

Anatomy & Embryology of Thyroid & Parathyroid Glands

Endocrine block

Color Index

Main Text

Male's Slides

Female's Slides

Important

Doctor's Notes

Extra Info

[The Editing File](#) 

Objectives



Describe the shape, position, relations and structure of the thyroid gland.



List the blood supply & lymphatic drainage of the thyroid gland.



List the nerves endanger with thyroidectomy operation.



Describe the shape, position, blood supply & lymphatic drainage of the parathyroid glands.



Describe the development of the thyroid & parathyroid glands.



Describe the most common congenital anomalies of the thyroid gland.

This lecture was presented by :

Dr. Khaleel Al Yahya

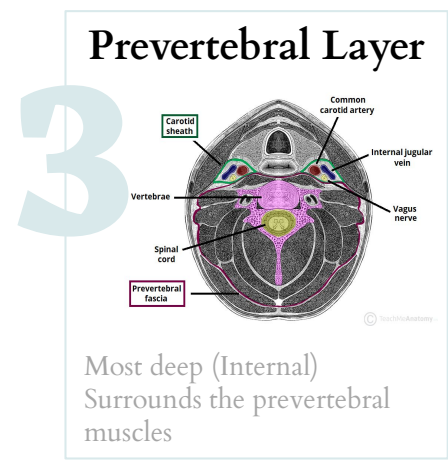
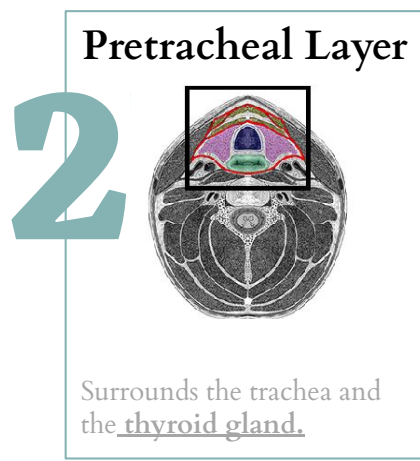
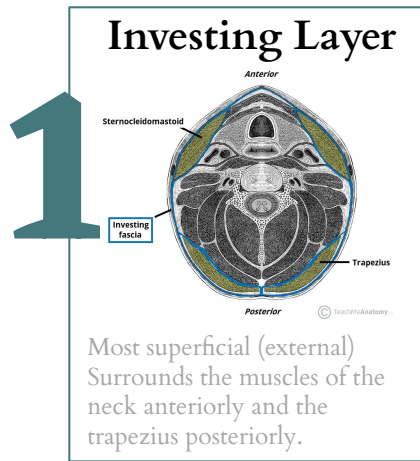
Dr. Sanaa Al Sharawi



You can find Atlas by [Clicking HERE!](#)

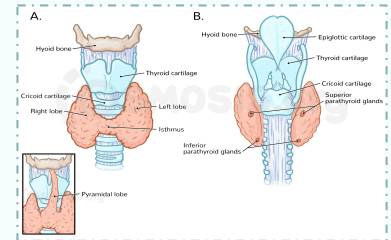
Overview of Thyroid Gland

The deep fascia or deep cervical fascia of the neck
(It's divided mainly into 3 layers)



Thyroid structure

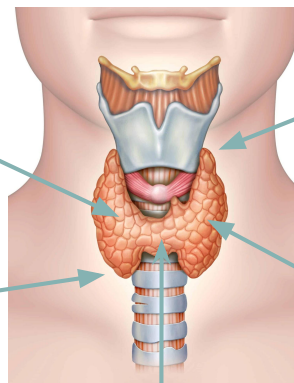
- ➔ Endocrine, **butterfly shaped gland**. 🦋
- ➔ Consists of right & left lobes
- ➔ Each lobe is **pear-shaped**.
- ➔ It is surrounded by a facial sheath derived from the **pretracheal layer** of the deep cervical fascia.
- ➔ Inside the pretracheal facial capsule, there is another **C.T capsule**. So, It's surrounded by 2 membranes.



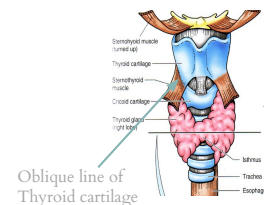
Thyroid lobes

Right lobe: pear shaped.

