



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



ANATOMY

MID | Lecture 4

# Blood and Nervous supply of the larynx

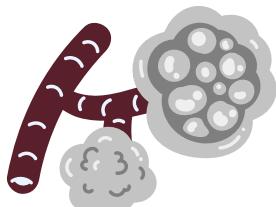
Written by: Deema Nasrallah



Reviewed by: Sara Masadeh

﴿وَلَقَدْ نَعْلَمُ أَنَّكَ يَضْيقُ صَدْرُكَ بِمَا يَقُولُونَ ﴾١٧ فَسَبِّحْ بِحَمْدِ رَبِّكَ وَكُنْ مِّنَ السَّاجِدِينَ ﴾

سبحان الله وبحمده، سبحان الله العظيم



وَلِلَّهِ الْأَسْمَاءُ الْحُسْنَى فَادْعُوهُ بِهَا

المعنى: القوي الغالب الجليل رفيع الشأن، قهر جميع المخلوقات، ودانت له وخضعت لقوته.

الورود: ورد في القرآن (٩٢) مرة.

الشاهد: «وَأَعْلَمُ أَنَّ اللَّهَ عَزِيزٌ حَكِيمٌ» [البقرة: ٢٦٠].



اضغط هنا لشرح أكثر تفصيلاً

**Before we begin:** the first 26 minutes of this lecture overlap by approximately 99% with the previous lecture. For the sake of comprehension and completeness, the remaining **1% of new information** was addressed in **the first five quiz questions**. Therefore, be sure to complete the quiz after finishing the lecture. **Good luck our future doctors!**

حفظكم الله ورعاكم

~Editor's Note

# 1-Functions of the Larynx

1) **Opens during respiration.**

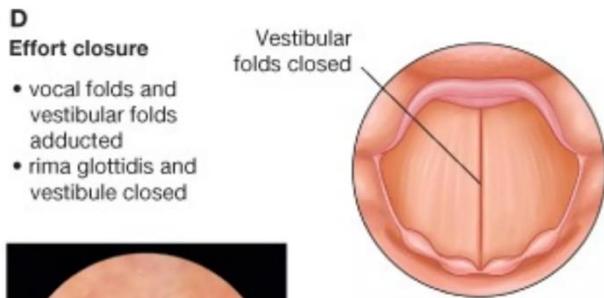
2) **Vibration of the true vocal cord during phonation.**

3) **Closure during swallowing (deglutition).**

4) **Effort closure.**

- This refers to complete adduction of the true vocal cords to retain air in the thoracic cavity and stabilize the trunk.
- The same mechanism also occurs during forceful inspiration and expiration (Valsalva maneuver).
- For example, during heavy lifting, the true vocal cords adduct, compressing the column of air beneath them as part of the process that increases intra-abdominal pressure. When the effort ends (such as lowering the weights), the vocal cords abduct, the trapped air is released, and the escaping air causes the cords to vibrate.

Dr.'s figure:



