ANATOMY OF THYROID AND PARATHYROID GLAND

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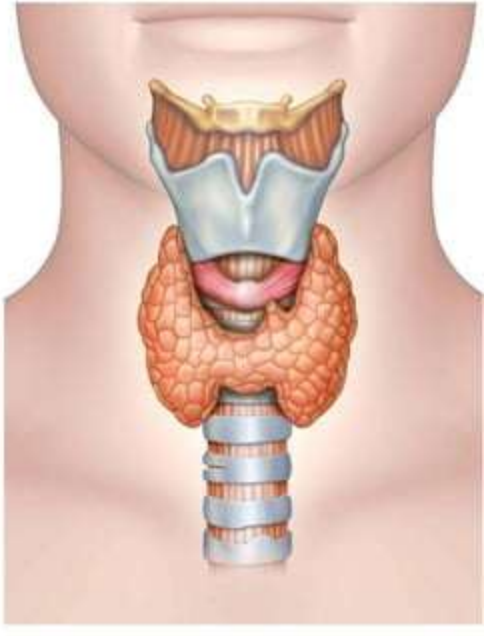
PG-1

- It is H – shaped
- It consists of two symmetrical lobes united by isthmus.
- Each lobe measures 5cm x 2.5cm x 2.5cm
- Isthmus measures 1.25cm x 1.25cm
  which Lies in front of the second ,third
  and fourth tracheal rings.
- Weight -15-25 gms

Is

- The lobes lie on the either side of the larynx and trachea.
- Each lobe extending from oblique line of the thyroid cartilage to the sixth tracheal ring.
- Lobe covers the anterolateral surface of the trachea, the cricoid cartilage and the lower part of the thyroid cartilage.
- Larger in females than in males
- Increases in size during pregnancy and menstruation.

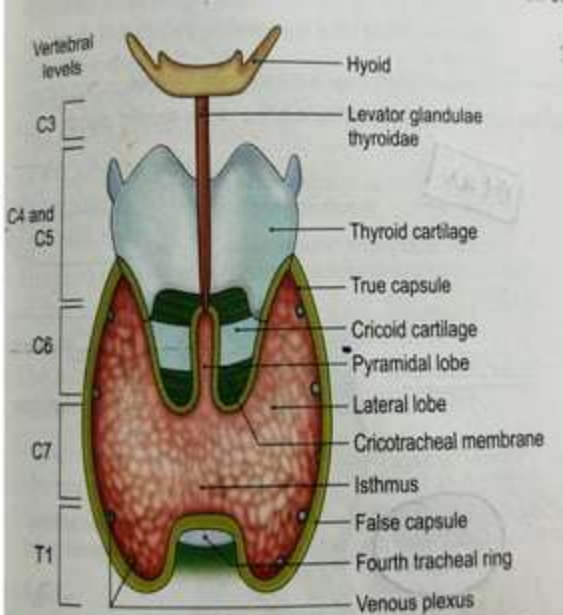


•The thyroid gland lies deep to the sternothyroid and sternohyoid muscles, located anteriorly in the neck.

•Consists of right and left lobes, anterolateral to the larynx and trachea

•relatively thin isthmus unites the lobes over the trachea.

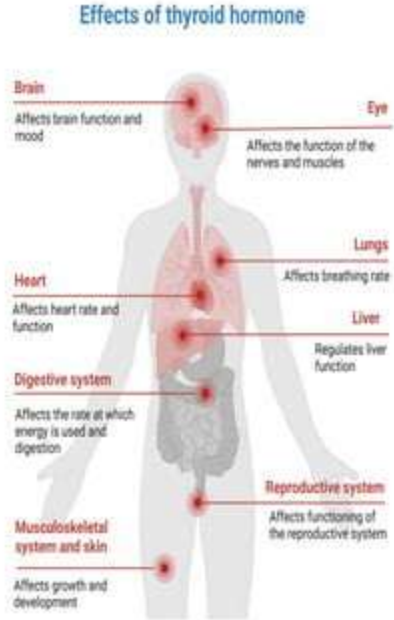
-usually anterior to the second and third tracheal rings.



ig. 8.2: Scheme to show the location and subdivisions of the hyroid gland including the false capsule

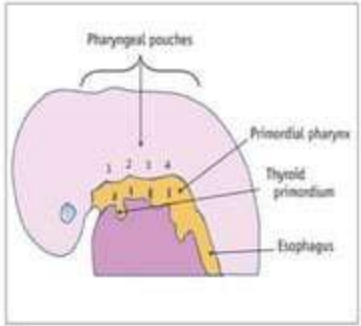
FUNCTION

- The thyroid gland is a small gland with significant effects.
- The mature thyroid gland is located in the neck and is responsible for delivering hormones to the body.
- Hormones released from the thyroid include thyroxine and calcitonin, which have an impact on the body's basal metabolic rate, heart, brain, muscle, digestive tract, and calcium homeostasis respectively
- The thyroid is the body's first endocrine gland to develop, with development beginning around the third week of gestation.



DEVELOPMENT

- The thyroid arises from the pharyngeal pouches,which are composed of endoderm.
- Thyroid development begins as a diverticular outgrowth from the primitive pharynx.
- The site of diverticulum is now seen as depression –foramen caecum.
- The diverticulum then descends inferiorly to reach its final destination in the neck.
- The medial ends of the two mandibular arches are separated by a midline swelling –tuberculum impar



- Traditionally , the thyroid is located inferior to the cartilage ,approximately at the level of the C5-T1 vertebrae.
- During its descent ,the thyroid connects to the tongue by the thyroglossal duct.

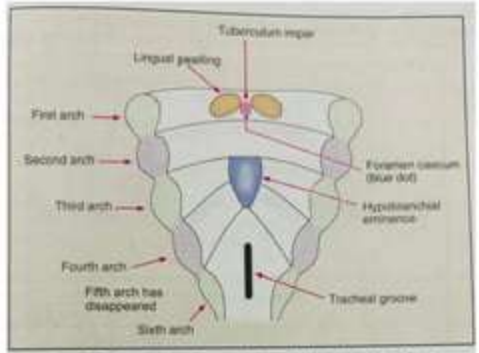


Fig. 9.9: Floor of the pharynx showing the foramen caecum from where the thyroglossal duct arises.

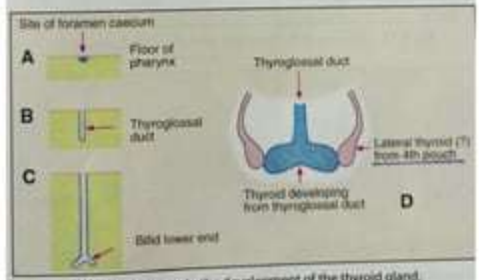
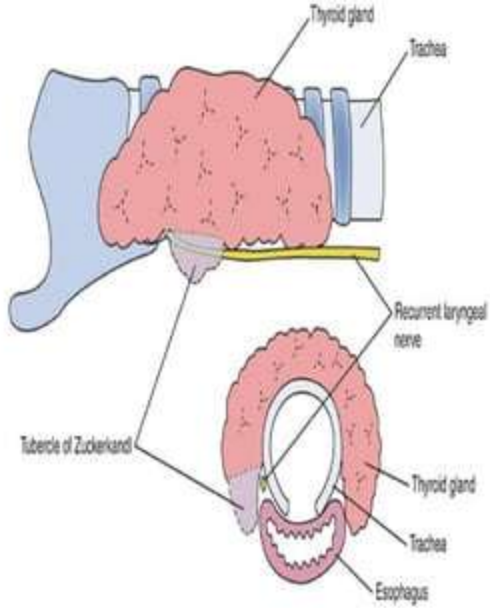
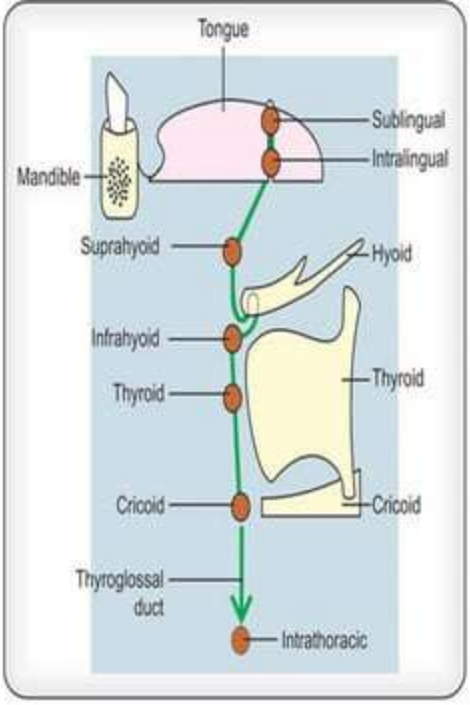


Fig. 9.10: Stages in the development of the thyroid gland.