Base: lies at the level of 4th or 5th tracheal rings.



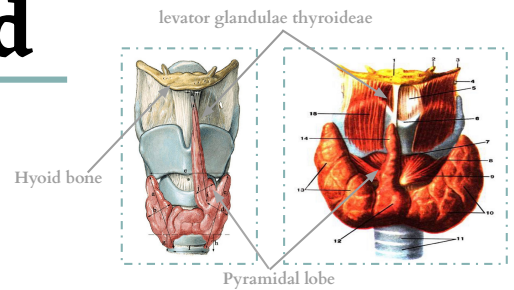
Apex: reaches up to the **oblique line of thyroid cartilage**.
(Posteriorly)



Left lobe: pear shaped.

The 2 lobes are **connected** to each other by a narrow median tissue mass called **isthmus**, which extends across the midline in front of the 2nd, 3rd & 4th tracheal rings.

Thyroid Gland



Pyramidal lobe (3rd lobe)

A 3rd small pyramidal lobe is often present.

projects from the upper border of the isthmus usually to left of middle line.

It's connected to hyoid bone by a fibrous or smooth muscular band called **levator glandulae thyroideae**.

represents in 50% of people the **fibrosed & obliterated thyroglossal duct**. It's a remnant of thyroglossal duct.

Relations of Thyroid Gland

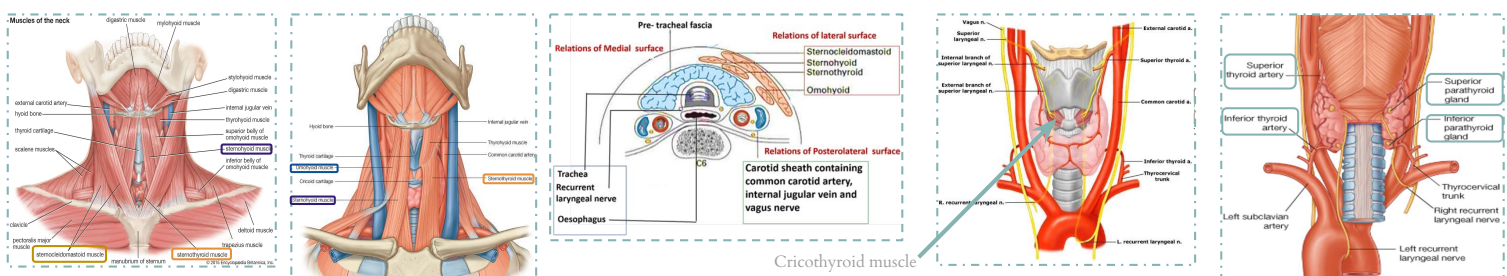
Surfaces

Anterolaterally (4S)	Posteriorly	Medially	
		(Above)	(Below)
<ol style="list-style-type: none"> 1. <u>S</u>ternohyoid. 2. <u>S</u>ternothyroid 3. <u>S</u>uperior belly of omohyoid. 4. <u>S</u>ternomastoid. <p>(From Medially to laterally)</p>	<p>Carotid sheath & its contents. (Internal carotid A, common carotid A, Vagus N, Internal jugular V)</p>	<ol style="list-style-type: none"> 1. Larynx 2. Pharynx 3. Cricothyroid muscle 4. External laryngeal nerve (supplying the cricothyroid muscle) 	<ol style="list-style-type: none"> 1. <u>T</u>rachea 2. <u>E</u>sophagus. 3. <u>R</u>ecurrent laryngeal nerve in <u>between</u>.

Posterior border is related to

Superior & inferior Parathyroid glands.

Anastomosis between superior & inferior thyroid arteries.



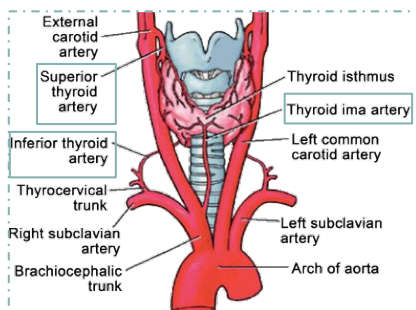
Thyroid Gland

supply

Arterial blood supply

Superior Thyroid A.

