

# Respiratory system

# Respiratory system

## **1- Introduction**

**2- Nose**

**3- Pharynx**

**4- Larynx**

**5- Trachea and bronchi**

**6- Pleurae**

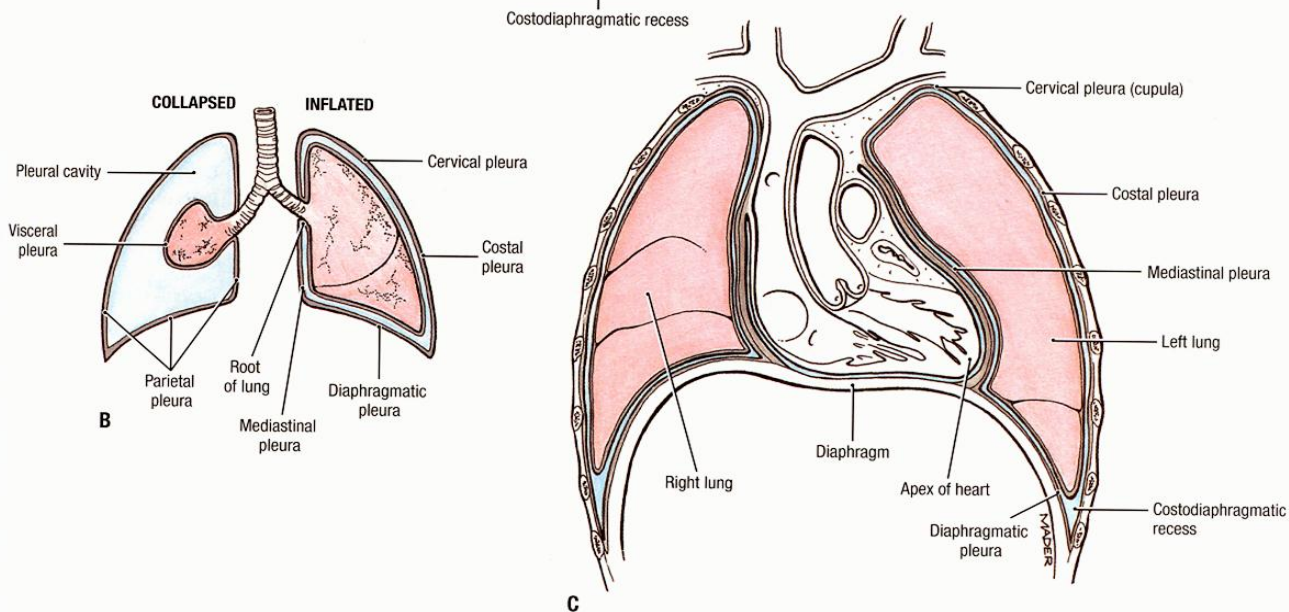
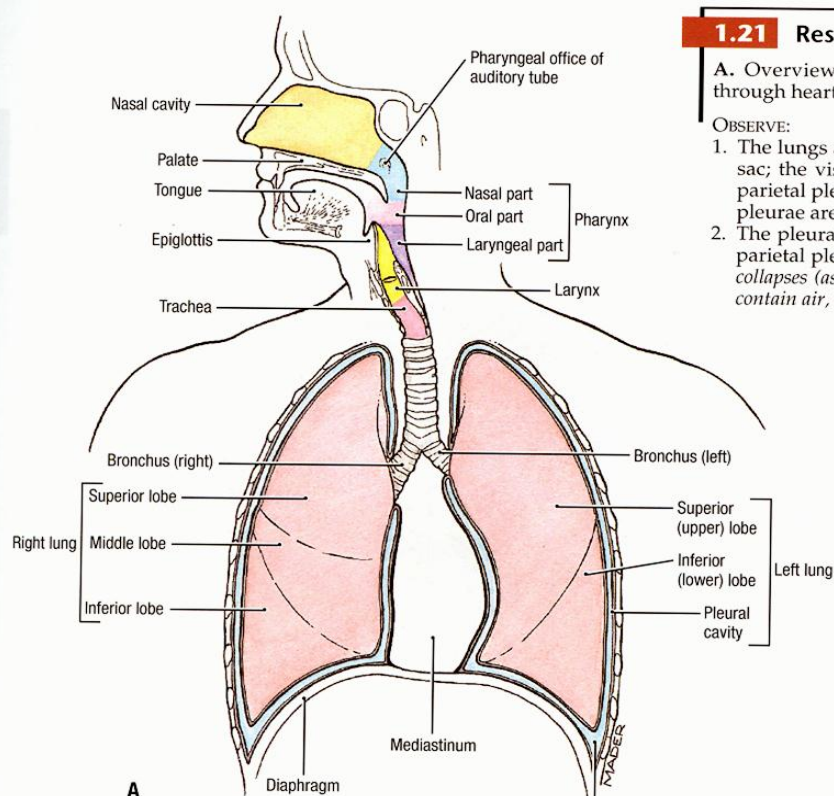
**7- Pulmons**

## 1.21 Respiratory system

A. Overview. B. Pleural cavity and pleura C. Coronal section through heart and lungs.

OBSERVE:

1. The lungs are invaginated by a continuous membranous pleural sac; the visceral (pulmonary) pleura covers the lungs, and the parietal pleura lines the thoracic cavity. The visceral and parietal pleurae are continuous at the root of the lung;
2. The pleural cavity is a potential space between the visceral and parietal pleurae that contains a thin layer of fluid. *When the lung collapses (as in B), the pleural cavity becomes a "real" space and may contain air, blood, etc.*
3. The left pleural cavity is smaller than the right because of the projection of the heart into the left side;
4. The parietal pleura can be divided regionally into the costal, diaphragmatic, mediastinal, and cervical pleura; note the costomediastinal recess between the costal and diaphragmatic parietal pleura.



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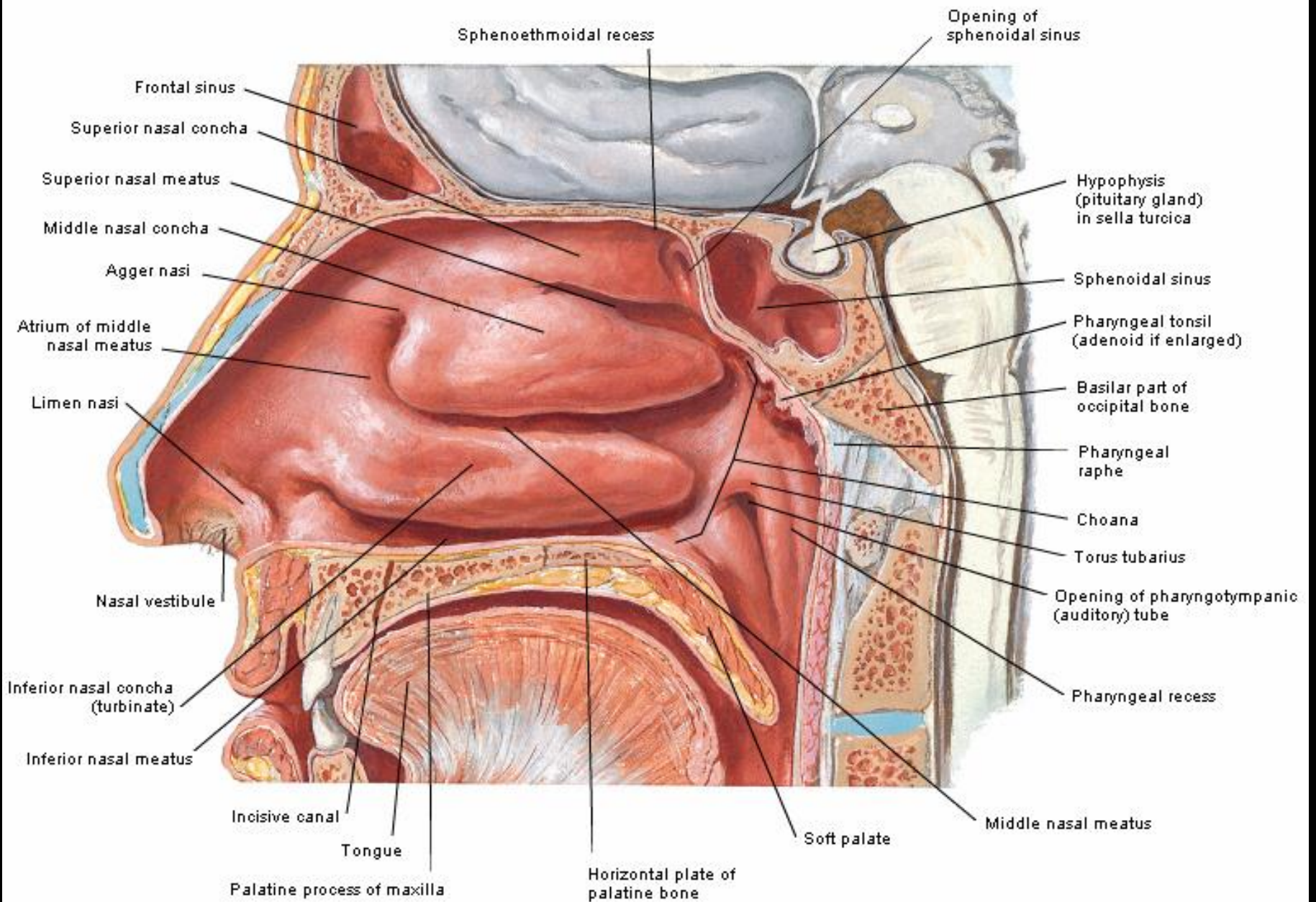
**3- Pharynx**