- Also, during the fifth week , the ultimobranchial bodies arises from fourth / fifth pharyngeal pouches
- The ultimobranchial bodies ultimately differentiate into the parafollicular C-cells , which play an essential role in calcium homeostasis.
- The ultimobranchial bodies fuse with the superior dorsolateral aspect of the developing thyroid ,forming Zuckerkandl's tubercle.
- Fully developed C-cells secrete calcitonin, which decreases serum calcium by inhibiting osteoclast function.



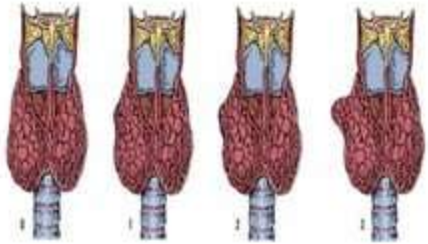
- By seventh week of gestation, the thyroid has reached its final destination in the neck. Normally, the thyroglossal duct degenerates by the tenth week of gestation with only the foramen caecum to indicate its former existence.
- In some instances, incomplete obliteration of the duct can lead to abnormalities, including thyroglossal duct cyst , lingual thyroid.
- **ECTOPIC THYROID TISSUE** : Thyroid tissue located outside the normal anatomic position in the anterior neck.
- It most commonly occurs secondary to failure of embryologic descent.
- Cellular differentiation and maturation then continues until the thyroid is functionally mature by the twelfth gestational week.



PELLIZO GRADING OF TUBERCLE OF ZUKERKANDL

Zuckerkandl's tubercle (ZT)

- It is defined as posterior extension of the lateral lobes composing of thyroid tissue only



- It is mostly circular or triangular in shape.
- Pelizzo graded the tubercle as

grade 0—unrecognizable,

grade I—only a thickening of the lateral edge,

grade II— < 1 cm and

grade III— > 1 cm.

Grade 0 is present in 0 to 11.25%, grade I —20%,

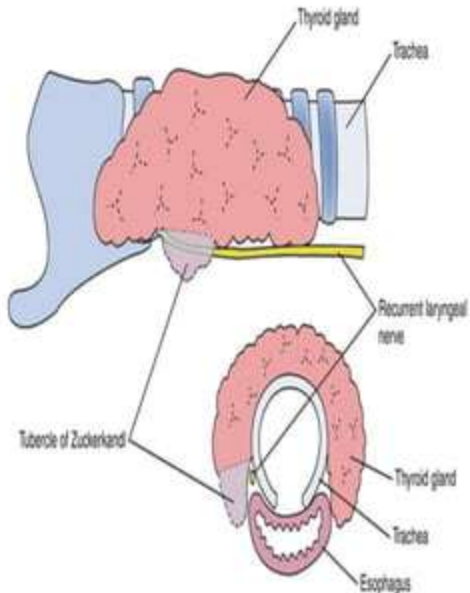
grade II—56.25%

and grade III—12.5%.

The surgical importance of Zuckerkandl's tubercle (ZT)

- Dissection and excision of ZT for total thyroidectomy
- Close relationship between ZT and recurrent laryngeal nerve (RLN).

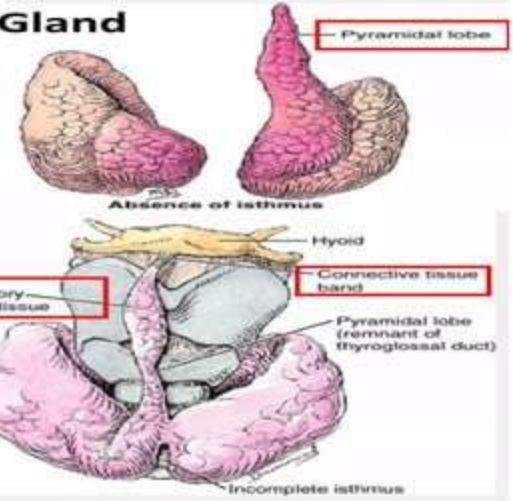
- The completeness of thyroidectomy requires removal of enlarged ZT which is posterolateral extension of thyroid lobes adjacent to RLN.
- Close relation of two structures urges careful, fine, and very close dissection around the nerve



PYRAMIDAL LOBE

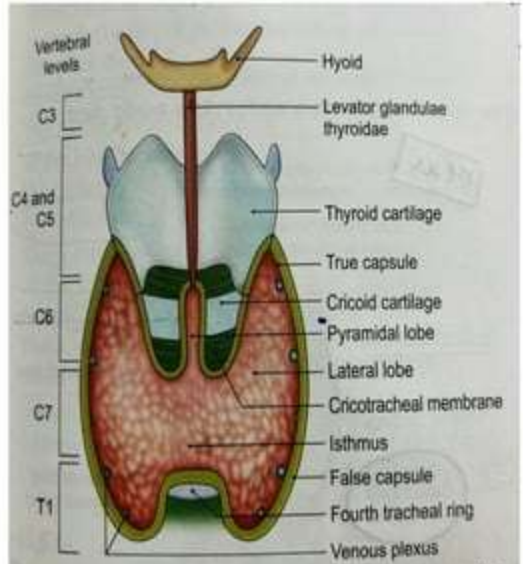
Pyramidal Lobe of the Thyroid Gland

- ~50% of thyroid glands have a pyramidal lobe
- Pyramidal lobe extends superiorly from the isthmus of the thyroid gland
- The fibrous tissue connecting pyramidal lobe with hyoid bone may contain levator glandulae thyroidae muscle (elevatior of thyroid gland)
- A band of connective tissue, often containing accessory thyroid tissue, may continue from the apex of the pyramidal lobe to the hyoid



levator glandulae thyroidae

- Knowledge about levator glandulae thyroidea is important during neck surgeries.
- This structure could represent the persisting distal end of thyroglosal duct
- Anterior cervical region should hence be clearly examined during total thyroidectomy in order not to leave behind residual thyroid tissue thyroid



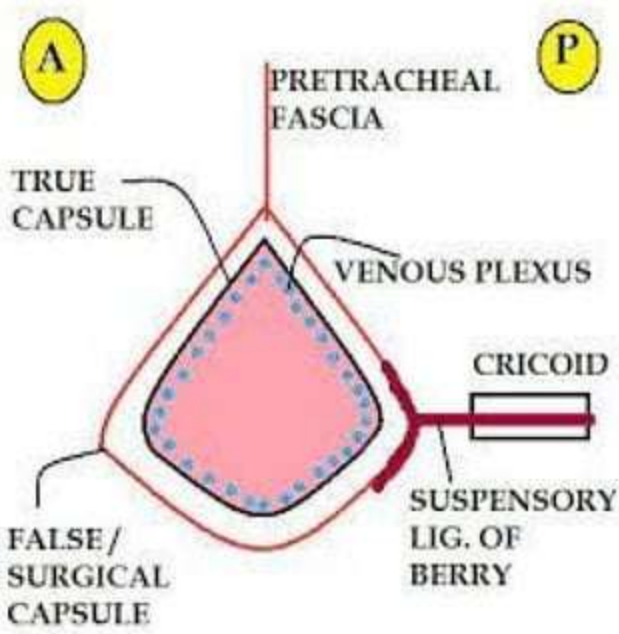
g. 8.2: Scheme to show the location and subdivisions of the yroid gland including the false capsule

CAPSULE

- This gland is invested by :

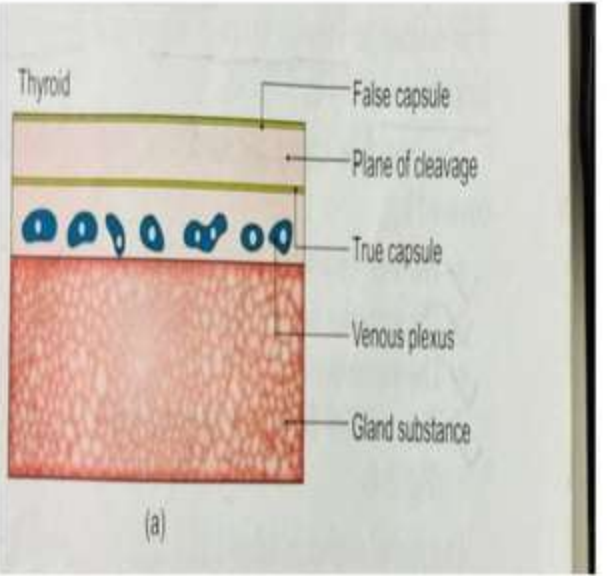
1) True capsule

2) False capsule



TRUE CAPSULE

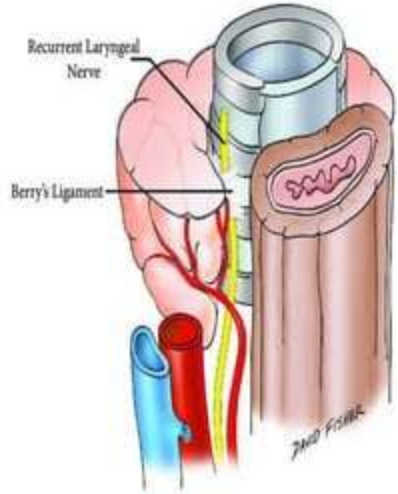
- It is thin and formed by condensation of its fibrous stroma.
- It is densely adherent to the gland
- This true capsule sends septa inside the gland to form pseudo-lobules
- A dense capillary plexsus is present deep to the capsule so to avoid hemorrhage during operation the thyroid along with true capsule is removed.