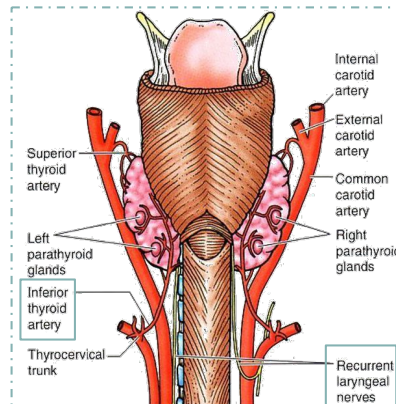
- Branch from the external carotid artery.
- Descends to the upper pole of the lobe, with the **external laryngeal nerve**.
- Runs along the upper border of the isthmus to anastomosis with its fellow on the other side.



Thyroid Ima A.

If Present:

- Arises from Aortic arch or from Brachiocephalic artery.
- Ascends in front of the trachea to reach the isthmus.

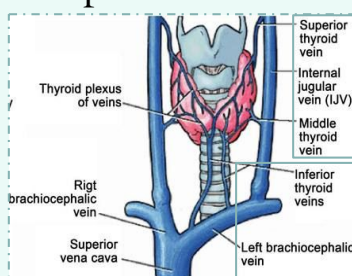


Inferior Thyroid A.

- Arise From the **thyrocervical trunk** of 1st part of **subclavian artery**.
- Then it curves medially behind the carotid sheath.
- It ascends behind the gland to the level of **cricoid cartilage** (at level of C6 vertebra).
- Then it anastomoses with the superior thyroid artery.
- The **recurrent laryngeal nerve** crosses either in front or behind it.

Venous drainage

- ➔ Superior thyroid vein → internal jugular V.
- ➔ Middle thyroid vein → internal jugular V.
- ➔ Inferior thyroid vein → left brachiocephalic V.



innervation & lymph

Innervation:

- ➔ Sympathetic: **Cervical Sympathetic Trunk.**
- ➔ Parasympathetic: **Branches of Vagus N.**

Lymph drainage:

- ➔ **Deep cervical & paratracheal Lymph nodes.**

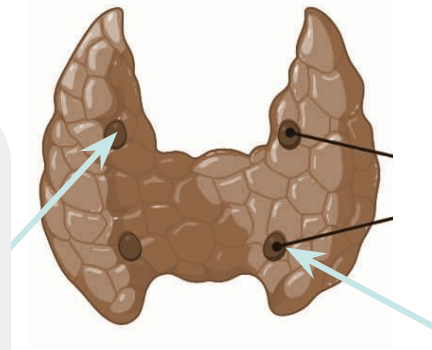
Parathyroid Gland

Overview

- ➔ 4 small ovoid bodies, about 6 mm. long.
- ➔ They lie within the facial capsule of the gland, (between the 2 membranes).

2 Superior Parathyroid

has a **constant position** at the **middle of the posterior border** of the gland.



2 Inferior Parathyroid

- **usually** at the level of the **inferior pole**.
- May be **lying within** the thyroid tissue or sometimes **outside** the facial capsule.



Did you know that the word "thyroid" comes from the Greek word "thyreos," which means "shield"? This name was given to the gland because of its resemblance to a shield or an oblong shape. The thyroid gland shape, with its two lobes connected by the isthmus, does bear a resemblance to a shield when viewed from certain angles.

Supply

Blood supply

- ➔ Superior **Thyroid Artery**
- ➔ Inferior **Thyroid Artery**

Venous drainage

- ➔ Superior **Thyroid Vein**
- ➔ Middle **Thyroid Vein**
- ➔ Inferior **Thyroid Vein**

Nerve supply

- ➔ **Sympathetic Trunk**; Superior & Middle Cervical Sympathetic Ganglia (vasomotor).