**4- Larynx**

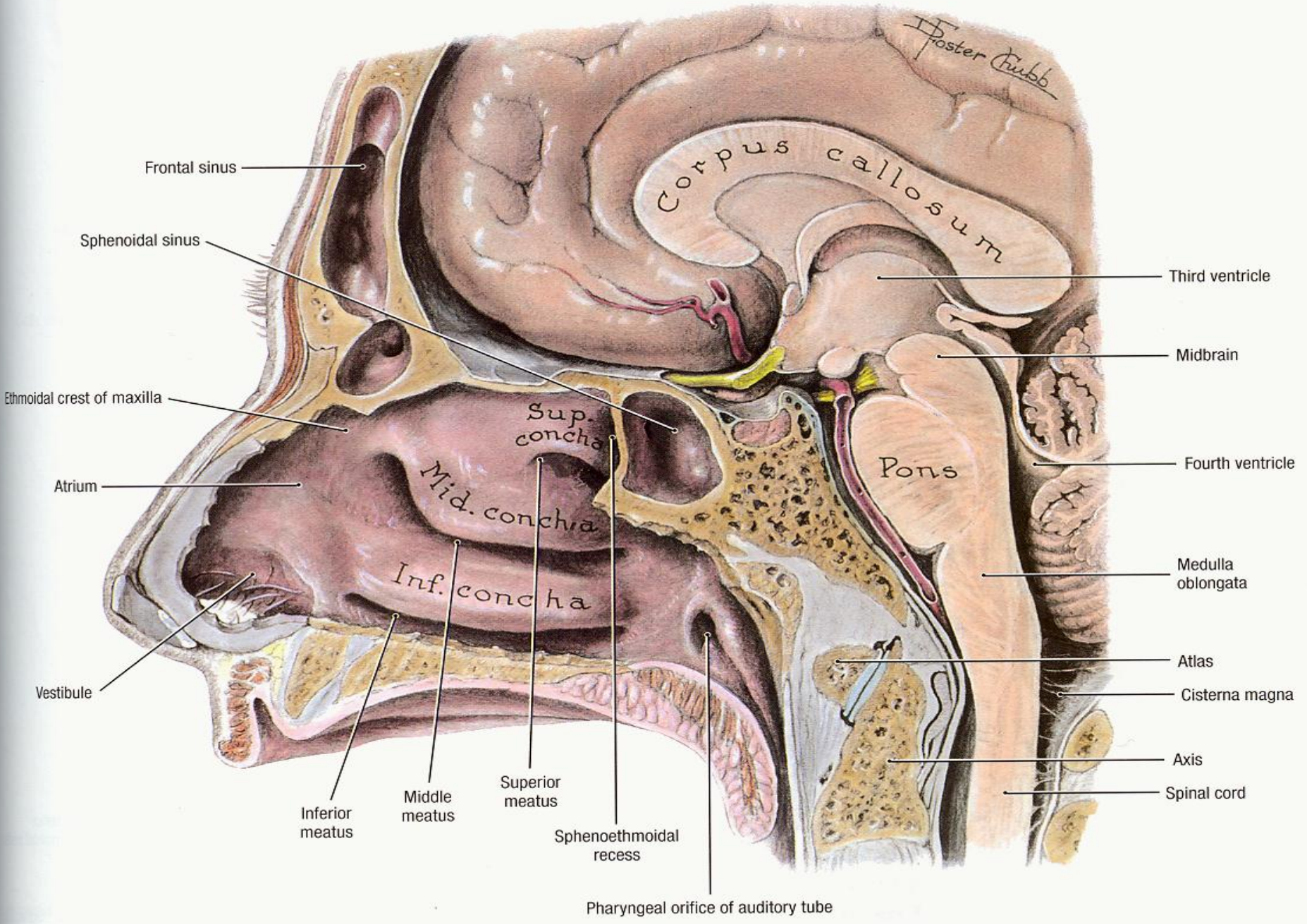
**5- Trachea and bronchi**

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*Poster Grubb*



Frontal sinus

Sphenoidal sinus

Ethmoidal crest of maxilla

Atrium

Vestibule

Inferior meatus

Middle meatus

Superior meatus

Sphenoethmoidal recess

Pharyngeal orifice of auditory tube

Corpus callosum

Sup. concha

Mid. concha

Inf. concha

Pons

Third ventricle

Midbrain

Fourth ventricle

Medulla oblongata

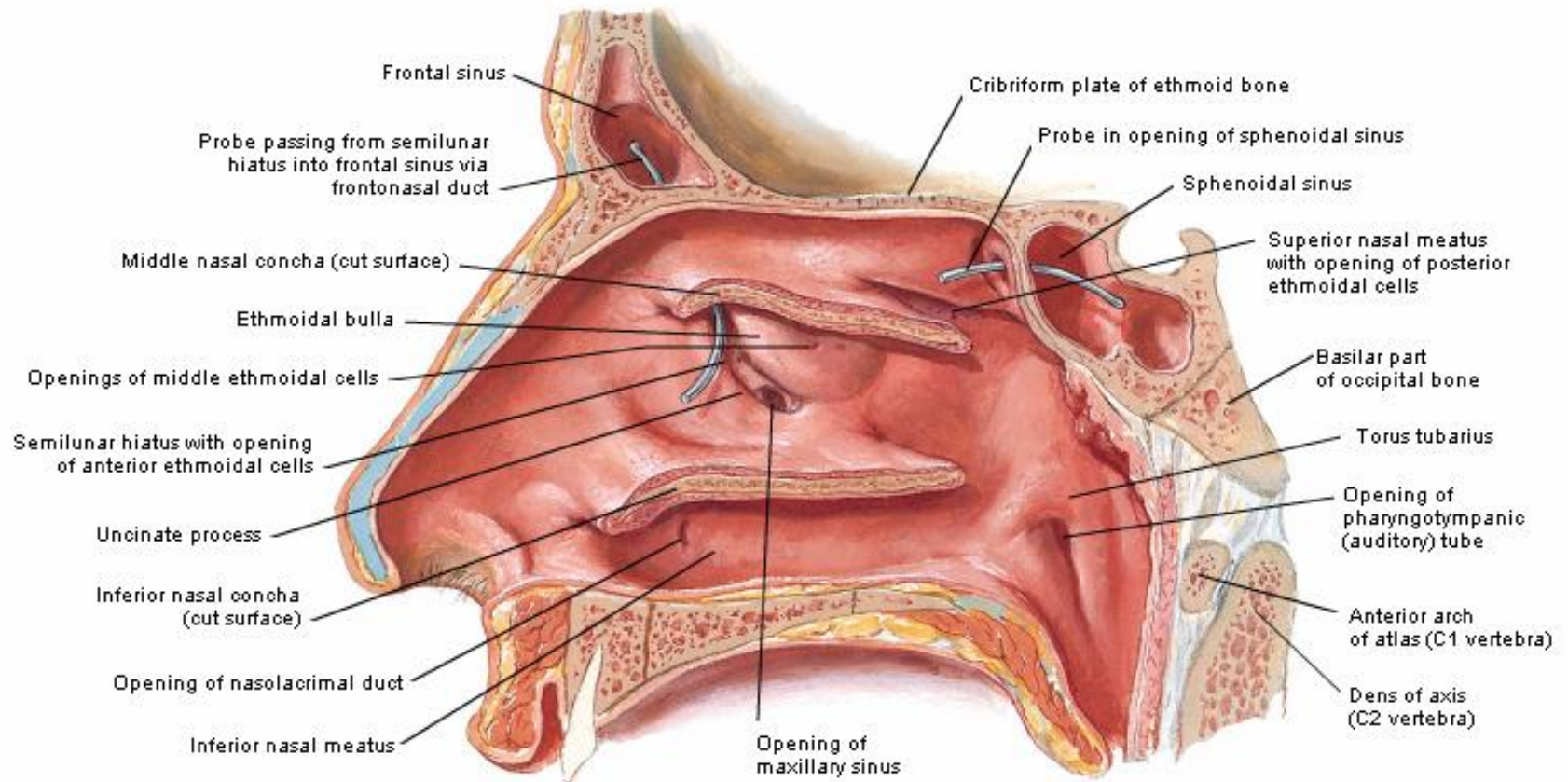
Atlas

Cisterna magna

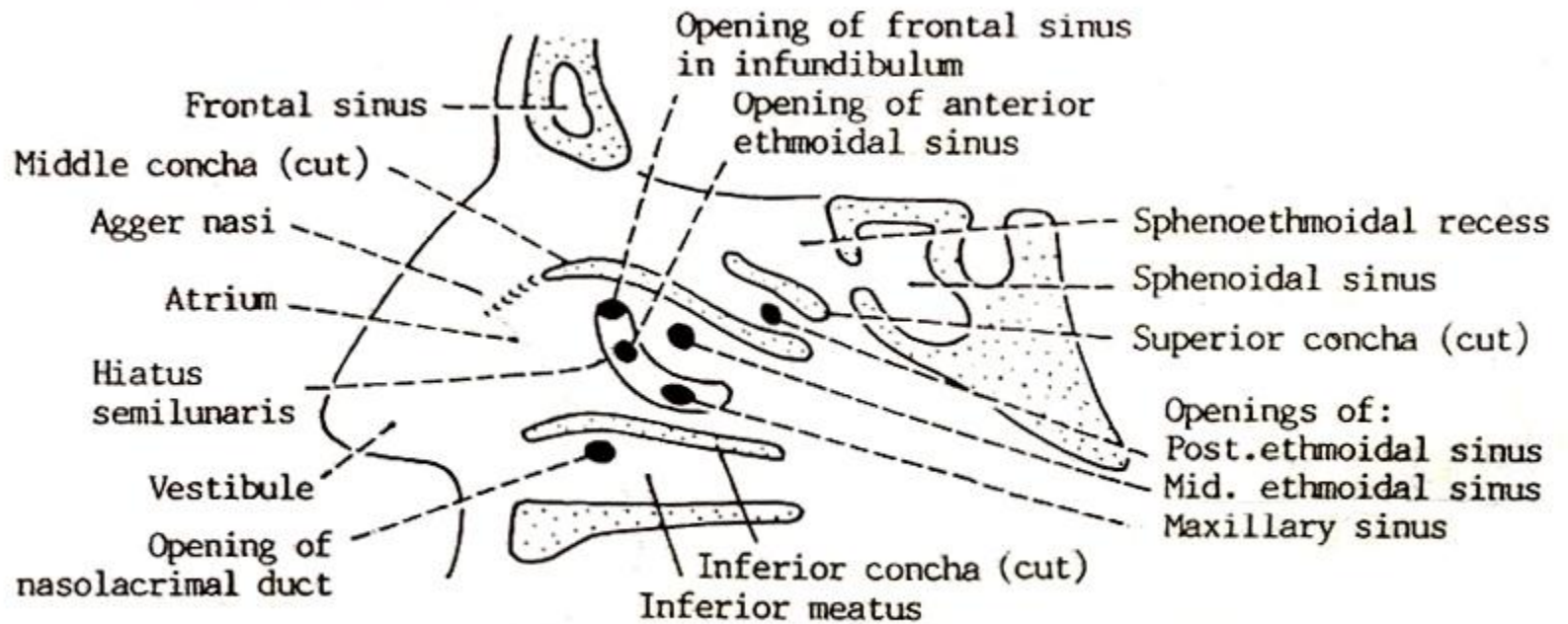
Axis

Spinal cord

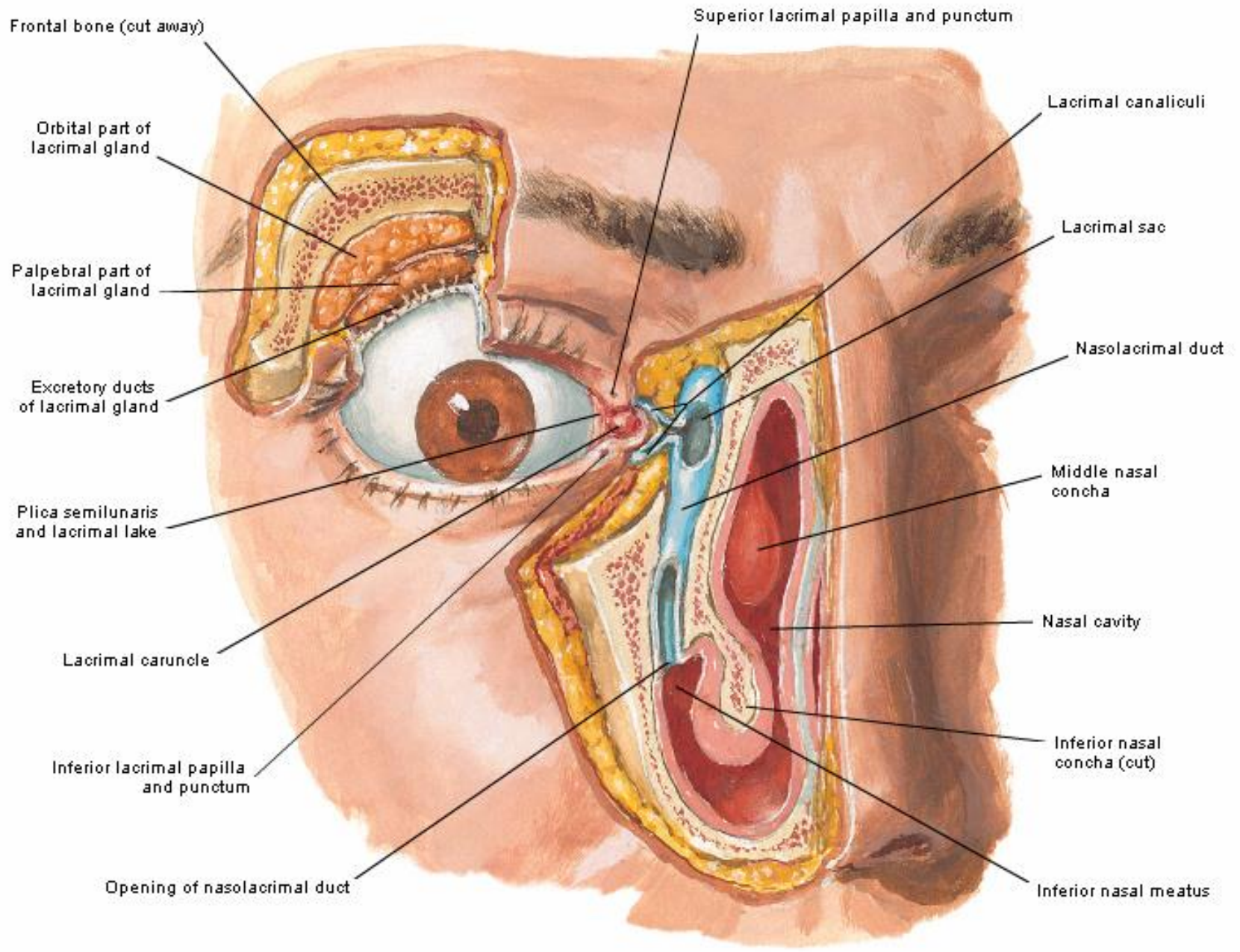
# Lateral Wall of Nasal Cavity - Nasal Conchae Removed