FALSE CAPSULE

- Derived from pretracheal fascia of deep cervical fascia.
- This fascia is different from the true capsule, and it can easily be separated from the capsule during surgery, whereas the true capsule of the thyroid cannot be separated.
- Traced above, the pretracheal fascia after enclosing the thyroid gland is attached to the oblique lines of thyroid cartilage, and the body of the hyoid bone in the midline.
- Its thin along the posterior border

- The fascia is thick and condenses on inner surface of the gland froms the ligament of berry.
- The ligament of Berry is connecting the cricoid cartilage and the 1st tracheal ring to the posteromedial aspect of each thyroid lobe .
- It is primary point of fixation of the thyroid to the surrounding structures.
- The thyroid gland moves up and down during swallowing because its capsule is attached to the laryngeal cartilages and hyoid bone , which moves up and down during swallowing.



IMPORTANCE OF LIGAMENT OF BERRY

- It has important surgical implications because of its relationship to the recurrent laryngeal nerve (RLN)
- Nerve passes deep to or through the ligament
- Small branches of the inferior thyroid artery lie close to the ligament and bleed during surgery.
- Extreme care is required to control bleeding here to avoid injury to RLN

RELATION

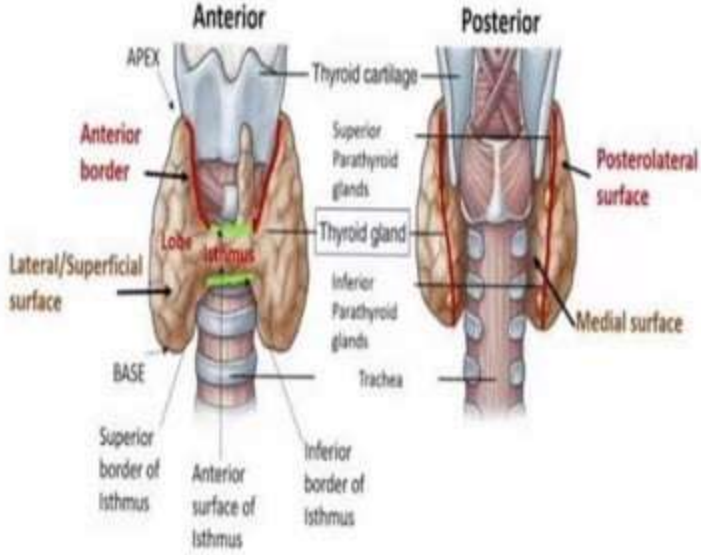
- Each lobe of the thyroid gland is roughly pyramidal (conical) in shape.
- It presents:

❖Apex

❖Base

❖Three surfaces (lateral, medial, and posterolateral)

❖Two borders (anterior and posterior)

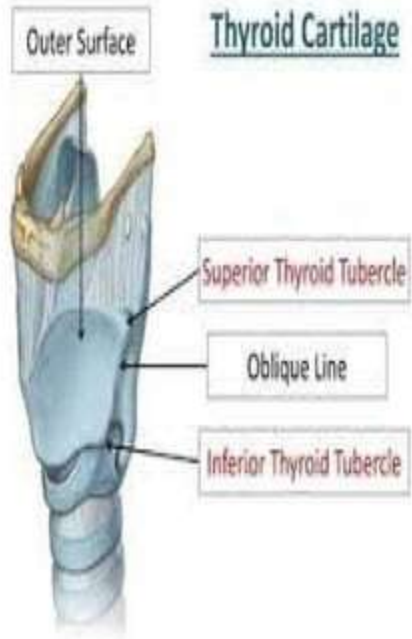


- On the lateral side of the thyroid cartilage there is oblique line
- This oblique line has relation with 3 muscles

-Sternothyroid

-Thyrohyoid

-Horizontly placed inferior constrictor



APEX

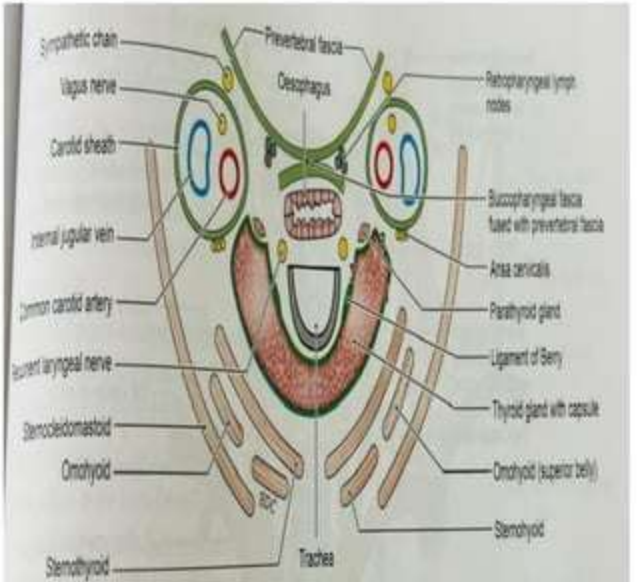
- The apex is directed upwards & slightly laterally.
- It extends upto the oblique line of the thyroid cartilage where it is limited above by the attachment of sternothyroid.
- The apex lies between the inferior constrictor medially and sternothyroid laterally
- And is related to sup. Thyroid artery and external laryngeal nerve.

BASE

- at the level of 4^{th}& 5^{th} tracheal rings.
- Its is related to inferior thyroid artery and RLN

LATERAL SURFACE

- It is convex and is covered by three strap muscles:
- Sternothyroid ,sternohyoid, and superior belly of omohyoid.
- Anterior border of sternocleidomastoid overlapping it inferiorly.
- The sterno-thyroid muscles do not completely meet in the midline above the level of the isthmus.
- The sternohyoid muscles meet at the median raphe which is typically spilt during thyroidectomy.



g14: Transverse section through the anterior part of the neck at the level of the isthmus of the thyroid gland. Also shows the ...ines to be of thyroid gland—1. lateral; 2. medial; 3. posterior

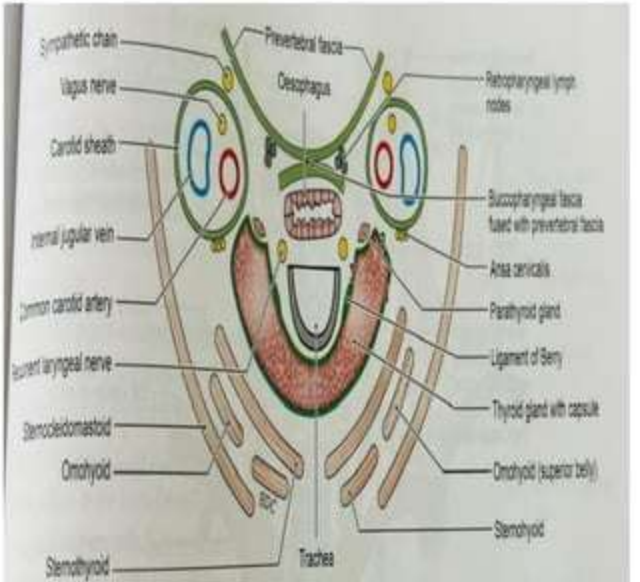
MEDIAL SURFACE

a) Two tubes : trachea and oesophagus

b) Two muscles : inferior constrictor and cricothyroid.

c) Two cartilages :cricoid and thyroid

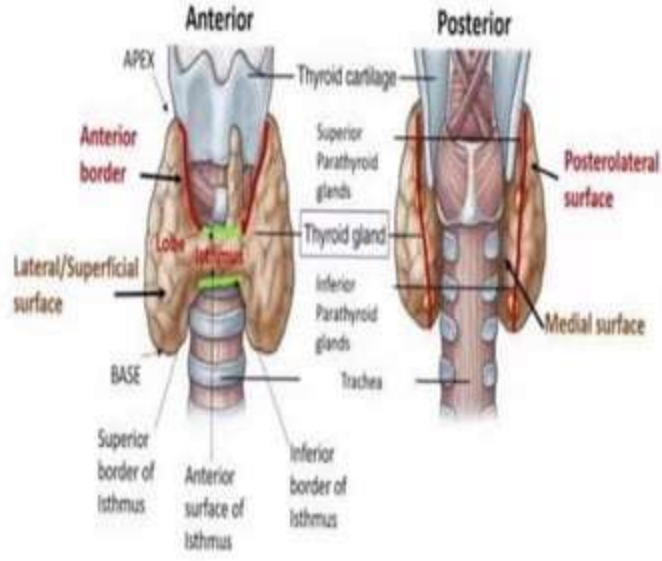
d)Two nerves : the external and recurrent laryngeal nerves.



