



MED437  
KING SAUD UNIVERSITY



# Thyroid and Parathyroid Glands

Lecture (2)

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هذا العمل مبني بشكل أساسي على عمل دفعة ٤٣٦ مع المراجعة والتدقيق وإضافة الملاحظات ولا يعني عن المصدر الأساسي للمذاكرة

- **Important**
- **Doctors Notes**
- Notes/Extra explanation

{وَمَنْ يَتَوَكَّلْ عَلَى اللَّهِ فَهُوَ حَسْبُهُ}

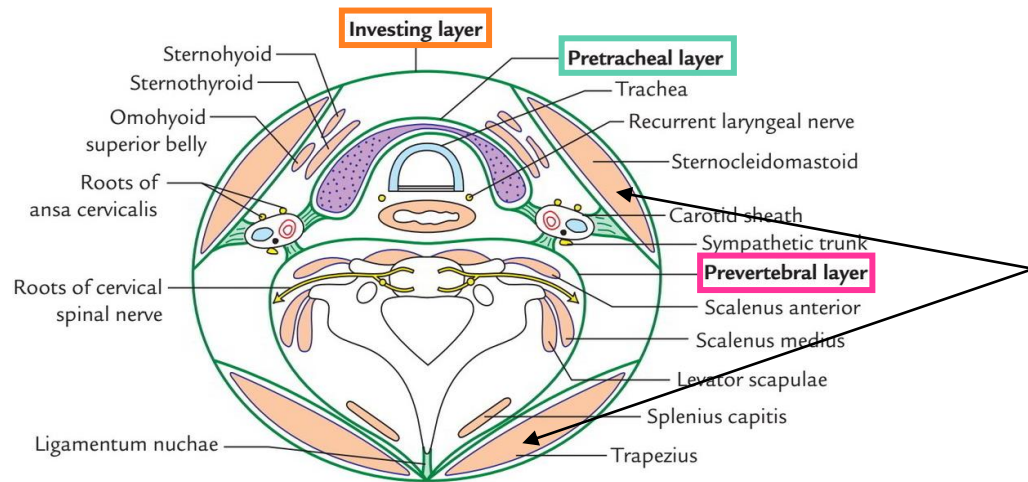
# ■ Objectives

**At the end of the lecture, students should be able to:**

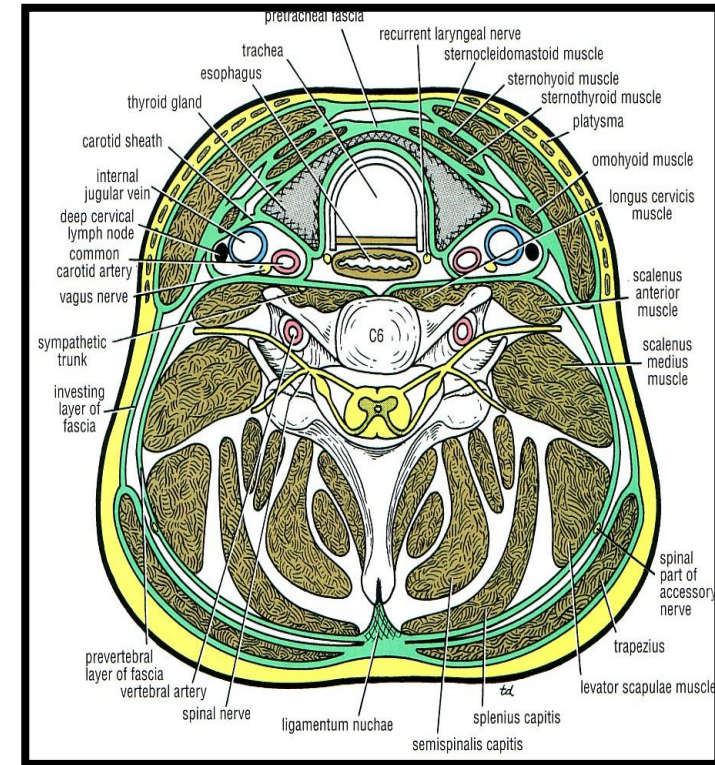
- ✓ Describe the shape, position, relations and of the **thyroid gland**.
- ✓ List the blood supply & lymphatic drainage of the **thyroid gland**.
- ✓ List the nerves endanger with thyroidectomy operation.
- ✓ Describe the shape, position, blood supply & lymphatic drainage of the **parathyroid glands**.