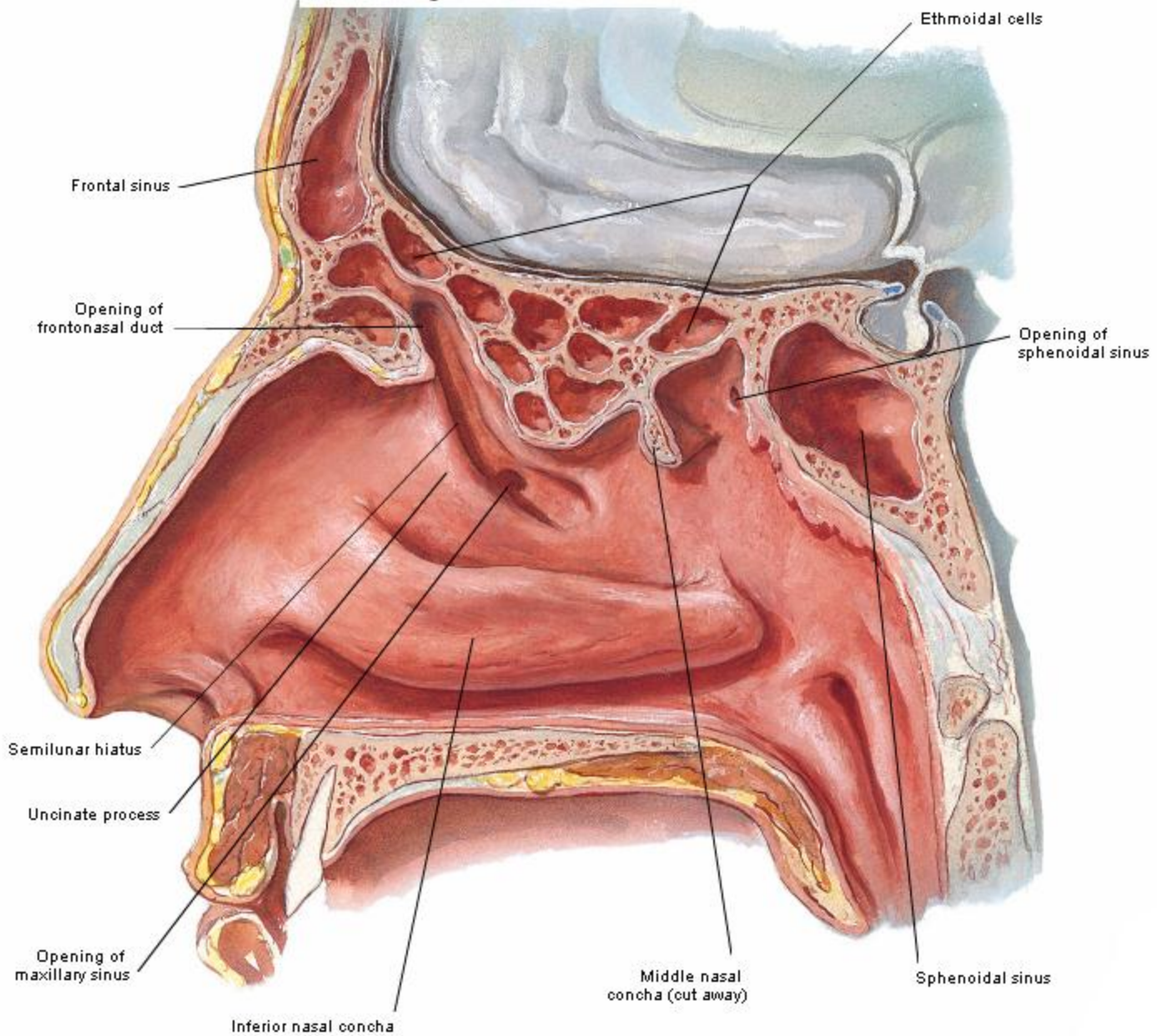


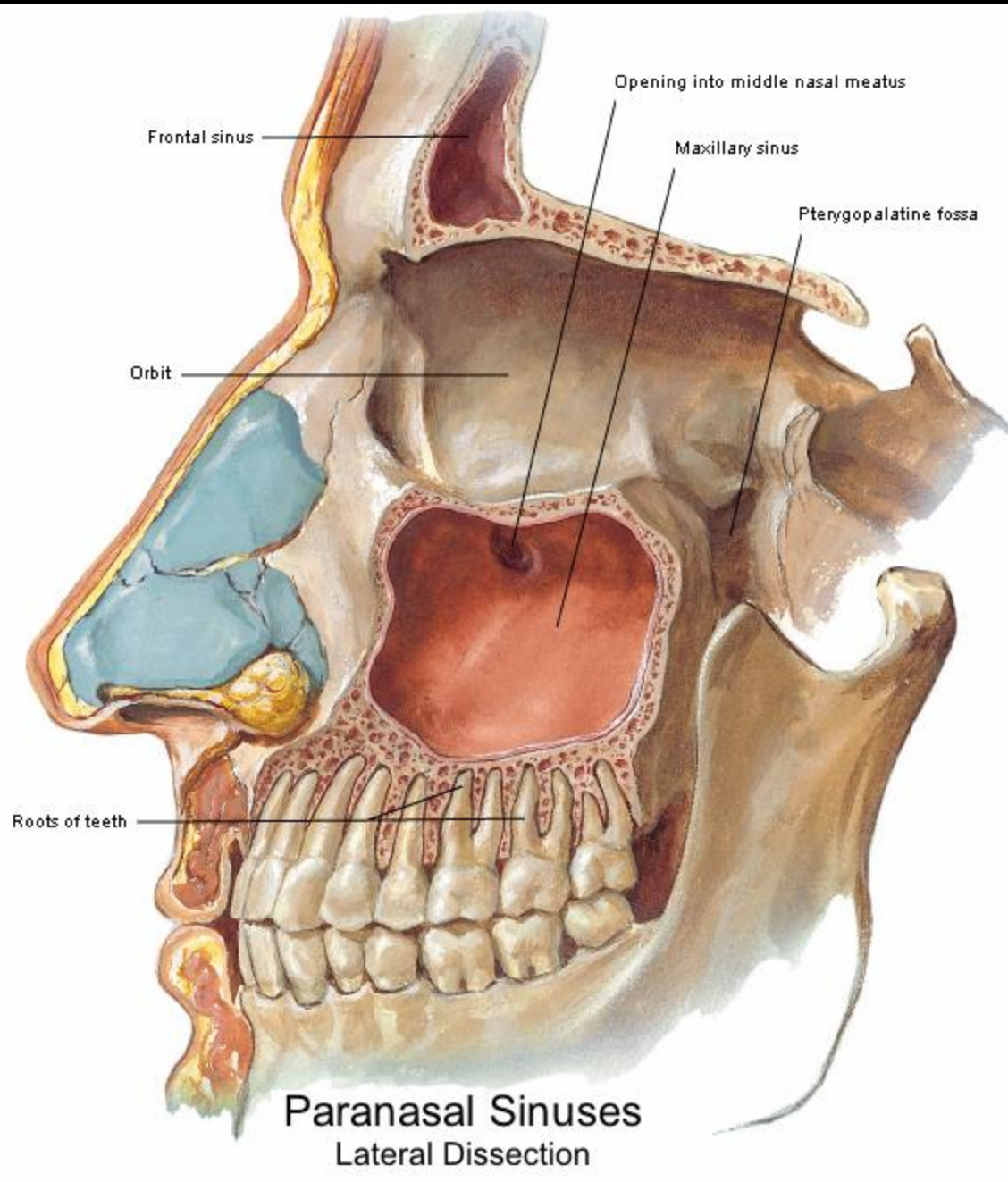
Lateral wall of the nose seen after removing the conchae.