Lymphatic drainage

- ➔ Deep Cervical
- ➔ Paratracheal

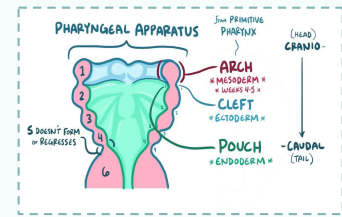
The same as thyroid gland except for the nerve supply, **only** sympathetic

Development of the Thyroid Gland

Pharyngeal Apparatus

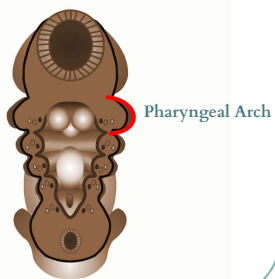
The Head & Neck region develops from the Pharyngeal

Apparatus. Pharyngeal apparatus is formed of (from outer to inner layer):
1-Groove: Ectoderm 2-Arch: mesoderm & neural crest 3- Pouch: Endoderm
mnemonic: GAP



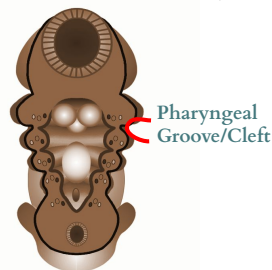
It is formed of

Pharyngeal Arches



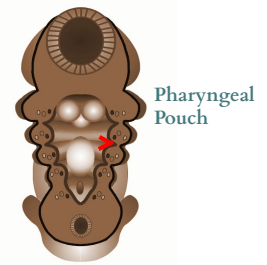
Pharyngeal Grooves

Or Clefts, Externally



Pharyngeal Pouches

Internally



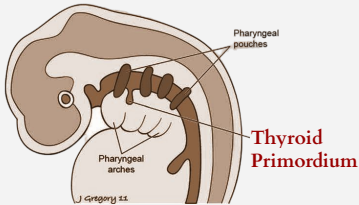
The Mesoderm in the head and neck regions divided into six cubical masses called the **6 pharyngeal or branchial arches**.

Each arch is formed of a **Core of Mesoderm**, Covered **Externally by Ectoderm** and the space between 2 arches from outside is called **cleft or groove**.

Each arch is lined from **inside by Endoderm** and the space between the 2 arches from inside is called **pouch**.

Thyroid Primordium

Thyroid Primordium

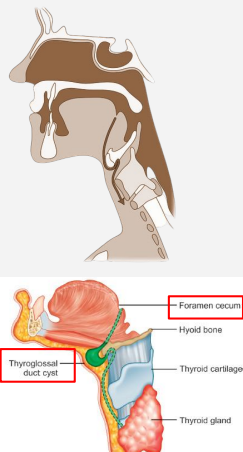
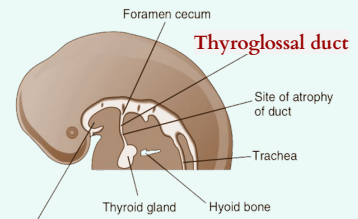


- By the **24th day** (4th week) after fertilization, the **thyroid gland** begin its development.
- It is the **first endocrine gland** to develop.
- It develops from the endoderm of the floor of the primitive pharynx.
- It develops from the (**Thyroid primordium**).

1

2

As the tongue grows, the developing thyroid gland **descends downward** in the neck. It descends **anterior** to the developing hyoid bone & laryngeal cartilages **through the thyroglossal duct**.

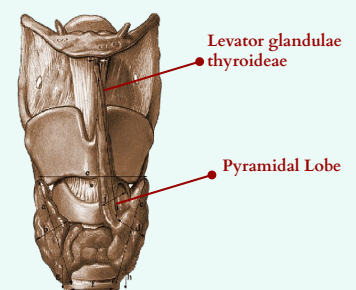


- The thyroid is connected to the developing tongue by a narrow tube, called the **thyroglossal duct**.
- At first the thyroid primordium is **hollow**, but soon it becomes solid & divided into **2 lobes and an isthmus**.
- By **7th gestational week (50th day)** the gland takes its **final shape & position** (anterior to trachea), and the thyroglossal duct begins to fibrose and degenerates.

3

4

- The upper end of duct **persists in the dorsum** of the tongue as the **foramen cecum**.
- The distal part of the duct may persists in **50% of people** to form the **pyramidal lobe**.
- The pyramidal lobe may be attached to the hyoid bone by fibrous or smooth muscle; the **Levator glandulae thyroideae**.