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Junes 25 de octubre de 2010

# 2-Blood Supply of the Larynx-Arteries

## Arteries:

- Superior laryngeal artery
- Inferior laryngeal artery

### ➤ Superior laryngeal artery:

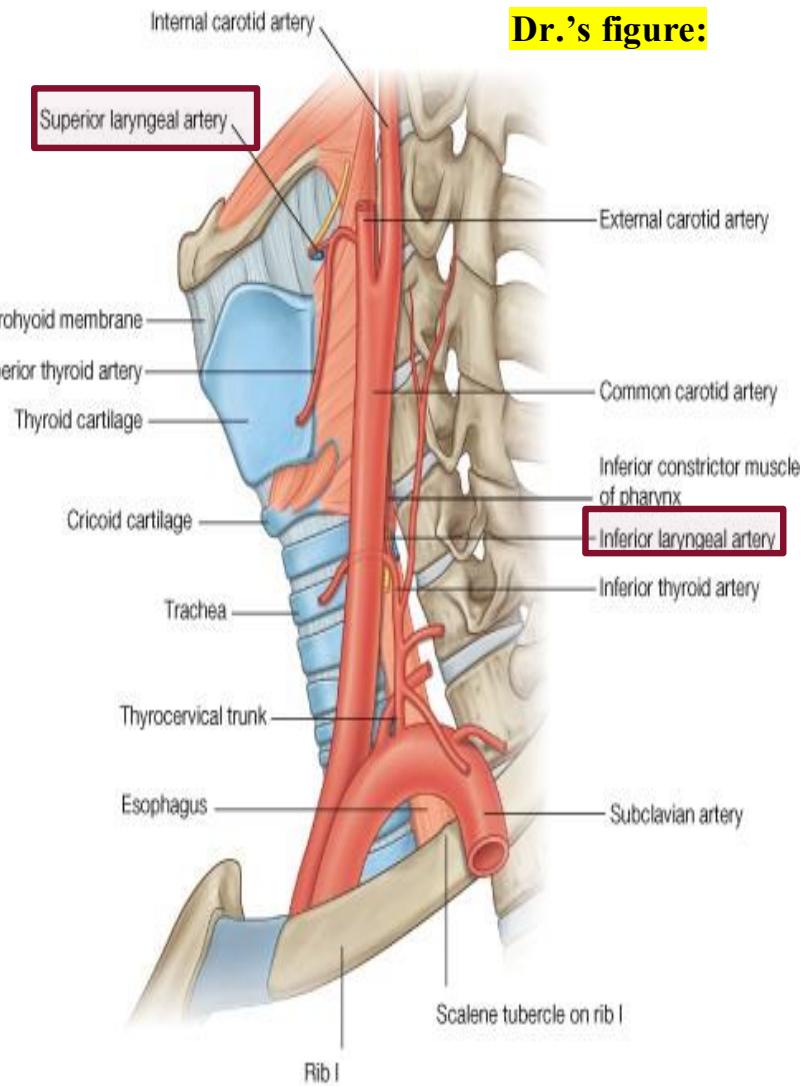
Originates from the **superior thyroid** artery branch of the **external carotid** artery.

**Superior laryngeal artery** accompanies the **internal laryngeal** nerve through the thyrohyoid membrane. However, the **superior thyroid artery** accompanies the **external laryngeal** nerve.

### ➤ Inferior laryngeal artery:

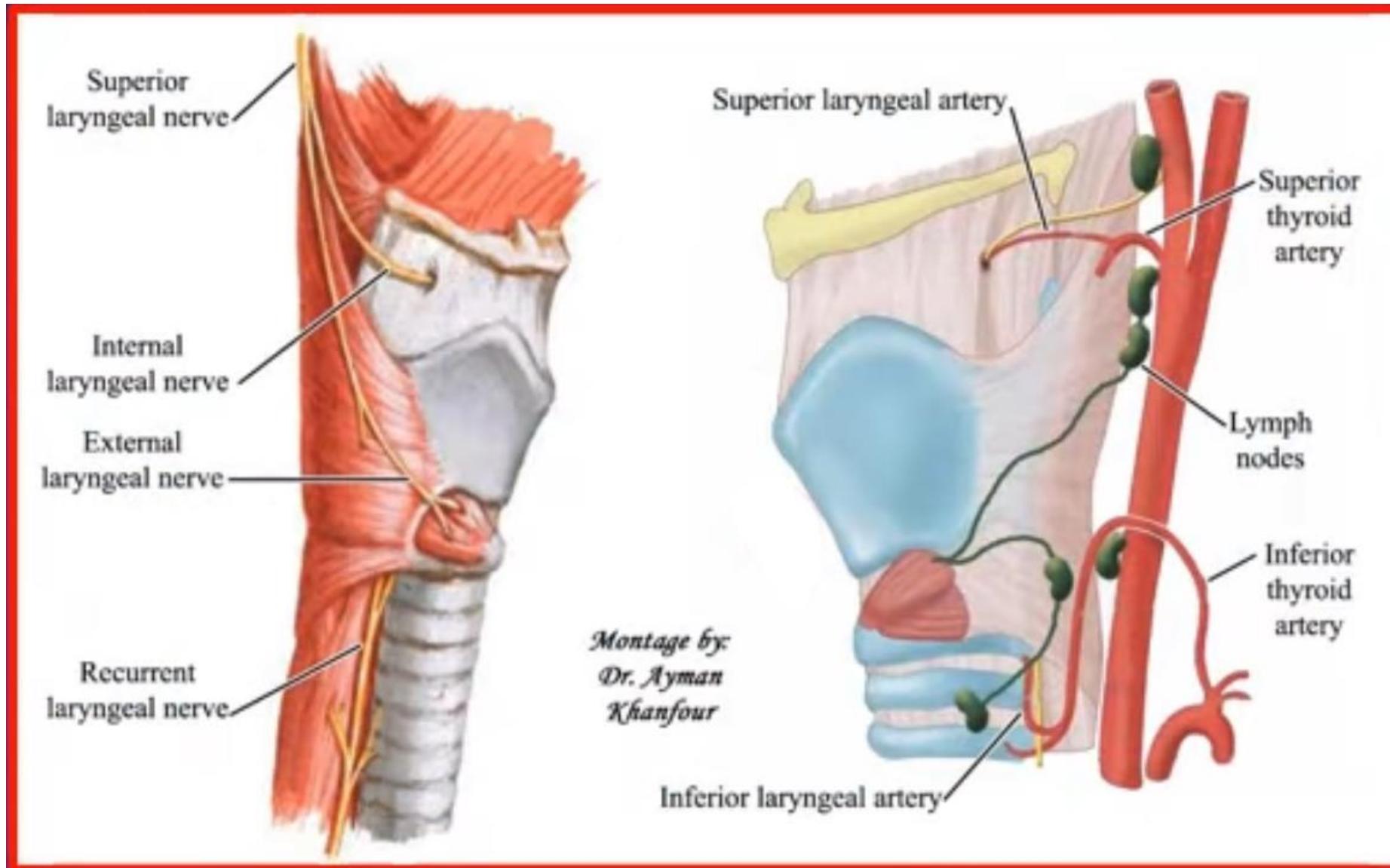
Originates from the **inferior thyroid** artery branch of the **thyrocervical trunk** of the **subclavian** artery.