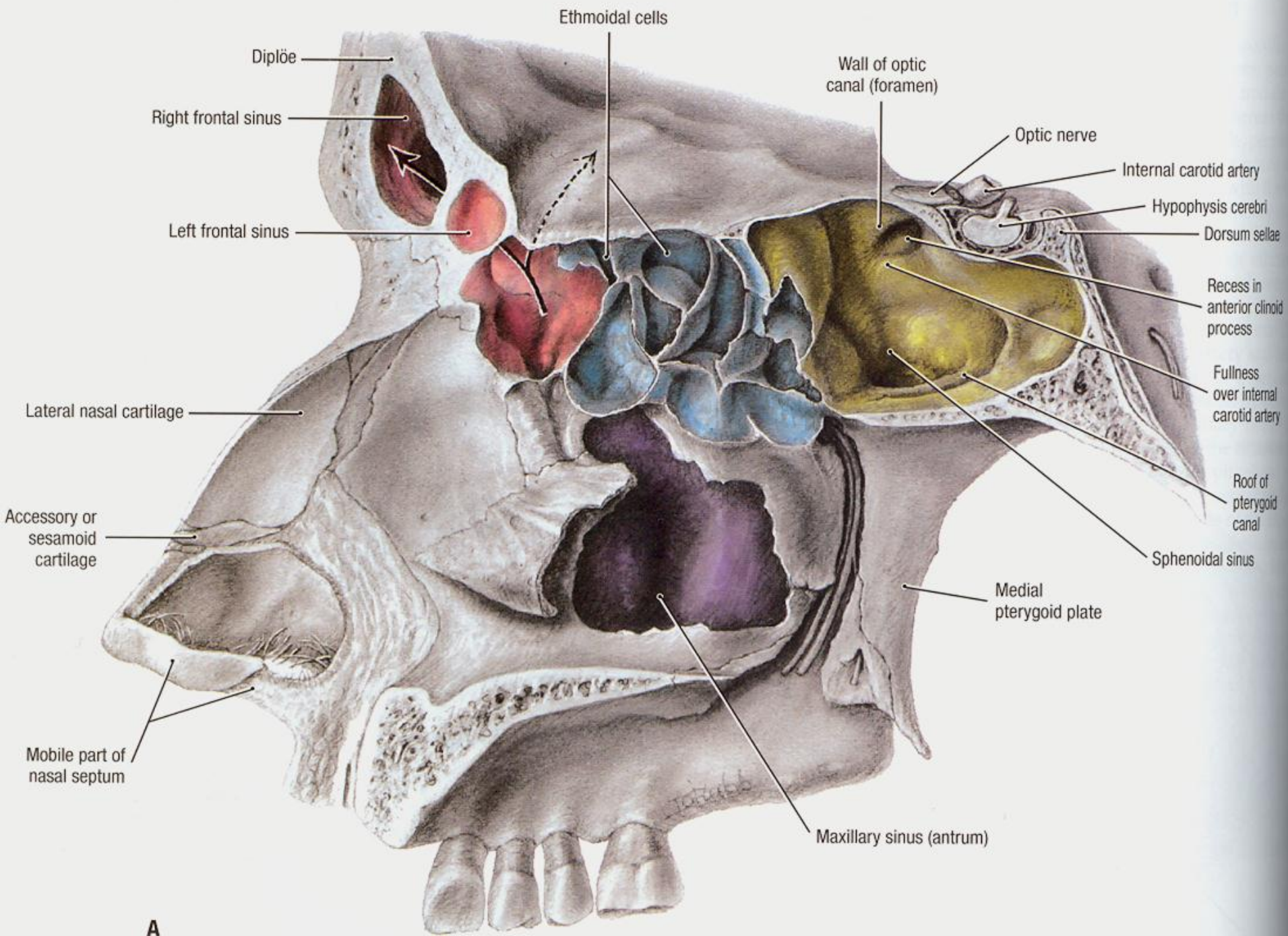


# Paranasal Sinuses

## Sagittal Section

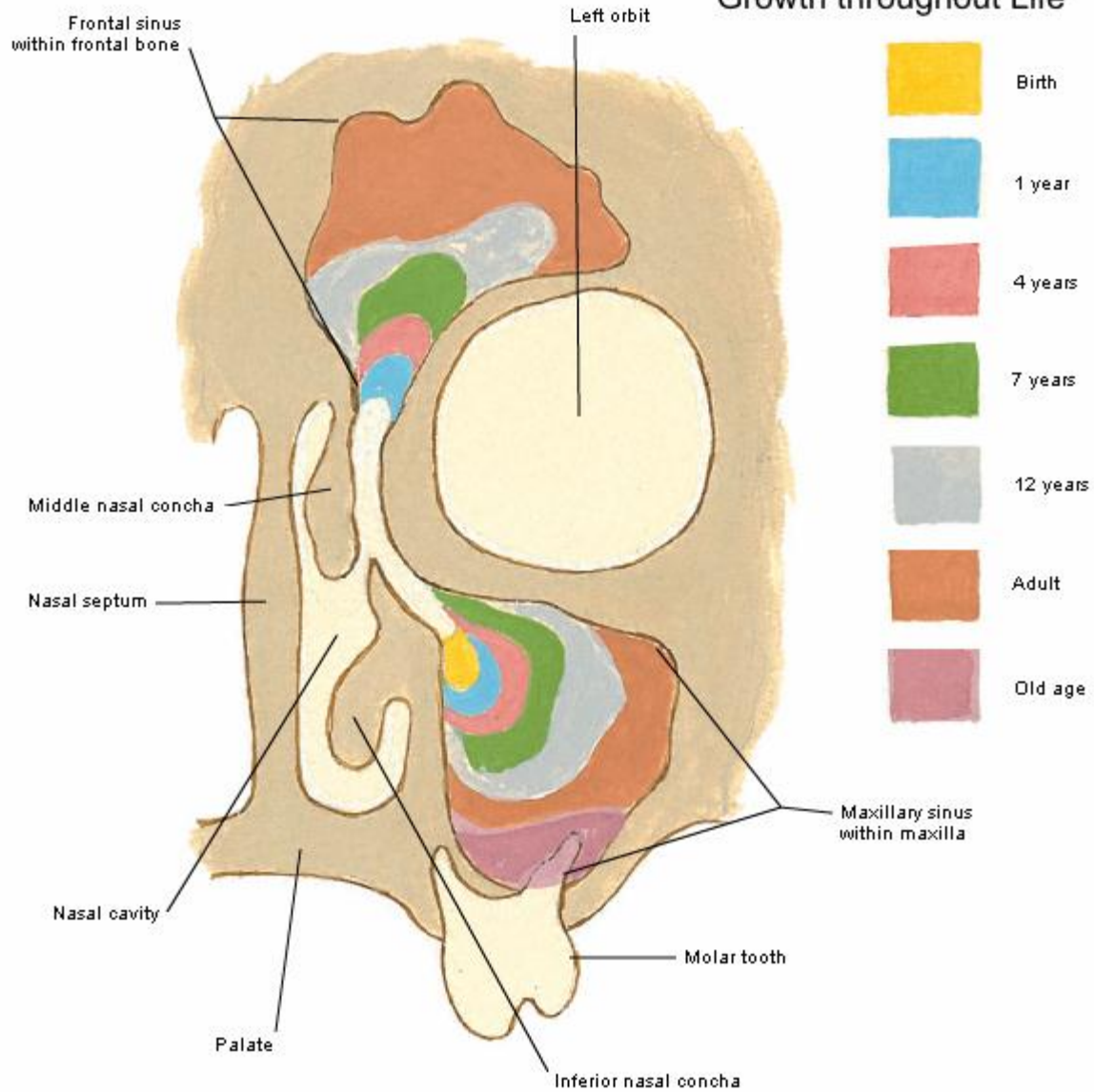




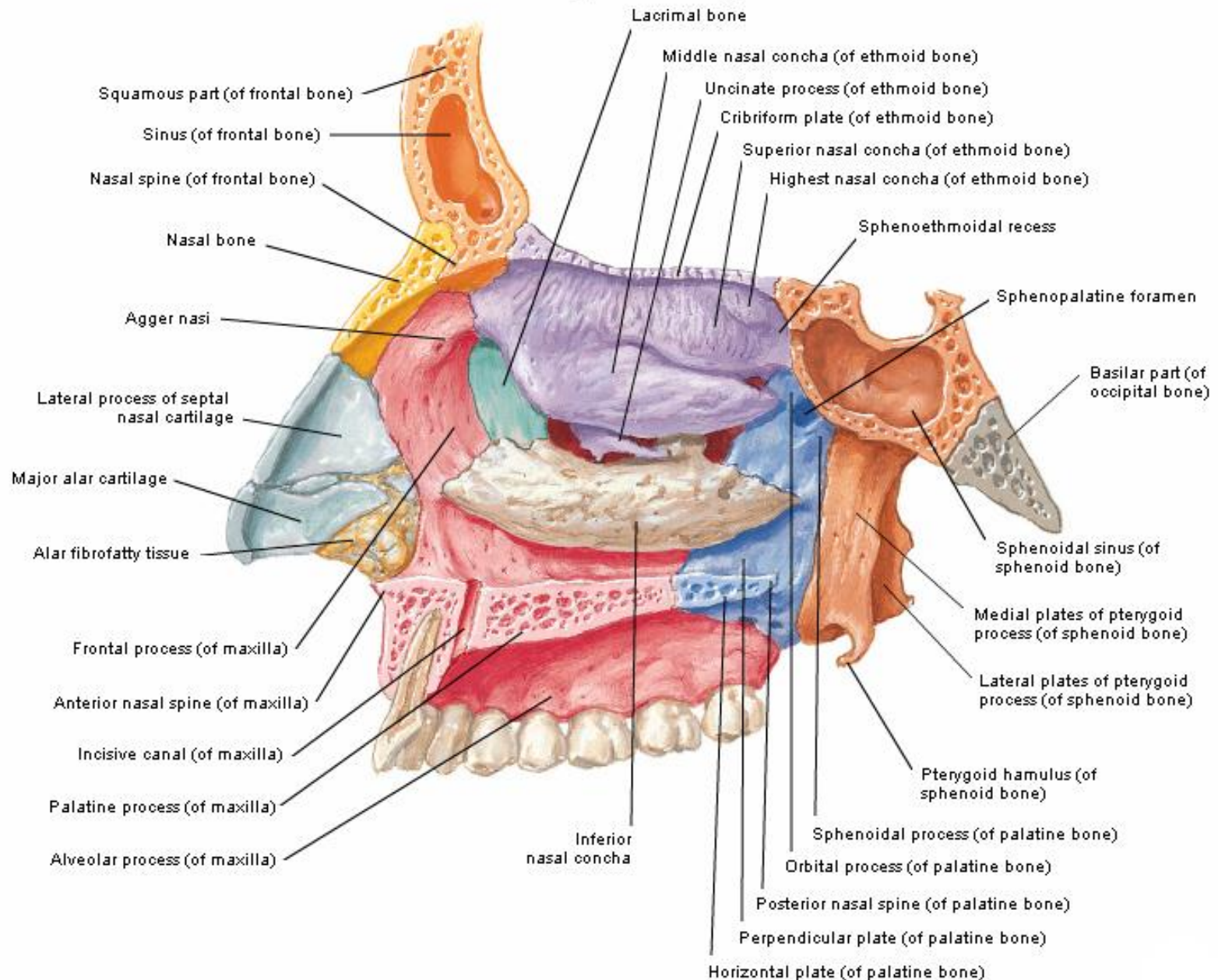


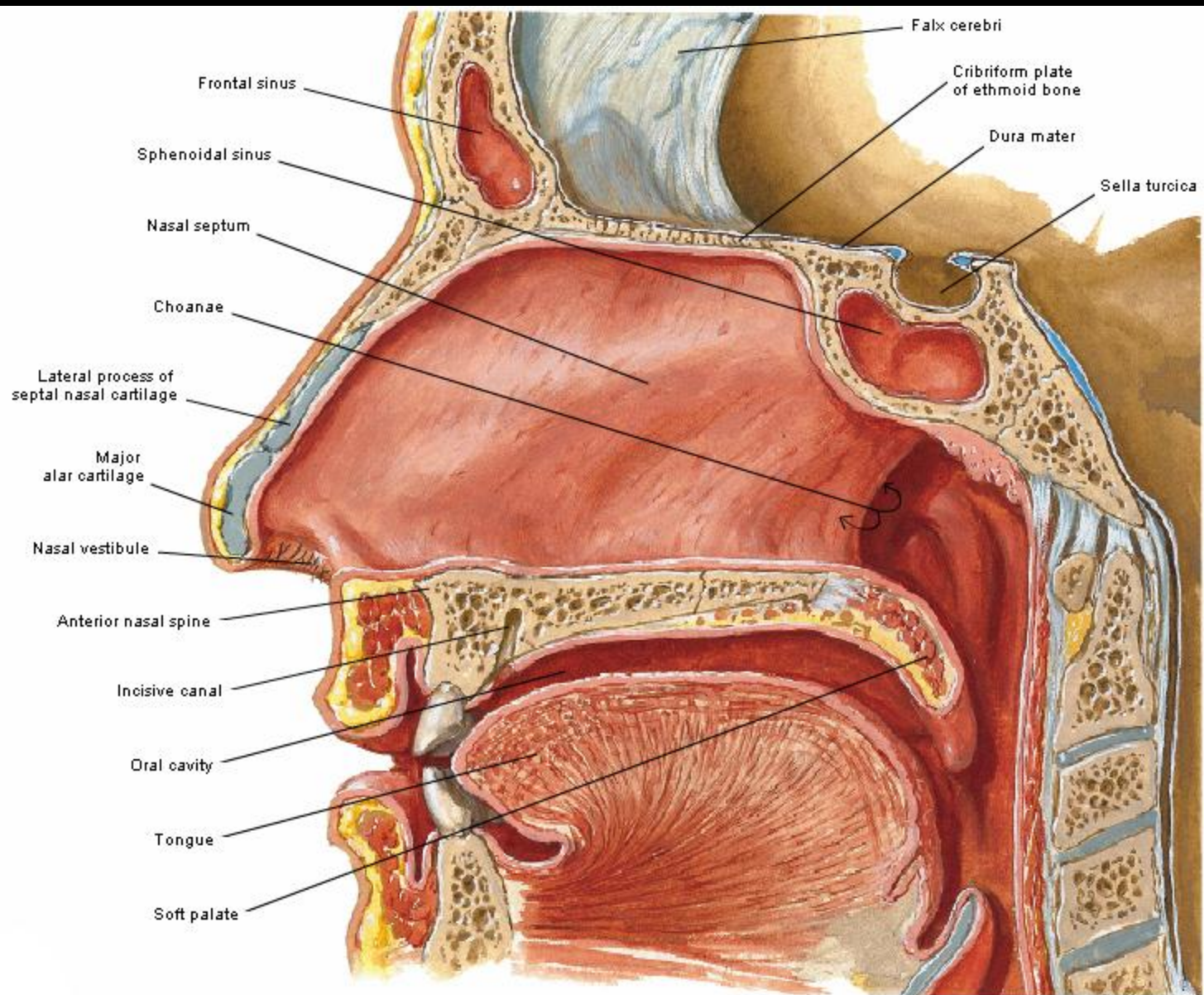
# Paranasal Sinuses

## Growth throughout Life



# Lateral Wall of Nasal Cavity - Bony Structure

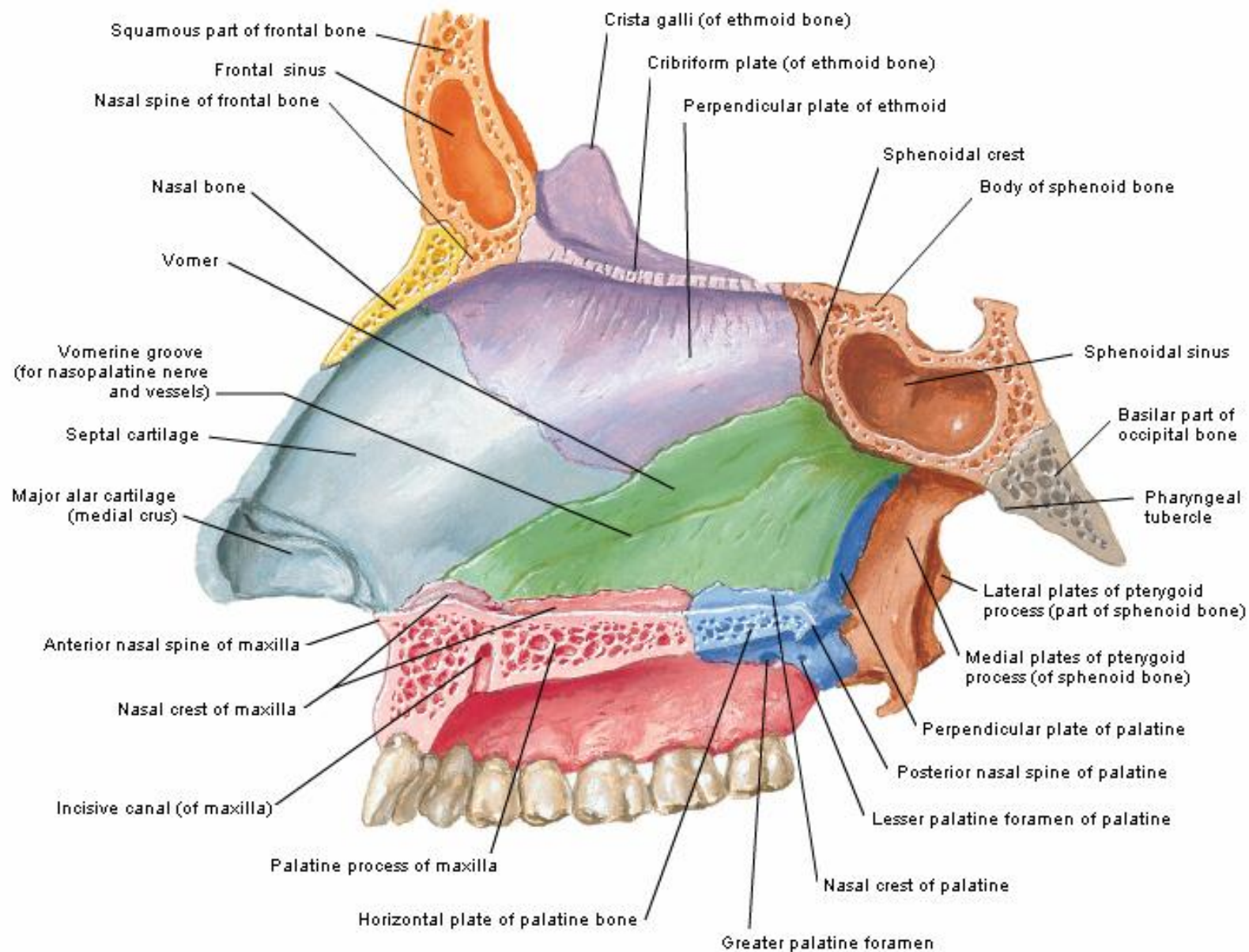




Medial Wall of Nasal Cavity (Nasal Septum)

