Thyroid gland

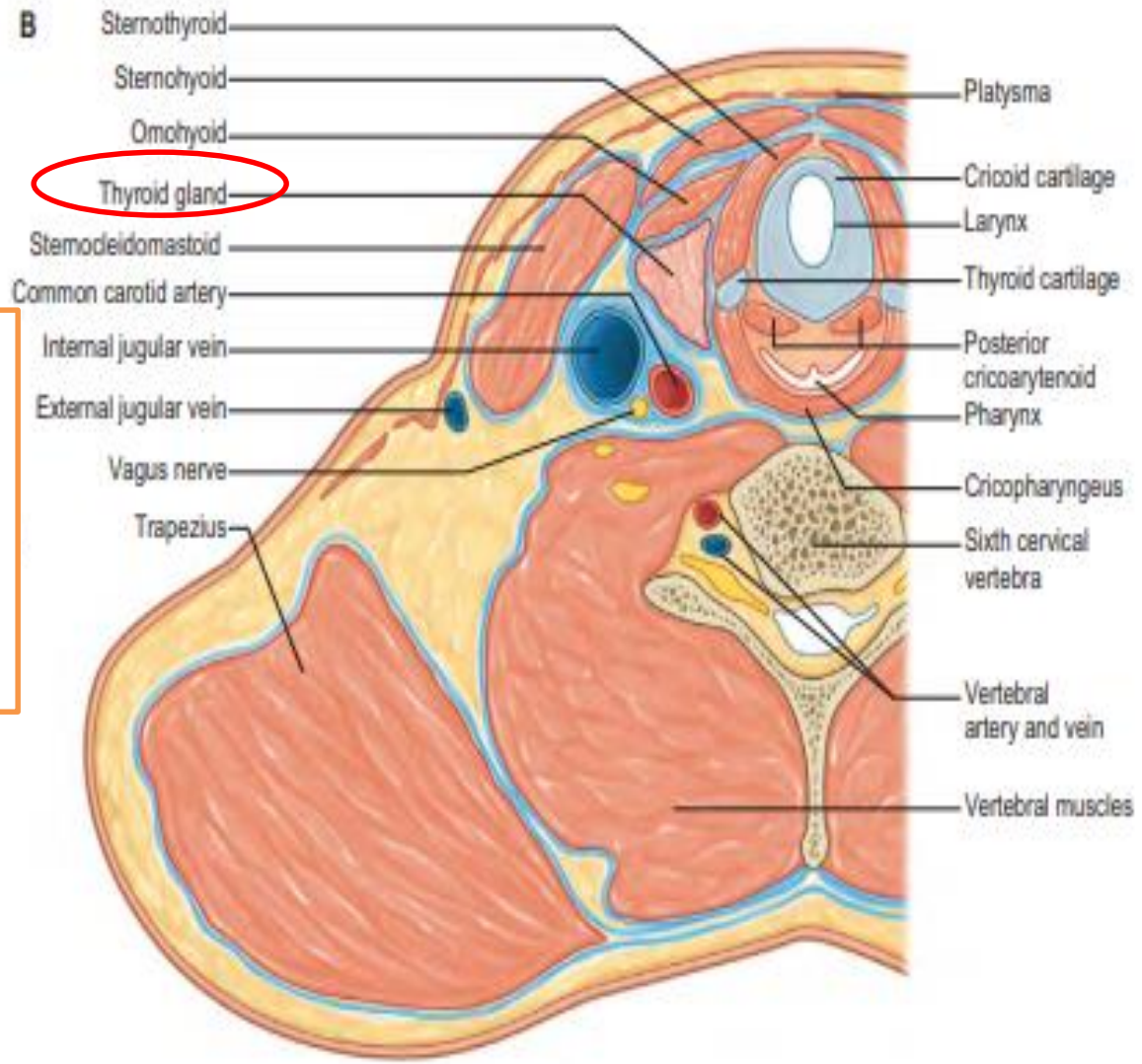
OBJECTIVES

1. **Recognize and understand the coverings of the thyroid gland and their clinical importance.**
2. **Recognize and understand the main parts of the thyroid gland and their locations, relations and connections.**
3. **Comprehend the blood supply of the thyroid gland, their relations with recurrent and external laryngeal nerves.**
4. **Understand the embryological origins of the pituitary gland and its associated malformations.**
5. **Grasp the clinical correlations of the midline structures of neck related to the thyroid gland and differentiate between them and the those on the lateral side of the neck.**
6. **Recognize and understand imaging of the thyroid gland.**
7. **Grasp the histological structure of the thyroid gland and its cells under light.**

Gross anatomy

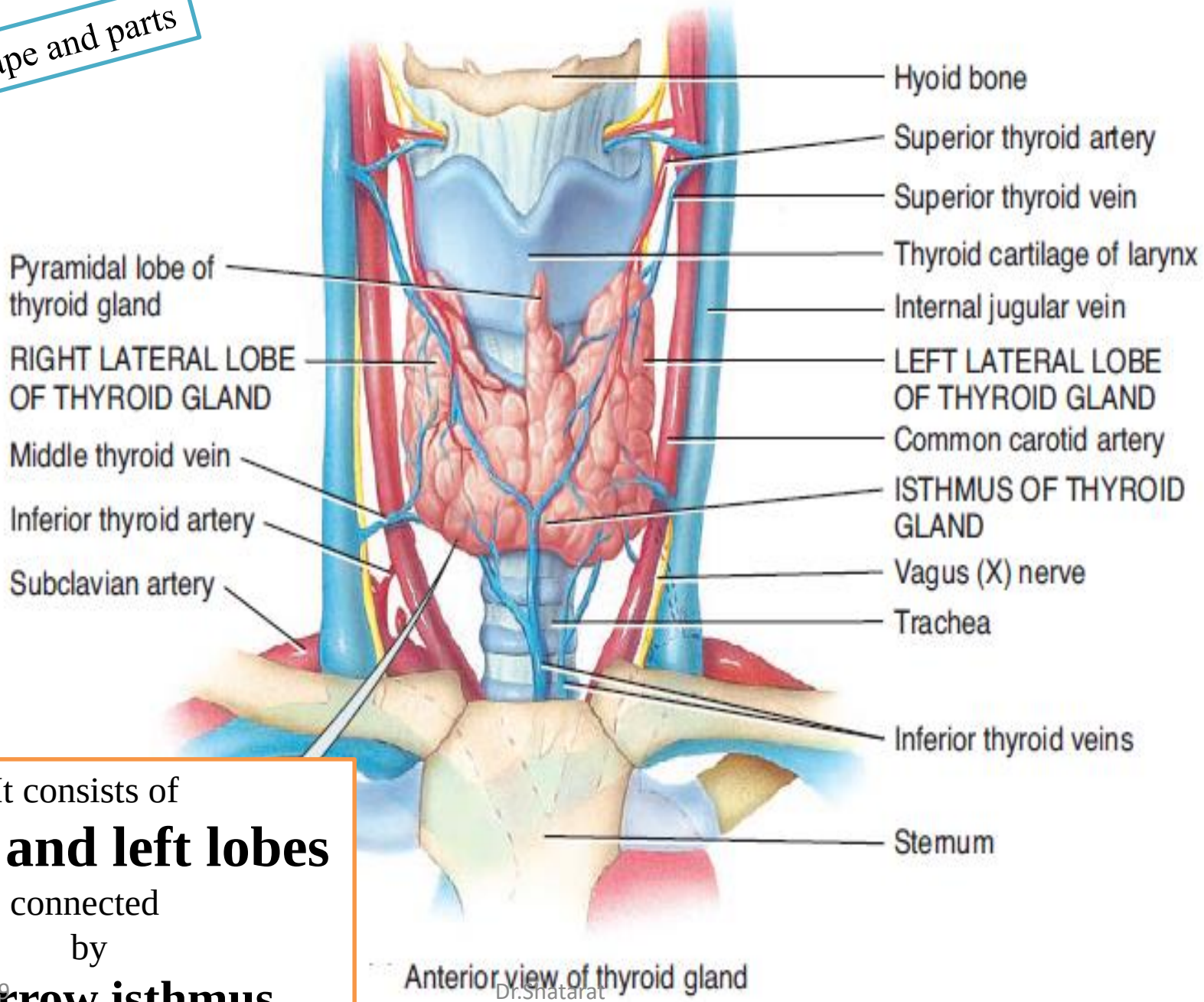
1-location

- It is placed **anteriorly** in **the lower neck** at the level with **the 5th cervical** to the **1st thoracic vertebrae**



Transverse sections through the neck at the level of the second **sixth cervical** vertebrae

2-Shape and parts



Anterior view of thyroid gland

It consists of

Right and left lobes

connected

by

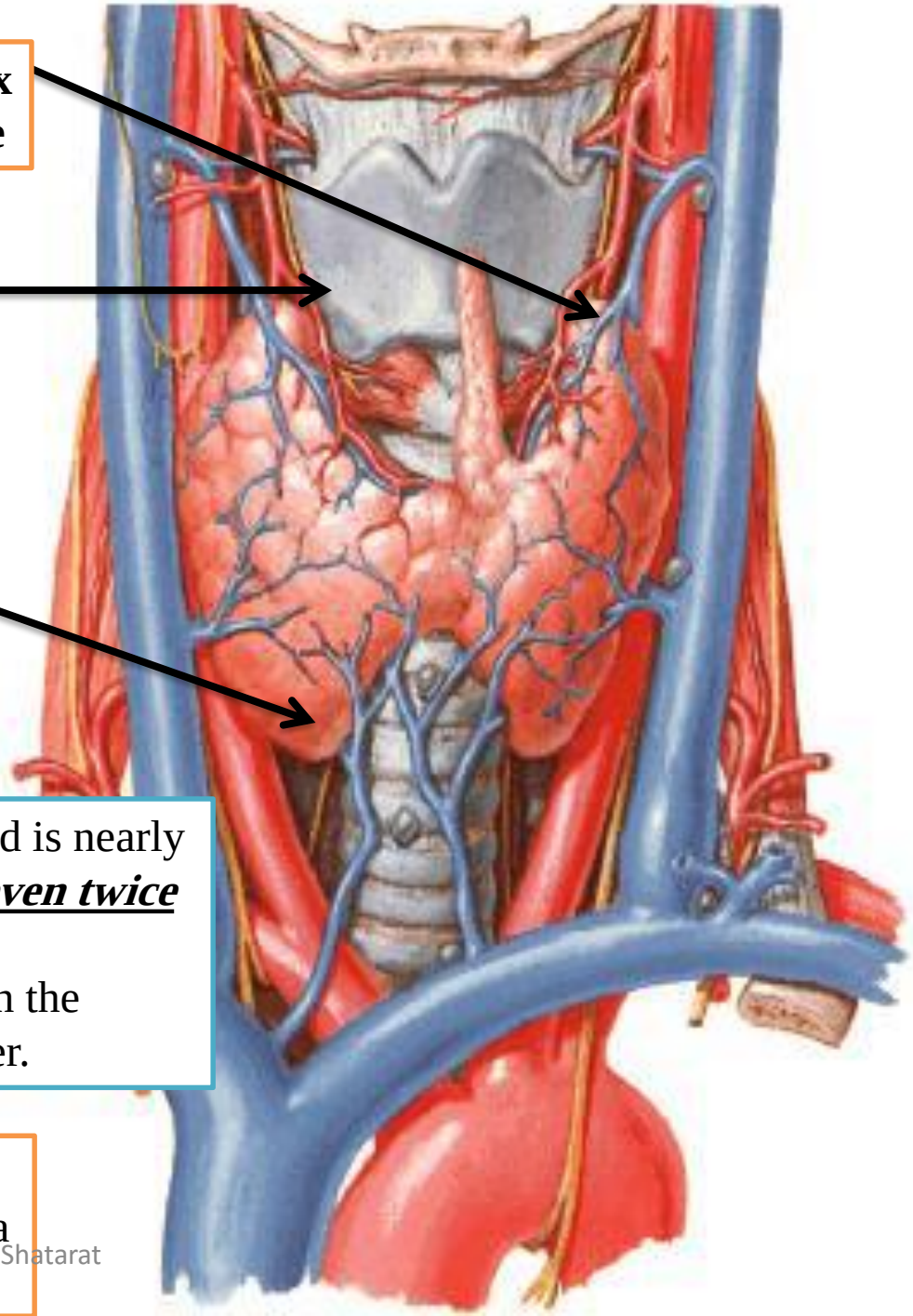
a narrow isthmus

3- Lobs

Each lobe is pear shaped → **Apex** **base**

its apex being directed upward as far as the ***oblique line on the lamina of the thyroid cartilage***

its base
lies below at the level of the **fourth or 5th tracheal ring.**



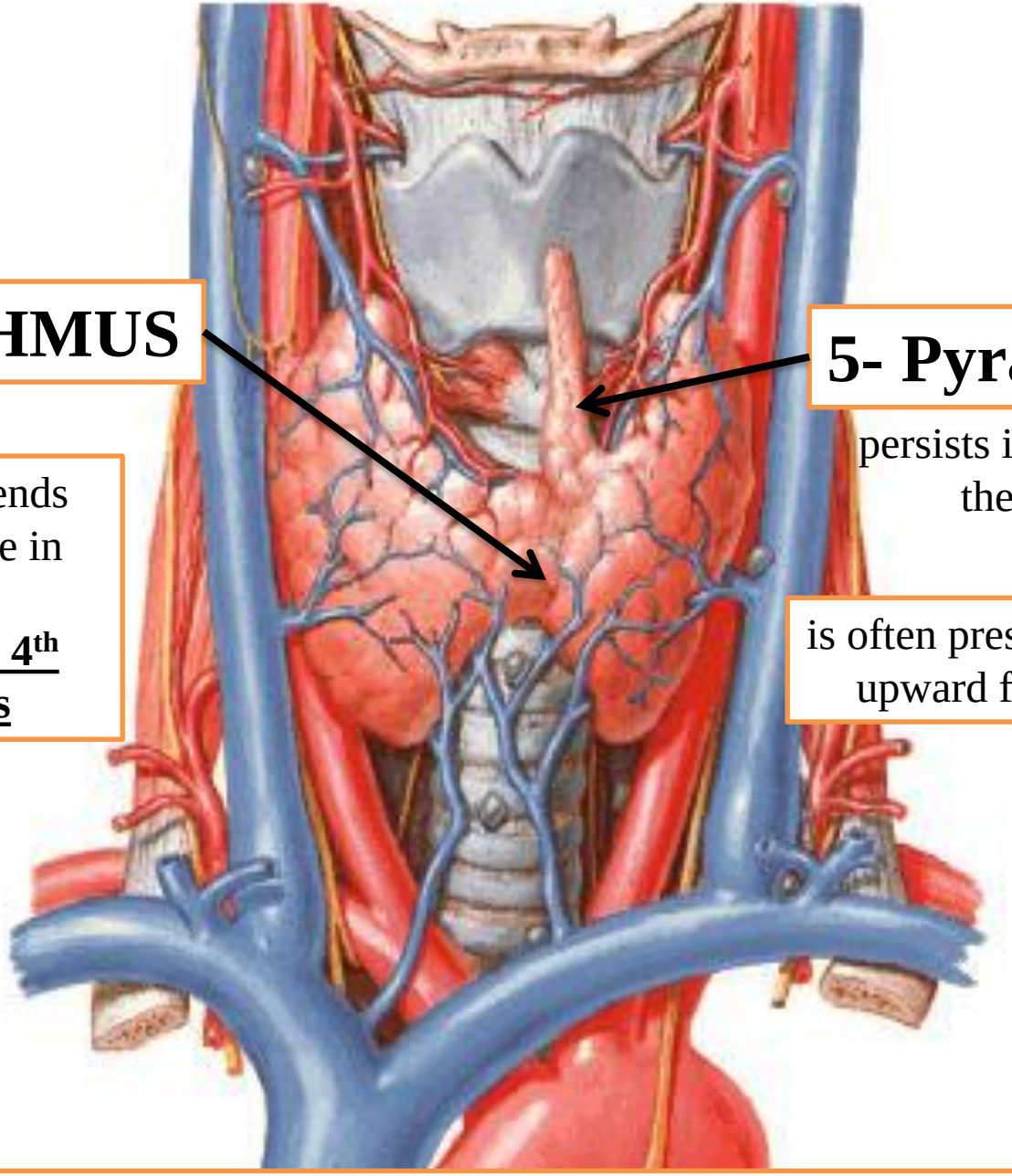
It should be noted that the normal thyroid gland is nearly always asymmetric. ***The right lobe may be even twice as large as the left lobe***.
The right upper pole extends higher up in the neck, and the lower pole extends lower.