**Inferior thyroid artery** **accompanies** the **recurrent laryngeal nerve**.



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# 2-Blood Supply of the Larynx-Arteries



# 3-Blood Supply of the Larynx-Veins

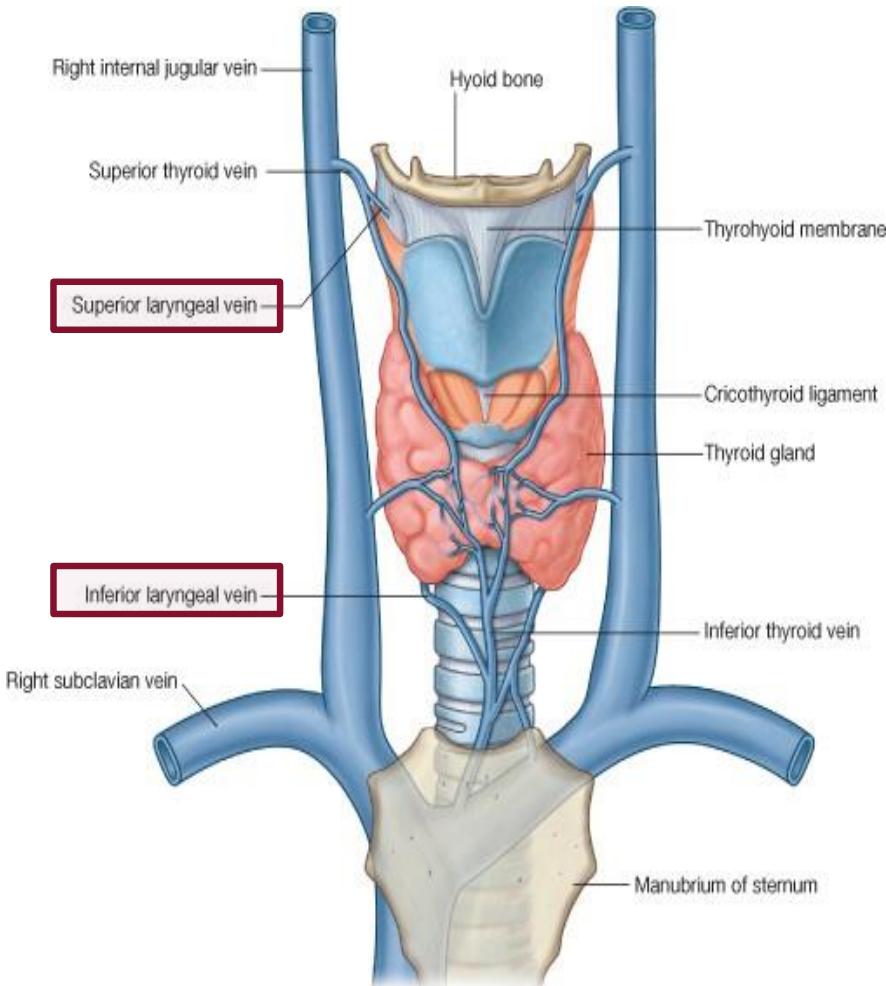
Dr.'s figure:

## Veins of the larynx: (opposite of arteries)

- Superior laryngeal vein.
- Inferior laryngeal vein.