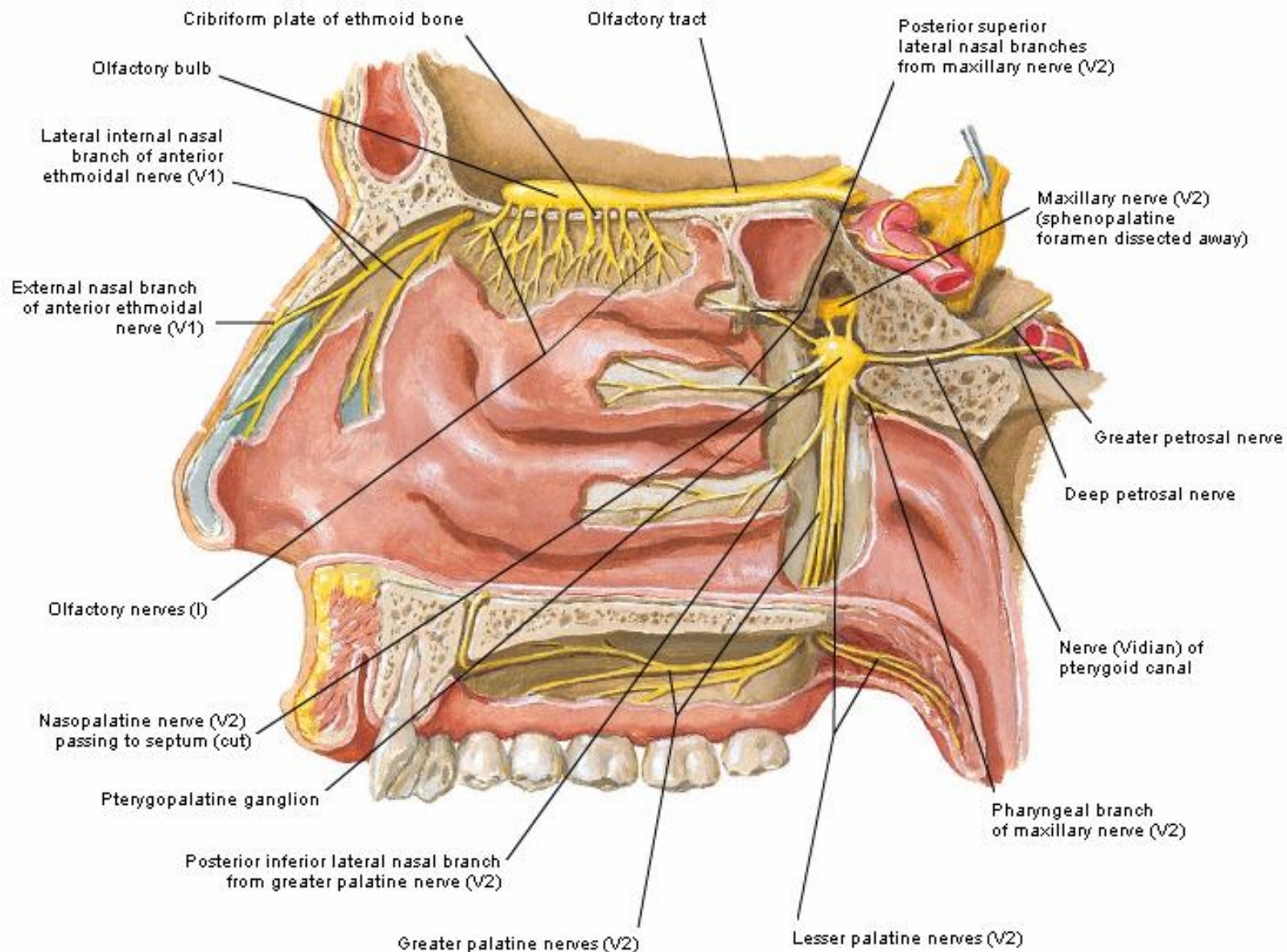


# Medial Wall of Nasal Cavity (Nasal Septum) Bones and Cartilages



# Nerves of Nasal Cavity

## Lateral Wall of Nasal Cavity



# Nerves of Nasal Cavity

## Nasal Septum

Medial internal nasal branch of anterior ethmoidal nerve (V1)

Olfactory bulb

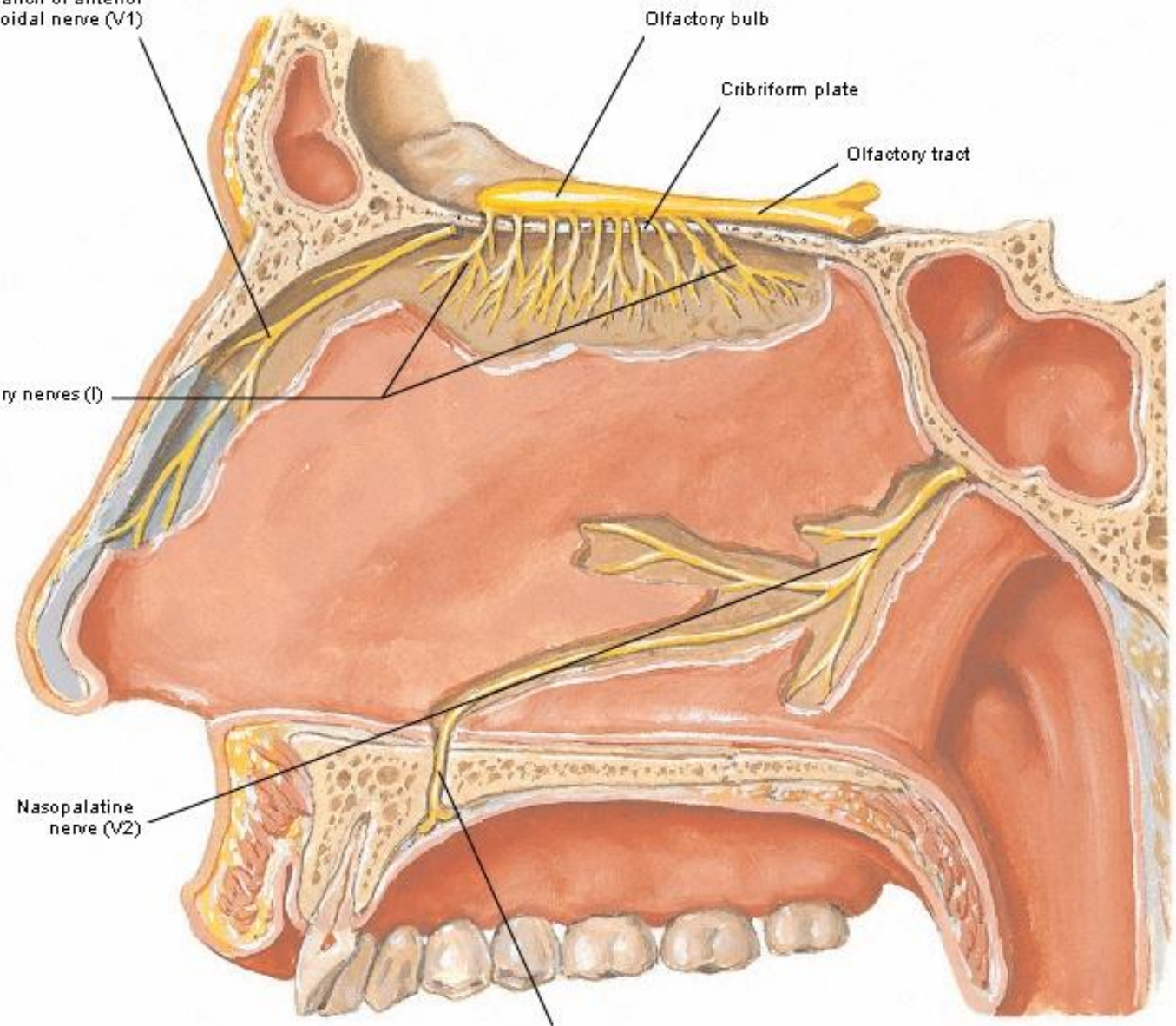
Cribriform plate

Olfactory tract

Olfactory nerves (I)

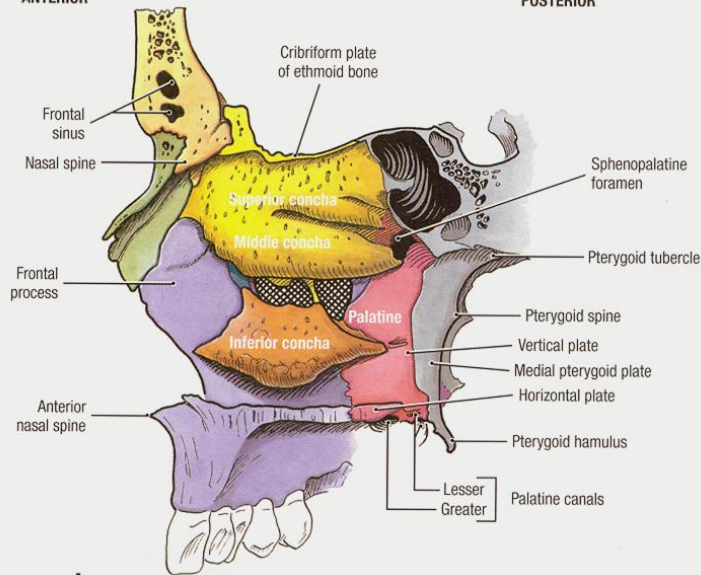
Nasopalatine nerve (V2)