Note

The posteromedial aspects of the lobes are attached to the side of the cricoid cartilage by a **lateral thyroid ligament**

4- THE ISTHMUS

The isthmus extends across the midline in front of **the 2ed, 3ed , and 4th tracheal rings**



5- Pyramidal lobe

persists in at least **15%** of the population

is often present, and it projects upward from the isthmus

Note

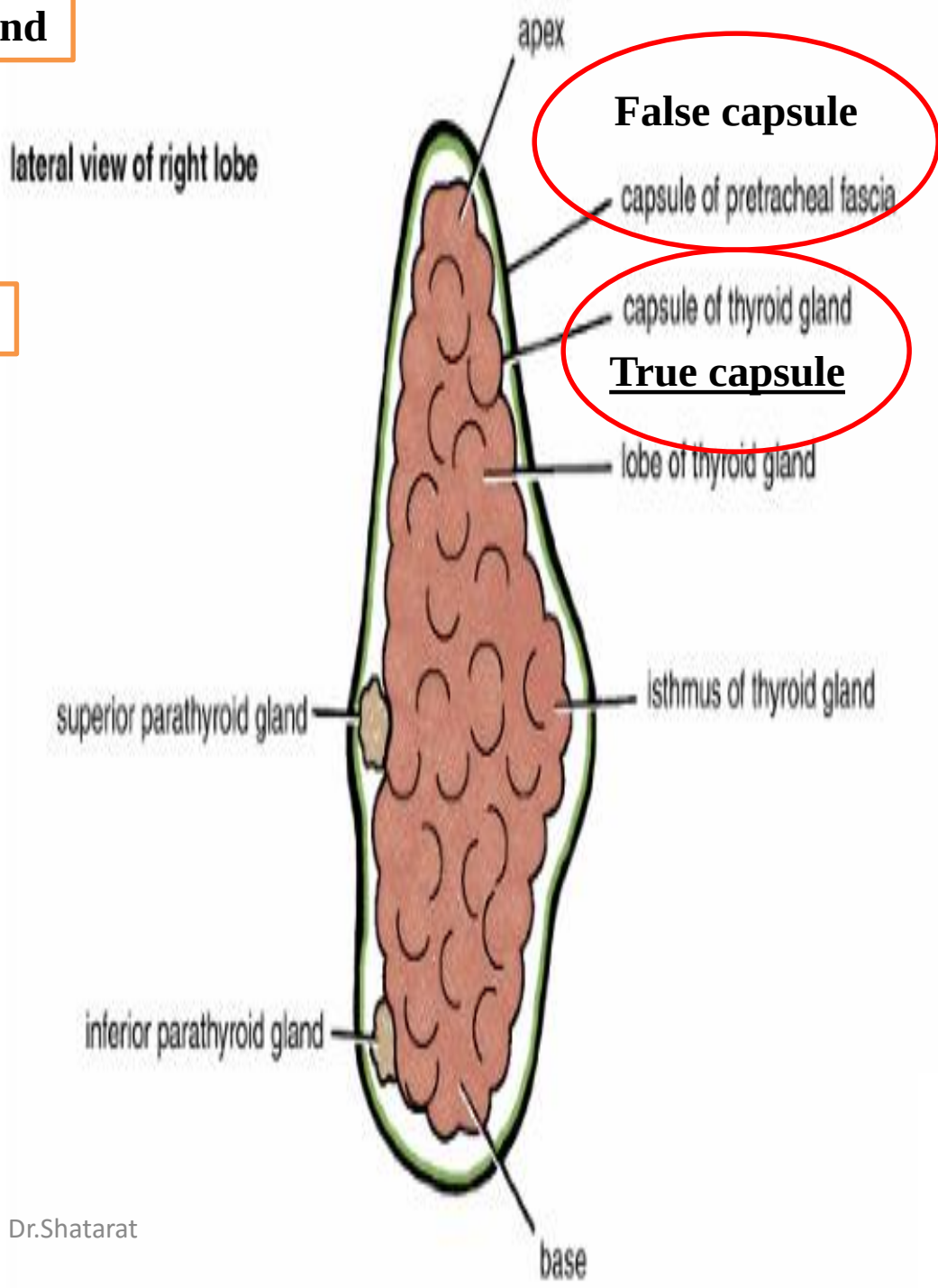
A fibrous or fibromuscular band, the levator of the thyroid gland, **musculus levator glandulae thyroideae,** sometimes descends from the body of the hyoid to the isthmus or pyramidal lobe

6- Coverings and fascia of the thyroid gland

The thyroid gland is surrounded by

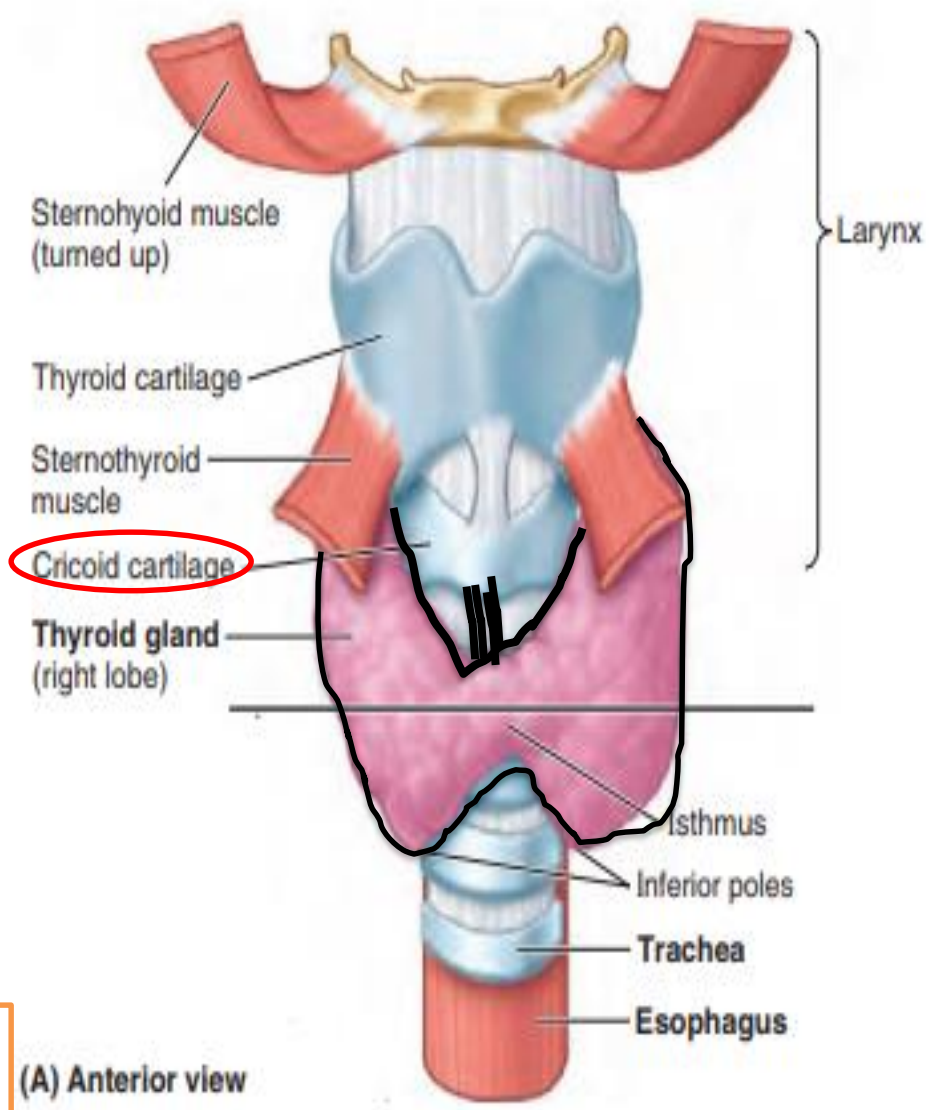
A-False capsule

B-True capsule



A-True capsule, a thin fibrous capsule,
which is formed by condensation of the stroma of the gland.

- It is attached by means of dense connective tissue to the cricoid cartilage (part of the larynx) and superior tracheal rings (part of the trachea).



Clinical note

The True capsule of thyroid capsule is much denser in front than behind and the enlarging gland therefore tends ***to push backwards,*** burying itself round the sides and even ***the back of the trachea and oesophagus.***

cause dangerous ***Dyspnea*** ***Dysphagia***

B- False capsule

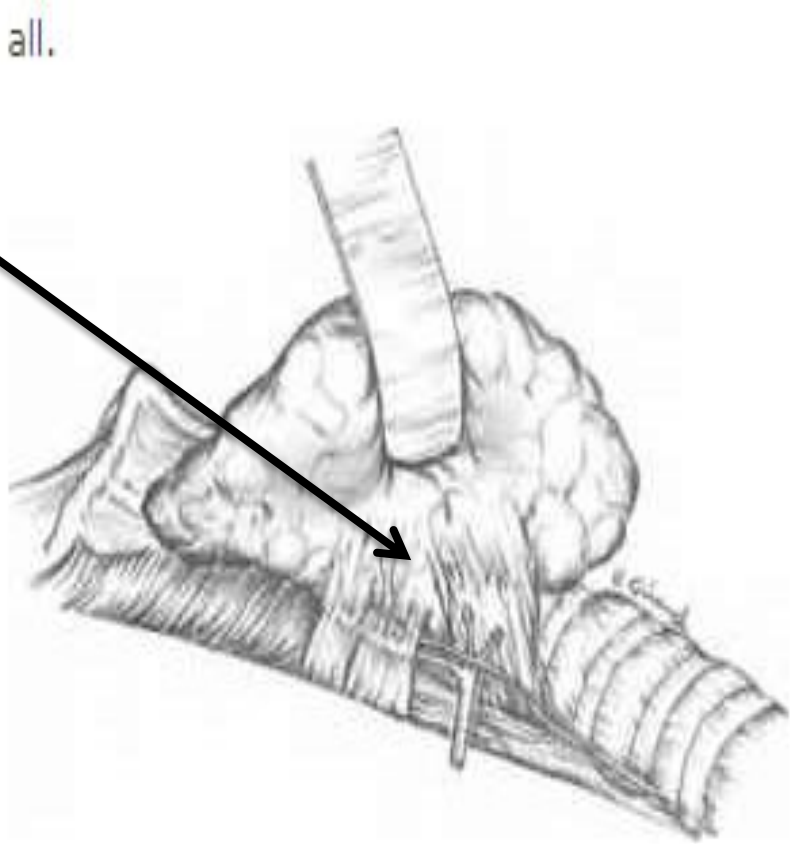
it is a loose sheath formed by the visceral portion of **the pretracheal** layer of deep cervical fascia external to the true capsule

- The false capsule thickens between the cricoid cartilage and thyroid gland to form the

ligament of Berry

(The suspensory ligament of the thyroid) gland

(attaches the thyroid gland to trachea)



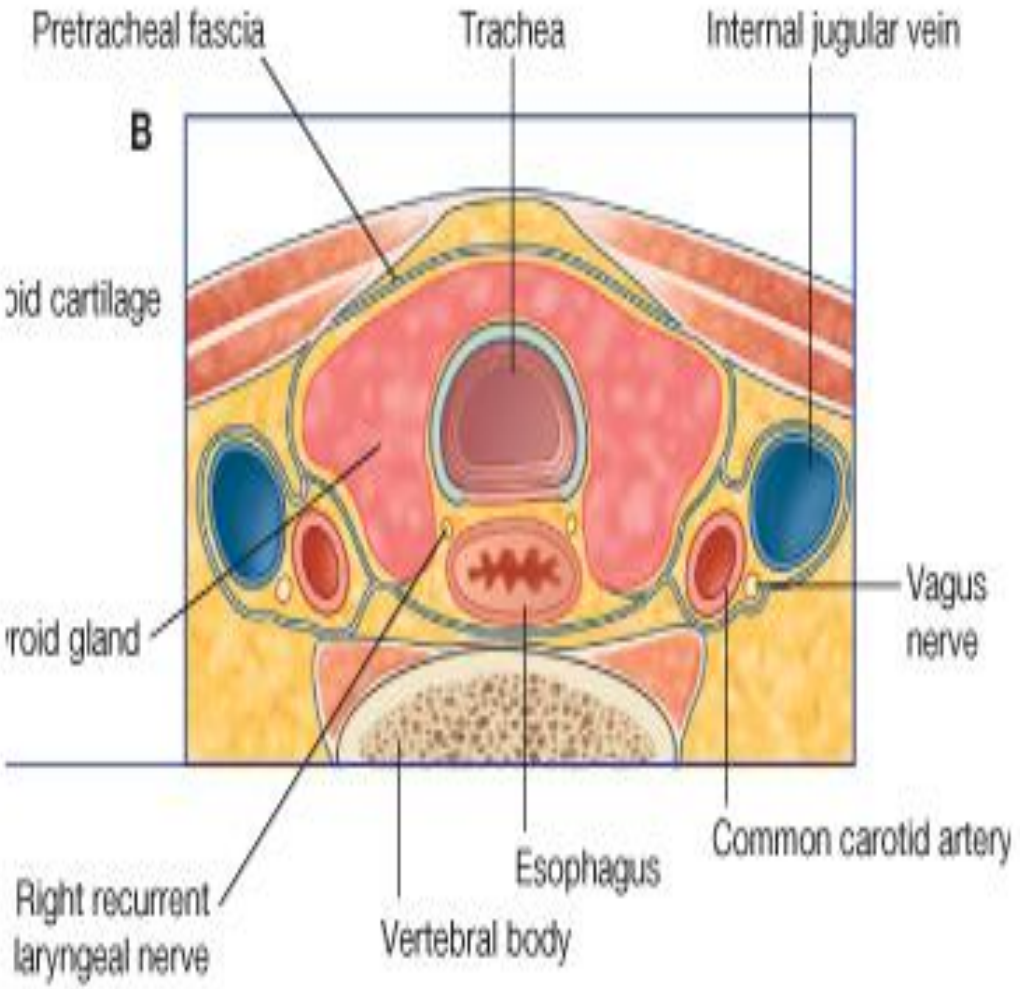
The false capsule of the thyroid gland also attaches the gland to the larynx and even to the hyoid bone

It is clear that the false capsule is attached to Both the larynx and trachea

This explains why the thyroid gland follows the movements of the larynx in swallowing.

Clinical note

This information is important because any pathologic neck swelling that is part of the thyroid gland ***will move upward when the patient is asked to swallow***



The pretracheal layer of deep cervical fascia is attached to hyoid bone

And

The attachment of the sternothyroid muscles to the thyroid cartilage effectively binds down the thyroid gland to the larynx

This limits upward expansion of the gland

However, downward expansion has no limitation

a large goitre will extend downwards into the superior mediastinum

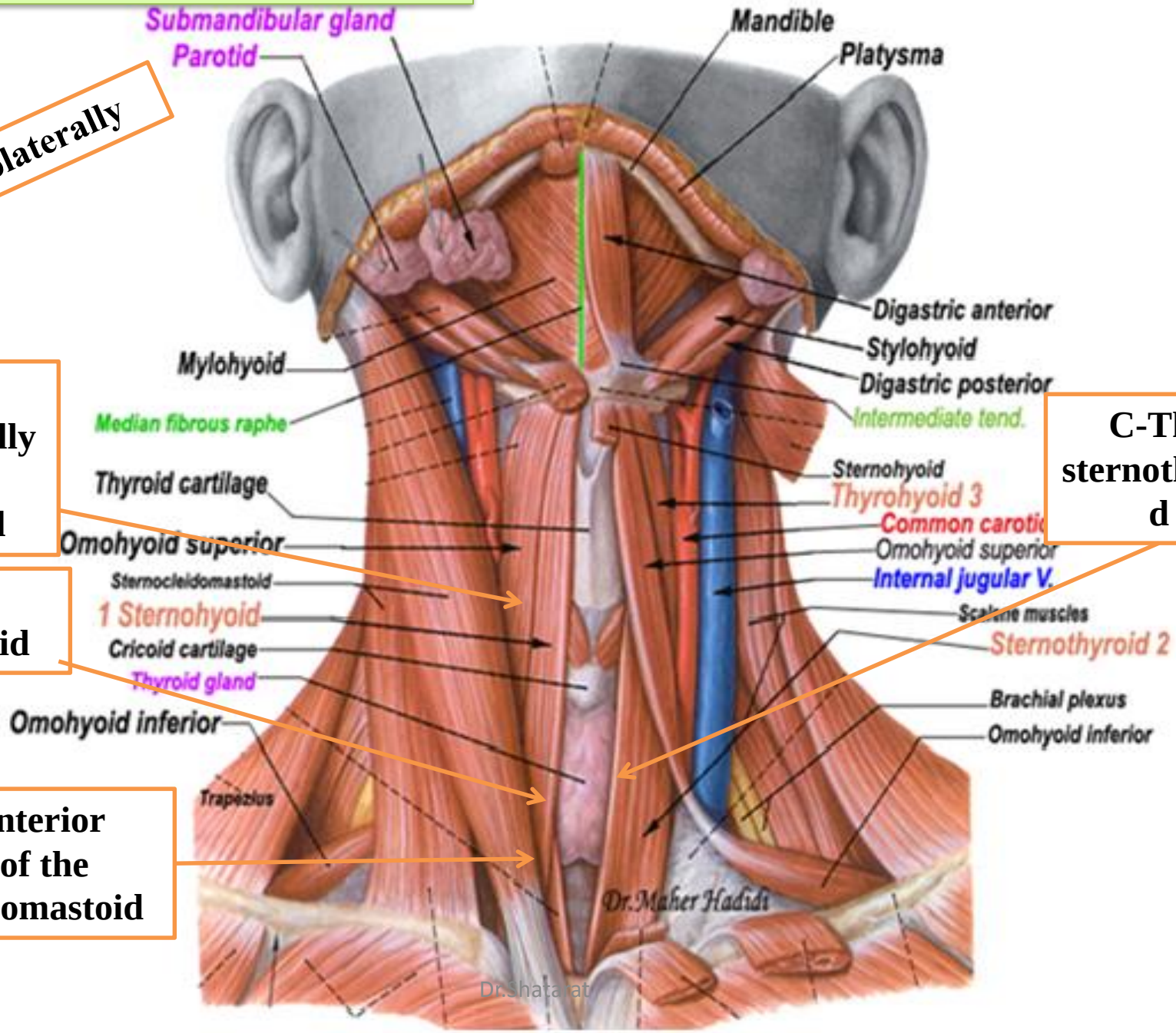
('Plunging Goitre')