➤ Both drain into the thyroid veins then:

- Superior thyroid vein-> internal jugular.
- Inferior thyroid vein-> left brachiocephalic vein.



## Lymphatics:

- Above true vocal cords: deep cervical lymph nodes.
- Below true vocal cords: paratracheal lymph nodes.
- Note that the true vocal cord has no lymphatic drainage.

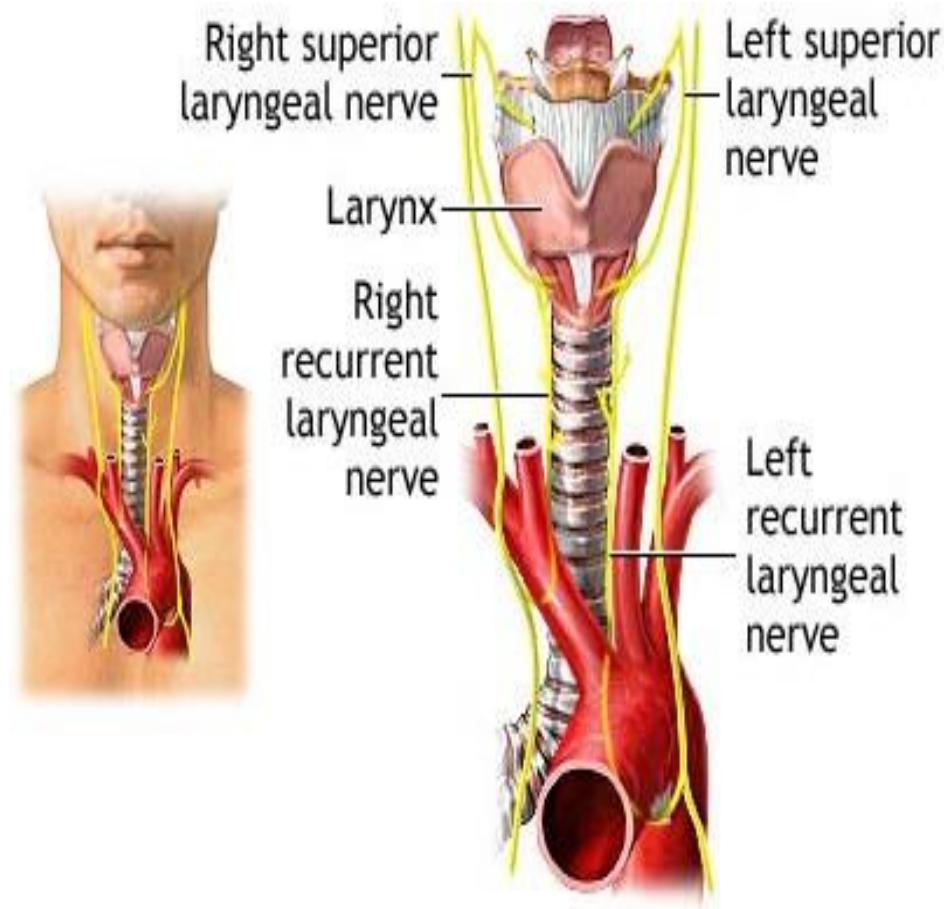
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# 4-Innervation of the Larynx

## Superior laryngeal nerve:

- Originates from the inferior vagal ganglia.
- Divides into **internal** and **external branches** above the hyoid bone.
- The **internal laryngeal nerve** penetrates the thyrohyoid membrane to provide **sensory** innervation to the mucosa **above** true vocal cords.
- The external branch (**external laryngeal nerve**) motor to the **cricothyroid muscle**.