Incisive canal

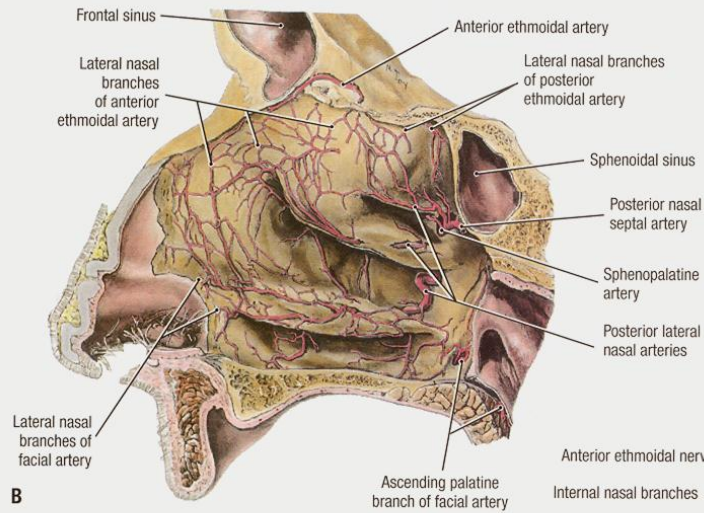


ANTERIOR

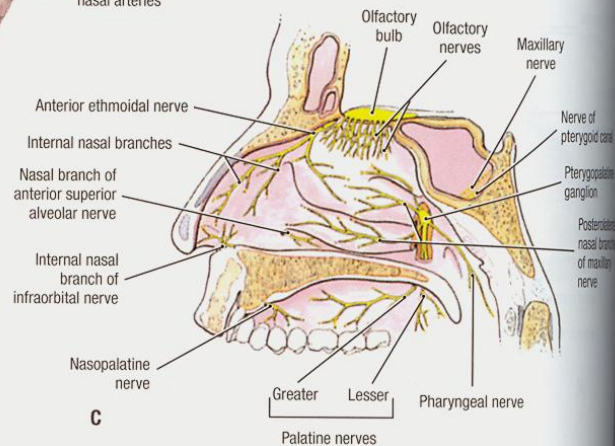
POSTERIOR



A



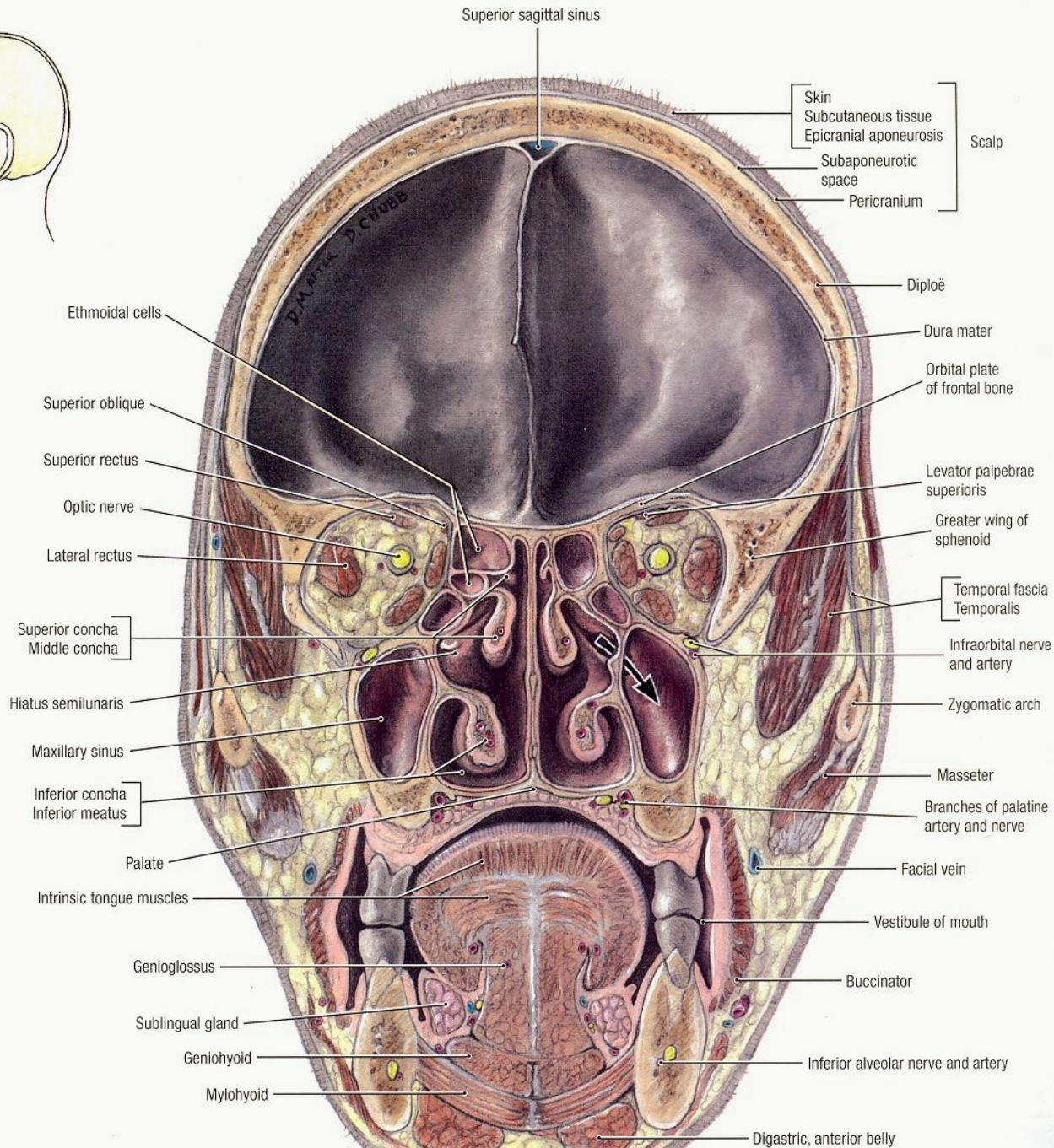
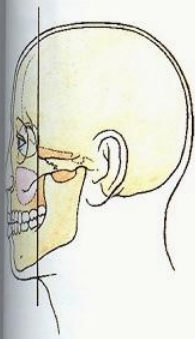
B

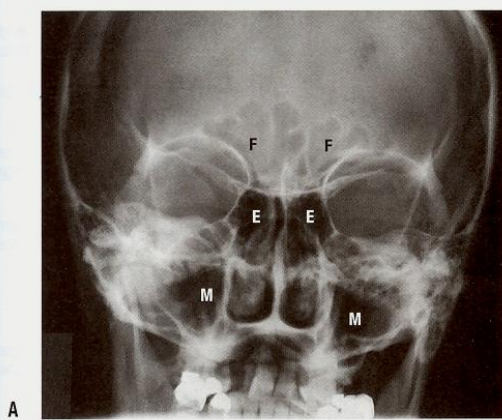


C

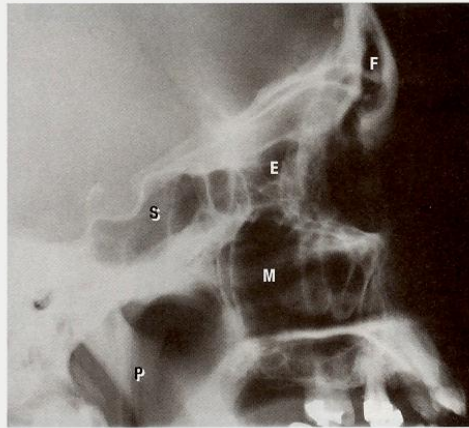
### 7.85 Lateral wall of nose, medial view of median section

**A. Bones.** (Frontal, peach; nasal, green; maxilla, purple; lacrimal, blue; ethmoid, bright yellow; palatine, red; sphenoid, gray.) The superior and middle conchae are parts of the ethmoid bone, whereas the inferior concha is itself a bone. The fragile, perpendicular plate of the palatine bone has a notch at its superior border; when in articulation with the body of the sphenoid bone, it forms the sphenopalatine foramen. **B. Arteries.** The lateral wall of the nose is supplied by the anterior and posterior ethmoidal branches of the ophthalmic artery, which enter the nasal cavity through the cribriform plate. The sphenopalatine artery arises from the maxillary artery and the ascending palatine artery and lateral nasal branches of the facial artery. **C. Innervation.** The lateral wall of the nose is supplied by posterior lateral nasal branches of the maxillary nerve (CN V2), the greater palatine nerve, and the anterior ethmoidal nerve. The olfactory neuroepithelium is in the superior part of the lateral and septal walls of the nasal cavity. The central processes of the bipolar olfactory neurosensory cells of this epithelium form approximately 20 bundles on each side, which together form the olfactory nerves. The olfactory nerves pass through the cribriform plate to enter the olfactory bulbs. An extension of the cranial meninges surrounds the olfactory nerve as it leaves the cribriform plate. Tearing of the meninges results in leakage of cerebrospinal fluid (CSF) into the nose, a condition called CSF rhinorrhea.

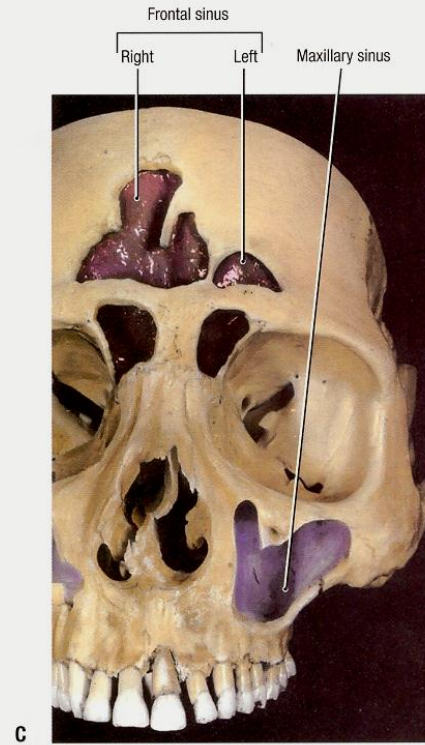




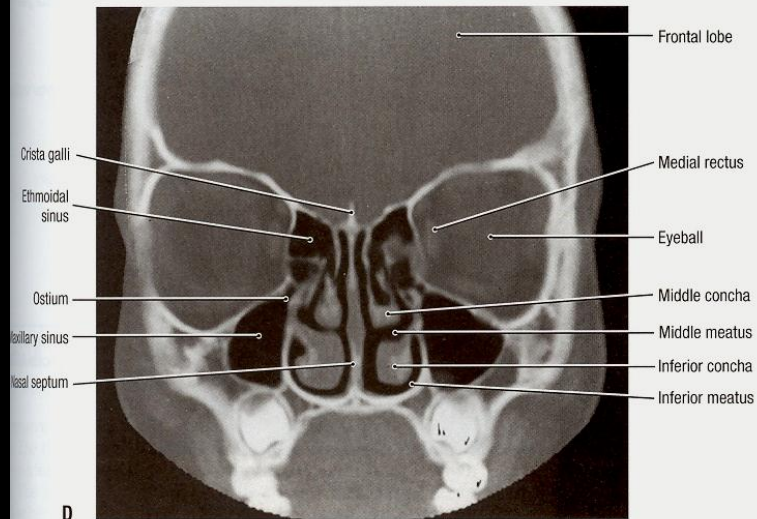
A



B



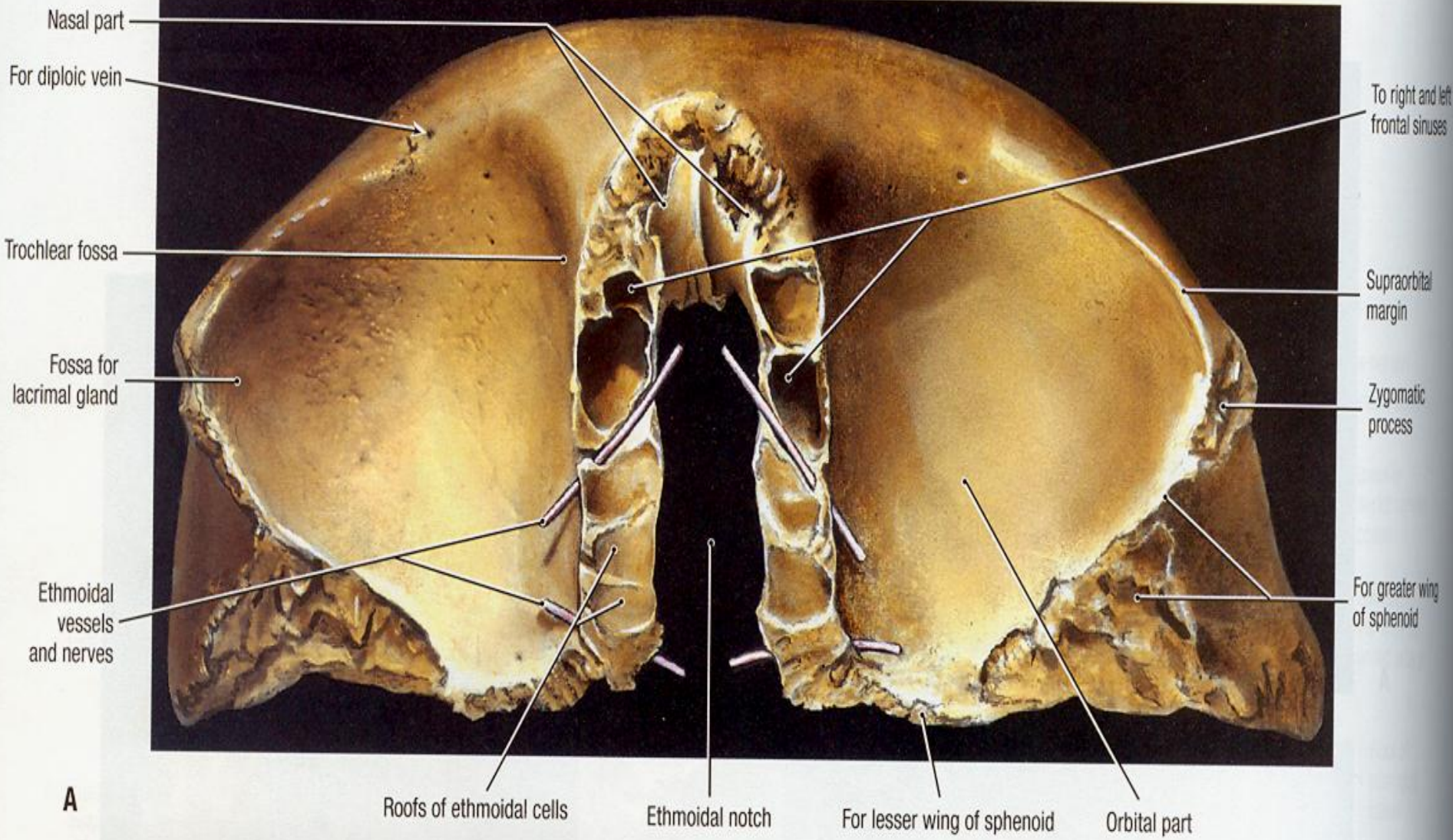
C



D

### 7.88 Imaging of paranasal sinuses

A. Radiograph, posteroanterior view. B. Radiograph, lateral view. *F*, frontal sinus; *E*, ethmoidal sinus; *S*, sphenoidal sinus; *M*, maxillary sinus; *P*, pharynx. C. Opened frontal and maxillary sinuses, anterior view. D. Computed tomographic (CT) scan, coronal plane.