Or

Retrosternal Goiter

7- Relations of the Lobes

Anterolaterally



A-The superior belly of the omohyoid

B-The sternohyoid

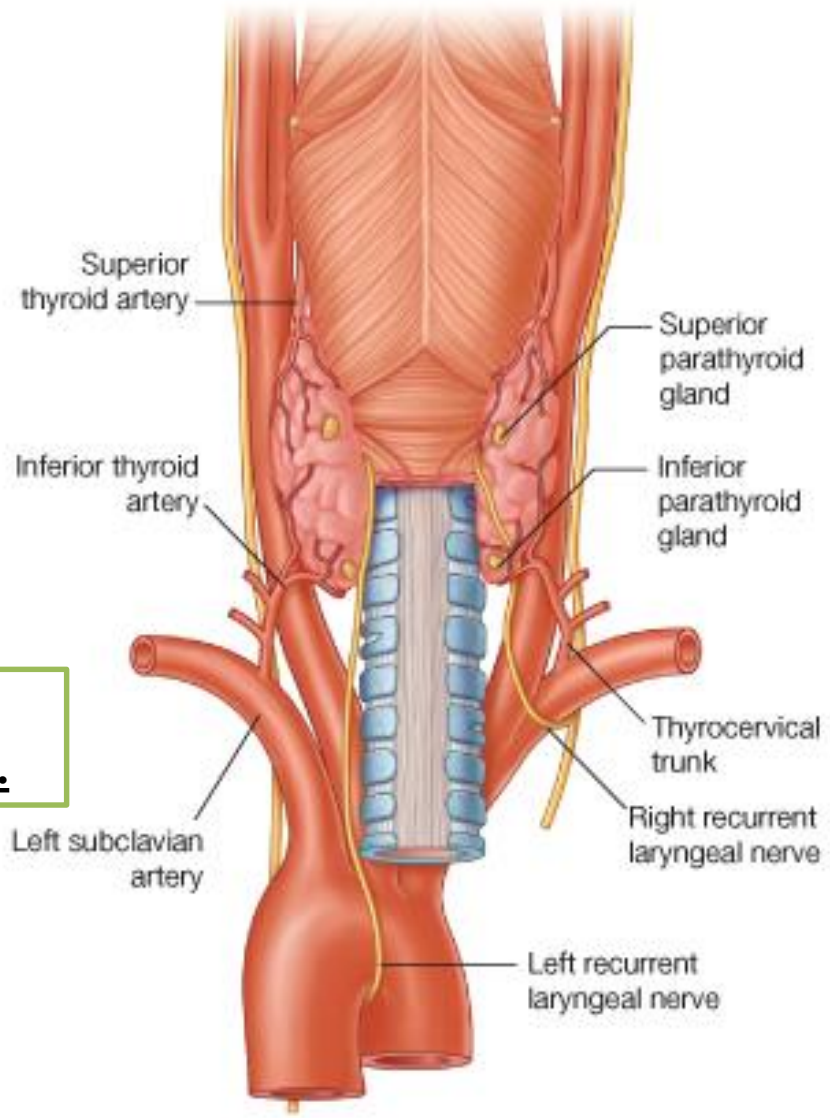
C-The sternothyroid

D-The anterior border of the sternocleidomastoid

Posteriorly

The rounded posterior border of each lobe is related posteriorly to **the superior and inferior parathyroid** glands and

The anastomosis between the **superior and inferior thyroid arteries.**



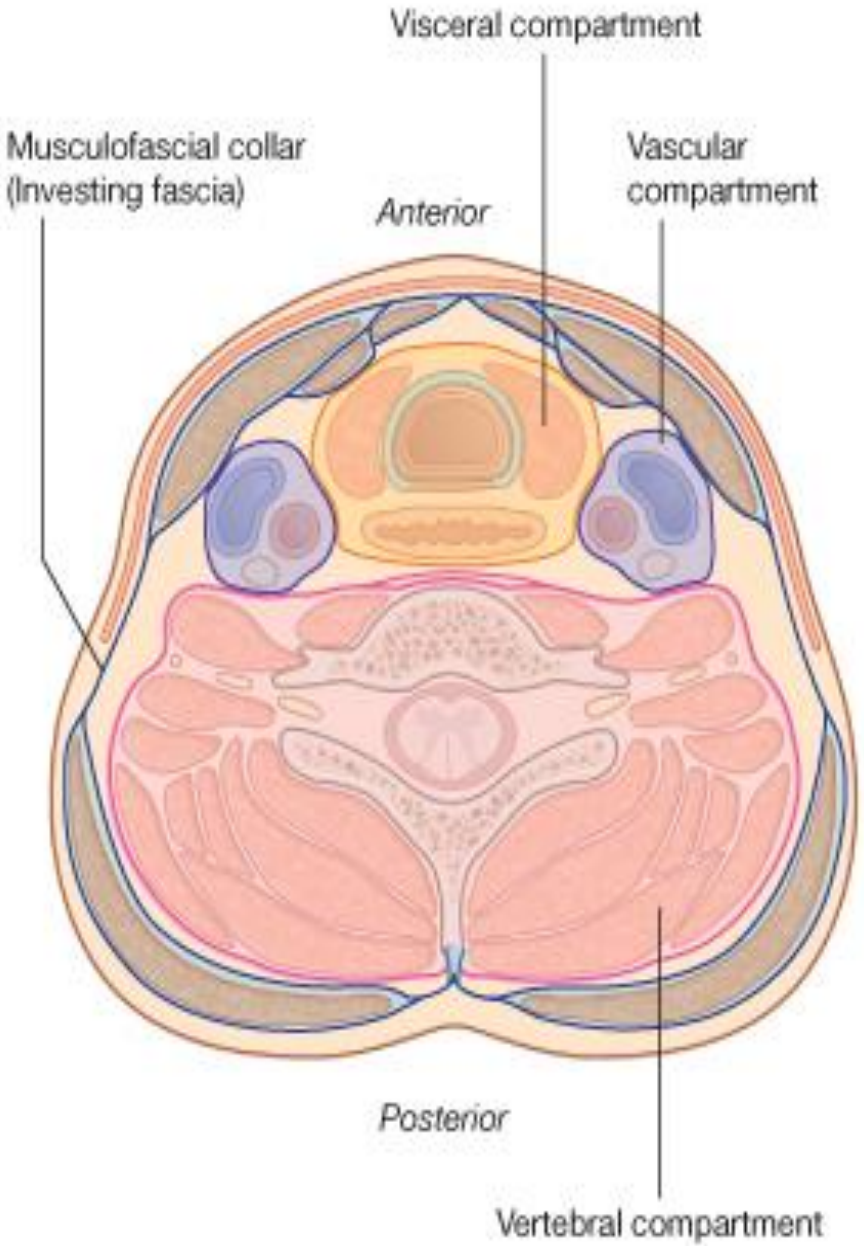
Posterior view

Posterolaterally:
The carotid sheath with the common carotid artery, the internal jugular vein, and the vagus nerve

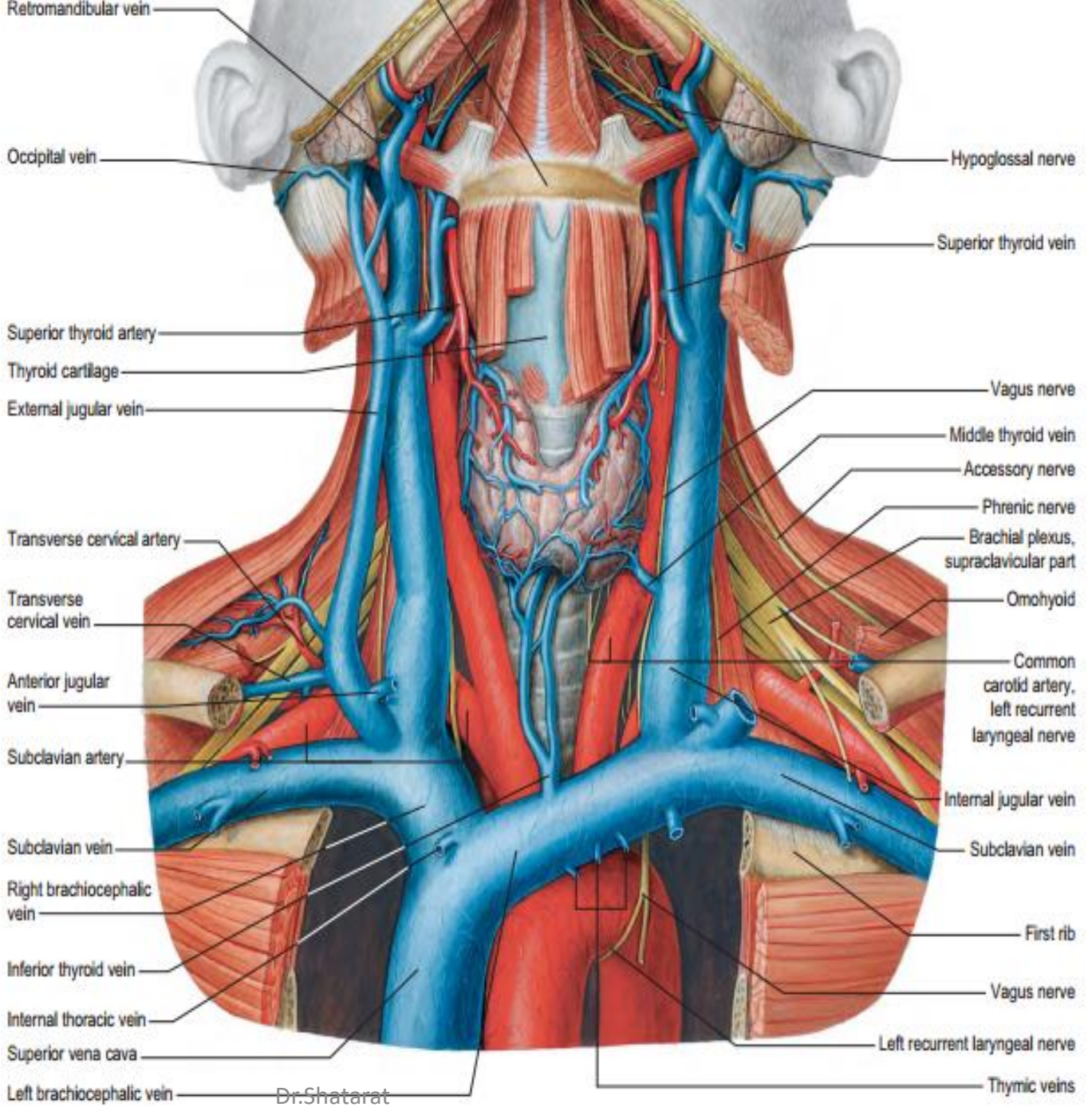
Medially:

The larynx, the trachea, the pharynx, and the esophagus. Associated with these structures are the cricothyroid muscle and its nerve supply, the external laryngeal nerve. In the groove between the esophagus and the trachea is

<u>the recurrent laryngeal nerve</u>



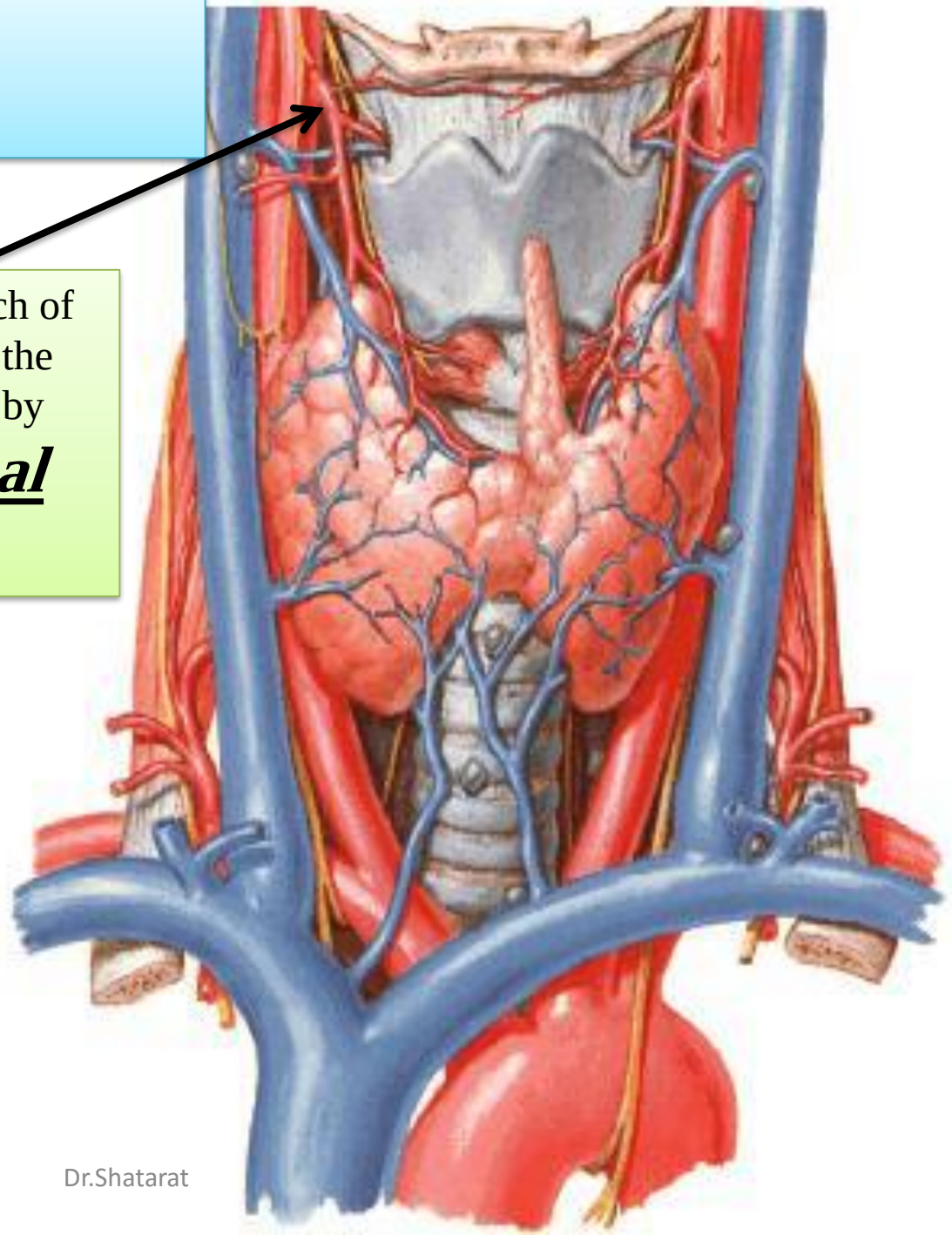
8-Blood Supply



A-The superior thyroid artery
B-The inferior thyroid artery
C- Sometimes the thyroidea ima.

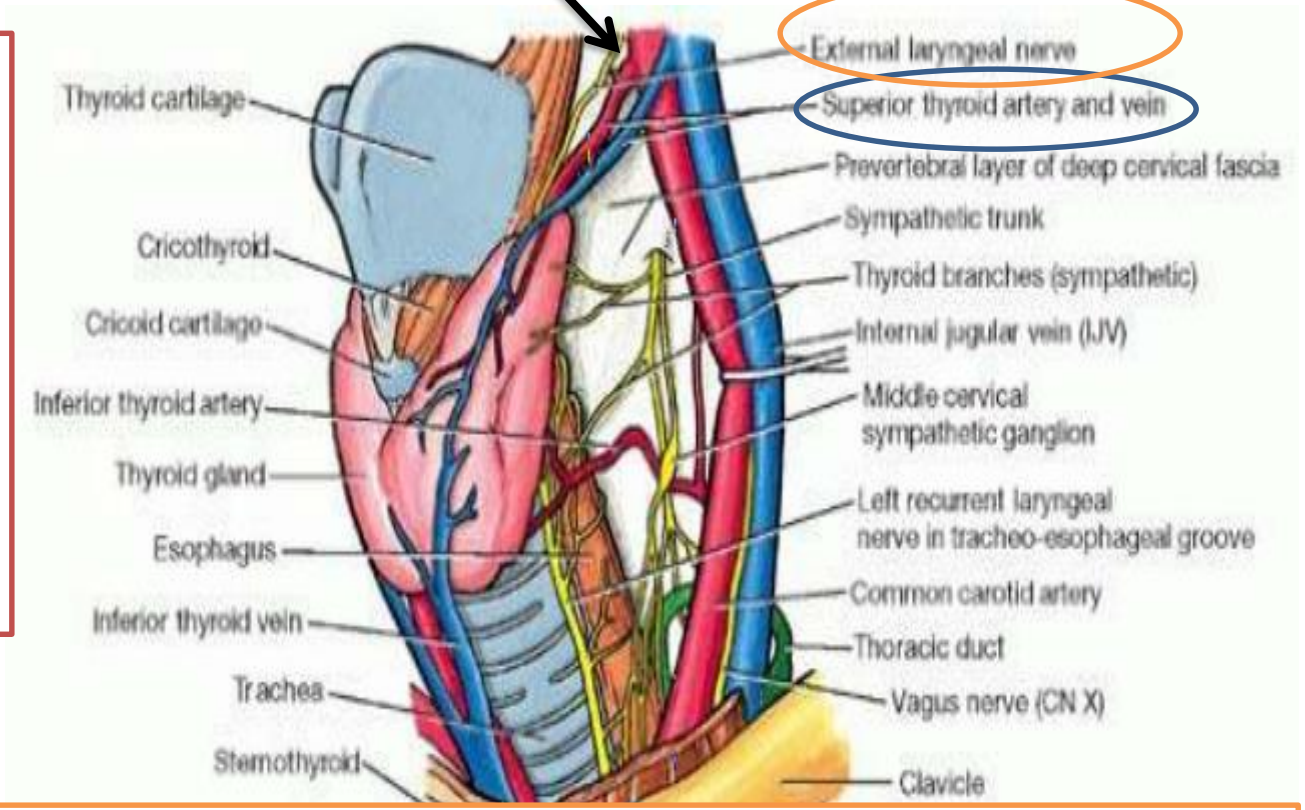
A-The superior thyroid artery, a branch of the external carotid artery, descends to the upper pole of each lobe, accompanied by

The External Laryngeal Nerve



The **superior thyroid artery on each side is related** to the external laryngeal nerve, which supplies the cricothyroid muscle.