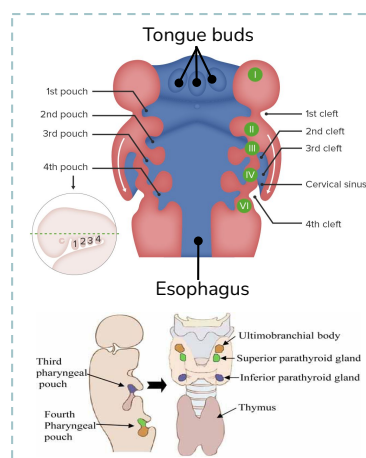
Development of the Parathyroid Glands

Pharyngeal pouches

These are pairs of pouches develop in a **craniocaudal** (من فوق) (تحت) sequence between the arches **internally**.

The first pair of pouches lies between the **first and second pharyngeal arches**.

There are four pairs of pharyngeal pouches, the fifth pair of pouches is **absent** or **rudimentary** (يختفي مع الوقت).



Each of the 3rd & 4th pharyngeal pouch develops into **dorsal and ventral parts**.

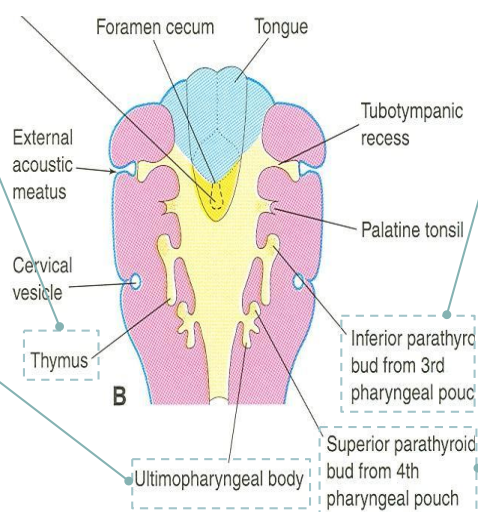
By the **sixth Week**

Ventral Part of 3rd Pouch

gives the **thymus** gland primordium

Ventral Part of 4th Pouch

Ultimopharyngeal body (it gives rise to **parafollicular cells** of thyroid that secrete calcitonin hormone that lowers the blood calcium level).



Dorsal Part of 3rd Pouch

develops into **inferior parathyroid bud**

Dorsal Part of 4th Pouch

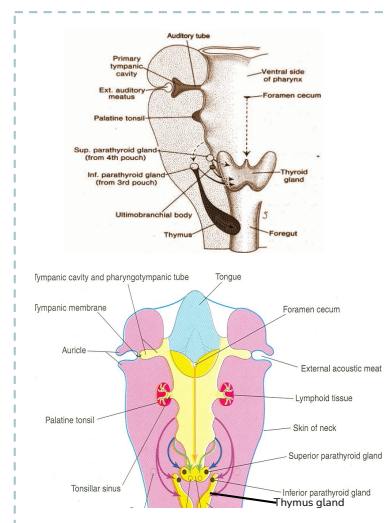
develops into **superior parathyroid bud**

Descent of thymus

As the **thymus primordium** develops, it **descends** downward to the thorax, behind the sternum in superior mediastinum, It draws the **inferior parathyroid bud** to a lower level than the superior parathyroid.

Both parathyroid glands lie **behind the thyroid gland**.

Basically, the inferior parathyroid bud gets pulled down with the thymus primordium, **عشان كذا تنزل تحت**



Congenital Anomalies

1 Congenital Hypothyroidism

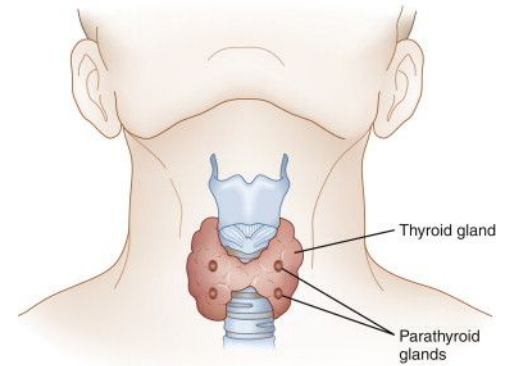
2 Persistence of Thyroglossal Duct

3 Cervical Thyroglossal Duct Cyst

4 Ectopic Thyroid Gland

5 Accessory Thyroid Tissue

6 Agenesis of the Thyroid Gland

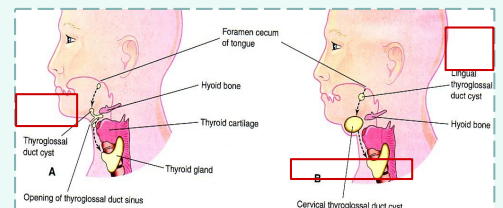


3. Cervical Thyroglossal Duct Cyst

(Locations of Cysts)

A, showing the possible locations of thyroglossal duct cysts through the broken line (الخط المنقطع) indicating the course of the duct. A thyroglossal duct sinus is illustrated.