14: Transverse section through the anterior part of the neck at the level of the isthmus of the thyroid gland. Also shows the ...ries to be of thyroid gland—1. lateral; 2. medial; 3. posterior

ANTERIOR BORDER

- It is thin and separates lateral and medial surfaces.
- It is related to anterior branch of the superior thyroid artery.



POSTERIOR BORDER

- It is thick and rounded.
- It separates the medial and the posterior surfaces.
- It is related to the longitudinal arterial anastomosis between superior and inferior thyroid arteries

ISTHMUS

- The isthmus is horizontal
- It presents two surfaces :

1. Anterior
2. Posterior

- Two borders

1. Superior
2. inferior

- **Anterior surface** is related to :

a)strap muscles (sternohyoid and sternothyroid) and (b) anterior jugular veins

- **Posterior surface** is

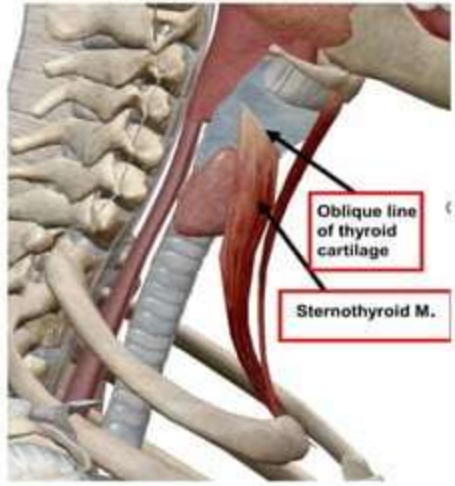
-related to 2nd ,3rd , and 4th tracheal rings.

-Superior border : related to anastomosis between the anterior branches of two superior thyroid arteries.

-Inferior borders : Along this border inferior thyroid vein emerge and thyroidea ima artery (when present) enters.

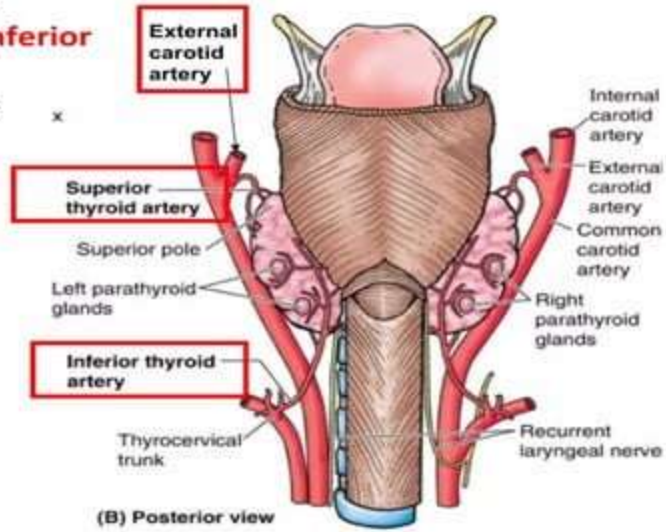
ENLARGING THYROID IS TEND TO GROW DOWNWARDS AND NOT UPWARDS

- Upper pole of thyroid gland can not expand above point of attachment of sternothyroid muscle
- The sternothyroid muscles are attached onto the oblique lines of the cartilage
- No limitation to the downward expansion of thyroid gland
- Pathologically enlarged thyroid gland (goitre) extended behind the sternum is termed retrosternal goitre.

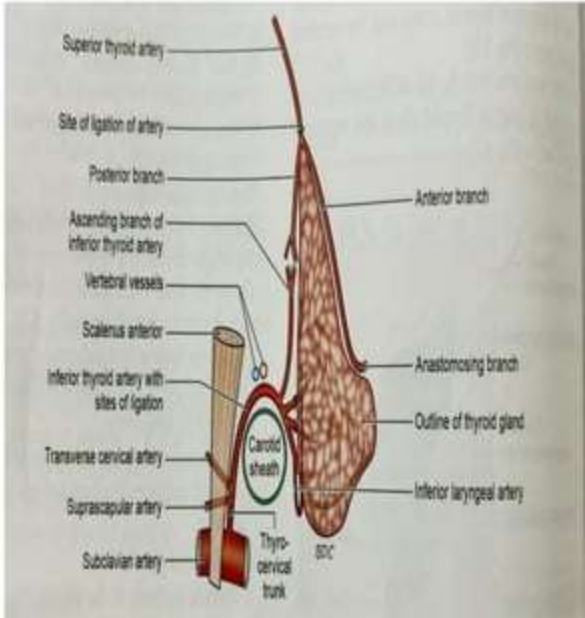


Arteries of the Thyroid Gland

- Thyroid gland is highly vascular
- Supplied by the **superior and inferior thyroid arteries**
- Vessels lie between the fibrous capsule and the loose fascial sheath
- **The first branch of the external carotid artery, the superior thyroid artery (STA)**, descend to the superior poles of the gland, pierce the pretracheal layer of deep cervical fascia, and **divide into anterior and posterior branches supplying mainly the anterosuperior aspect of the gland**



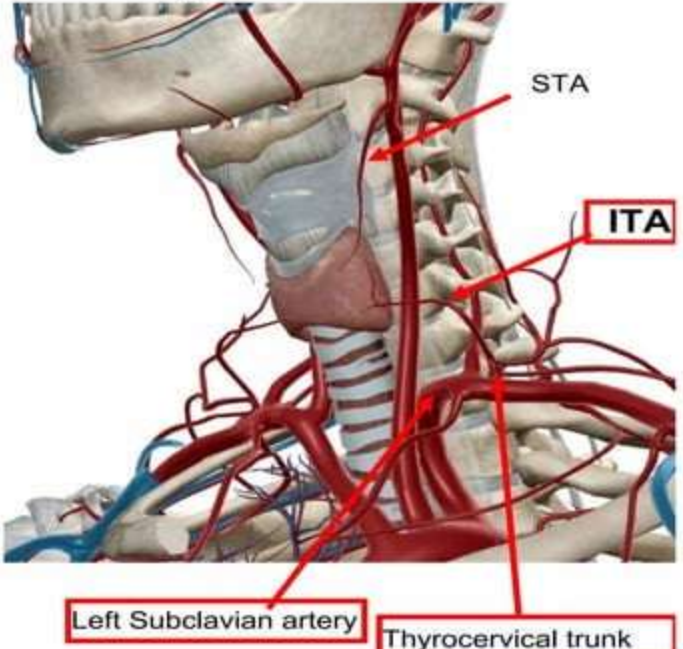
- at the upper pole at artery divides into anterior & posterior branches.
- The anterior branch descends on the anterior border of the lobe and continues along the upper border of the isthmus to anastomose with its fellow of the opposite side.
- The posterior branch descends on the posterior border of the lobe and anastomoses with the ascending branch of inferior thyroid artery



Arterial supply of the surfaces of thyroid gland. Sites of ligatures of the superior and inferior thyroid arteries are sho

Arteries of the Thyroid Gland

- **Inferior thyroid arteries** (ITA) are branches of the **thyrocervical trunks** arising from the **subclavian arteries**, run superomedially posterior to the **carotid sheaths** to reach the posterior aspect of the gland
- **Supply the postero-inferior aspect**, including the inferior poles of the gland
- The right and left superior and inferior thyroid arteries form anastamoses within the gland

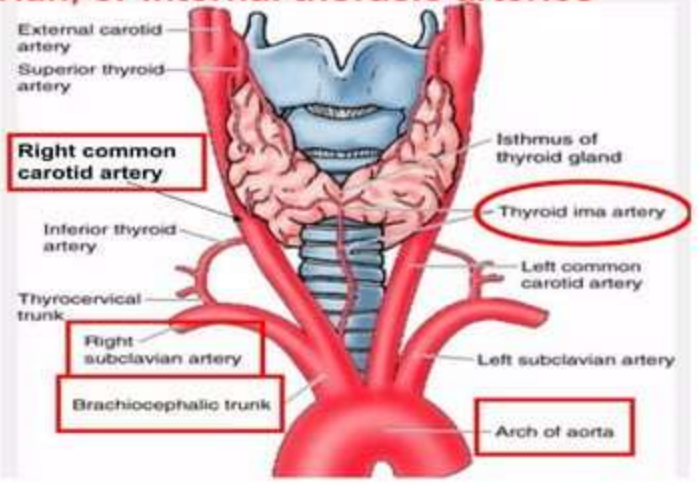


Thyroid Ima Artery

- ~10% of people have small unpaired thyroid ima artery (branch of brachiocephalic trunk)
- Other possible sources of Ima artery: arch of the aorta, right common carotid, subclavian, or internal thoracic arteries

- Ascends on the anterior surface of the trachea and continues to the thyroid isthmus

- The presence of this artery must be considered before tracheotomy (as a potential source of bleeding!)