Damage to the external laryngeal nerve results in an inability to tense the vocal folds and in **hoarseness**



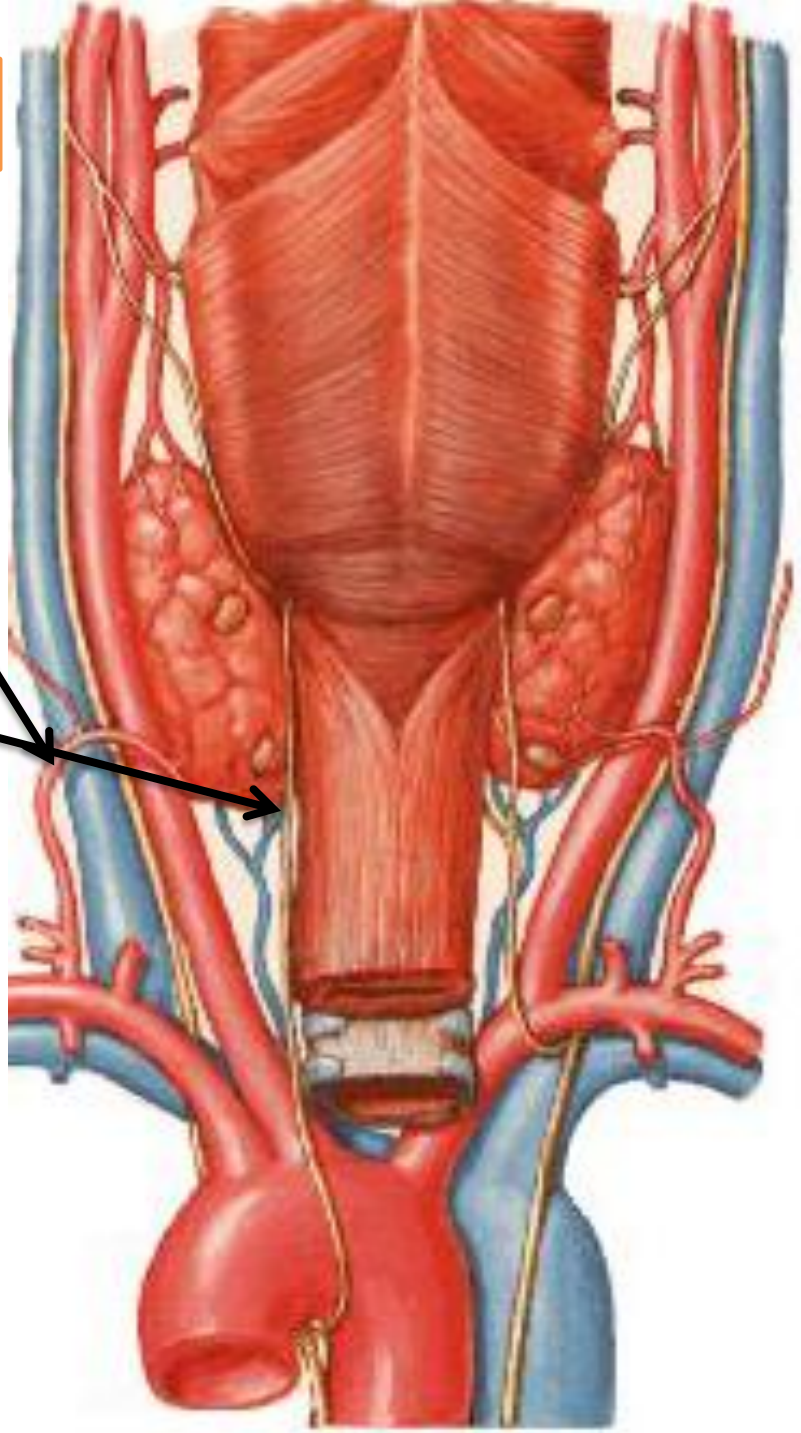
Thus, ***<u>The Superior Thyroid Artery during surgery on the thyroid ,</u>*** is ***<u>ligated near the gland</u>*** to avoid injury to **the external laryngeal nerve**

B-The inferior thyroid artery

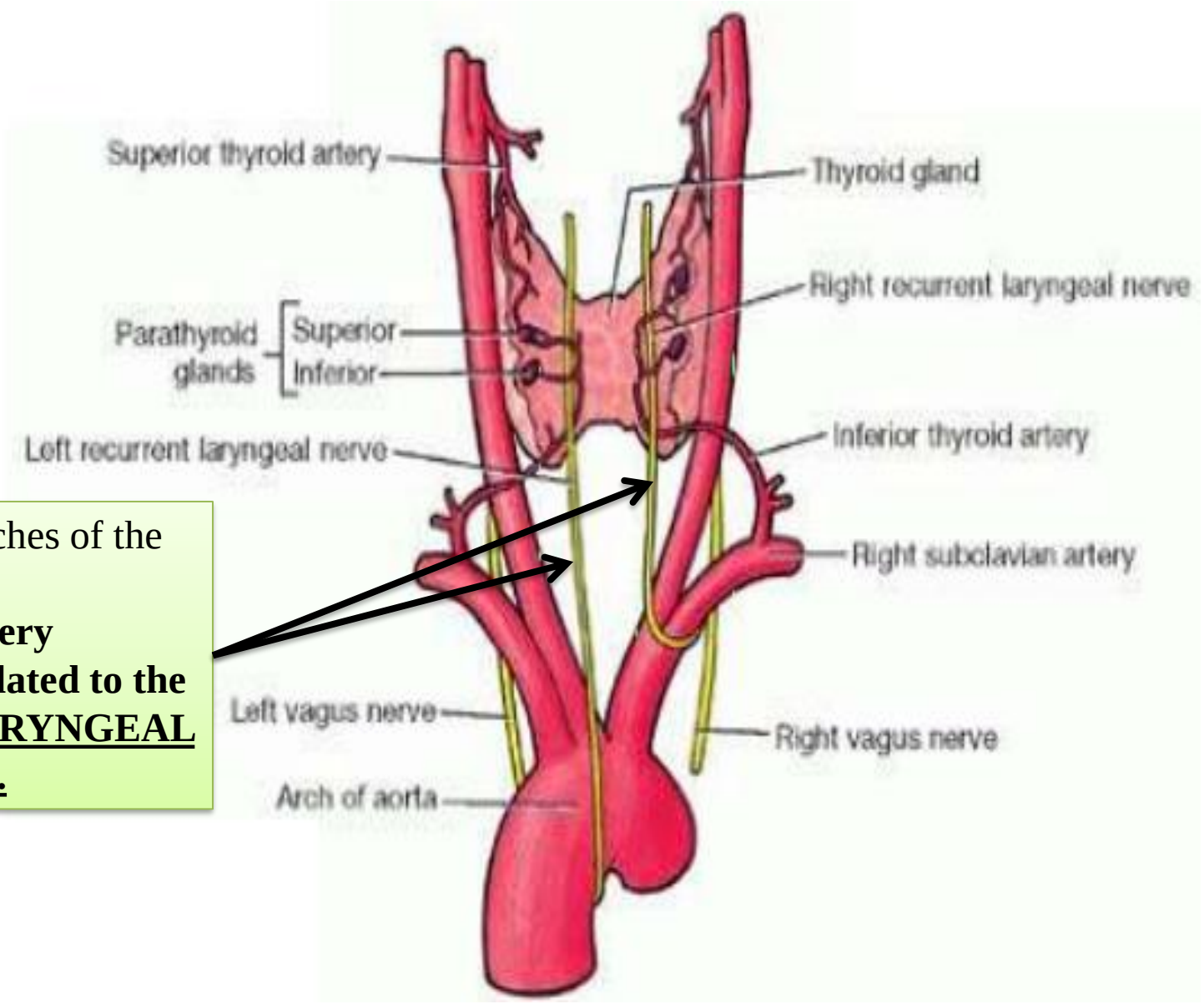
- a branch of ***the thyrocervical trunk***, ascends behind the gland to the level of the cricoid cartilage.
- It then turns medially and downward to reach the posterior border of the gland.

The recurrent laryngeal nerve

crosses either in front of or behind the artery, or it may pass between its branches.



The terminal branches of the **inferior thyroid artery** on each side are related to the **RECURRENT LARYNGEAL NERVE.**



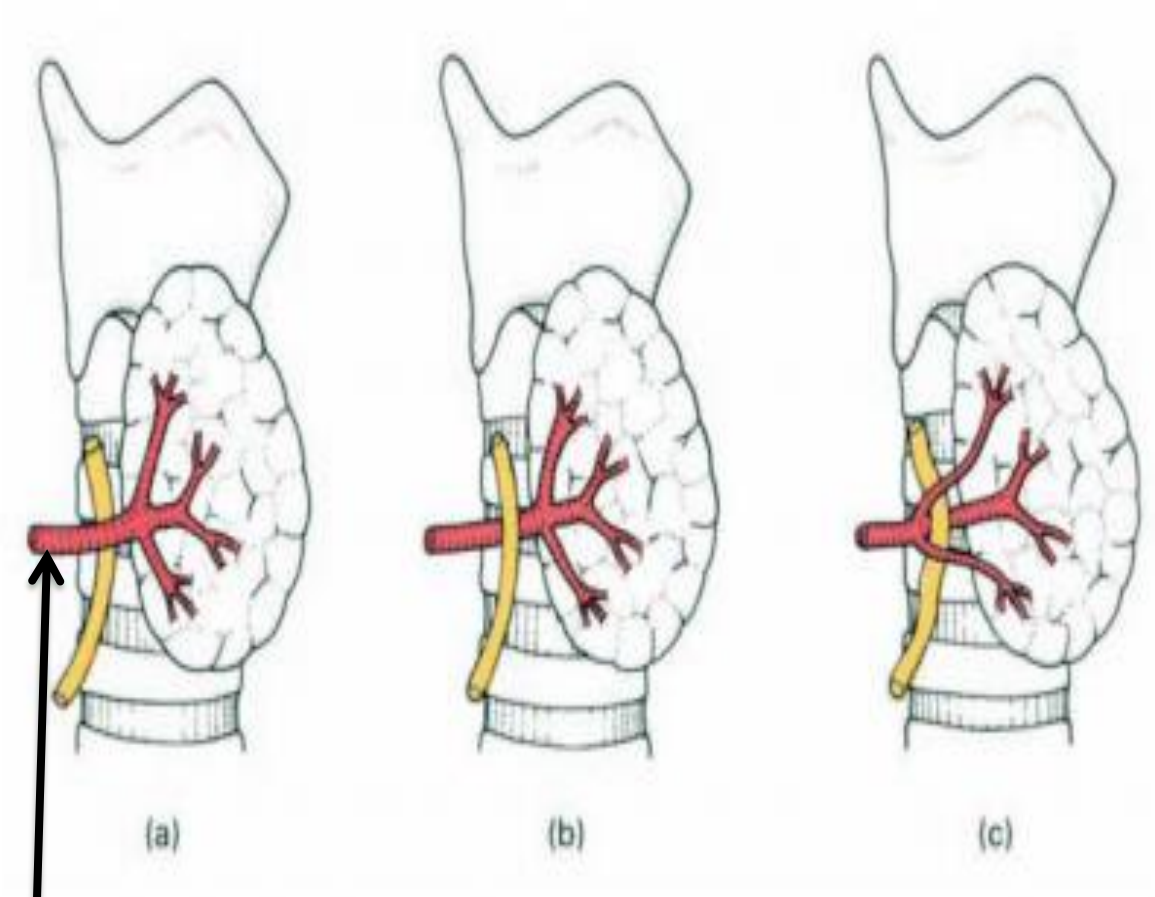


Fig. 191 The relationship of the recurrent laryngeal nerve to the thyroid gland and the inferior thyroid artery. (a) The nerve is usually deep to the artery but (b) may be superficial to it or (c) pass through its branches. In these diagrams the lateral lobe of the thyroid is pulled forwards, as it would be in a thyroidectomy.

Thus, ***THE INFERIOR THYROID ARTERY during surgery on the thyroid ,***

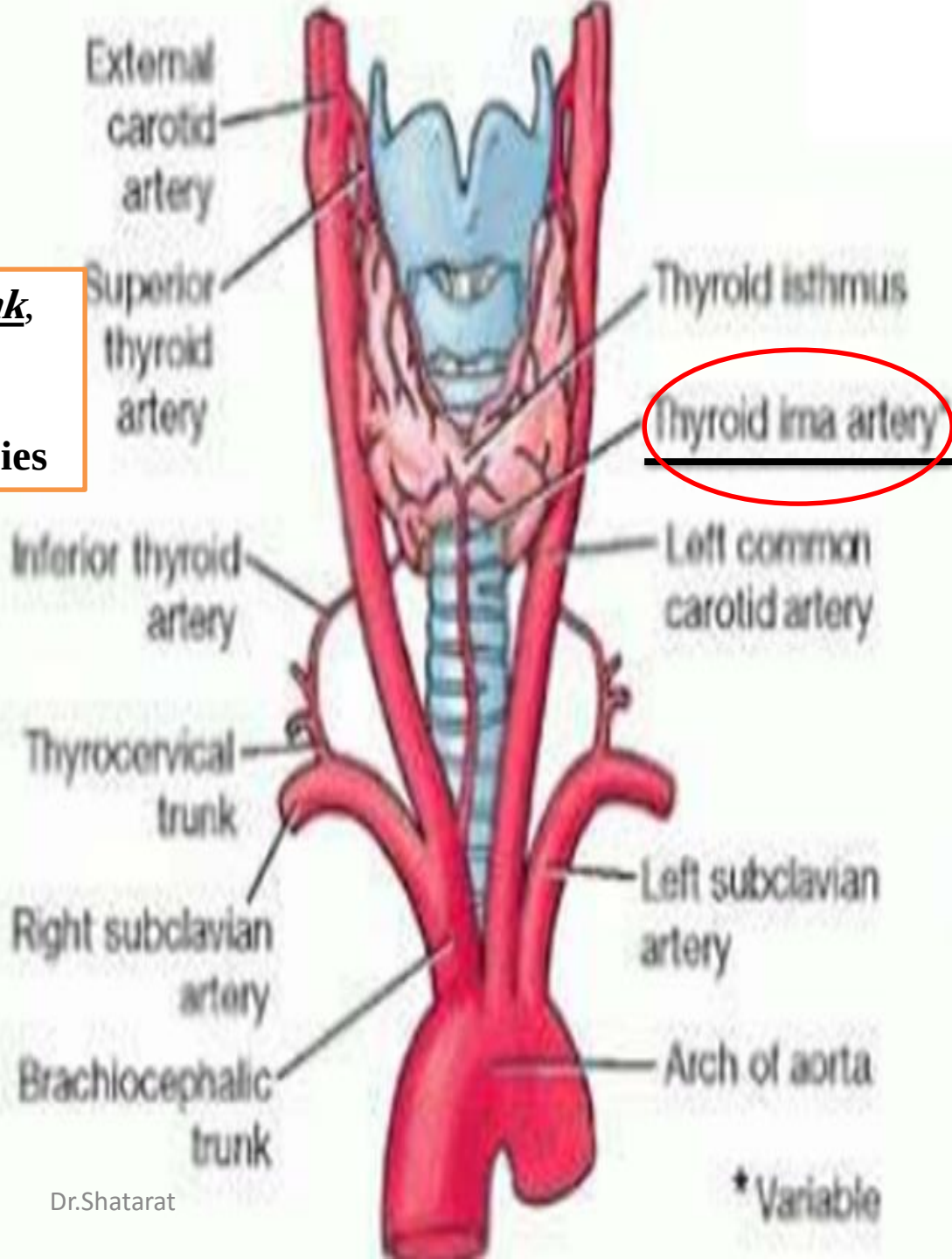
is ***ligated away from the gland*** to avoid injury to the recurrent laryngeal nerve

C-The thyroidea ima, In approximately 10% of people, a thyroid ima artery

Variable

arises from ***the brachiocephalic trunk***, **or the arch of the aorta**, **from the right common carotid ubclavian, or internal thoracic arteries**

ascends on the anterior surface of the trachea, which it supplies, and continues to the isthmus of the thyroid gland.