Dr.'s figure:

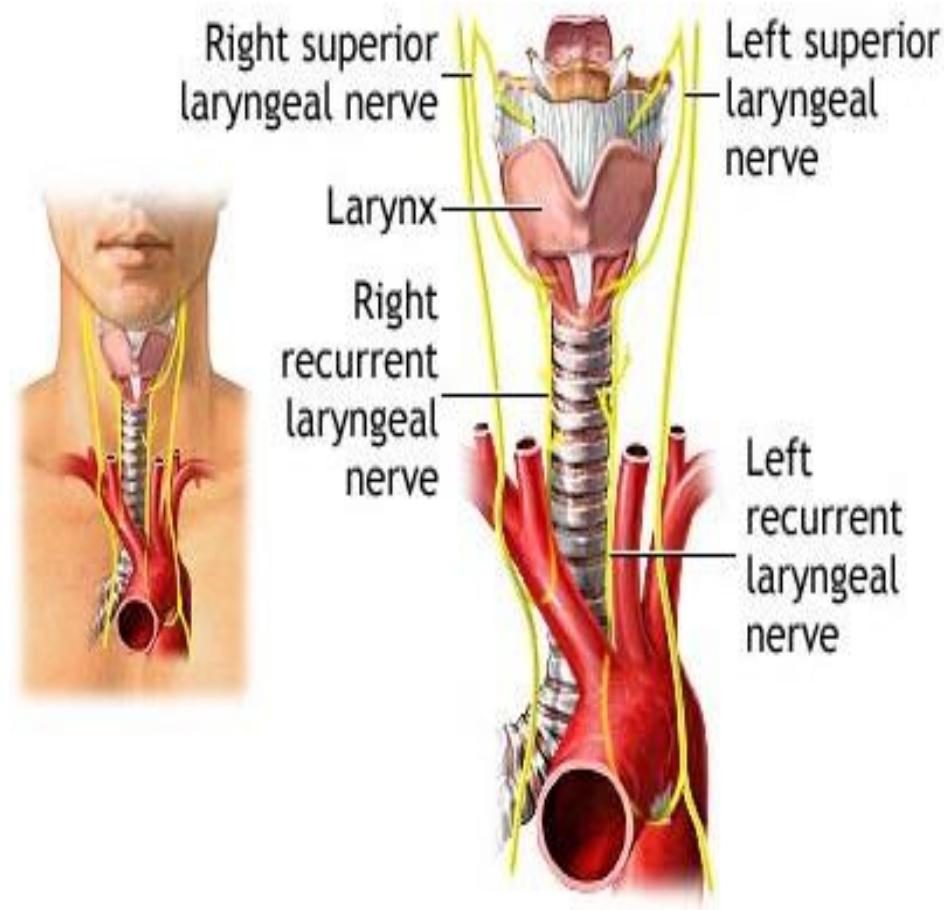


# 4-Innervation of the Larynx

## Recurrent laryngeal nerve:

- Sensory to the laryngeal cavity **below** true vocal cords.
- Motor to all intrinsic muscles of the larynx **except** for the **cricothyroid muscle**.
- Left recurrent is longer than the right recurrent; because the left vagus descends downwards and loops under the arch of the aorta (origin of left recurrent), however, the right vagus loops under the right subclavian at the root of the neck (origin of right recurrent) then both nerves ascends between trachea and esophagus.

Dr.'s figure:



# 5-Innervation of the Larynx

## Summary for the Innervation:

We divide the innervation into sensory and motor:

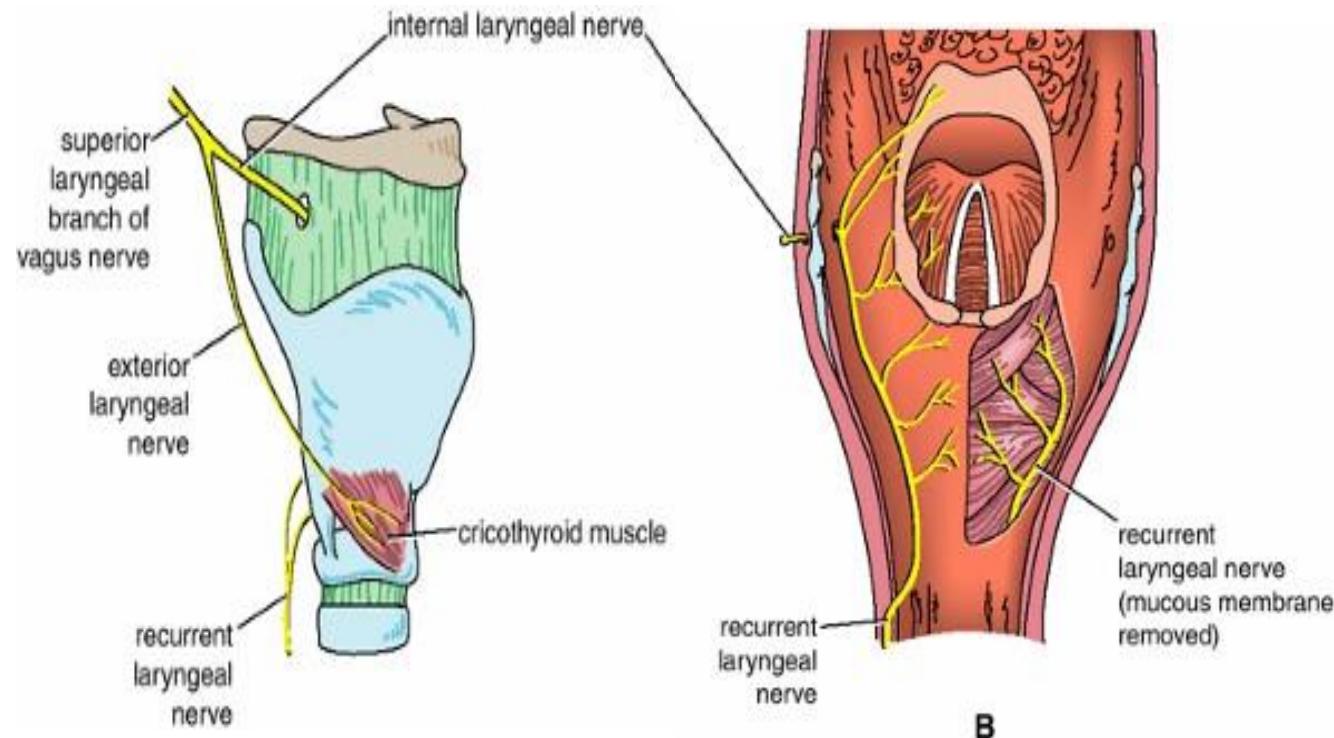
### Sensory:

- Above true vocal cords: internal laryngeal.
- Below true vocal cords: recurrent laryngeal.

### Motor:

All muscles innervated by recurrent laryngeal nerve **except** cricothyroid by external laryngeal nerve.

Dr.'s figure:



# 5-Relations of the larynx

- On each side :

Carotid sheath (contents: 1-nerve, 2-artery, 3-vein) and lateral lobe of the thyroid gland.

1-Vagus nerve

2-Common carotid artery (Branches into → internal & external carotid)