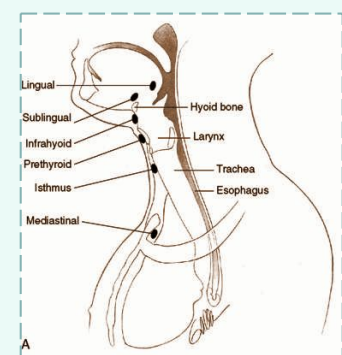
B, illustrating lingual & cervical thyroglossal duct cysts. Most of thyroglossal duct cysts are the located just **anterior to hyoid bone**.



Normally, thyroglossal duct undergo fibrosis and degenerated after the thyroid gland takes its final position. In case of the thyroglossal cyst, the duct does not completely close, forming a cyst. When the cyst get infected, it may rupture and open to the external environment forming a sinus.

4. Ectopic Thyroid Gland

- The thyroid glands develops high up close to **foramen cecum** of the developing tongue.
- Then it **descends** along the **thyroglossal duct** to reach its final position by the **7th week**.
- **Ectopic**: Descent of the thyroid could be arrested (نتوقف) at any point, or extends down behind the sternum in the thorax.



Clinical Notes

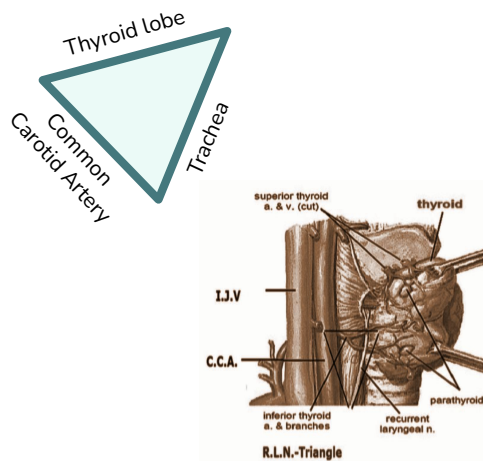
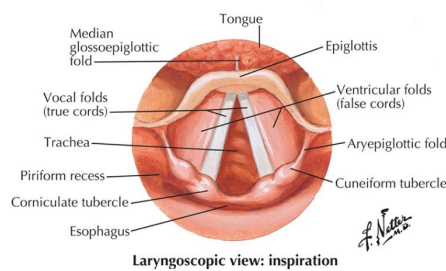
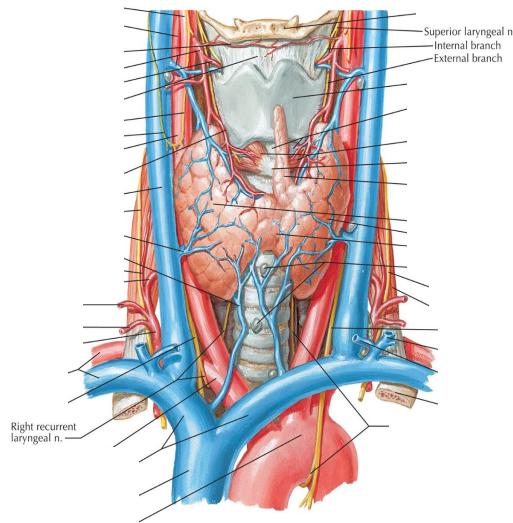
Recurrent Laryngeal Nerve Injury

- The **inferior thyroid artery** is closely associated with the **recurrent laryngeal nerve**.

This nerve can be found, in a triangle bounded laterally by the **common carotid artery**, medially by the **trachea**, and superiorly by the **thyroid lobe**.