Clinical note

The possible presence of this artery must be considered when performing procedures **in the midline of the neck inferior to the isthmus because it is a potential source of bleeding**

Lesions of the Laryngeal Nerves

The muscles of the larynx are innervated by the recurrent laryngeal nerves, with the exception of the cricothyroid muscle, which is supplied by the external laryngeal nerve. Both these nerves are vulnerable during operations on **the thyroid gland because of the close relationship between them and the arteries of the gland.**

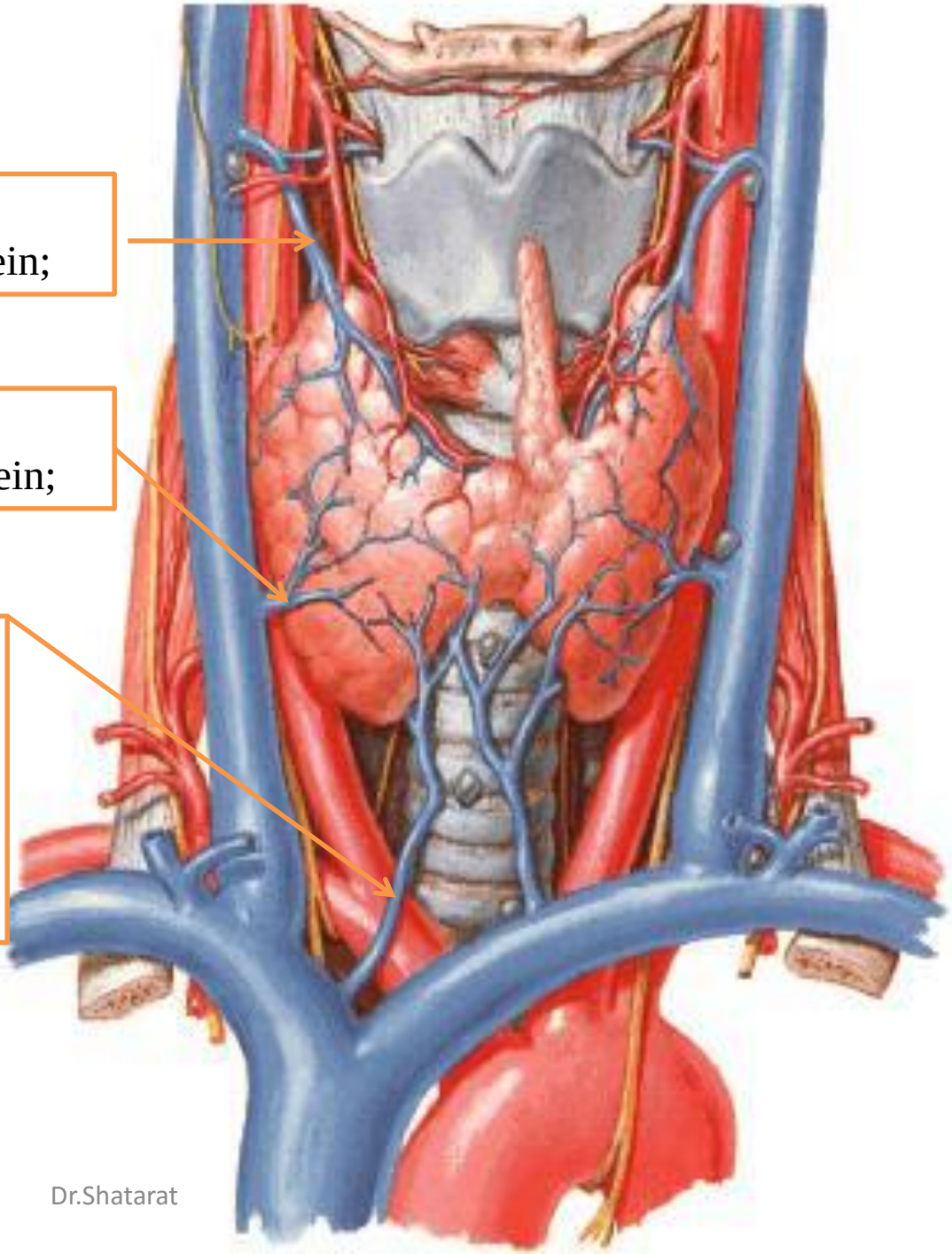
To be discussed next year

9-The veins from the thyroid gland

A-Superior thyroid vein
which drains into the internal jugular vein;

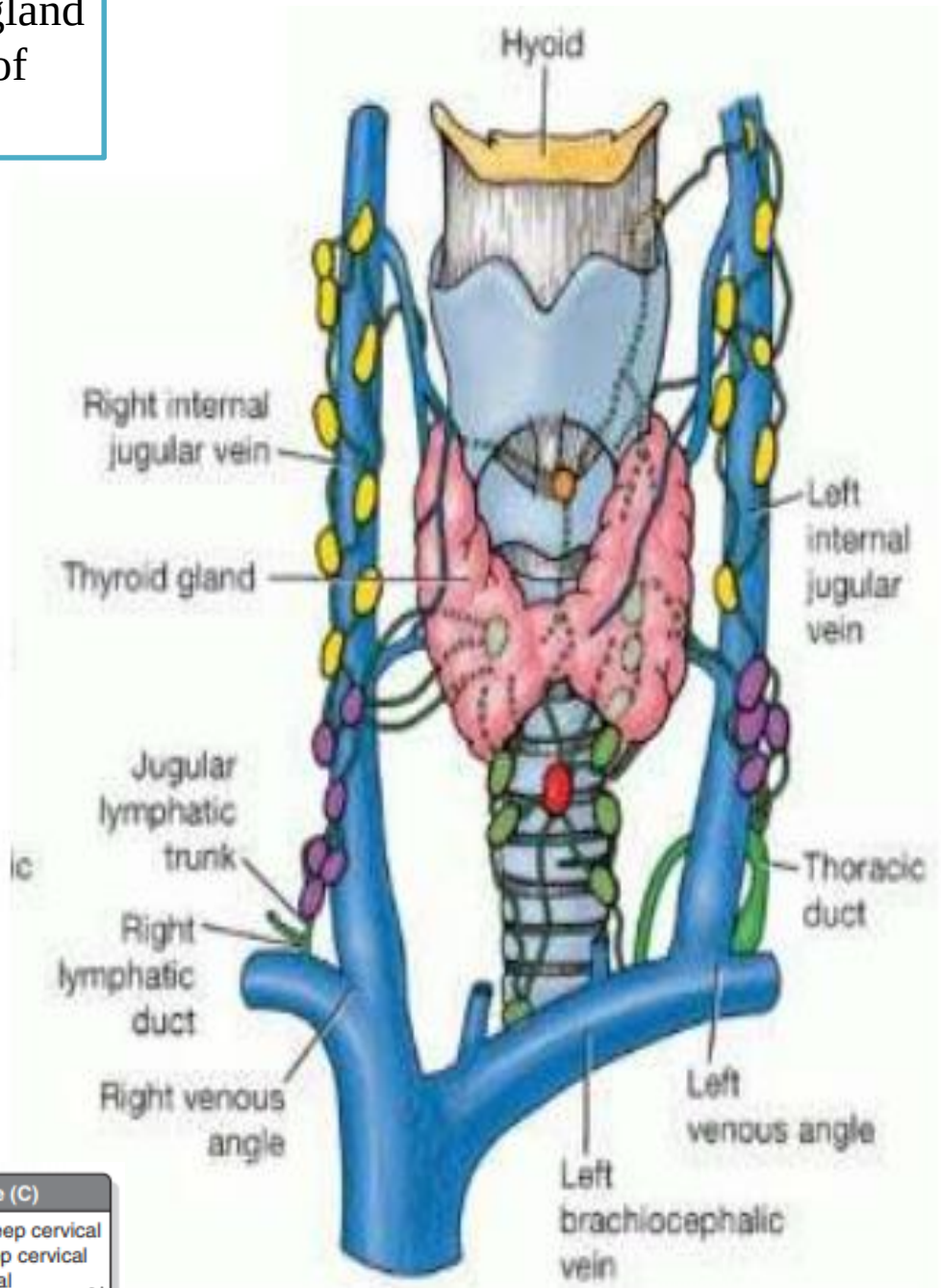
B-The middle thyroid vein
which drains into the internal jugular vein;

C-The inferior thyroid vein
The inferior thyroid veins of the two sides anastomose with one another as they descend in front of the trachea. They drain into the left brachiocephalic vein in the thorax



10-The lymphatic vessels of the thyroid gland communicate with a capsular network of lymphatic vessels

From this network, the vessels pass initially to **prelaryngeal, pretracheal**, and **paratracheal** lymph nodes, which drain in turn to the superior and inferior deep cervical nodes
Inferior to the thyroid gland, the lymphatic vessels pass directly to the inferior deep cervical lymph nodes



The uppermost, just above the thyroid
isthmus, in front of the cricoid cartilage, and medial to
a pyramidal lobe, if present, is a constant node group
of one to five nodes, which has been termed

The Delphian node

enlargement of which is indicative of metastasis from **thyroid or laryngeal carcinoma.**

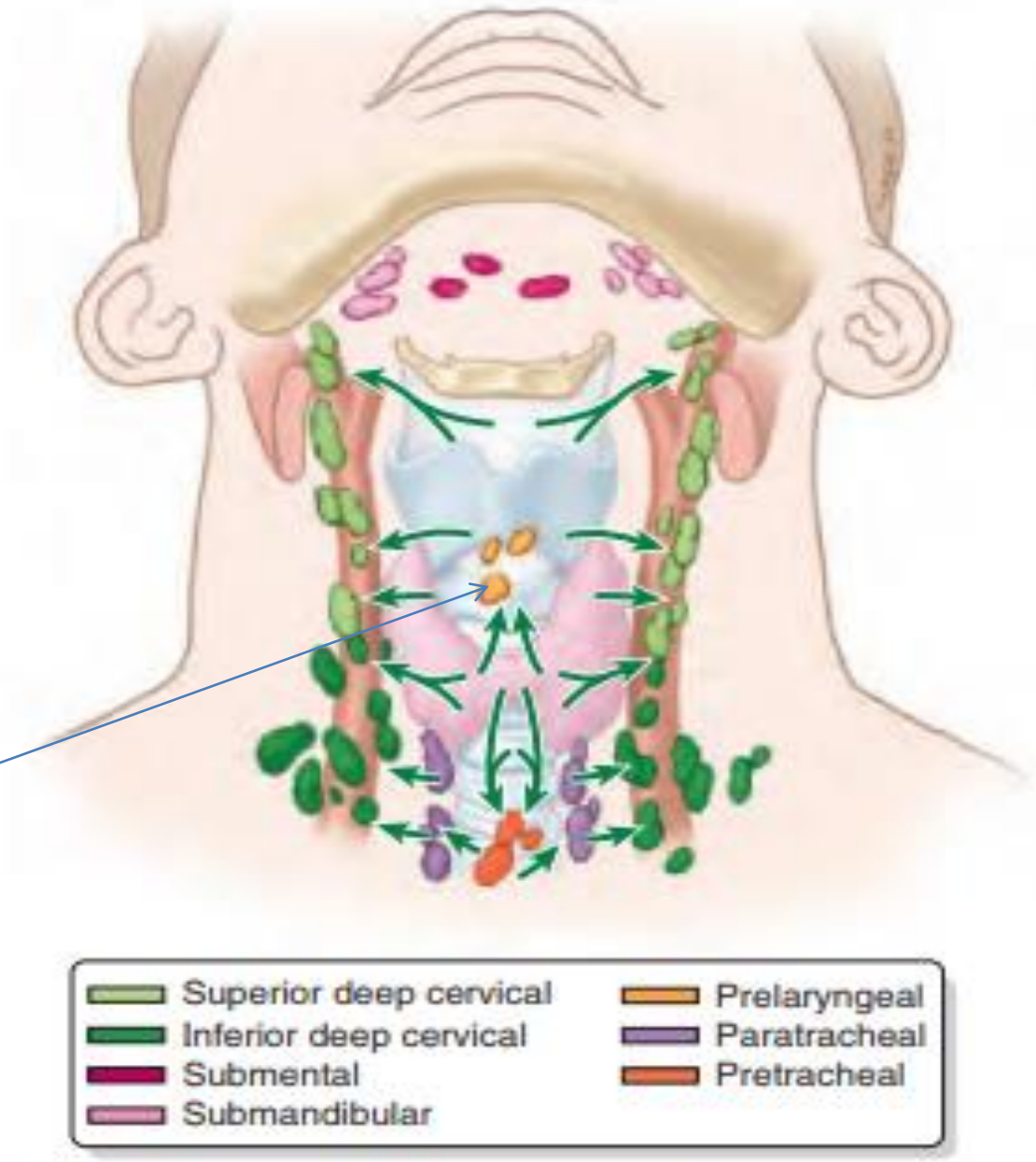


FIGURE 8.29. Lymphatic drainage of thyroid gland, larynx, and trachea. The *arrows* indicate the direction of lymph flow.

Embryology

In a cross section of the embryo in the area of the head and neck

The following can be noticed

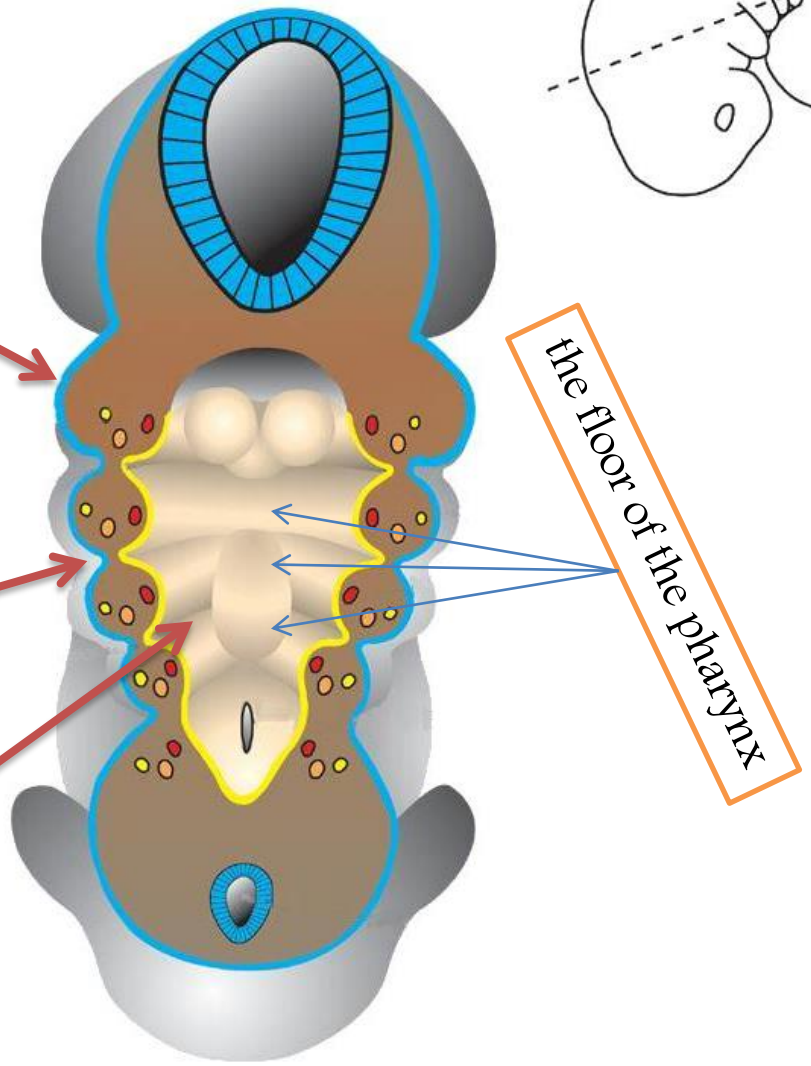
THE **PHARYNGEAL ARCHES**

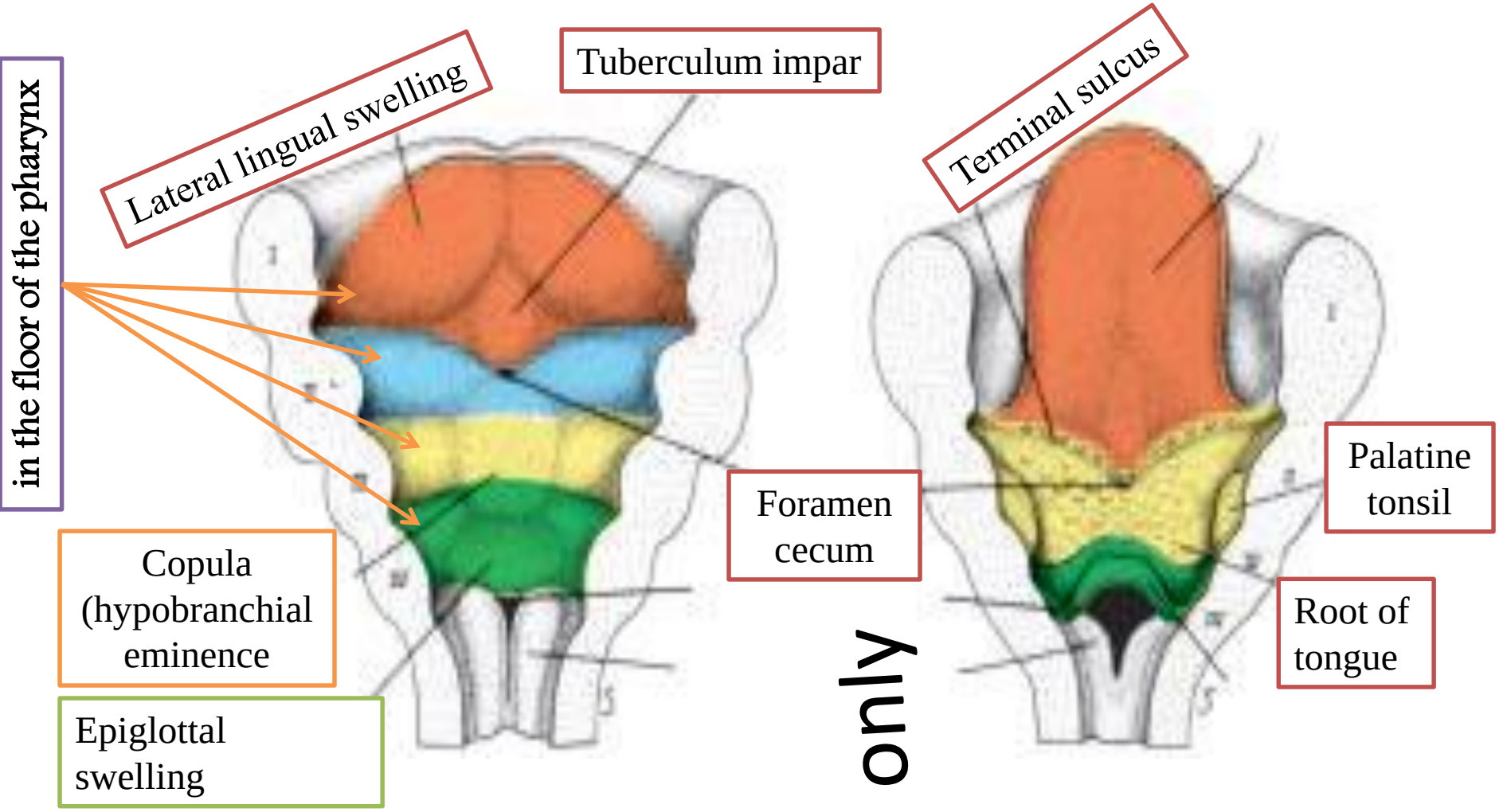
THE **PHARYNGEAL ARCHES**
are separated
by deep clefts known as