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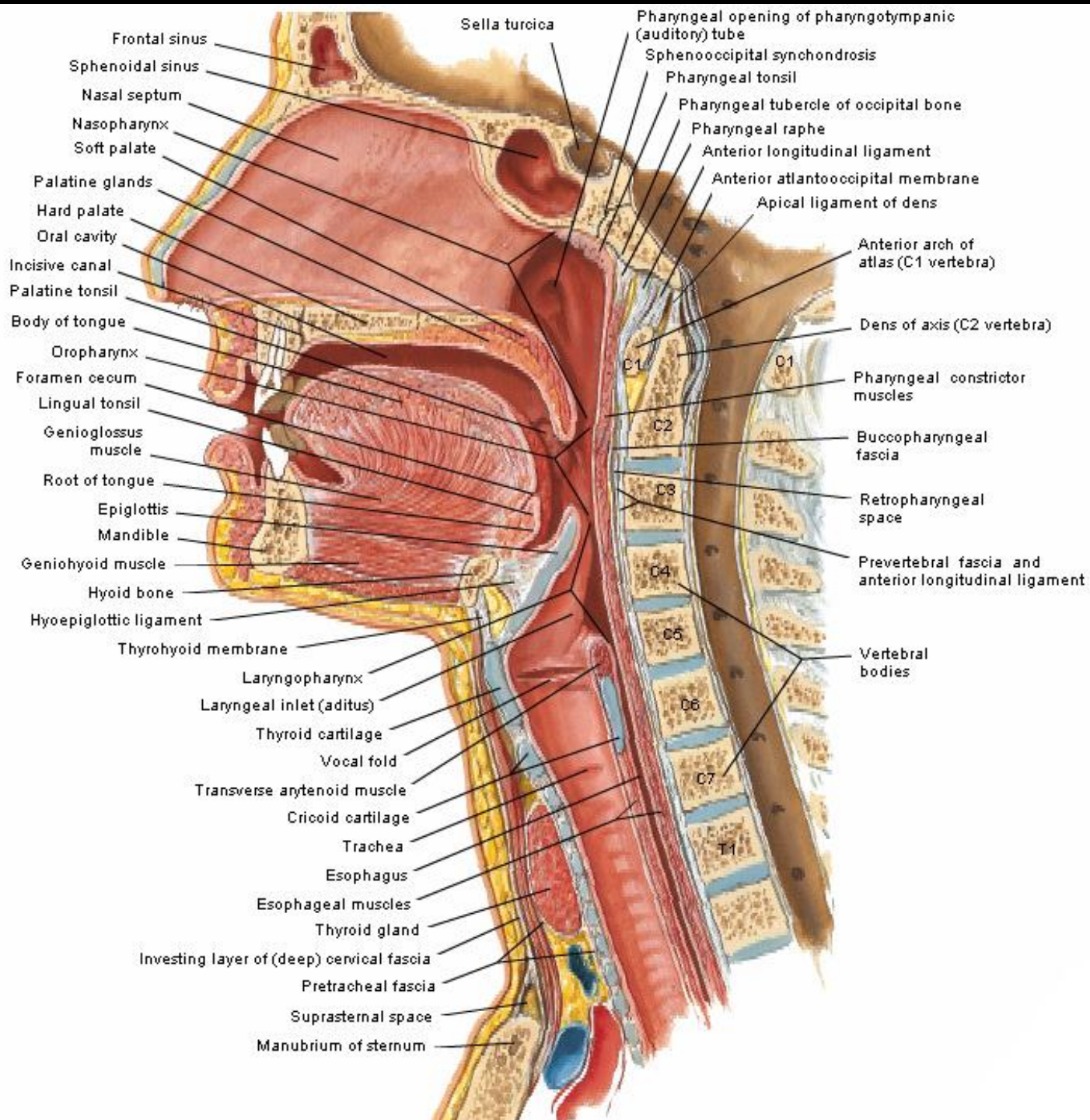
**3- Pharynx**

