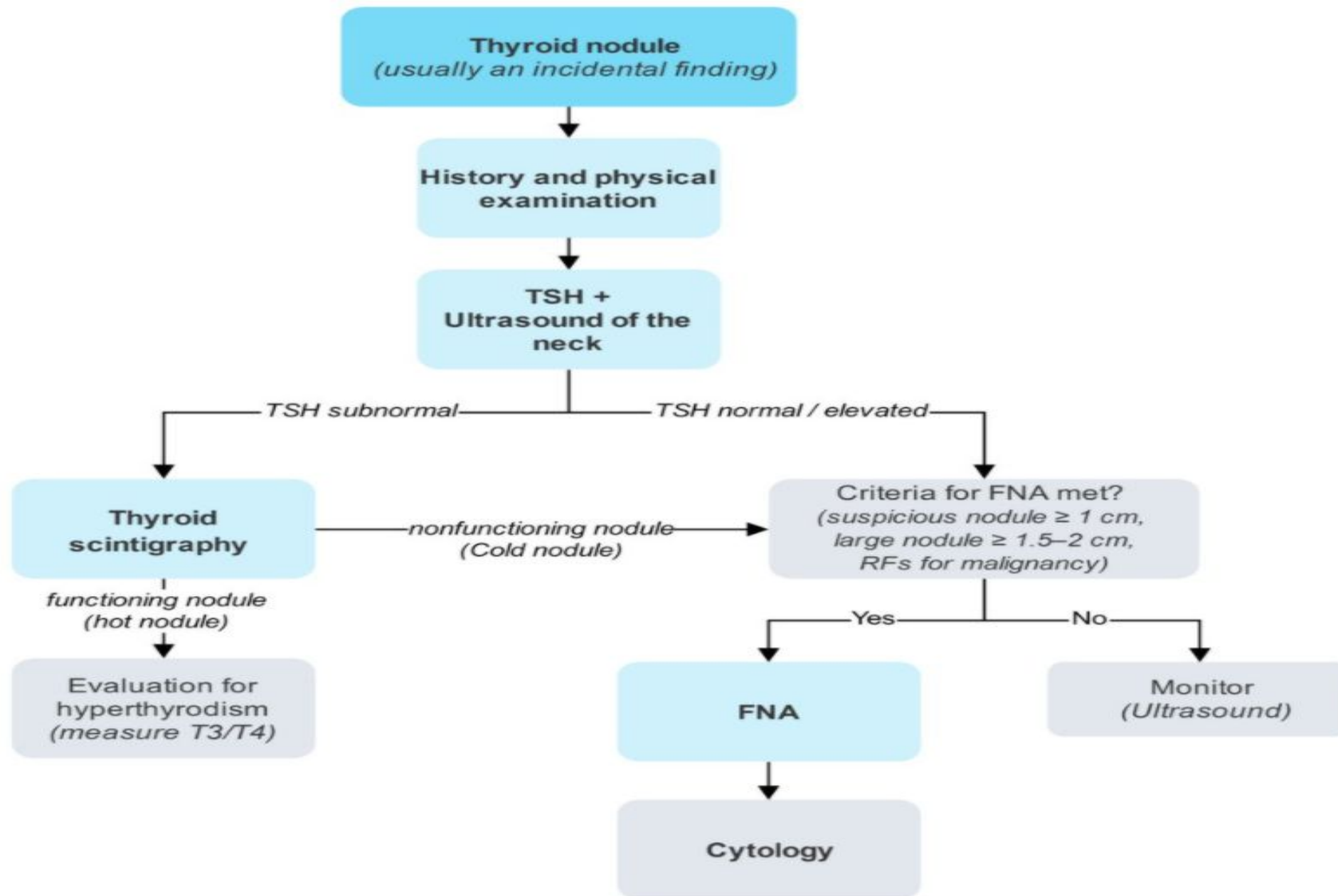
Solitary (SN) or dominant nodule in MNG.

Risk of malignancy is double in solitary and solid nodule ,
four Times in males .

Solitary Nodule in children.

Positive family history? MEN II A , MEN II B .

Calcified thyroid nodules are usually benign.



Bethesda Reporting system

The Bethesda System for Reporting Thyroid Cytopathology

(Baloch et al. Diagn Cytopathol, 2008)

(Ali & Cibas (eds) 2009 The Bethesda System for Reporting Thyroid Cytopathology. Springer, NY)

	(risk of malignancy)
I. Nondiagnostic	
II. Benign	< 3 %
III. Follicular lesion/Atypia of undetermined significance	5-10 %
IV. Follicular neoplasm	20-30 %
V. Suspicious for malignancy	50-75 %
VI. Malignant	100 %

Treatment for solitary thyroid nodule

Hyperthyroid

More than 3cm operate.