PHARYNGEAL CLEFTS

with development of the arches and clefts,
a number of outpocketings,

The pharyngeal pouches appear

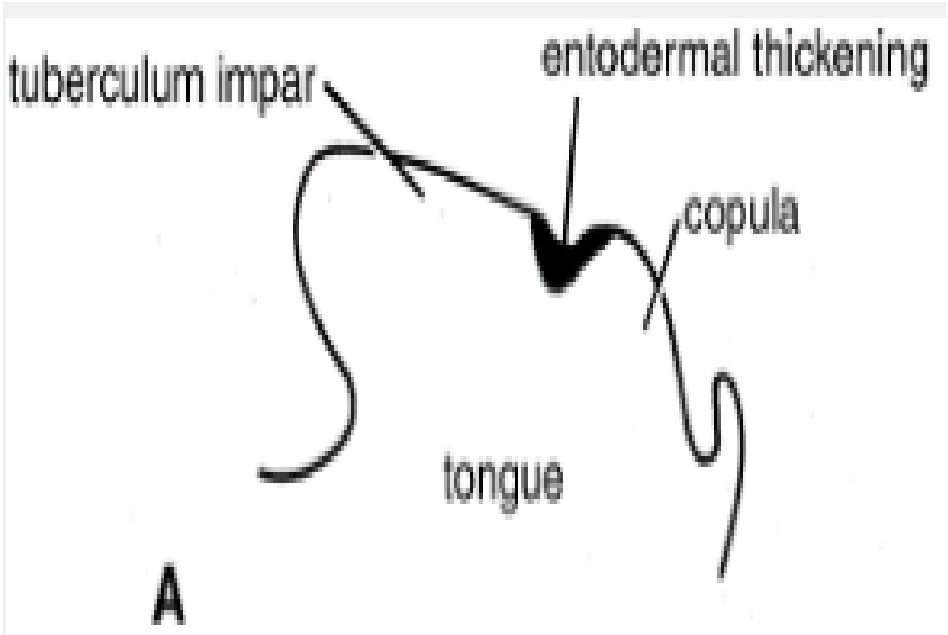


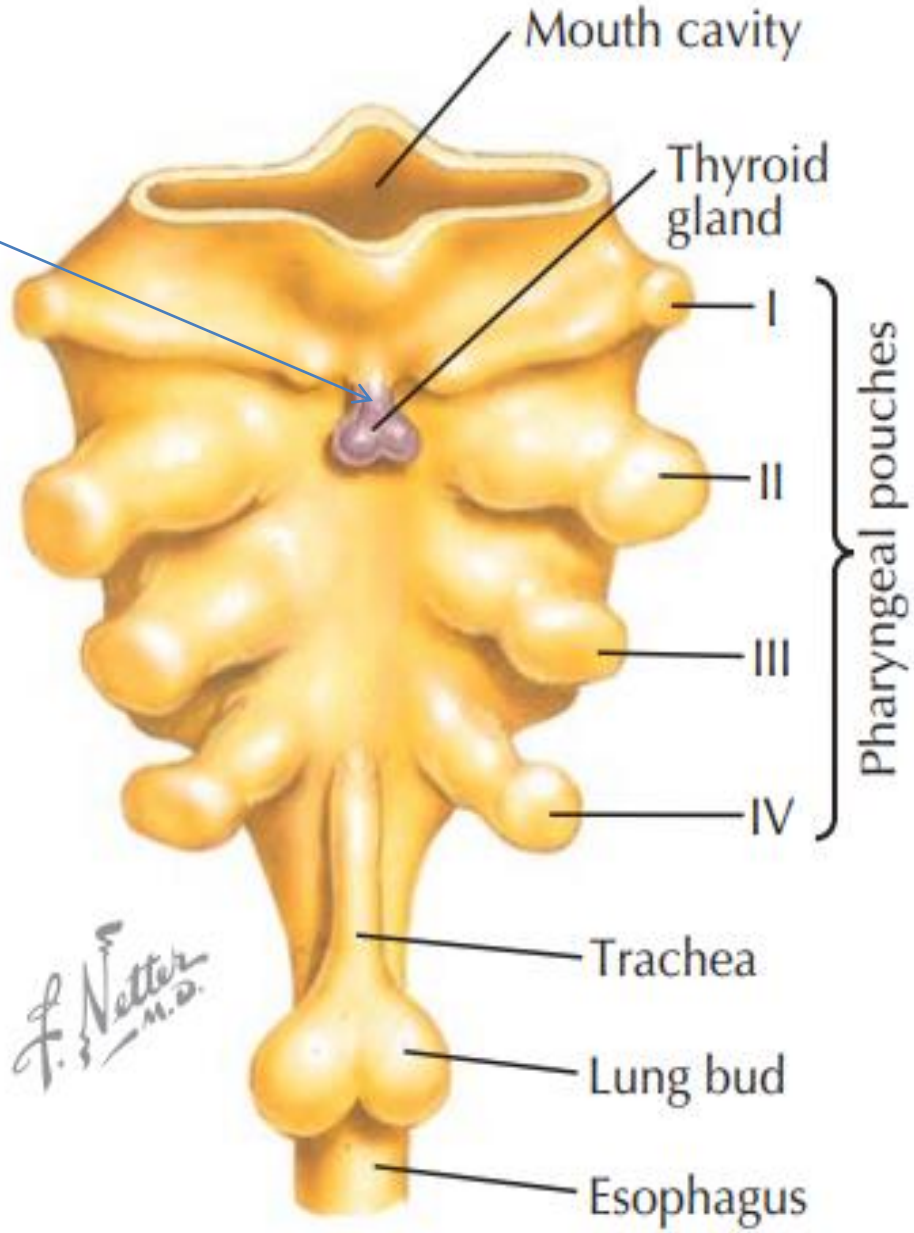

in the floor of the pharynx
Lateral lingual swelling
Tuberculum impar
Terminal sulcus
Palatine tonsil
Foramen cecum
Root of tongue
Copula (hypobranchial eminence
Epiglottal swelling

Read only

Thyroid Gland

1-begins to develop during the third week ***as an endodermal thickening*** in the floor of the pharynx between the **tuberculum impar** and **the copula** at a point later indicated by the **foramen cecum**

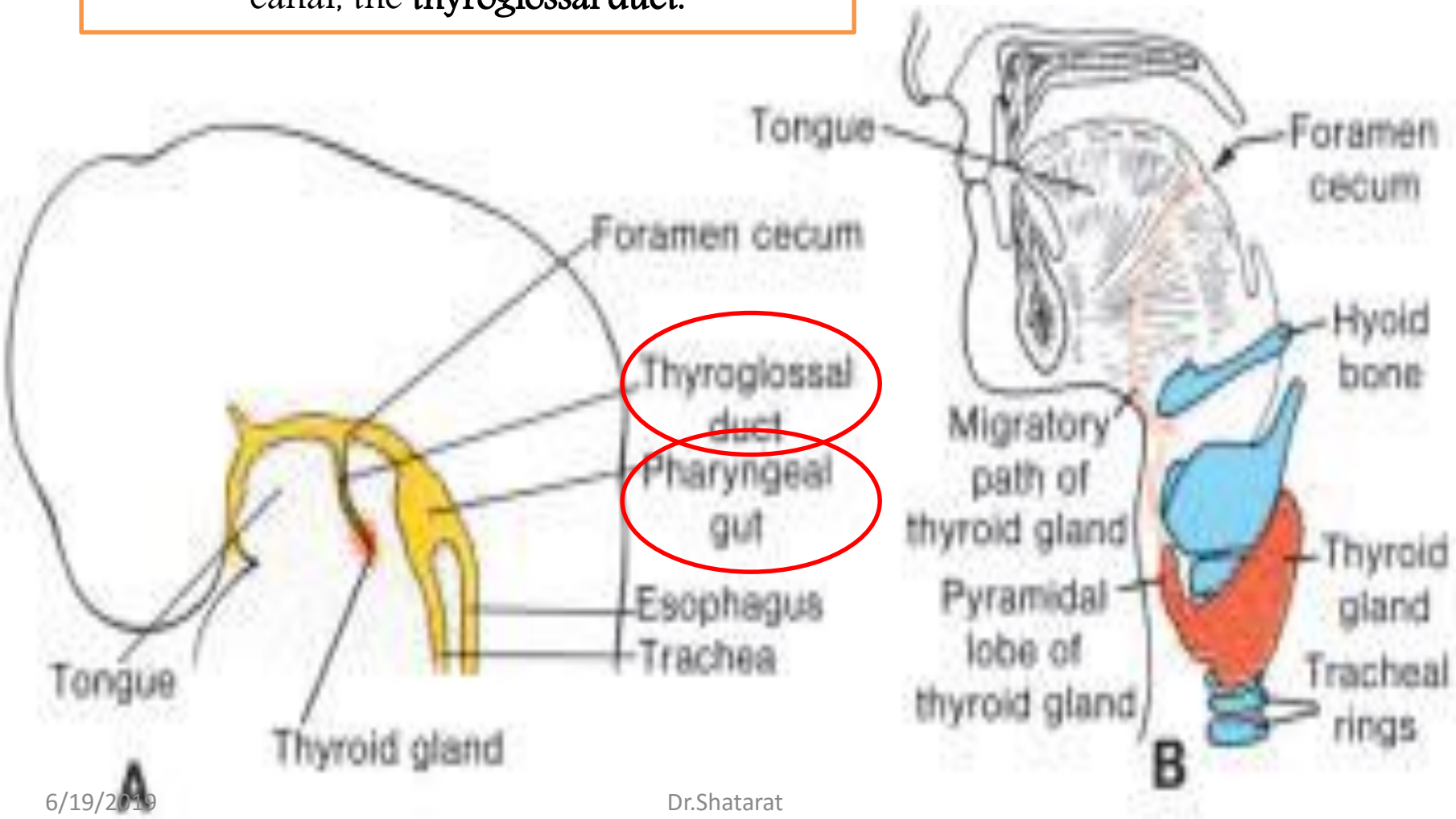




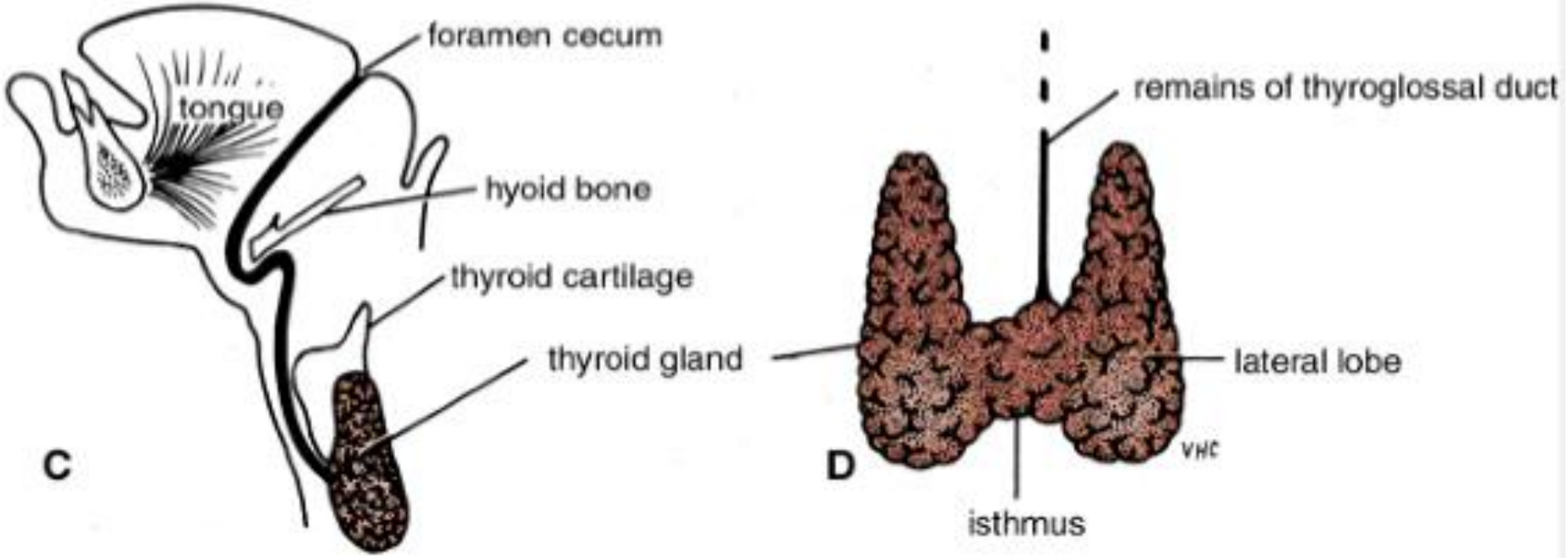
Pharynx (ventral view) 4th week

2- It descends in front of the pharyngeal gut as a bilobed diverticulum

3- During this migration, the thyroid remains connected to the tongue by a narrow canal, the **thyroglossal duct.**



4-As development continues, the duct elongates, and its distal end becomes bilobed. Soon, the duct becomes a solid cord of cells, and as a result of epithelial proliferation, the bilobed terminal swellings expand to form the thyroid gland



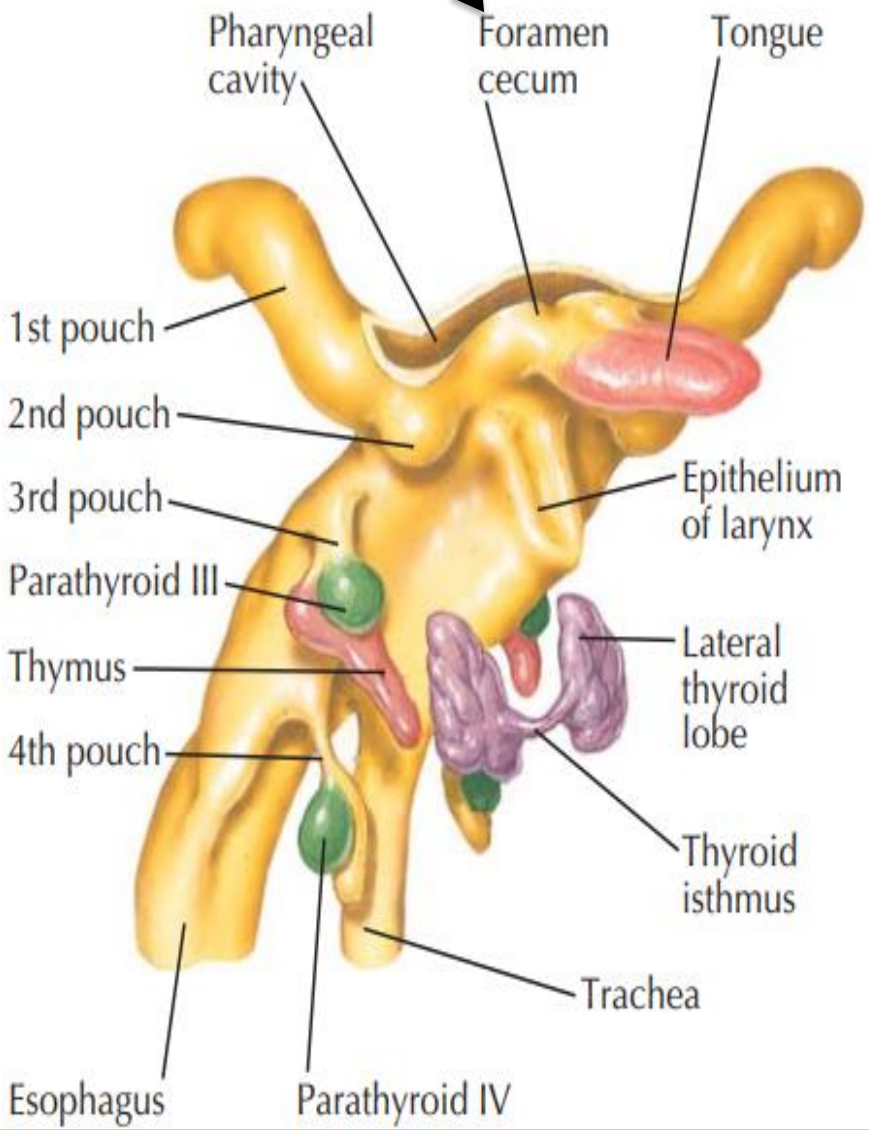
5-The thyroid gland now migrates inferiorly in the neck and passes either anterior to, posterior to, or through the developing body of the hyoid bone.

6-By the seventh week, it reaches its final position in relation to the larynx and trachea.

Meanwhile, the solid cord connecting the thyroid gland to the tongue fragments and disappears.