# Parts of the deep cervical fascia of the neck

- It is divided mainly into 3 layers (or more) important during surgeries:
  - Investing layer (covers neck completely)
  - Pretracheal layer (covers thyroid gland and trachea)
  - Prevertebral layer (surrounds vertebra & prevretbral muscles).
- The carotid sheath is part of the deep cervical fascia of the neck

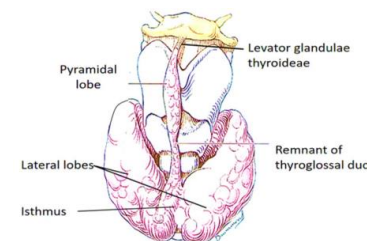
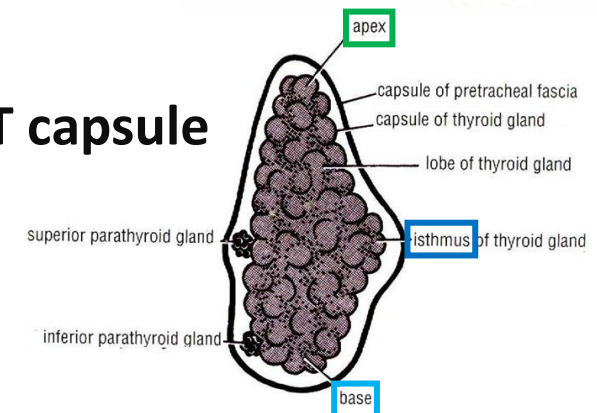
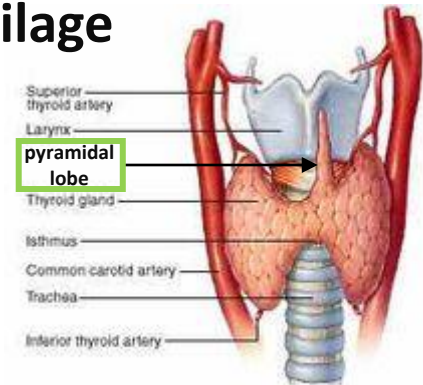
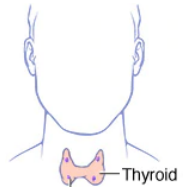


**Note:**  
At the 4 the corners of the neck, the investing layer separates to form two layers (anterior and posterior layers) to cover the sternocleidomastoid muscle in the anterolateral corner and trapezius muscle in the posterolateral corner



# Thyroid Gland "الغدة الدرقية"

- **Endocrine, butterfly** shaped gland, Consists of right & left lobes connected to each other by a **narrow isthmus**, which overlies the **2nd ,3rd & 4th tracheal rings**.
- **The gland is surrounded by a facial sheath derived from the pretracheal layer of the deep cervical fascia, what is the clinical importance?\***
- Each lobe is **pear- shaped**, its **apex** reaches up to the **oblique line of thyroid cartilage**
- Its **base** lies at the level of **4th or 5th tracheal rings** (remember trachea has 16-20 rings)
- A **3rd small pyramidal lobe** is often present which **projects** from the **upper border of the isthmus usually to left of middle line**, its connected to **hyoid bone** by a fibrous or muscular band called **levator glandulae thyroideae**
- This lobe represents **in 50% of people** the fibrosed & obliterated thyroglossal duct It is surrounded by a **facial sheath** derived from the **pretracheal layer of the deep cervical fascia**, inside it there is another **C.T capsule**
- So, it s surrounded by **2 membranes**