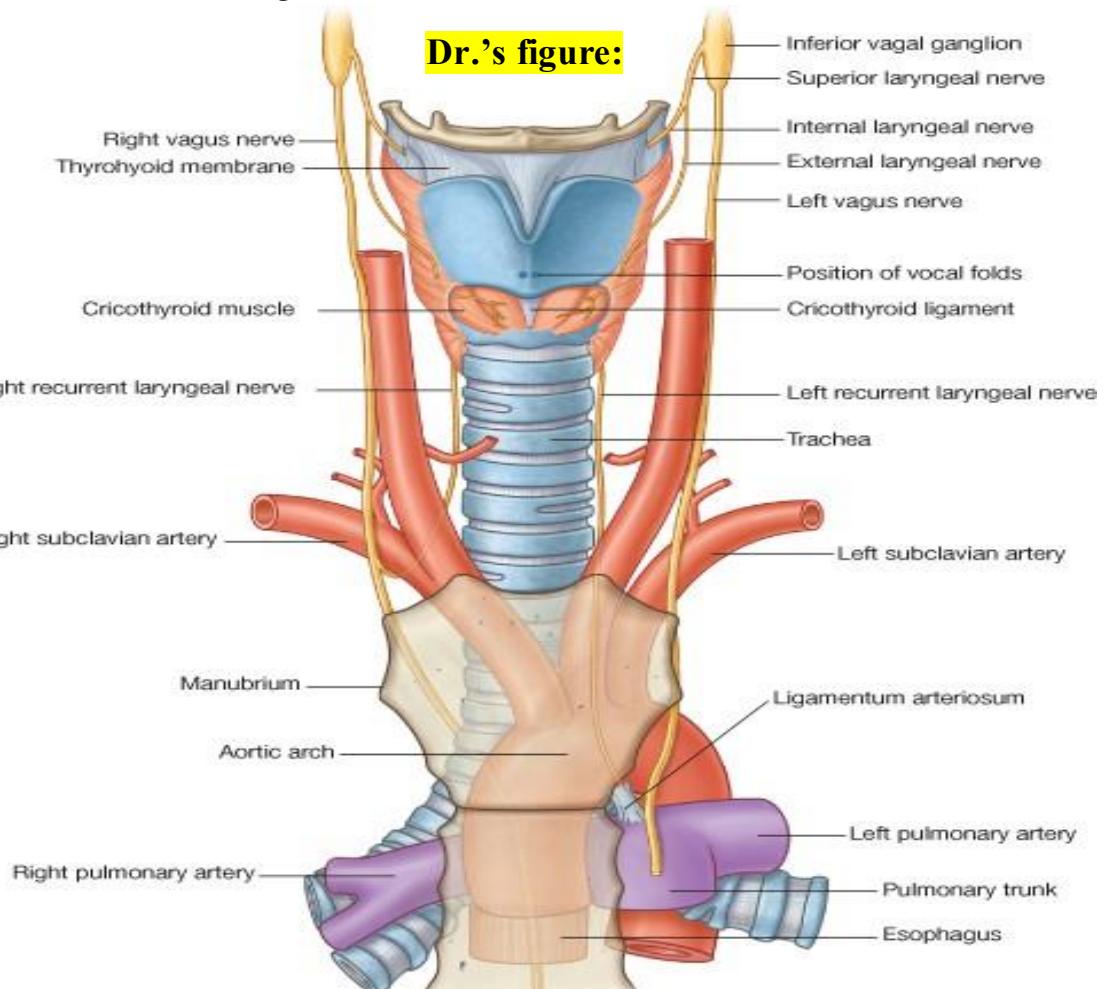
3-Internal jugular vein

• Posterior:

• Pharynx and the right recurrent laryngeal nerve

• Anterior:

• Skin, fascia and its contents, 4 infra-hyoid muscles



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# 6-Thyroidectomy~ Clinical Application

- During a thyroidectomy, particularly in cases involving a tumor, additional care is required when ligating the superior thyroid artery to avoid injuring the nearby external laryngeal nerve, as this nerve runs in close proximity to the artery.
- If the nerve is damaged on **both sides**, it typically results in significant hoarseness and vocal fatigue. Injury in **only one side** often leads to weakness of the voice, as the affected cricothyroid muscle (which tenses the vocal cords) is partially compromised.

# 7-Section of the Recurrent Laryngeal nerve

Remember the recurrent laryngeal nerve runs along the inferior thyroid artery. When an injury occurs, we are concerned with two things: **Respiration** (more important) and **Speech**.

We have four cases:

## 1. Unilateral complete section:

One vocal fold (on the affected side) in the position midway between abducted and adducted.

Speech not greatly affected as the other vocal cord compensate for the action.

## 2. Bilateral complete section:

Both vocal folds in position midway between abducted and adducted causing difficulty in respiration.

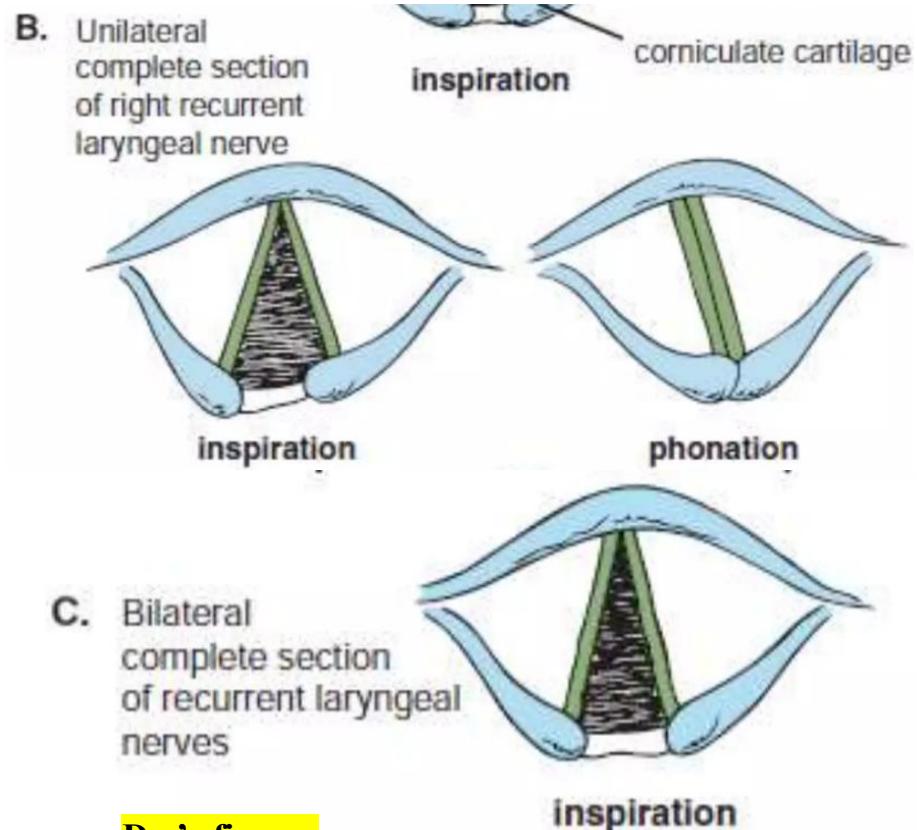
Breathing is impaired since the rima glottis is partially close and speech is lost.