7-The site of origin of the thyroglossal duct on the tongue remains as a pit called **the foramen cecum**.

8-The thyroid gland may now be divided into a small median isthmus and two large lateral lobes



Pharynx and derivatives (between 6th and 7th weeks)

as we mentioned before, most glands have two different origins

Second origin of the thyroid gland

9-The ultimobranchial bodies (from the fifth pharyngeal pouch) and ***neural crest cells*** are believed to be incorporated into the thyroid gland, where they form the **parafollicular cells**, which produce calcitonin.

Congenital Anomalies of the Thyroid Gland

1-Agenesis of the Thyroid

Failure of development of the thyroid gland may occur and is the commonest cause of **cretinism**

2-Incomplete Descent of the Thyroid

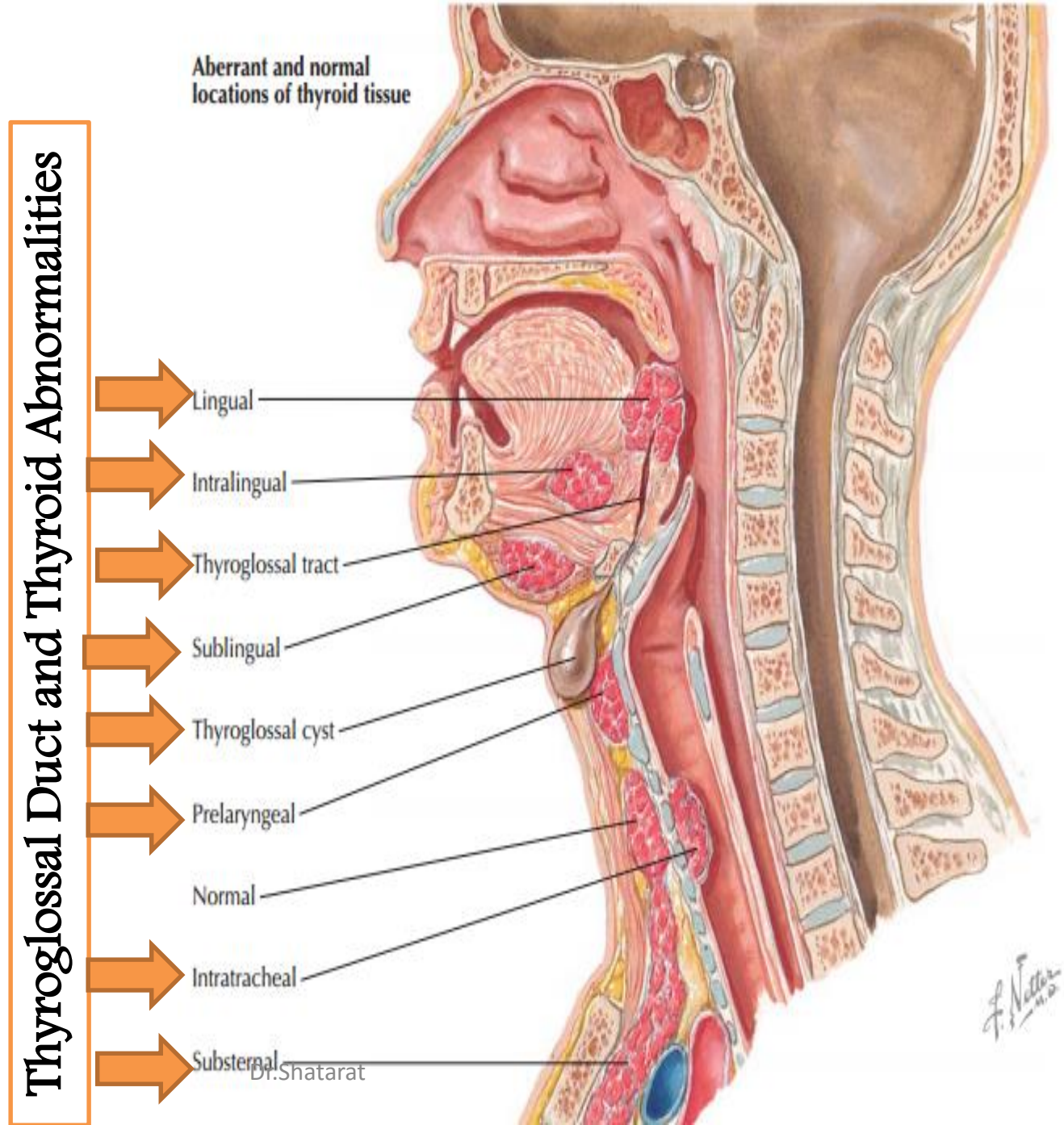
The descent of the thyroid may be arrested at any point between the base of the tongue and the trachea **Lingual thyroid is the most common form of incomplete** descent The mass of tissue

Lingual thyroid.

Aberrant thyroid tissue may be found anywhere along the path of descent of the thyroid gland. It is commonly found in the base of the tongue, just behind the foramen cecum, and is subject to the same diseases as the thyroid gland itself.

caution!!!
A mass in the posterior midline might be the only thyroid in the patient's body

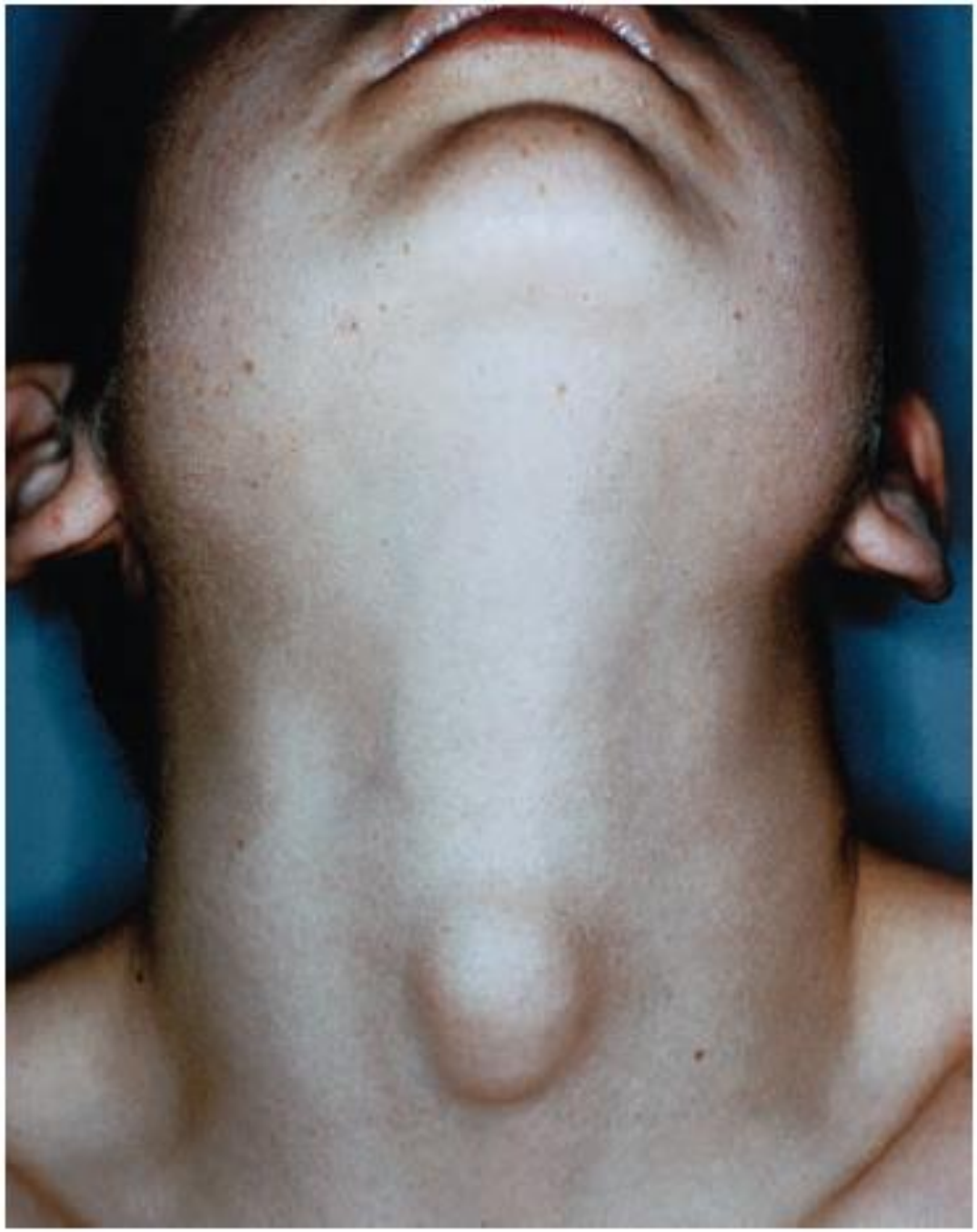
Thyroglossal Duct and Thyroid Abnormalities



3-Persistent Thyroglossal Duct

Conditions related to a persistence of the thyroglossal duct

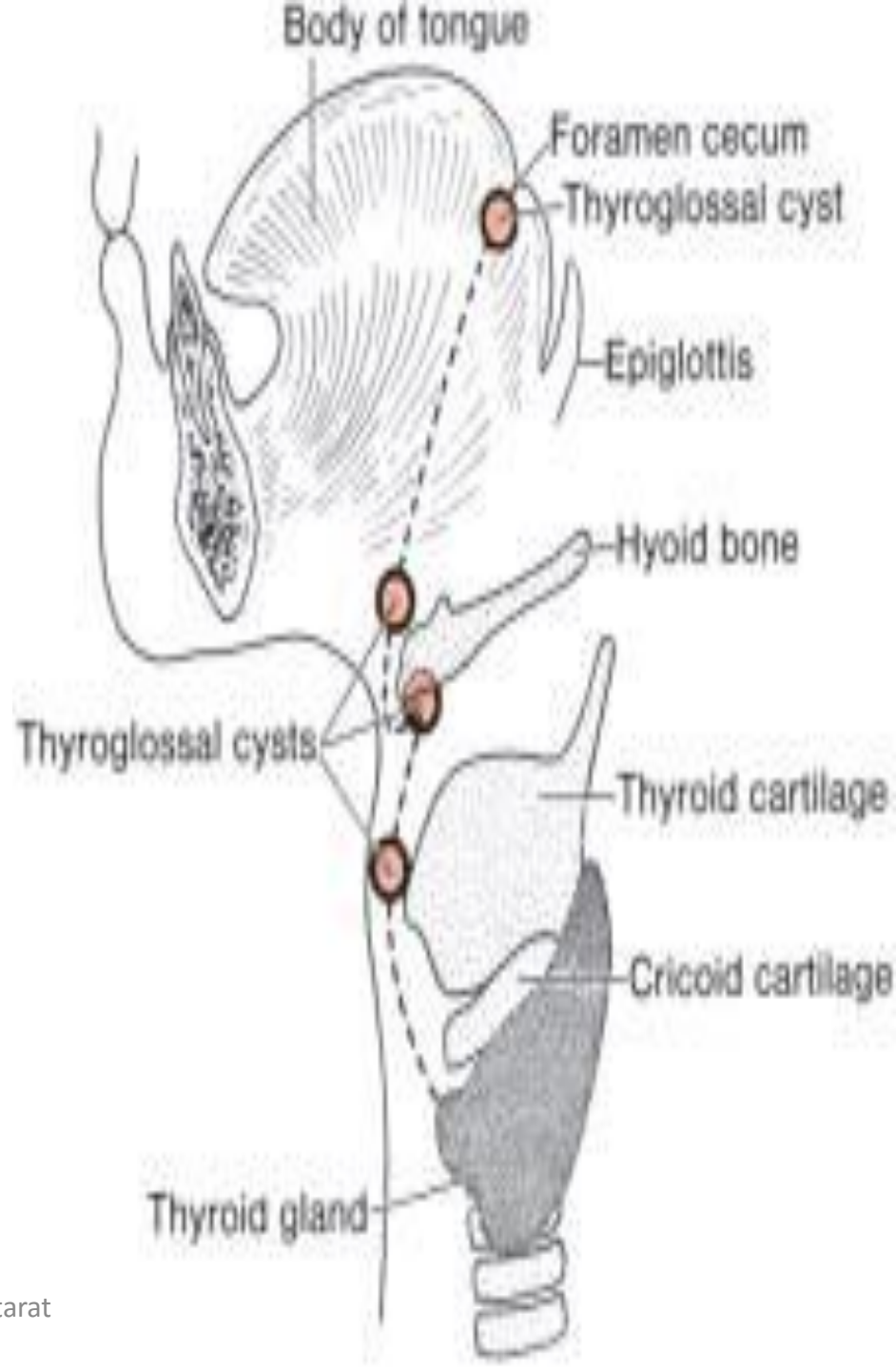
usually appear in childhood, in adolescence, or in young adulthood



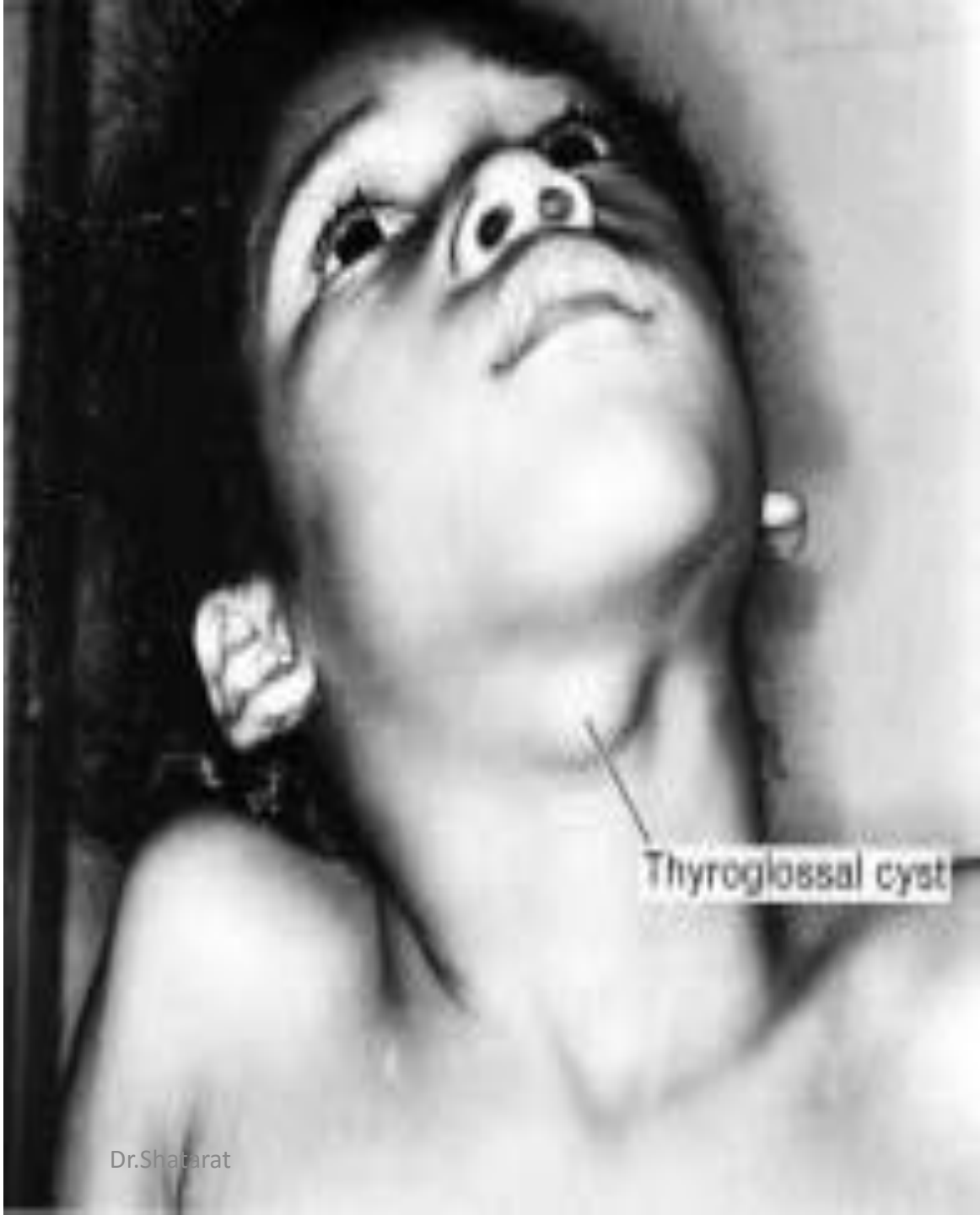
A thyroglossal cyst.

Thyroglossal Duct and Thyroid Abnormalities

A **thyroglossal cyst may lie at any point along the migratory pathway of the** thyroid gland but is always near or in ***the midline of the neck*** by its name, it is a cystic remnant of the thyroglossal duct, Although approximately 50% of these cysts are close to or just inferior to the body of the hyoid bone they may also ***be found at the base of the tongue*** or close ***to the thyroid cartilage***. Sometimes a ***thyroglossal cyst is connected to the outside by a fistulous canal***, a **thyroglossal fistula. Such a fistula usually** arises secondarily after rupture of a cyst but may be present at birth.



Thyroglossal cyst. These cysts, which are remnants of the thyroglossal duct, may be anywhere along the migration pathway of the thyroid gland. They are commonly found behind the arch of the hyoid bone. An important diagnostic characteristic is their **midline location.**



Branchial Fistulas

lateral

cervical
cyst

Branchial fistulas occur when the second pharyngeal arch fails to grow caudally over the third and fourth arches, leaving remnants of the second, third, and fourth clefts in contact with the surface by a narrow canal.