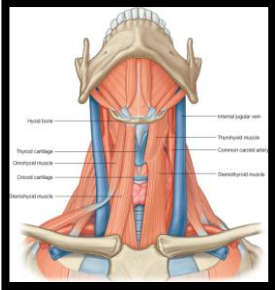
\*تقدر تعرف اذا التيومر داخل الغدة الدرقية او خارجها، تقول للمريض يبلع ريقه لو التيومر يطلع وينزل اثناء البلع معناها انه داخل الغدة ( لان اللابنركس يطلع وينزل اثناء البلع)

# Thyroid Gland Relations

Omohyoid > the prefix “omo” means shoulder  
 \*There are:  
 Superior belly of omohyoid > from hyoid bone  
 Inferior belly of omohyoid > from scapula  
 Connected to each other by a common tendon



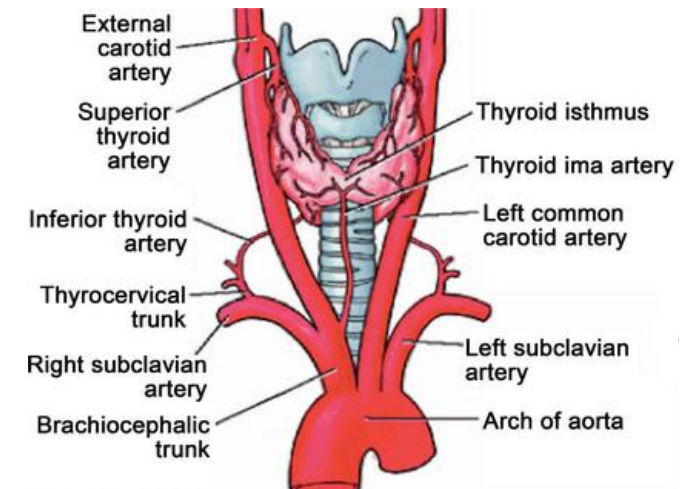
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Anterolaterally	Posteriorly	Medially	
<p>4s</p> <ol style="list-style-type: none"> <li>1. Sternothyroid</li> <li>2. Sternohyoid</li> <li>3. Superior belly of omohyoid*</li> <li>4. Sternomastoid (most superficial)</li> </ol> 	<p>Carotid sheath &amp; its contents (common carotid artery, Internal carotid artery, internal jugular vein and vagus nerve)</p>	Above	Below
		<ol style="list-style-type: none"> <li>1. Larynx</li> <li>2. Pharynx</li> </ol>	<ol style="list-style-type: none"> <li>1. Trachea</li> <li>2. Esophagus</li> <li>3. Recurrent laryngeal nerve in between trachea and esophagus</li> <li>4. Cricothyroid muscle</li> <li>5. External laryngeal nerve</li> </ol>
<p><b>Rounded posterior border</b></p>			
<ol style="list-style-type: none"> <li>1. Superior parathyroid glands</li> <li>2. Anastomosis between superior thyroid arteries</li> <li>3. Inferior parathyroid glands</li> <li>4. Anastomosis between inferior thyroid arteries</li> </ol>			

Sternothyroid, sternohyoid, superior belly of omohyoid and thyrohyoid are called “strap muscles” or “infrahyoid muscles” which keep the neck structures in position.

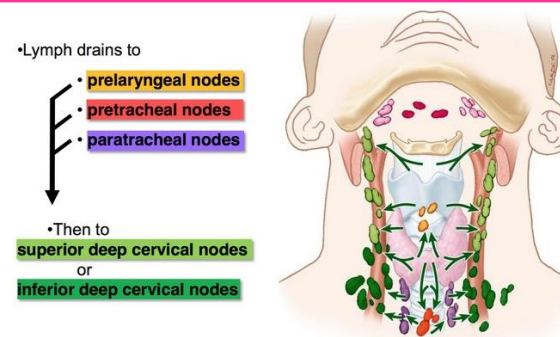
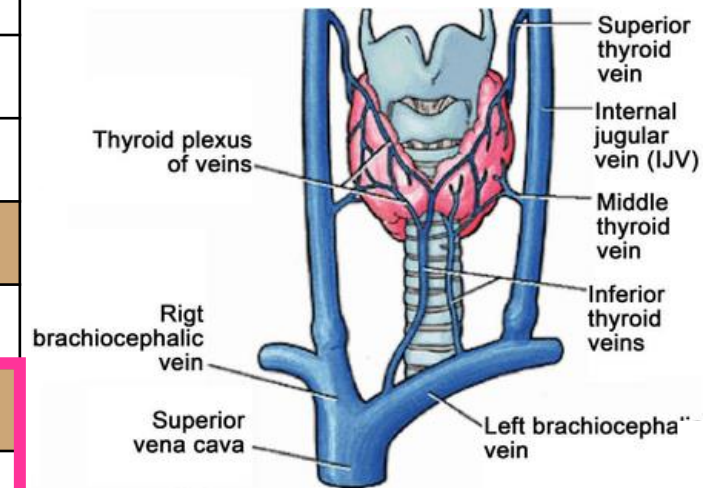
# Thyroid Gland Supply