Less than 3cm radioactive iodine

Euthyroid

FNA

Malignant Suspicious → **Operate**

Benign with pressure symptoms → **operate**

Cystic

Recurrent after 2-3 aspiration

Bloody

More than 4 cm

Inadequate repeat FNA

operate



Thyroid cancer

Un common cancer 4 per 100.000 .

M:F 1:3 , 4% of all cancers .

Only endocrine cancer spread by all means lymphatic
blood , local spread .

Differentiated thyroid cancer

Papillary thyroid cancer

Follicular thyroid cancer

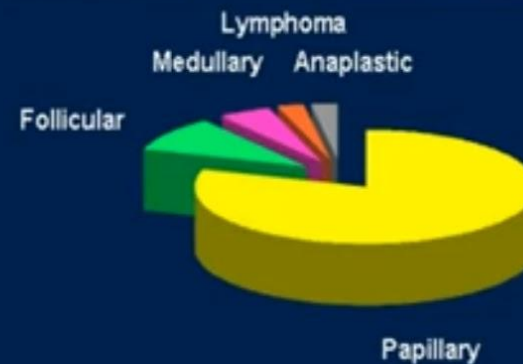
Medullary thyroid cancer

Anaplastic thyroid cancer.

Malignant lymphoma.

Squamous cell carcinoma.

Thyroid Cancer



Risk factors for thyroid cancer

Head neck radiation

MEN II A , B.

Hoarseness .

Single , firm , cold nodule.

Enlargement on thyroid suppression .

Thyroid nodule in old males , and children.

FAP.

Cowden's, Gardner's syndrome.

Papillary carcinoma

Commonest thyroid cancer 75-80% more common in female
30 - 40 y.

Commonest in children 85%.

Previous radiation to neck.

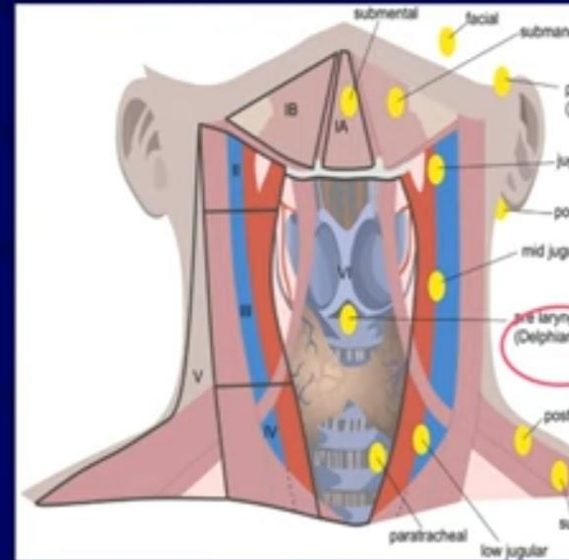
Multi-focality is common 85%.

Not capsulated.

Lymphatic spread to cervical
and paratracheal, lymph nodes .

Blood spread is late .

Rare variants subtypes are bad prognosis tall , columnar,
diffuse sclerosing.



Clinical presentation

Slowly growing thyroid nodule.

Painless.

Enlarged cervical lymph nodes .

Pressure symptoms.

Distant metastasis MC (Lung).

Prognostic indicators (AGES SCALE)

: Age

: Grade

: Extent

: Size T1 < 1cm T2 more than 1cm and less than 4 cm T3 > 4 cm

Thyroid Cancer Statistics

Thyroid cancer is the most rapidly increasing cancer in the U.S., but compared to other cancers, the death rate is relatively low.

2 out of 3

cases are found in people
younger than 55

About **2%**

of cases of thyroid cancer
occur in children and
teens



Thyroid cancers occur
**3 times more
frequently in women**
than in men

Most women are
diagnosed in
their 40s or 50s



Most men are
diagnosed in their
60s or 70s

Prognostic Factors

Patient
factors

Tumour factors

Management factors

Age

Tumour size

Delay in therapy

Sex

Tumour histology

Extent of surgery

Nodal metastases (in
elderly patients)