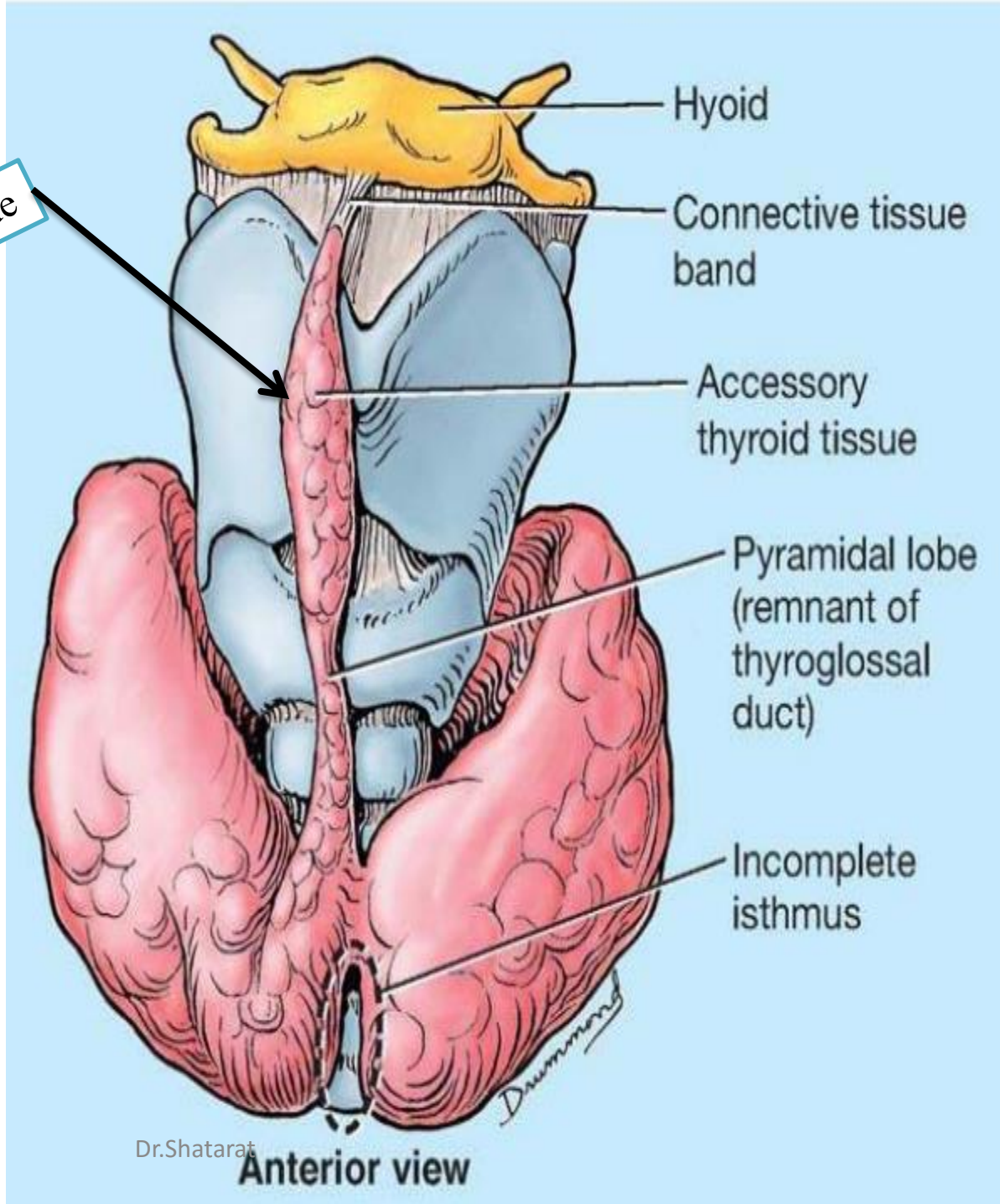
Such a fistula, found on the lateral aspect of the neck directly anterior to the **sternocleidomastoid muscle, usually provides drainage for a lateral cervical cyst** ***These cysts, remnants of the cervical sinus, are most often*** just below the angle of the jaw

Frequently a lateral cervical cyst is not visible at birth but becomes evident as it enlarges during childhood.

Patient with a lateral cervical cyst. These cysts are always on the ***lateral*** side of the neck in front of the sternocleidomastoid muscle. They commonly lie under the angle of the mandible and do not enlarge until later in life.

4-Thyroglossal Sinus (Fistula)
Occasionally, a thyroglossal cyst ruptures spontaneously,
producing a sinus). Usually, this is a result of an infection of a cyst. All remnants of the thyroglossal
duct should be removed surgically

5-Accessory Thyroid Tissue



Radiology

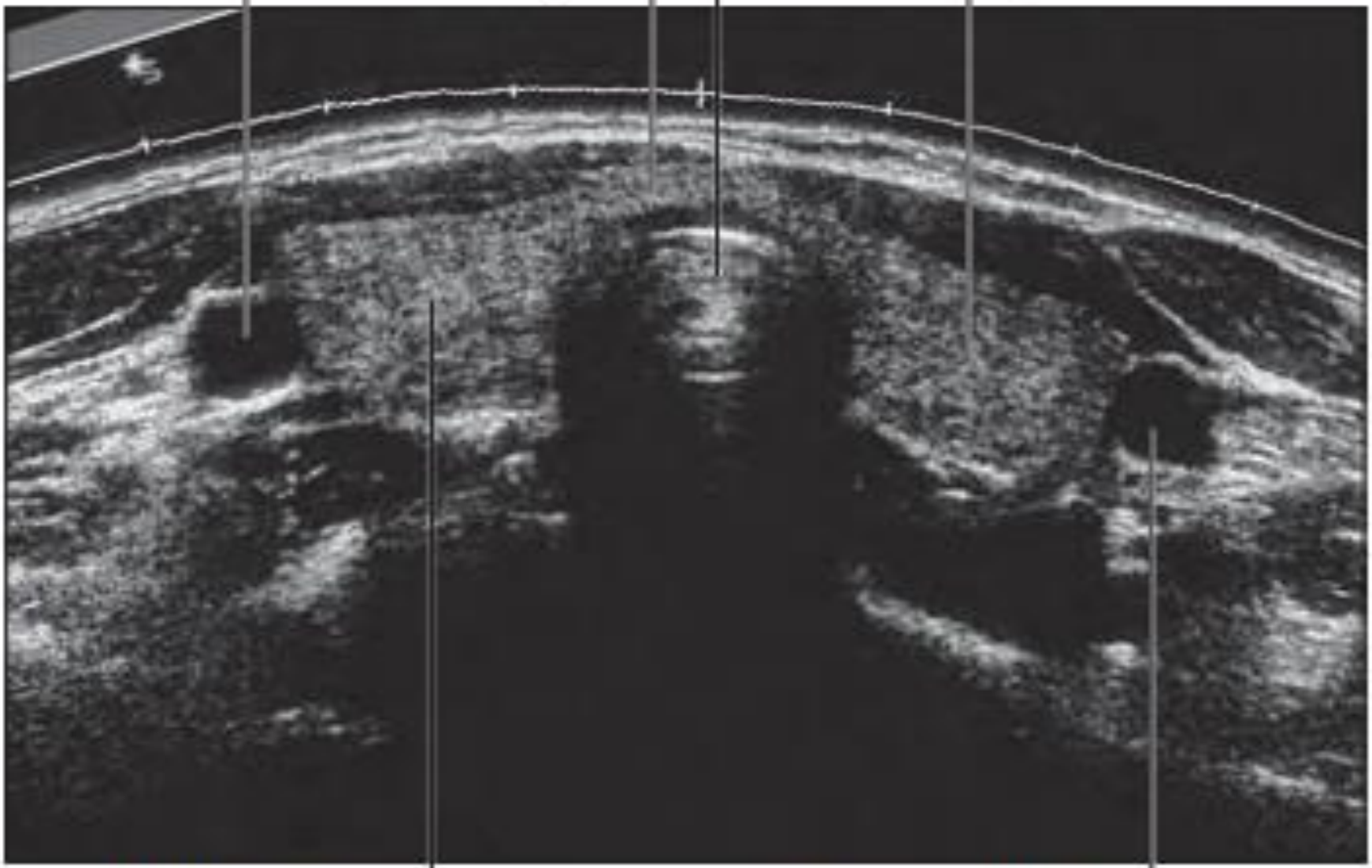


Fig. 28.20 Thyroid sonogram.

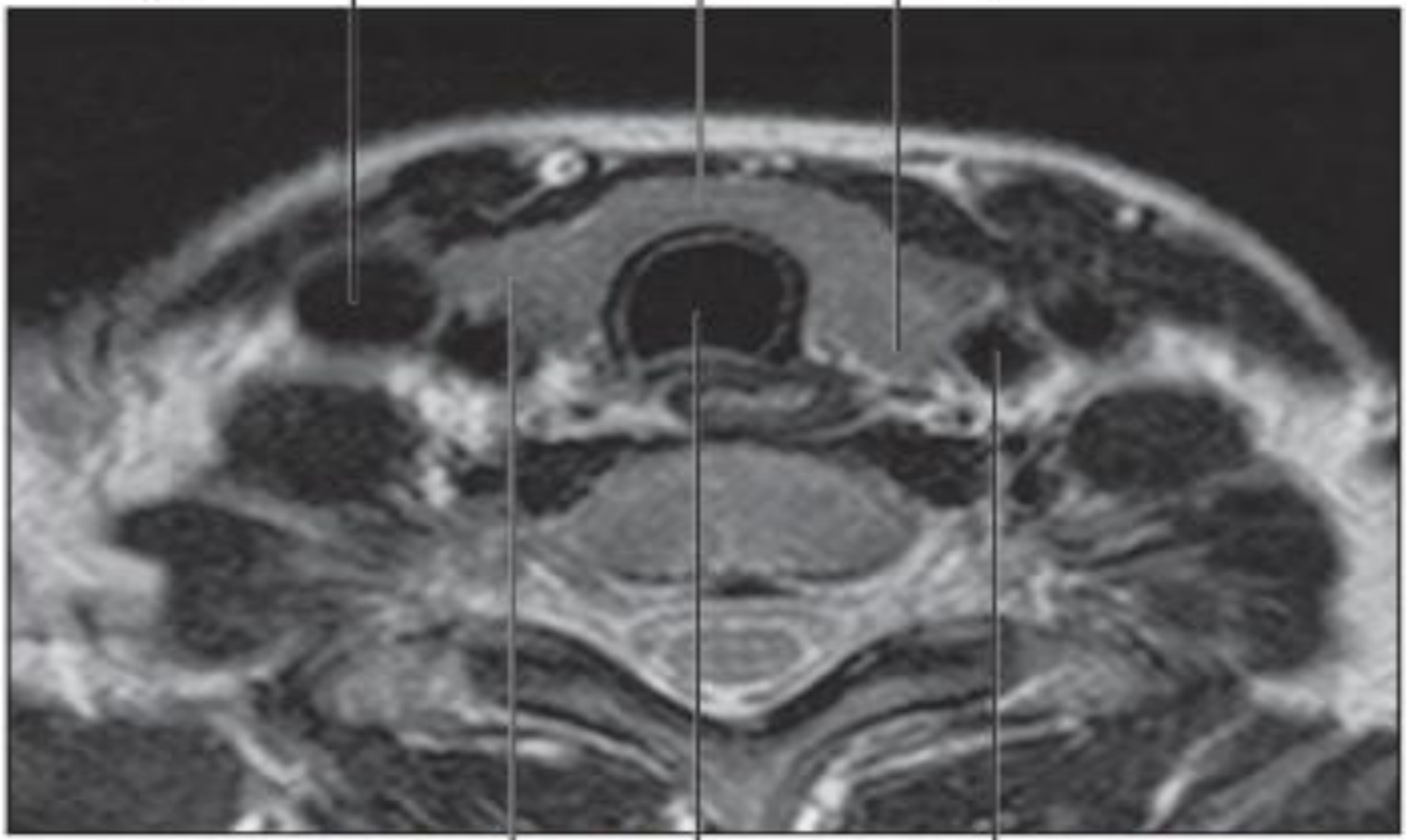
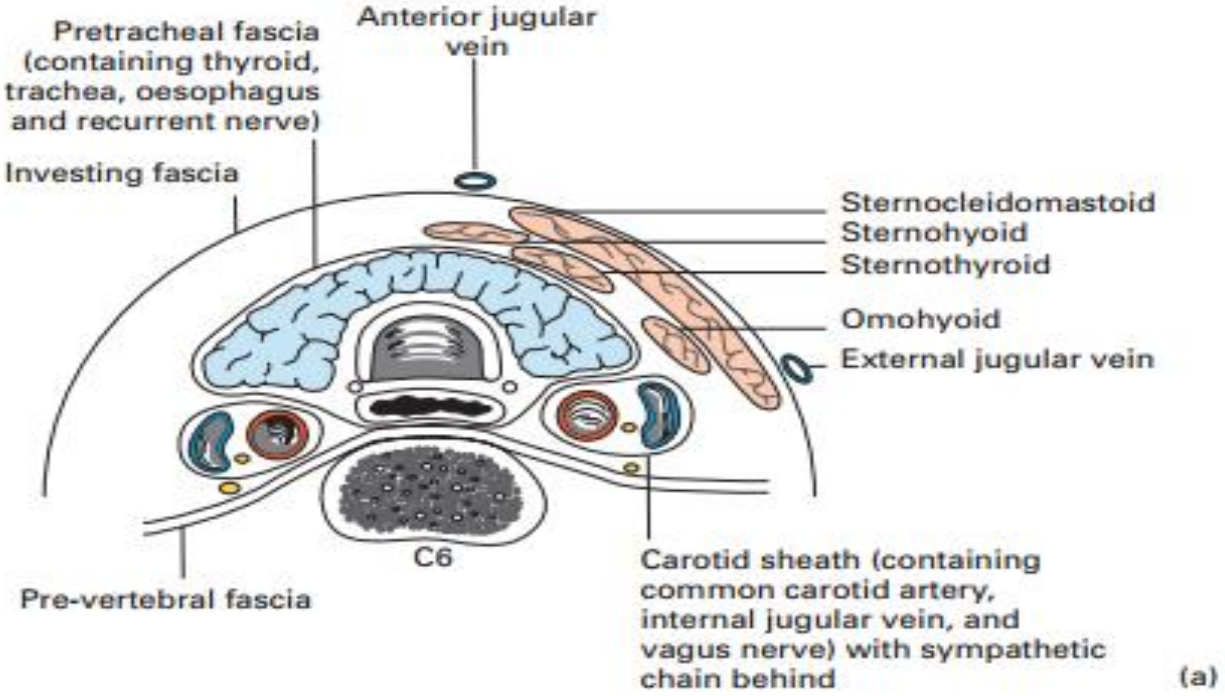


Fig. 28.21 T_2-weighted MRI at the level of the thyroid isthmus: compare with **Fig. 28.20.**



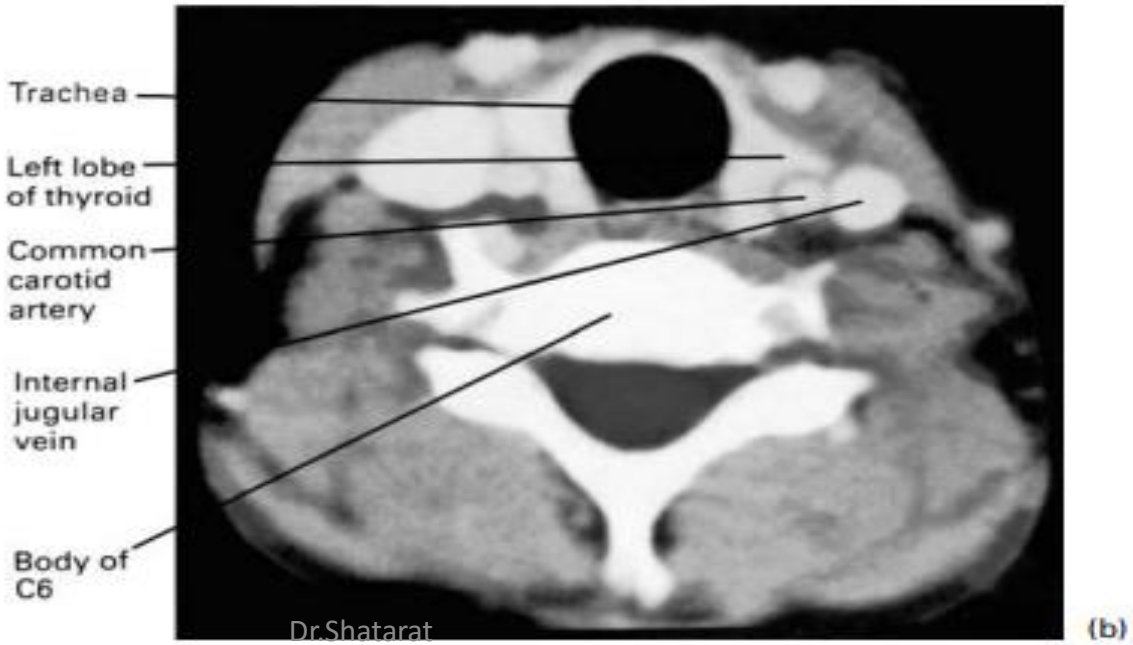


Fig. 188 (a) Transverse section of the neck through C6—showing the fascial planes and also the contents of the pretracheal fascia (or 'visceral compartment of the neck'). (b) CT scan through the C6 level; compare this with the diagram.

Metastatic disease to the thyroid is common; it likely
relates to its rich blood supply of approximately 560 mL/100 g tissue/min (a flow rate per gram of tissue
that is second only to the adrenal glands)


The End