Arterial supply	
<b>Superior thyroid artery</b>	<p>It is <b>the 1st branch</b> of the <b>external carotid artery</b></p> <p>It descends to the upper pole of the lobe, with the <b>external laryngeal nerve</b></p> <p>It runs along the upper border of the isthmus to anastomosis with its fellow</p>
<b>Thyroidea ima artery</b>	<p>If present, it arises from <b>aortic arch</b> or from <b>brachiocephalic artery</b>, It ascends in front of the trachea to reach the isthmus.</p> <p><b>This artery might get damaged during tracheostomy tube insertion.</b></p>
<b>Inferior thyroid artery</b>	<p>From the <b>thyrocervical trunk</b> of <b>1st part of subclavian artery</b>,</p> <p>It ascends behind the gland to the level of cricoid cartilage (C6)</p> <p>Then it curves medially behind the carotid sheath</p> <p>Then it reaches the posterior aspect of the gland &amp; descends downwards</p> <p><b>The recurrent laryngeal nerve crosses either in front or behind it</b></p>



# Thyroid Gland Supply

Veins drainage	
Superior thyroid vein	Drains into → Internal jugular vein
Middle thyroid vein	Drains into → Internal jugular vein
Inferior thyroid vein	Drains into → Left brachiocephalic vein
Lymph drainage	
<u>Deep cervical &amp; paratracheal lymph nodes</u>	
Innervation(autonomic)	
Sympathetic	Cervical Sympathetic Trunk
Parasympathetic	Branches of vagus nerve



# Larynx

## Supply

Only in boys slides

<b>Motor</b>	<ul style="list-style-type: none"><li>- All intrinsic muscles, are supplied by <b>the recurrent laryngeal nerve of vagus nerve</b> except cricothyroid.</li><li>- The <b>cricothyroid</b> is supplied by <b>external laryngeal</b> of superior laryngeal of vagus.</li></ul>
<b>Sensory</b>	<ul style="list-style-type: none"><li>- Above the vocal cords : Internal laryngeal nerve, of superior laryngeal of the vagus nerve.</li><li>- Below the vocal cords: <b>Recurrent laryngeal nerve</b>, of the vagus nerve.</li></ul>

<b>Upper half</b>	- Superior laryngeal artery, branch of superior thyroid artery
<b>Lower half</b>	- Inferior laryngeal artery, branch of inferior thyroid artery

- Accompany the corresponding arteries

- The lymph vessels drain into the deep cervical lymph nodes.



# Clinical importance

## Superior thyroid artery

- 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 thyroid gland.
- Its lesion will cause hoarseness of voice.

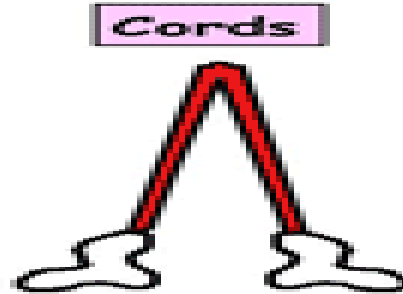
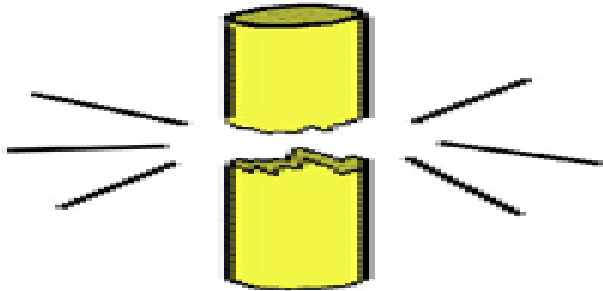
## Inferior thyroid artery