- NB. Recurrent laryngeal nerve lesion may result in **impaired breathing & speech**. (An injury to the recurrent laryngeal nerve is much more severe than external laryngeal nerve)

- The relationship of the recurrent laryngeal nerve and the inferior thyroid artery is highly variable in that the nerve can lie deep or superficial to the artery, and be different on either side of the neck. So, **Consideration of this nerve and its branches must be given during thyroidectomy**.



External Laryngeal Nerve Injury

- The **External laryngeal nerve** runs close to the **superior thyroid artery** before turning medially to supply the **cricothyroid muscle**.

- **High ligation of the superior thyroid artery during thyroidectomy places this nerve at risk of injury**, so it should be ligated within the upper pole of the gland. Its lesion **will cause hoarseness of voice**.

Extra

To Summarize This Slide

Artery: Superior Thyroid A.

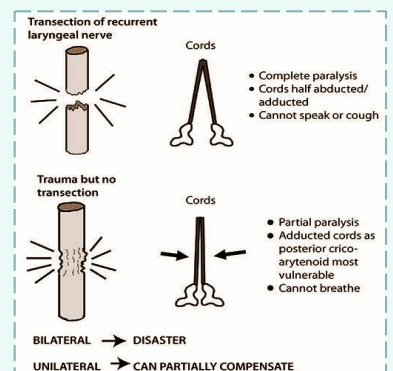
Nerve: External Laryngeal N.

Injury: Hoarseness of voice

Artery: Inferior Thyroid A.

Nerve: Recurrent Laryngeal N.

Injury: Impaired breathing and Speech



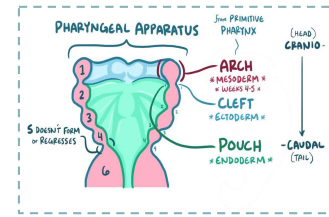
Summary of Anatomy

	Thyroid gland	Parathyroid gland		
Note	<ul style="list-style-type: none"> - 2 lobes are connected to each other by a narrow isthmus, which overlies the 2nd ,3rd & 4th tracheal rings. - Apex reaches up to the oblique line of thyroid cartilage. - Its base lies at the level of 4th or 5th tracheal rings. 	<ul style="list-style-type: none"> - 4 small ovoid bodies lie within the facial capsule of the gland between the 2 membranes 		
Covering	<ul style="list-style-type: none"> - Inside the pretracheal of the deep cervical fascia. - Another fibrous C.T capsule . - It's surrounded by 2 membranes. 	They lie within the thyroid tissue Covering or sometimes outside the facial capsule .		
Relation	Antero-laterally	<ol style="list-style-type: none"> 1. Sternothyroid. 2. Sternohyoid. 3. Sternomastoid. 4. Superior belly of omohyoid. 		
	posteriorly	Carotid sheath & its contents. (IJV, vagus N, internal & common carotid A)		
	Medially	Above		<ol style="list-style-type: none"> 1. Larynx Above 2. Pharynx 3. Cricothyroid muscle 4. External laryngeal nerve
		Below		<ol style="list-style-type: none"> 1. Trachea 2. Esophagus Below 3. Recurrent laryngeal nerve in between
Posterior border	<ol style="list-style-type: none"> 1. The superior & inferior Parathyroid glands. 2. Anastomosis between superior & inferior thyroid arteries. 			
Arterial	<ul style="list-style-type: none"> - Superior thyroid Artery from the external carotid It descends to the upper pole of the lobe, with the external laryngeal nerve. - Thyroidea ima Artery from aortic arch or from brachiocephalic artery. - Inferior thyroid Artery From the thyrocervical trunk of 1st part of subclavian artery. It ascends behind the gland to the level of cricoid cartilage (at level of C6 vertebra). 	<ul style="list-style-type: none"> - Superior thyroid arteries. - Inferior thyroid arteries 		
Venous	<ul style="list-style-type: none"> - Superior thyroid vein→ Internal jugular vein. - Middle thyroid vein→ Internal jugular vein. - Inferior thyroid vein→ Left brachiocephalic vein. 			
Lymph	<ul style="list-style-type: none"> - Deep cervical lymph nodes. - Paratracheal lymph nodes. 			
Innervation	<ul style="list-style-type: none"> - Sympathetic : Cervical sympathetic trunk. - Parasympathetic Branches of vagus. 	- Sympathetic trunk : Superior & Middle cervical sympathetic ganglia (vasomotor).		
Clinical notes	<p>During thyroidectomy</p> <ul style="list-style-type: none"> - External laryngeal N close to → superior thyroid A → lesion will cause hoarseness of voice notes. - Recurrent laryngeal N close to → inferior thyroid A → lesion results in impaired breathing & speech. 			