**Unilateral:** one side injured.

**Bilateral:** both sides injured.

**Complete:** cut of all fibers of the nerve.

**Partial:** injury of the superficial fibers.



# 7-Section of the Recurrent Laryngeal nerve

Partial injury is more severe, because the cut superficial nerve fibers start injuring the **abductor muscles**, as a result the vocal cords undergo **adduction**.

This situation is more dangerous, especially if it occurs on both sides, as it can cause suffocation.

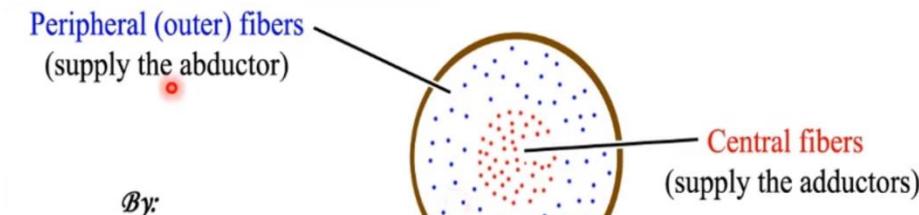
## 3. Unilateral partial section:

One cord affected.

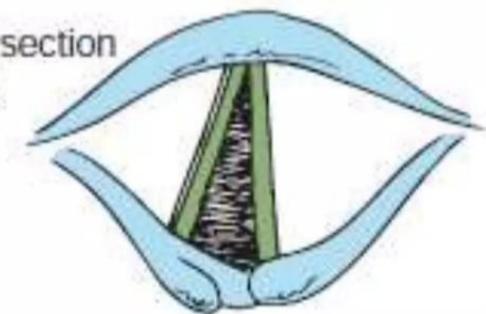
Hoarseness of the voice (the other vocal fold compensates the action).

## 4. Bilateral partial section:

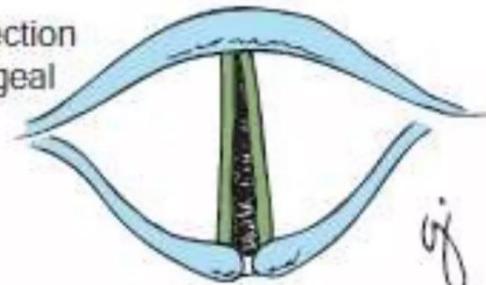
**Most dangerous**, in this case adduction of both true vocal cords occurs, requiring tracheostomy (suprasternal opening to the trachea).



D. Unilateral partial section of right recurrent laryngeal nerve



E. Bilateral partial section of recurrent laryngeal nerves



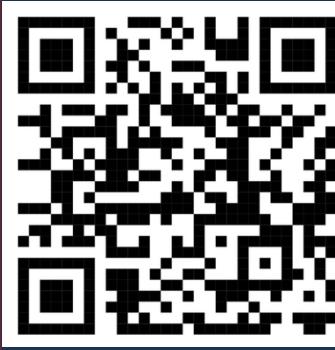
Dr.'s figure:

inspiration



# **ANATOMY QUIZ LECTURE 4**

For any feedback, scan the code or click on it.



### Corrections from previous versions:

| Versions | Slide # and Place of Error | Before Correction                      | After Correction  |
|----------|----------------------------|--|---|
| v0 → v1  | 5<br>13                    | —<br>Recurrent laryngeal <b>artery</b> | Rewrote the first paragraph<br>Recurrent laryngeal <b>nerve</b> |
| v1 → v2  |                            |  |   |