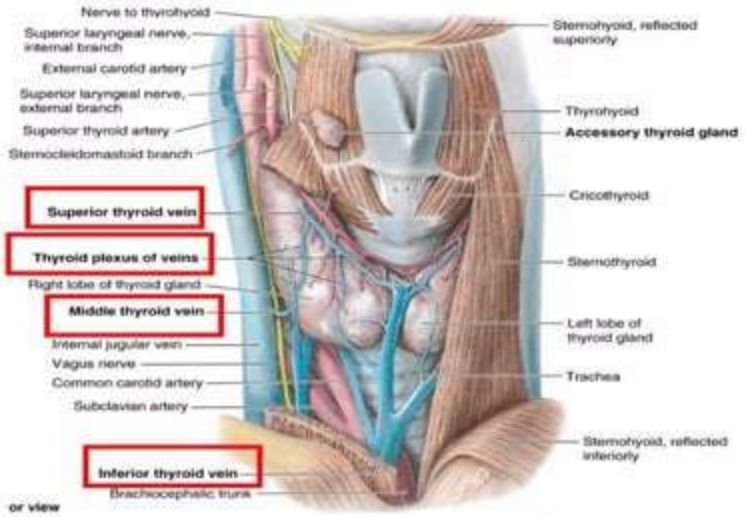
Veins of the Thyroid Gland

- Three pairs of thyroid veins (superior, middle, inferior) form **thyroid plexus of veins** on the anterior surface of the thyroid gland and anterior to the trachea

- **Superior thyroid veins** accompany the superior thyroid arteries

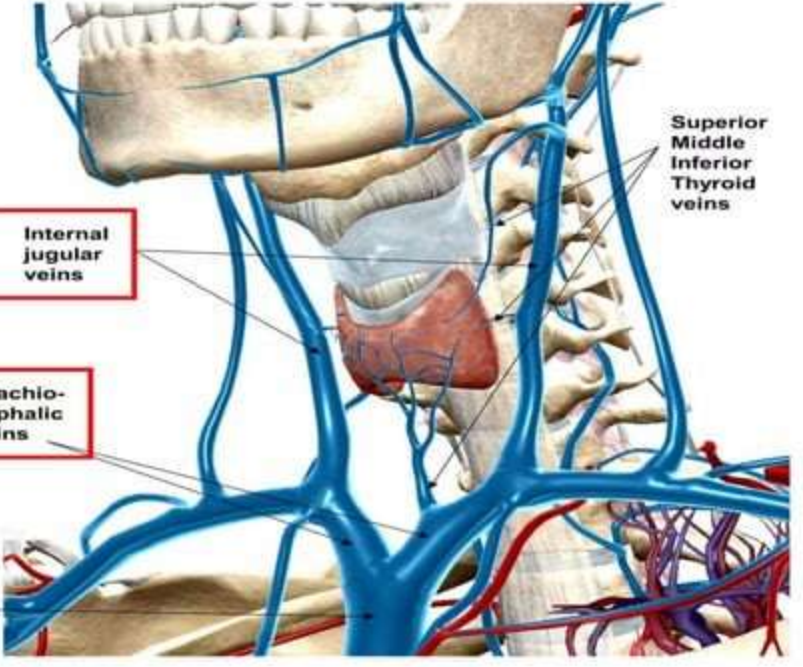
Middle thyroid veins do not accompany but run essentially parallel courses with the inferior thyroid arteries

Inferior thyroid veins accompany the thyroid ima artery (if artery is present)



Thyroid Veins

- Superior and middle thyroid veins drain into the internal jugular veins
- Inferior thyroid veins drain into the brachio-cephalic veins posterior to the manubrium of sternum



INFERIOR THYROID VEIN

Inferior thyroid vein : these are usually two or three in number and descend directly from the lower pole of the gland and isthmus into the left brachiocephalic vein.

-**Thyroid vein of kocher** : may emerge between middle and inferior vein and drain into IJV.

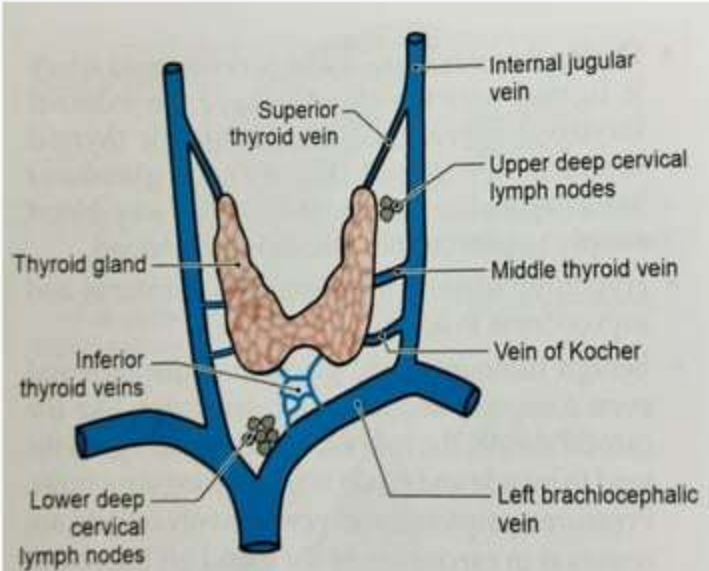
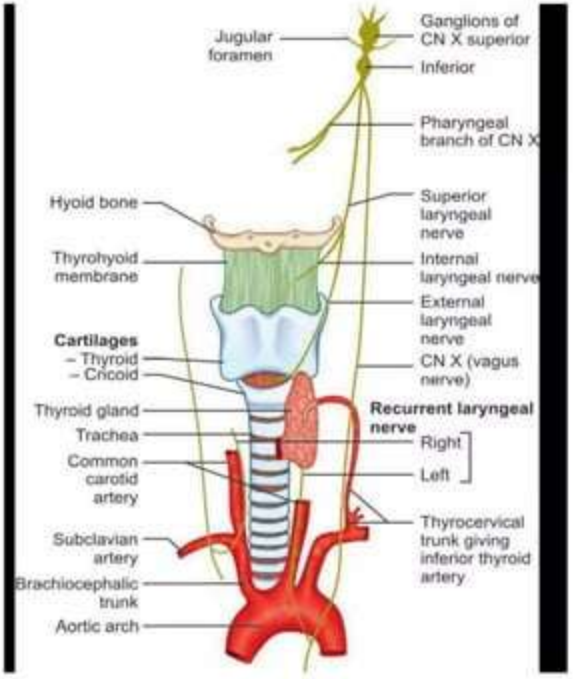


Fig. 8.8: Venous drainage and lymphatic drainage of the thyroid gland (lateral view). Deep cervical lymph nodes are also shown

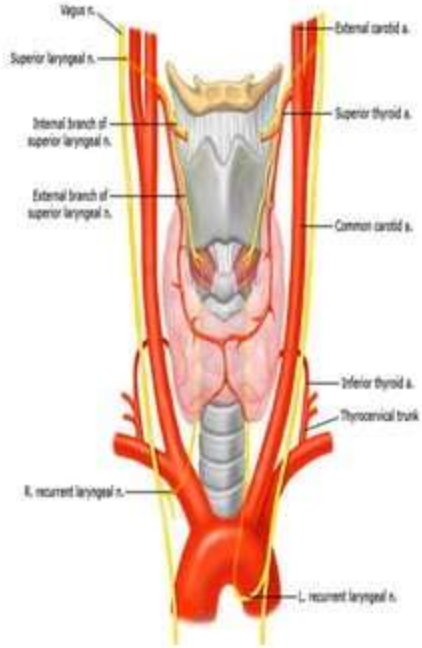
NERVE SUPPLY

- INNERVATION
- PRINCIPALLY FROM ANS
- Parasympathetic- from vagus
- Sympathetetic fibres – from superior ,middle, inferior, ganglia of sympathetic trunk
- Enter the gland along with the blood vessel.