- **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 base of thyroid lobe.
- 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, or **between** the branches of the artery, and be different on either side of the neck.
- So high consideration of this nerve and its branches must be given during thyroidectomy as its lesion may result in impaired breathing & speech.

# Semon's law (damage of the laryngeal nerves)

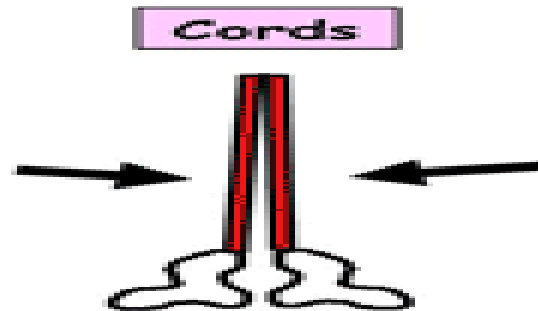
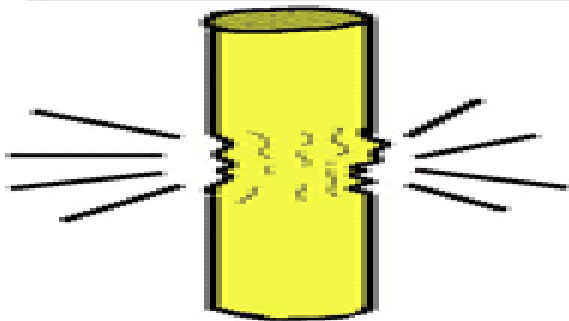
- Semon's Law indicates the different effect between **minor damage** (surgical trauma) & **complete transection** of the recurrent laryngeal nerve due to surgery in region of the neck (e.g. thyroidectomy or parathyroidectomy)

Transection of recurrent laryngeal nerve



- Complete paralysis
- Cords half abducted/adducted
- Cannot speak or cough
- **But can breath.**

Trauma but no transection

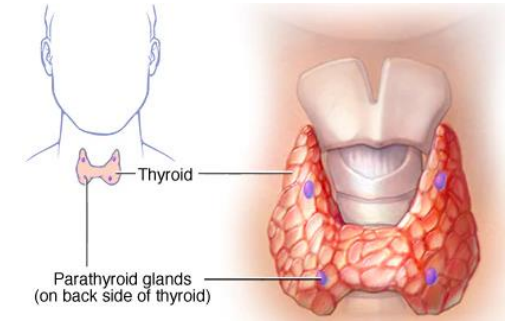


- Partial paralysis
- Adducted cords as posterior crico-arytenoid most vulnerable
- **Cannot breathe**

BILATERAL → DISASTER

UNILATERAL → CAN PARTIALLY COMPENSATE

# Parathyroid Gland "الغدة الجار درقية"



- **4 small ovoid bodies**, about **6 mm long**
- They lie within the **facial capsule** of the **gland**, **(between the 2 membranes)** *(to be more specific, the are between the pretracheal fascia and the fibrous capsule)*
- **2 superior parathyroid** has a **constant position** at the **middle of the posterior border** of the thyroid gland.
- **2 inferior parathyroid** usually at the **level of the inferior pole**.
- They lie **within the thyroid tissue** or **sometimes outside the facial capsule**.