Summary of Embryology

Pharyngeal apparatus:

- 6 cubicle pharyngeal or branchial arches.
- The core (mesoderm), Inner (endoderm), Outer (ectoderm).
- The space between 2 arches from outside is called cleft or groove & from inside is called pouch.



Development of thyroid gland

24th day after fertilization

The thyroid gland begins its development (Thyroid primordium).

By 7th week (50 days)

The gland takes its final shape & position, and the (50th day) thyroglossal duct begins to fibrose and degenerate.

Development of parathyroid gland

By the 6th week:

dorsal part of the 3rd pouch

inferior parathyroid bud

dorsal part of the 4th pouch

Superior parathyroid bud

ventral part of the 3rd pouch

thymus gland primordium

ventral part of the 4th pouch

Ultimopharyngeal body

Congenital Anomalies of Thyroid gland

Cervical thyroglossal duct cyst

Most of thyroglossal duct cysts are located just anterior or inferior to the hyoid bone.

Ectopic thyroid tissue

Ectopic : Descent of the thyroid could be arrested at any point, or extends down behind the sternum in the thorax.

Accessory thyroid tissue

Agenesis of thyroid gland

Persistence of thyroglossal duct

Congenital hypothyroidism

Thyroglossal duct

- The upper end of duct persists in the dorsum of the tongue as the foramen cecum.
- The distal part of the duct may persists in 50% of people to form the **pyramidal lobe**.
- It may be attached to the hyoid bone by fibrous or smooth muscle; the **Levator glandulae thyroideae**.

MCQs

Q1- A patient visits primary care physician with a complaint of a lump in his neck. During the examination, the physician palpates a smooth, midline structure connecting the two lobes of the thyroid gland, what is the structure?

A- Carotid sheath

B- Isthmus

C- Esophagus

D- Hyoid bone

Q2- A 55-year-old man undergoes a surgical procedure in which the surgeon accidentally damages a structure located medial to the thyroid gland. As a result, the patient experiences impaired breathing and aphonia. Which structure is most likely damaged?

A- Recurrent laryngeal N.

B- Vagus N.

C- External laryngeal N.

D- Thyroid ima A.

Q3- During thyroidectomy, if the doctor ligates the superior thyroid artery, which nerve could be damaged?

A- External laryngeal

B- Internal laryngeal

C- Recurrent laryngeal

D- Vagus

Q4- by the end of which week will the thyroid gland reach its final shape and position?

A- 6th week

B- 3d week

C- 7th week

D- 5th week

Q5- Inferior parathyroid gland develops from?

A- 2nd pharyngeal arch

B- 3rd pharyngeal pouch

C- 4th pharyngeal pouch

D- 1st pharyngeal arch

Q6- A surgeon is performing a thyroidectomy on a patient. As the surgeon dissects the area, they encounter a muscle that is located directly next to the thyroid gland on its medial side. Which one of the following muscles is most likely to be encountered in this position?

A- Cricothyroid

B- Sternomastoid

C- Sternohyoid

D- Sternothyroid

Q7- which one of the following is an embryological remnant of foramen cecum of the tongue?

A- 3d pharyngeal pouch

B- 2d pharyngeal pouch

C- Thyroglossal duct

D- 1st pharyngeal cleft

Answers: 1-B 2-A 3-A 4-C 5-B 6-A 7-C

[For Anki flashcards click here](#)



Team leaders

✦ **Renad M Alshehri**

✦ **Faris Alzahrani**

✦ **Aseel Alshehri**

Team Members

✦✦ **Remaz Almahmoud**

✦ **Moath Alhudaif**

✦✦ **Aljoharah Alkhalifah**

✦✦ **Mohammed Alarfaj**

✦ **Noura Alateeq**

✦ **Faisal Alshowier**

✦ **Bayan Abdullah**

✦ **Khalid Alsobei**

✦ **Wajd Almutairi**

✦ **Amira Abdulaziz**