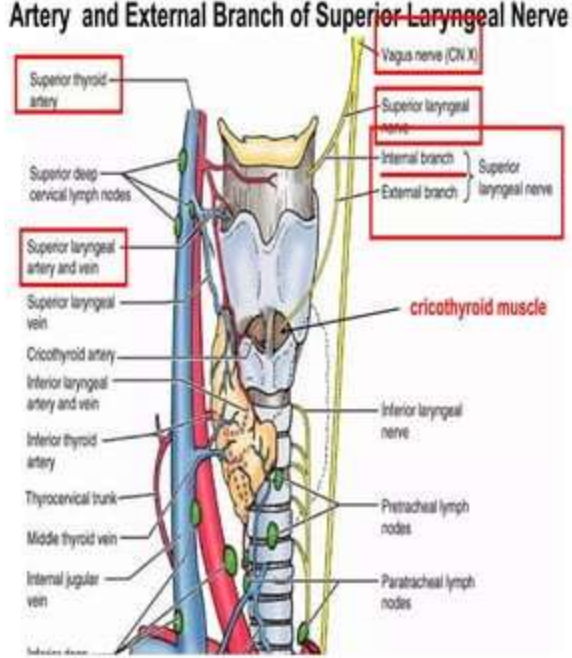
Nerve related to thyroid artery

- The superior thyroid artery is having relation with external branch of the superior laryngeal nerve.
- The inferior thyroid artery has relationship to the recurrent laryngeal nerve.
- These two nerves have critical importance during thyroidectomy.



SUPERIOR THYROID ARTERY AND EXTERNAL LARYNGEAL NERVE

- The external laryngeal nerve is immediately behind the artery.
- But they part company as the artery reaches pole of the gland and the nerve ascends to supply the cricothyroid muscle.
- In thyroidectomies the artery ligated close to the upper pole, or its anterior and posterior branches are ligated instead, to avoid damage to the external laryngeal nerve.



Superior laryngeal nerve

- This nerve originates at the inferior ganglion of vagus nerve (nodose ganglion) close to the jugular foramen.
- The average length of superior laryngeal nerve is about 2 cm in males and 1.5 cms in females.
- It courses posterior and medial to the internal carotd artery and descends antero inferiorly to reach the larynx.
- At the level of greater cornu of hyoid bone it divides into a large internal laryngeal and a smaller external laryngeal branch.

The internal laryngeal nerve

- It passes between thyrohyoid muscle and the thyrohyoid membrane.
- It pierces the thyrohyoid membrane along with superior laryngeal artery and vein to supply sensaton to the interior of larynx.
- It supplies sensaton to supraglots and pyriform sinus.
- After entering into the larynx this nerve divides into three branches i.e. superior, middle and inferior.

The internal laryngeal nerve

- The superior division divides into two / three branches supplying sensations to the lingual surface of epiglotis, lateral aspect of glosso epiglotic fold.
- The middle division innervates the aryepiglotic fold, vocal folds, vestibular folds and the posterior aspect of arytenoid.
- The inferior division is the largest of the branches of superior laryngeal nerve.
- It lies along the medial aspect of pyriform fossa.

External laryngeal nerve

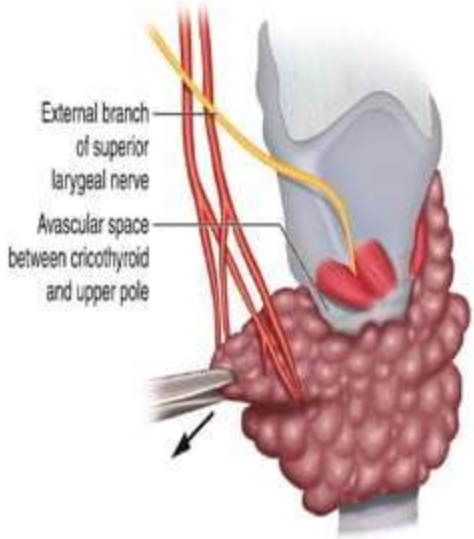
- The external laryngeal nerve at the level of superior horn of thyroid cartilage turns medially and runs posterior and parallel to the oblique line.
- This nerve lies deep to the superior thyroid artery.
- Its relationship with the superior pole of thyroid gland is highly variable.

JOLLS TRIANGLE OR STERNOLARYGEAL

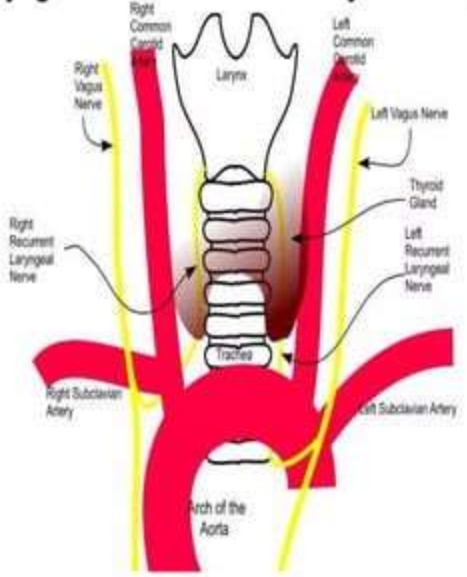
- is used for identification of external laryngeal nr.
- **boundaries**
- Lateral - Upper pole of thyroid gland and superior thyroid vessels
- Superior - Attachment of the strap muscles and deep investing layer of fascia to the hyoid
- Medial – Midline
- Floor – Cricothyroid muscle

Cricothyroid spaces of reeves

- This is supposed to be an avascular space between the upper pole of thyroid and the cricothyroid muscle.
- Dissection confined to this area helps the surgeon in avoiding injury to the surrounding important structures like the superior laryngeal nerve.



Anatomical Relationships Between Recurrent Laryngeal Nerve and Inferior Thyroid Artery



INFERIOR THYROID ARTERY AND RECURRENT LARYNGEAL NERVE

- The recurrent laryngeal nerve has variable relationship to the artery.
- Ligating the inferior thyroid artery well lateral to the gland, or carefully ligating a small branches on the surface of the gland,helps to safeguard the nerve.

Recurrent laryngeal nerves:

- Always asymmetric.

- Left recurrent laryngeal nerve arises from vagus in the chest.
- It crosses the arch of aorta to reach the neck.
- It ascends posterior to the thyroid gland to reach the tracheo oesophageal groove.

- The RLN often lies immediately posterolateral to the ligament of berry.
- But sometimes it can be embedded in the fibrous connections of the ligament.
- In a standard anatomic relationship, the tubercle of Zuckerkandl lies immediately lateral to and covers the RLN
- Injury to RLN can lead to hoarsness and aspiration due to motor and sensory dysfunction respectively, manifesting as hoarseness and/or aspiration.

- the right side recurrent laryngeal nerve arises from vagus in the chest and reaches the neck by crossing anterior to right subclavian artery.

- It loops around the right subclavian artery to reach the trachea-oesophageal groove posterior to thyroid gland.

- It enters the larynx behind the cricothyroid articulaton and inferior cornua of thyroid.

-**Left recurrent laryngeal nerve** is more closely related to the trachea in its lower part when compared to that of the right nerve.

- At the lower pole of thyroid gland right nerve is slightly more anterior than the left