Experience of surgeon

Thyroid hormone therapy

Local invasion

Treatment with

Distant metastases

postoperative
radioiodine

Poor prognostic factors

Poor Prognostic Factors

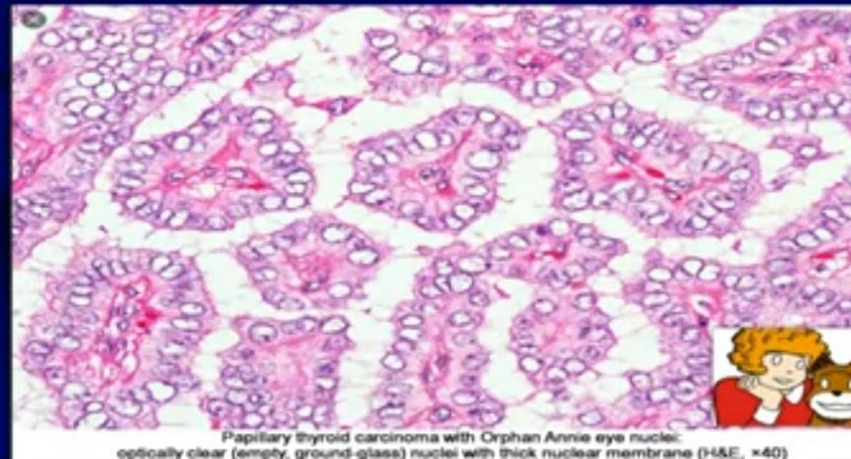
- ▣ Age >45 years
- ▣ Male sex
- ▣ Poorly differentiated
 - Differentiated thyroid cancer – 10 year survival ~90%
 - Anaplastic thyroid cancer – median survival <1 year
- ▣ Tumor Size
- ▣ Extrathyroid extension

Histological characteristics of PTC

Papillary projections

Orphan annie nuclei (Ground glass).

Psammoma bodies .



Papillary thyroid carcinoma with Orphan Annie eye nuclei: optically clear (empty, ground-glass) nuclei with thick nuclear membrane (H&E, $\times 40$).

Follicular carcinoma

Less common 10%.

More common in females 3:1

Older age group 50 years.

Common in endemic goiter areas.

Usually solitary, encapsulated tumors.

Vascular and capsular invasion.

Blood spread more common ,lymphatic spread rare 5%.

Hemorrhage into lesion is common.

Bone secondries are typically vascular warm pulsatile
vertebrae ribs ,skull and long bones.

HURTHLE CELL CARCINOMA

Variant of follicular carcinoma

3% of thyroid cancer.

From oxyphilic cells cannot be diagnosed by FNA.

Rarely trap iodine 5%.

Multifocal , bilateral , lymph nodes metastasis is common .

Aggressive high mortality rate 20% at 10y.

Total Thyroidectomy : is treatment of choice.

Medullary carcinoma

Neuroendocrine tumor Para follicular C cells (Neura Crest) origin.

5% of Thyroid malignancies .

Upper two thirds of lobes Bilateral , multicentric.

Amyloid stroma .

Spread by lymphatic and blood.

Serum calcitonin , CEA are high .

Medullary thyroid cancer

Sporadic in 80%

Age more 30 year.

Unilateral.

Familial in 20% MEN II A , B

Age less 30 years

Bilateral

MEN II A: Sipple less aggressive.

MEN II B: Sizemore more aggressive.

Clinical features

Solid mass in the neck.

Painful ,rapidly enlarging.

Lymph nodes enlargements.

Recurrent laryngeal nerve involvement.

Respiratory, and swallowing problems.

Diarrhea .

Flushing.

Liver metastasis.

Diagnosis and treatment

Family history.

FNAC.

Serum calcitonin, CEA levels.

Urinary vanillyl mandelic acid (VMA).

Total Thyroidectomy, and Central para tracheal lymph nodes are cleared? modified neck dissection.

Anaplastic tumor

- **Highly aggressive tumor**
- **Old age**
- **Area of endemic goiter**
- **Surgery to relive airway obstruction.**
- **Radiotherapy, chemotherapy?**
- **Kill in 6 months**

Malignant lymphoma

- Non –Hodgkin B type.
- Long standing hashimoto's thyroiditis.
- Elderly females.
- Primary thyroid tumor ,or part of generalized lymphoma.
- Rapid growing, painful mass.
- Treatment by Chemo and Radio Therapy.

Metastatic thyroid cancer

- Kidney
- lung
- Breast
- Melanoma

Treatment by Resection *IF* Primary tumor is controlled.

Preoperative assessment

- **T4 T3 TSH Thyroid antibodies.**
- **Serum Ca level.**
- **CEA, Calcitonin Thyroglobulin.**
- **US to cervical LNs to detect mez.**
- **Indirect direct laryngoscopy .**
- **Doppler US.**
- **CT for Retrosternal goiter.**
- **Lugol's iodine 10 days pre op.**
- **ECG cardiac fitness Thyrotoxic.**



Complication of Thyroidectomy

Recurrent laryngeal nerve injury.

External superior laryngeal nerve injury.

Hypo para-thyroidism.

Laryngeal edema

Bleeding-haematoma

Upper air way obstruction in 12 hours



Hypothyroidism.

Keloid , granuloma.

Wound infection.

RLN Injury

Unilateral

hoarseness of voice,

Choking , coughing with drinking liquids

Bilateral : Stridor

Transient Recovery within 6-12 m

Permanent 3 times more common

Always identify RLN during Thyroid Surgery