SUPPLY	
<b>Arterial</b>	Superior thyroid arteries   Inferior thyroid arteries.
<b>Veins drainage</b>	Superior thyroid veins   Middle thyroid veins   Inferior thyroid veins
<b>Lymph drainage</b>	Deep cervical lymph nodes   Paratracheal lymph nodes
<b>Nerve supply</b> <b>Sympathetic</b> <b>Trunk</b>	Superior cervical sympathetic ganglia (vasomotor) Middle cervical sympathetic ganglia (vasomotor)

Same as thyroid gland

# You can skip this slide:

- The 1<sup>st</sup> groove gives the external acoustic meatus
- The 1<sup>st</sup> pouch gives the auditory tube

Together they give the air drum

- The 2<sup>nd</sup> pouch gives the palatine tonsil
- The 2<sup>nd</sup> arch gives the smooth contour of the neck( an anomaly here can cause cyst or sinus)
- The 3<sup>rd</sup> pouch and the 4<sup>th</sup> pouch are explained later.
- The mesoderm of each arch will have a nerve and an artery and also will give derivatives ( bone, muscle, cartilage)
- The 1<sup>st</sup> arch gives the 4 muscles of mastication, that's why the nerve supply for all of them is mandibular nerve.
- The 2<sup>nd</sup> arch gives the muscles of the face ( nerve supply is facial nerve)
- The 3<sup>rd</sup> arch gives stylopharyngeus (glossopharyngeal nerve)
- The 4<sup>th</sup> arch gives cricothyroid (external laryngeal)
- The 6<sup>th</sup> arch gives all the muscles of larynx except cricothyroid

# SUMMARY

	Thyroid Gland				Parathyroid Gland
Notes	<ul style="list-style-type: none"> <li>Consists of 2 lobes, and each lobe has an apex and base (level of 4<sup>th</sup> or 5<sup>th</sup> tracheal rings)</li> <li>The 2 lobes are connected by a narrow isthmus which extends in front of 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> tracheal rings.</li> <li>The gland is surrounded by a CT capsule and a pretracheal layer of deep cervical fascia.</li> </ul>				4 ovoid bodies lie within facial capsule between the 2 membranes
Relations	Anterolaterally	Posteriorly	Medially		
			Above	Below	
	<ol style="list-style-type: none"> <li>Sternohyoid</li> <li>Sternothyroid</li> <li>Superior belly of omohyoid</li> <li>Sternomastoid</li> </ol>	Carotid sheath & its contents	<ol style="list-style-type: none"> <li>Larynx</li> <li>pharynx</li> </ol>	<ol style="list-style-type: none"> <li>Trachea</li> <li>Esophagus.</li> <li>Recurrent laryngeal nerve.</li> <li>Cricothyroid muscle.</li> <li>External laryngeal nerve.</li> </ol>	
Arterial	Superior, and inferior <b>thyroid</b> artery, and thyroidea ima artery				Superior and inferior <b>thyroid</b> artery
Venous	Superior, middle and inferior <b>thyroid</b> veins				
Lymphatic	Deep cervical and <b>paratracheal</b> lymph nodes				
Innervation	Sympathetic: <b>cervical</b> sympathetic trunk Parasympathetic: branches of <b>vagus</b>				Superior & middle <b>cervical</b> sympathetic ganglia

# MCQs

**1- Which of the following arteries is crossed by the recurrent laryngeal?**

- A- superior thyroid
- B- inferior thyroid
- C- thyroidea ima artery
- D- none of the above

**2- Which one of the following is related to the thyroid gland medially but from above?**

- A- larynx
- B- trachea
- C- esophagus
- D- sternohyoid

**3- A surgeon is performing a thyroidectomy on a patient with graves disease and He accidentally ruptured the superior thyroid artery. which of the following nerves is the most susceptible to injury?**

- A- recurrent laryngeal
- B- external laryngeal
- C- phrenic nerve
- D- none are susceptible

**4- Which of the following is branch of the thyrocervical artery?**

- A- external carotid
- B- thyroidea ima artery
- C- superior thyroid
- D- inferior thyroid

**5- Which of the following structures lies anterior to the thyroid lobe?**

- A- inferior belly of omohyoid.
- B- internal jugular vein.
- C- Vagus nerve.
- D- Sternohyoid.



Good luck  
Special thank for team436 ❤️

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- References:
  1. Girls' & Boys' Slides
  2. Earthslab.com
  3. TeachMeAnatomy.com

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