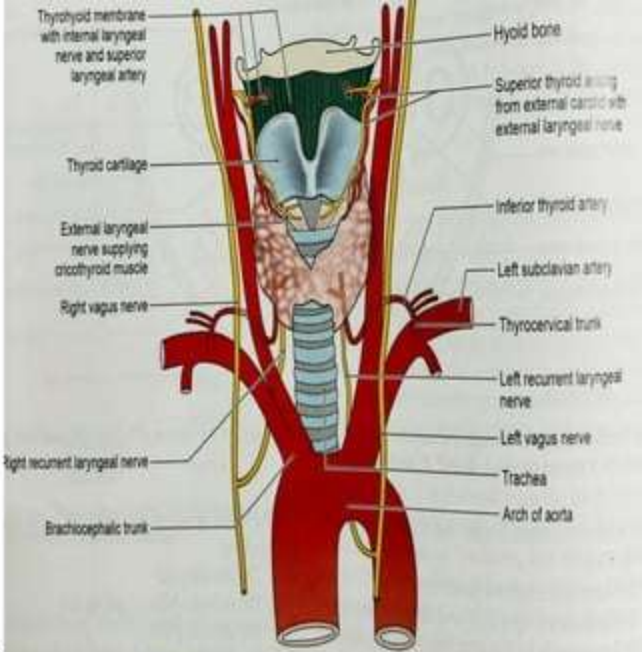
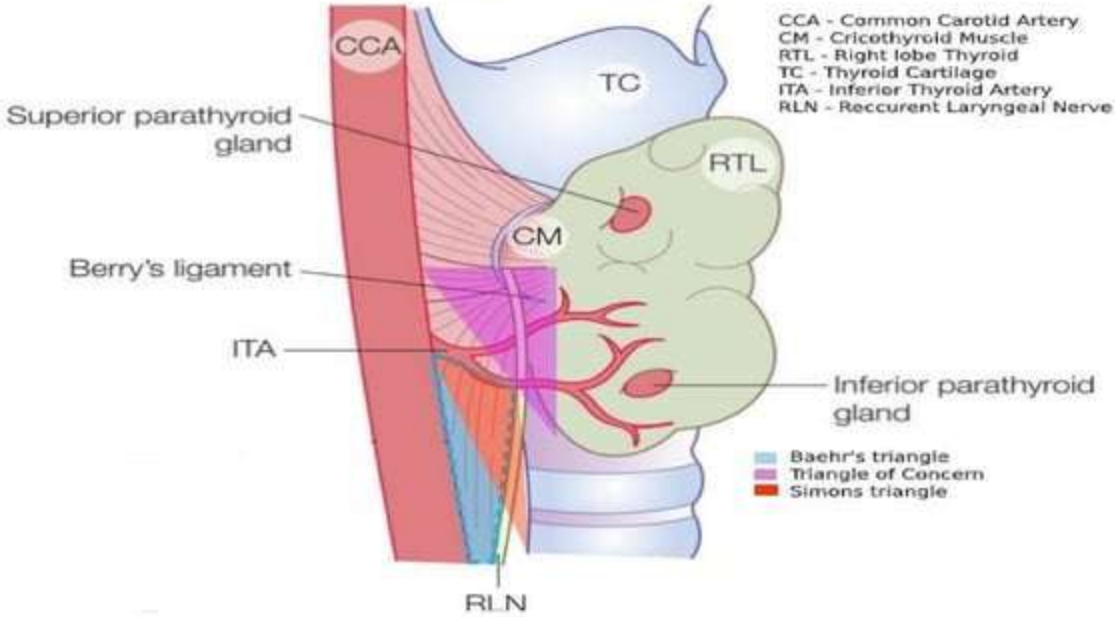


Fig. 8.6: Arterial supply of anterior aspect of thyroid gland

IMPORTANT TRIANGLES OF RLN



RLN TIANGLE (OF LORE)

- **BOUNDARIES**
- Medially- trachea &oesopahgus
- Laterally- strap ms.
- Sup- lower pole of thyroid.
- Apex-directed interiorly at thoracic inlet
- Significance- RLN runs through this triangle
- On rt side- from lateral to medial
- On left side-straight upto the tracheo-oesopaheal groove

BEAHRS TRIANGLE OR RIDDLE'S TRAINGLE

- SUP- inferior thyroid artery
- MED-TRACHEA
- LATERALLY- common carotid artery

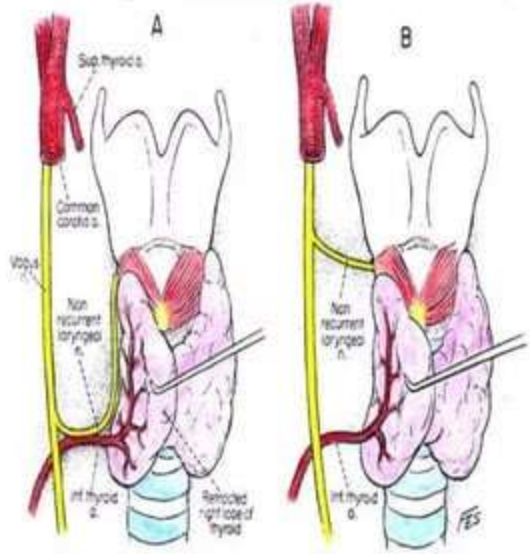
SIMONS TRIANGLE

- AIM: Use to identify the recurrent laryngeal nerve.

- BOUNDARIES:
- Medial border is formed by recurrent laryngeal nerve.
- laterally lies the common carotid arteries.
- Superiorly: cricothyroid muscle

NON – RECURRENT LARYNGEAL NERVE

- is an anomalous RLN.
- It does not have a recurrent course. After origin from the vagus , it runs directly medially to supply the larynx running along the inferior thyroid artery
- It does not hook around the subclavian on the right or aortic arch on the left.
- The anomaly is more common on the right side and is often associated with anomalous right subclavian artery which in such cases arises from the left side of descending aorta and runs behind the oesophagus causing dysphagia dysphagia lusoria).



Types of NRLN

- Type 1 occurs where the NRLN arises directly from the vagus and travels with the superior thyroid pedicle vessels.
- Type 2A, the NRLN travels transversely, parallel and superficial to the trunk of the inferior thyroid artery .
- Type 2B occurs where the nerve travels in a transverse path parallel, but deep to or between the branches of the inferior thyroid artery.

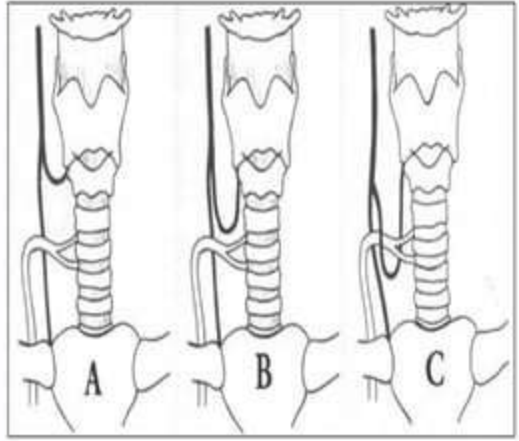


Fig. 1 - Schematic presentation of the three types of NRILN. A: Type 1. B: Type 2A. C: Type 2B.

LYMPHATIC DRAINAGE

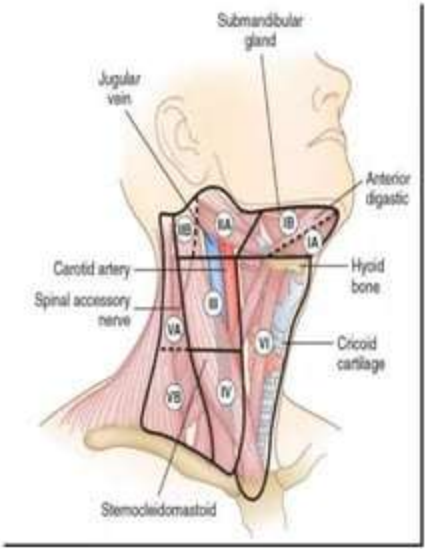
- the thyroid gland contains a rich network of lymphatics
- The lateral aspects of the gland drain-

- into level 3 and level 4 those of the posterior triangle (level 5)

- The more medial aspects of the gland

- drain into the nodes of the anterior compartment of the neck (level 6).

- Drain into those of the superior mediastinum (level 7)



HISTOLOGY

- The thyroid gland is made-up of the following two types of secretory cells.
- **Follicular cells**
- lining the follicles of the gland secretes T3 & T4 which stimulate basal metabolic rate and somatic and psychic growth of the individual.
- During **active phase**, the lining of the follicles **is columnar**, while in
- **resting phase- cuboidal.**
- Follicles contain the colloid (the hormone in their lumina
- Parafollicular cells (C cells) are fewer and light cells.
- These lie in between the follicles. They secrete thyro-calcitonin which promotes deposition of calcium salts in skeletal and other tissues, and tends to produce hypocalcaemia.
- These effects are opposite to those of parathormone.

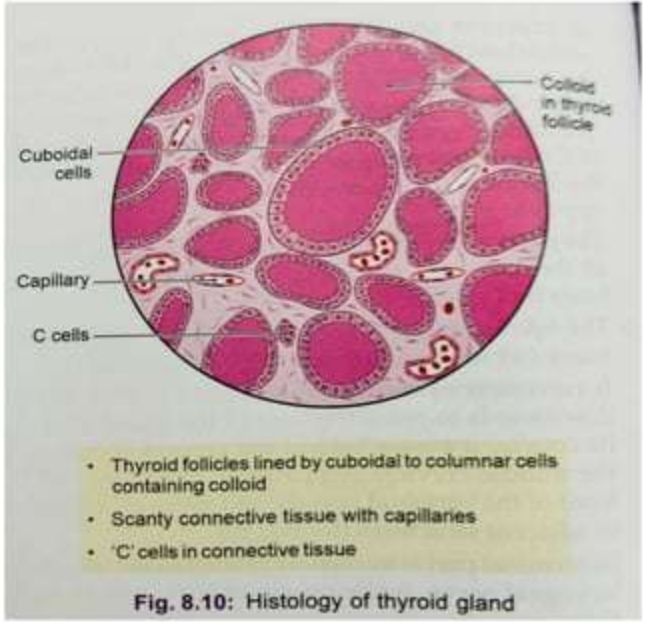


Fig. 8.10: Histology of thyroid gland

APPLIED ANATOMY

- Removal of the thyroid (thyroidectomy) with true capsule may be necessary in hyperthyroidism.
- In subtotal thyroidectomy, the posterior parts of both lobes are left behind .This avoids the risk of simultaneous removal of the parathyroids and also of postoperative myxoedema (caused by deficiency of thyroid hormones),
- During thyroidectomy, the superior thyroid artery is ligated near the gland to save the external laryngeal nerve; and the inferior thyroid artery is ligated away from the gland to save the recurrent laryngeal nerve
- Hypothyroidism causes cretinism in infants and myxoedema in adults.
- Benign tumours of the gland may displace and even compress neighbouring structures, like the carotid sheath, the trachea, etc.

Malignant growths tend to invade and erode neighbouring structures.

Pressure symptoms and nerve involvements are common in carcinoma of the glands giving rise to dyspnoea, dysphagia and dysphonia.

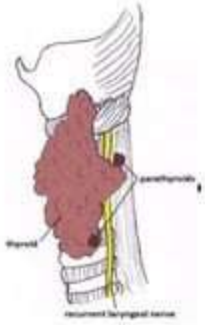
TRIANGLE OF CONCERN

- The commonest site for bleeding in thyroidectomy is the 'triangle of concern: comprising the
- medial-trachea
- laterally- RLN nerve,
- base- loose fat above the sternum
- apex- Berry's ligament

This triangle has the small branches of small branches of the inferior thyroid artery that require meticulous haemostasis with in the vicinity of RLN, which can cause Injury to nerve.

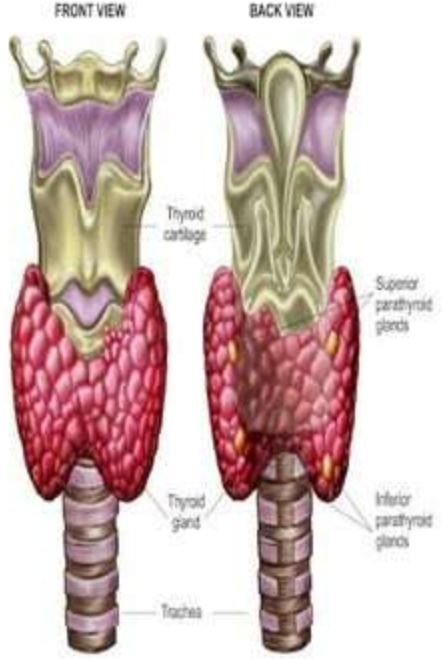
Cricothyroid space

PARATHYROID GLAND



Parathyroid glands:

- Parathyroid glands which secrete parathormone are typically 4 in number i.e. two superior and two inferior.
- 10% of patents may have supernumerary parathyroid glands.
- Each parathyroid gland weighs 35-40 mg measuring about 3-8 mm in all three dimensions.
- These glands can vary in color between yellow to reddish brown.



INFERIOR PARATHYROID GLAND

- Inferior parathyroid gland is found within 1 cm inferior, lateral or posterior to the inferior pole of thyroid gland in at least 50% of case.

- Usually inferior parathyroid gland lies anterior to a plane drawn along the course of recurrent laryngeal nerve

- Commonly inferior parathyroid glands could a so be seen within the capsule of thyroid gland.

SUPERIOR PARTHYROID GLAND

- Superior parathyroid gland

- can be found in the posterior aspect of thyroid lobe just 1 cm above the crossing of inferior thyroid artery and recurrent laryngeal nerve.

- Superior parathyroid gland could be commonly seen located in the posterolateral aspect of superior pole of thyroid gland at the cricothyroid cartilage junction.

DEVELOPMENT

- glands are derived as follows:
- The inferior parathyroid glands develop from endoderm of the third pharyngeal pouch (parathyroid III).
- The superior parathyroid glands develop from endoderm of the fourth pharyngeal pouch (parathyroid IV)

the third pouch also gives origin to the thymus this organ is closely related to parathyroid III.

-When the thymus descends towards the thorax, parathyroid III is carried caudally along with it for some distance. Meanwhile, parathyroid IV is prevented from descending caudally, because of the close relationship of the fourth pouch to the developing thyroid gland.

As a result, parathyroid III becomes caudal to parathyroid IV.

Hence, the parathyroid glands derived from the fourth pouch become the superior parathyroid glands and those derived from the third pouch become the inferior parathyroid gland.

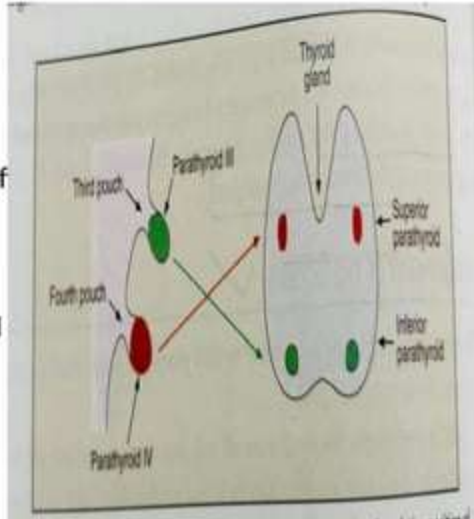
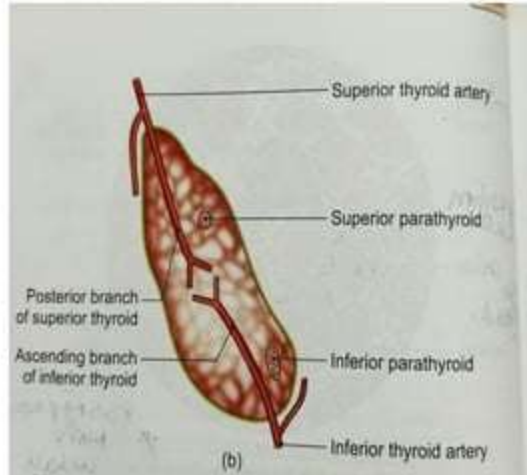


Fig. 9.8: Derivation of superior and inferior parathyroid glands. Note that the relative position of parathyroid III and IV is reversed during development.

VASCULAR SUPPLY

- The parathyroid glands receive a rich blood supply
- from the inferior thyroid artery
- from the anastomosis between the superior and inferior thyroid arteries.
- The veins and lymphatics of the gland are associated with those of the thyroid and the thymus.



yroid glands: (a) Transverse section through the left lobe of the
l gland

NERVE SUPPLY

- Vasomotor nerves are derived from the middle and superior cervical ganglia.
- Parathyroid activity is controlled by blood calcium levels; low levels stimulate and high levels inhibit the activity of the glands.

HISTOLOGY

- The reticular tissue forms framework of the parathyroid gland. The parenchyma consists of principal cells and oxyphilic cells.
- Principal cells or chief cells are arranged in sheets with numerous sinusoids and capillaries traversing them.
- The principal cells are polygonal or round with a centrally placed vesicular nuclei and a pale staining acidophilic cytoplasm
- Oxyphilic cells are a few in number, occur singly or in small groups. These are larger than principal cells. They have darkly staining nuclei and strongly acidophilic cytoplasm.
- Oxyphilic cells are seen to increase with age.
- The principal or chief cells secrete parathormone responsible for maintaining the blood calcium level.

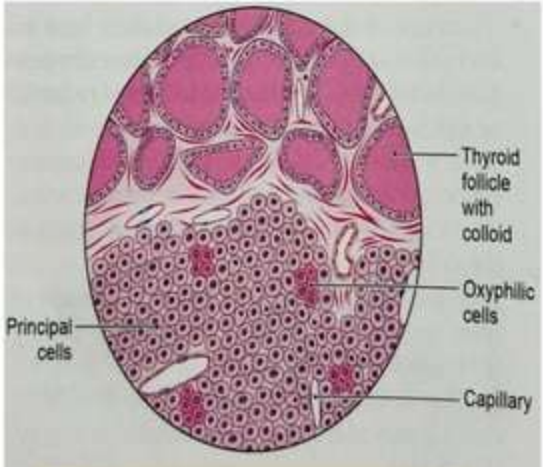


Fig. 8.13b: Histology of the parathyroid gland

APPLIED ANATOMY

- Tumours of the parathyroid glands lead to excessive secretion of parathormone (hyper-parathyroidism).
- This leads to increased removal of calcium from bone, making them weak and liable to fracture.
- Calcium levels in blood increase (hypercalcaemia) and increased urinary excretion of calcium can lead to the formation of stones in the urinary tract.
- Hypoparathyroidism may occur spontaneously or from accidental removal of the glands during thyroidectomy. This results in hypocalcaemia leading to increased neuromuscular irritability causing muscular spasm and convulsions (tetany).
- Parathyroid glands are tough glands and will continue to function, if these are transplanted from an excised thyroid gland into the sternocleido-mastoid.

THANKYOU