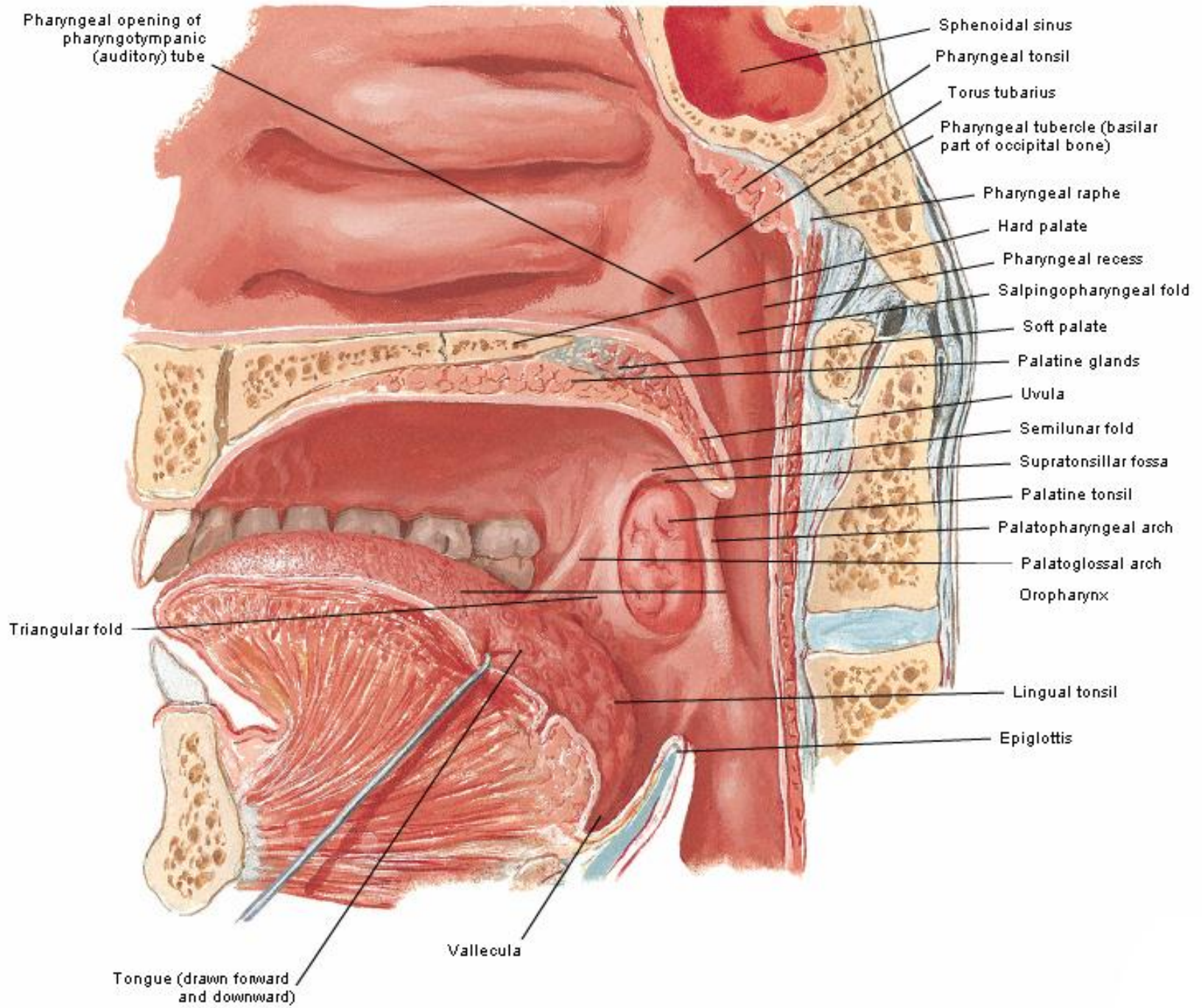
**4- Larynx**

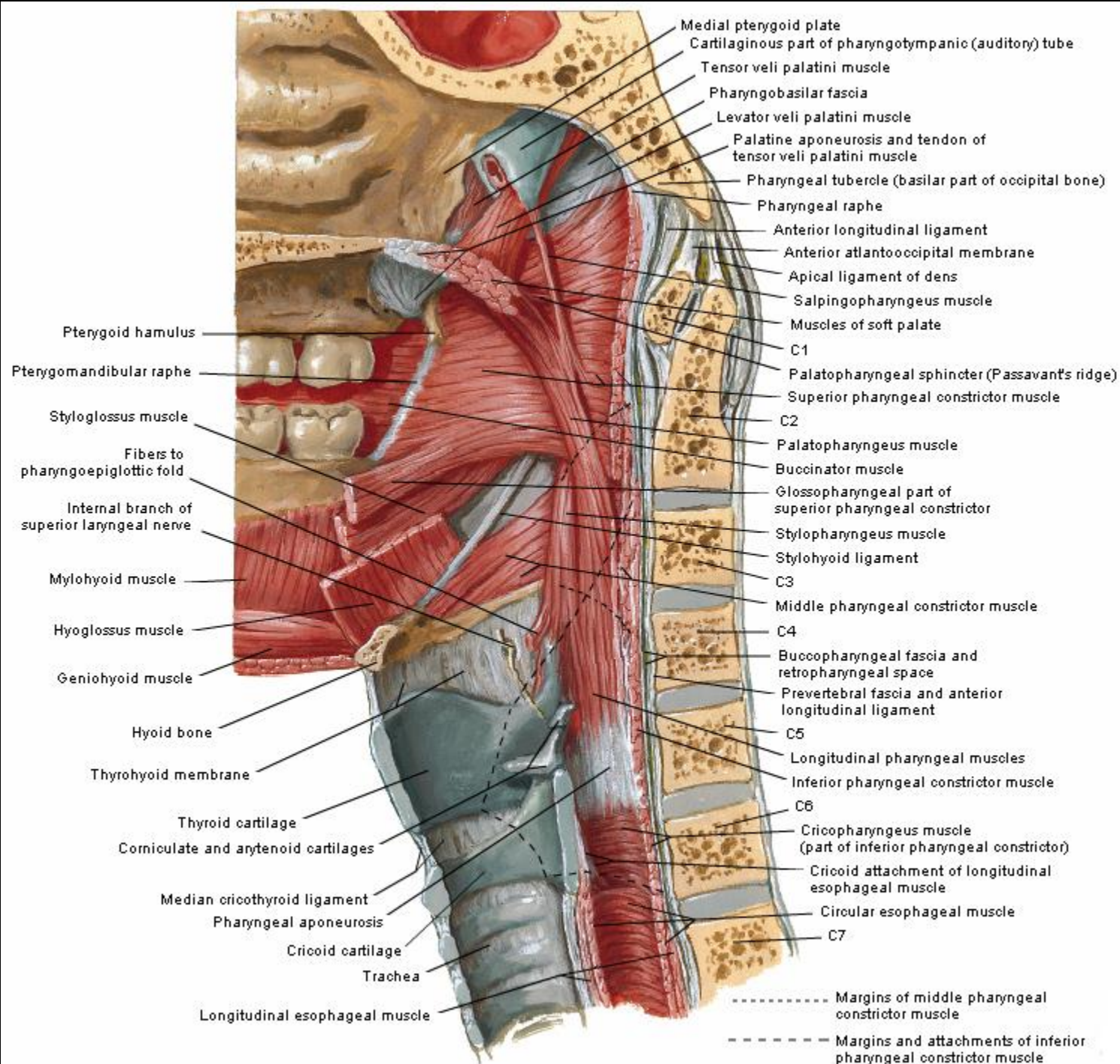
**5- Trachea and bronchi**

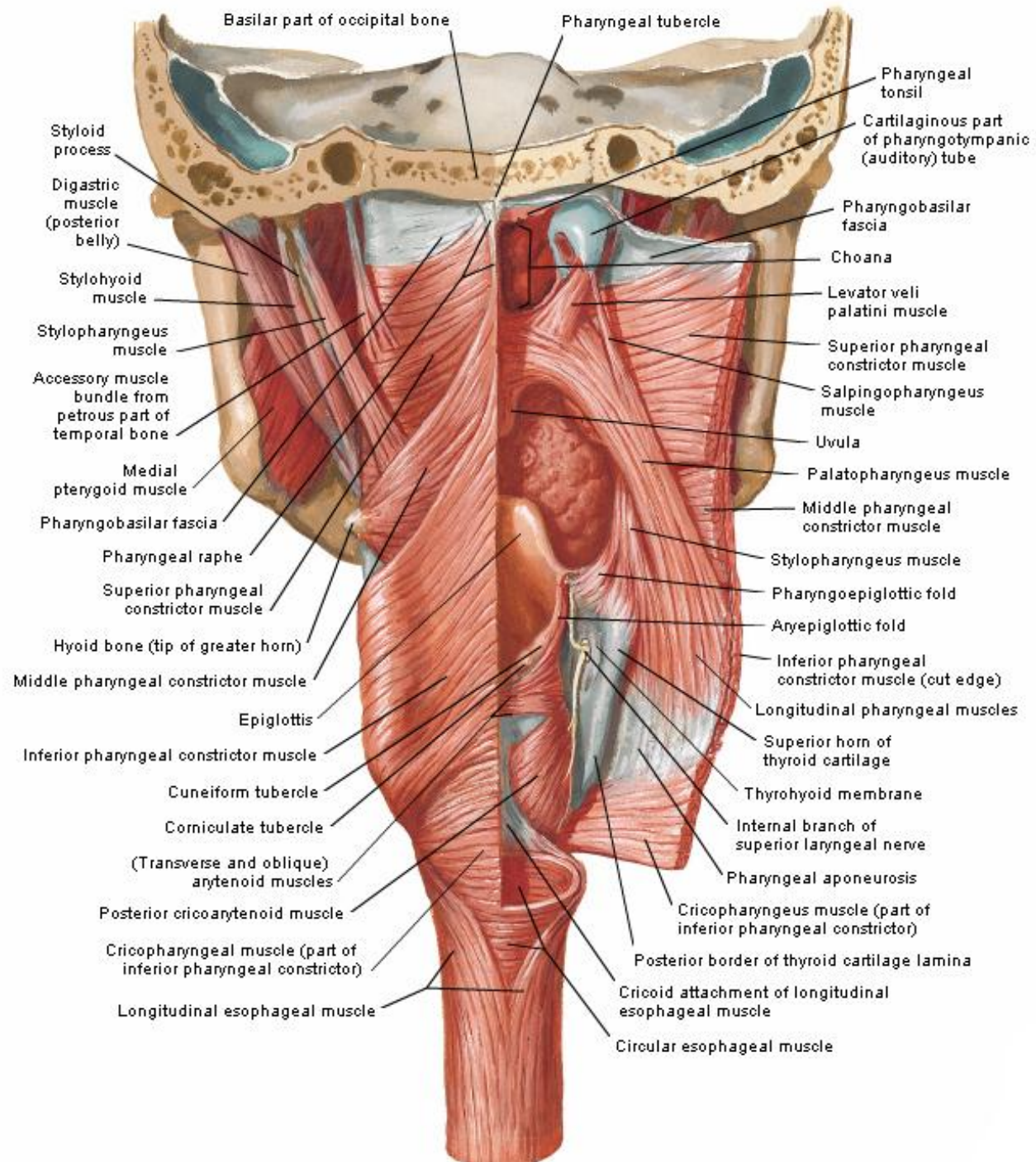
**6- Pleurae**

**7- Pulmons**



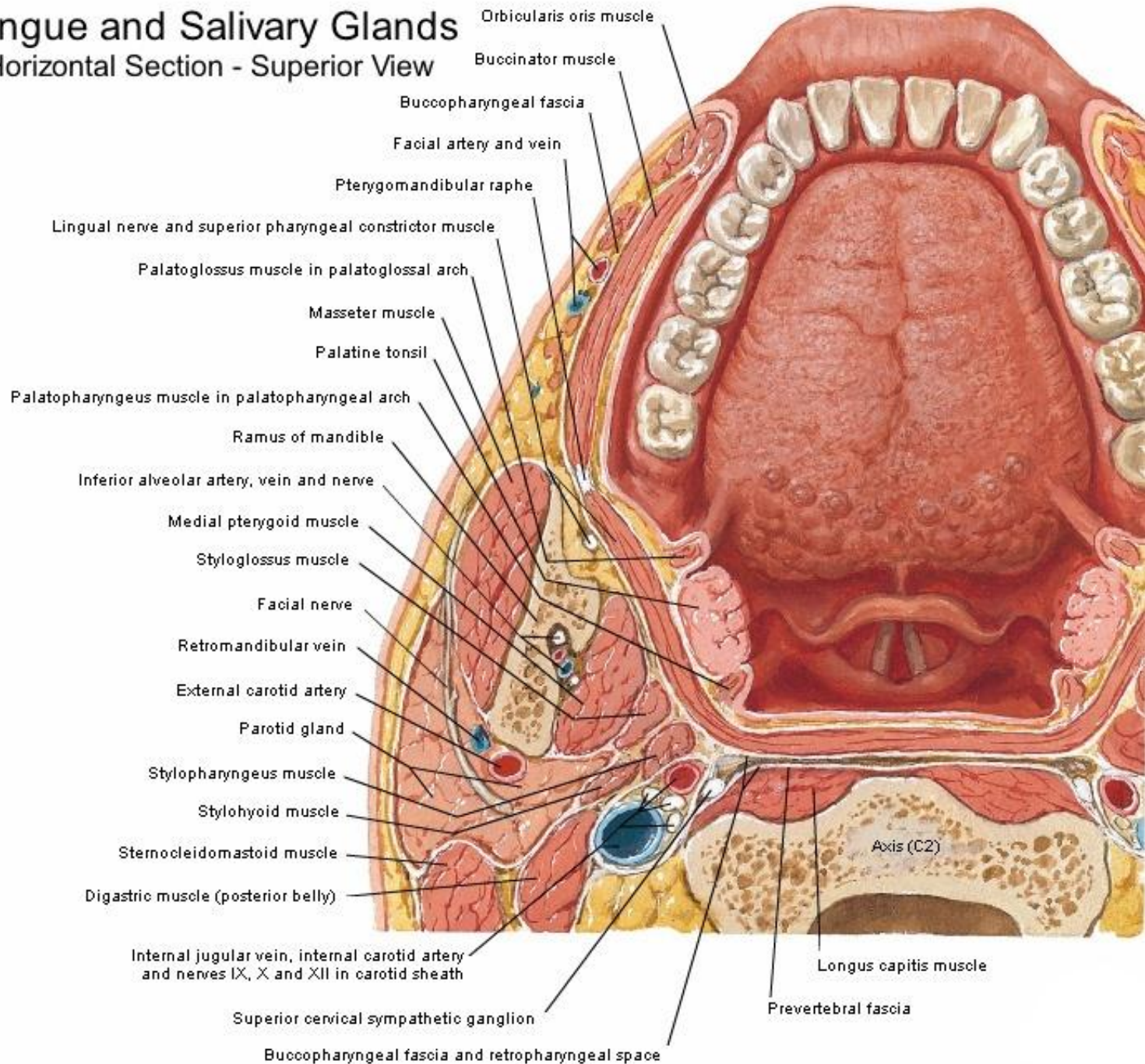


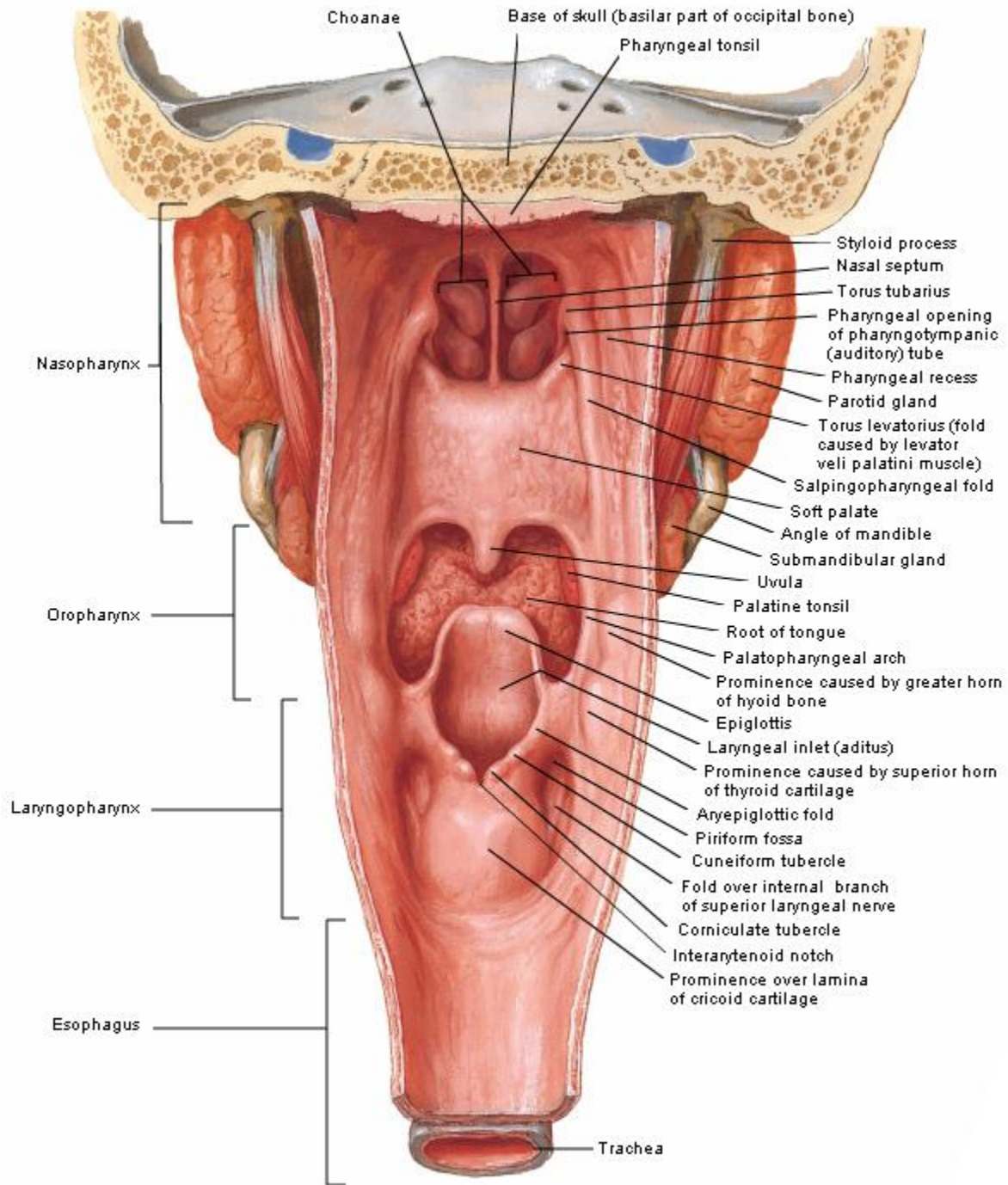


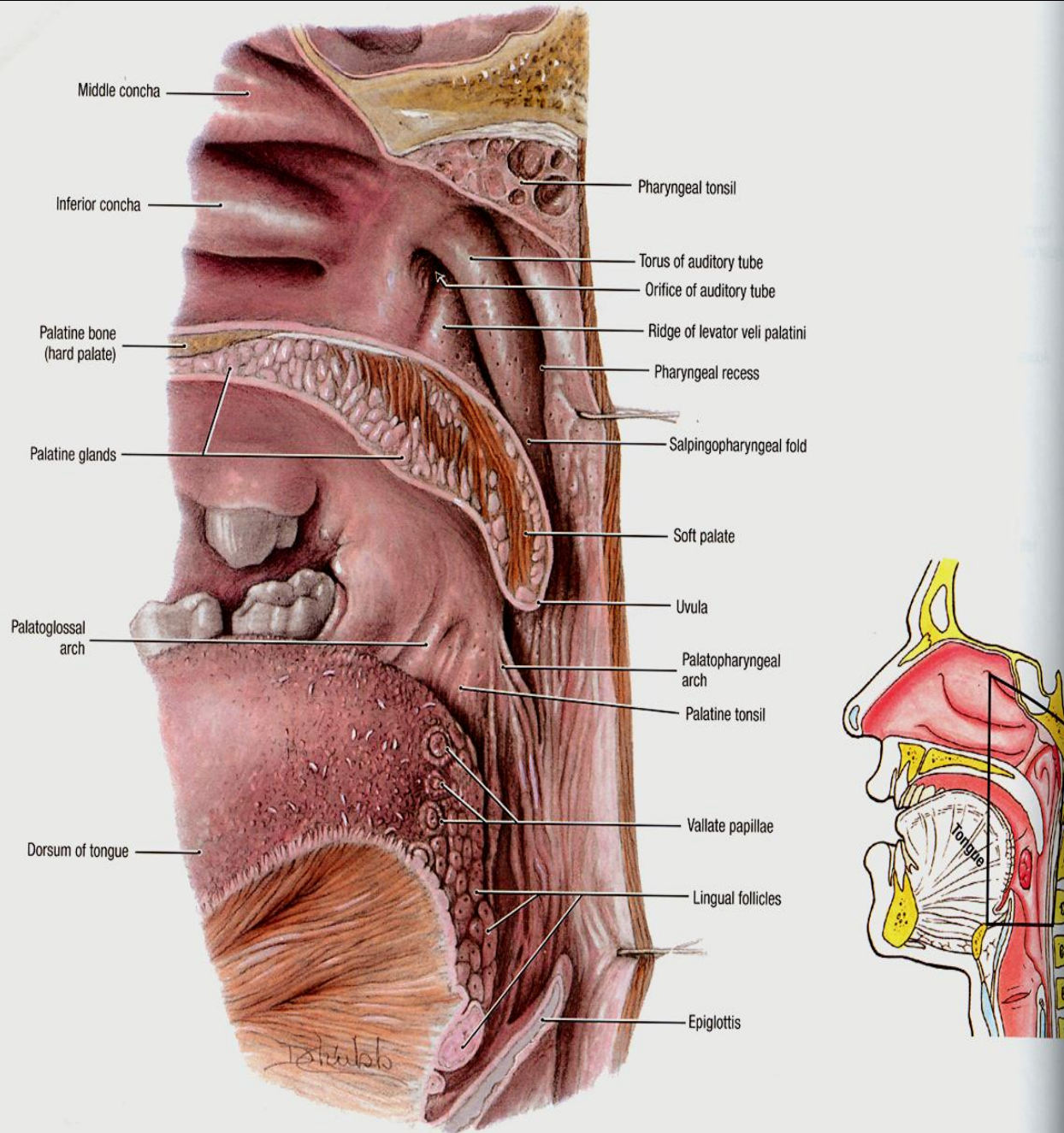


# Tongue and Salivary Glands

## Horizontal Section - Superior View







**8.39** Interior of pharynx—I, median section



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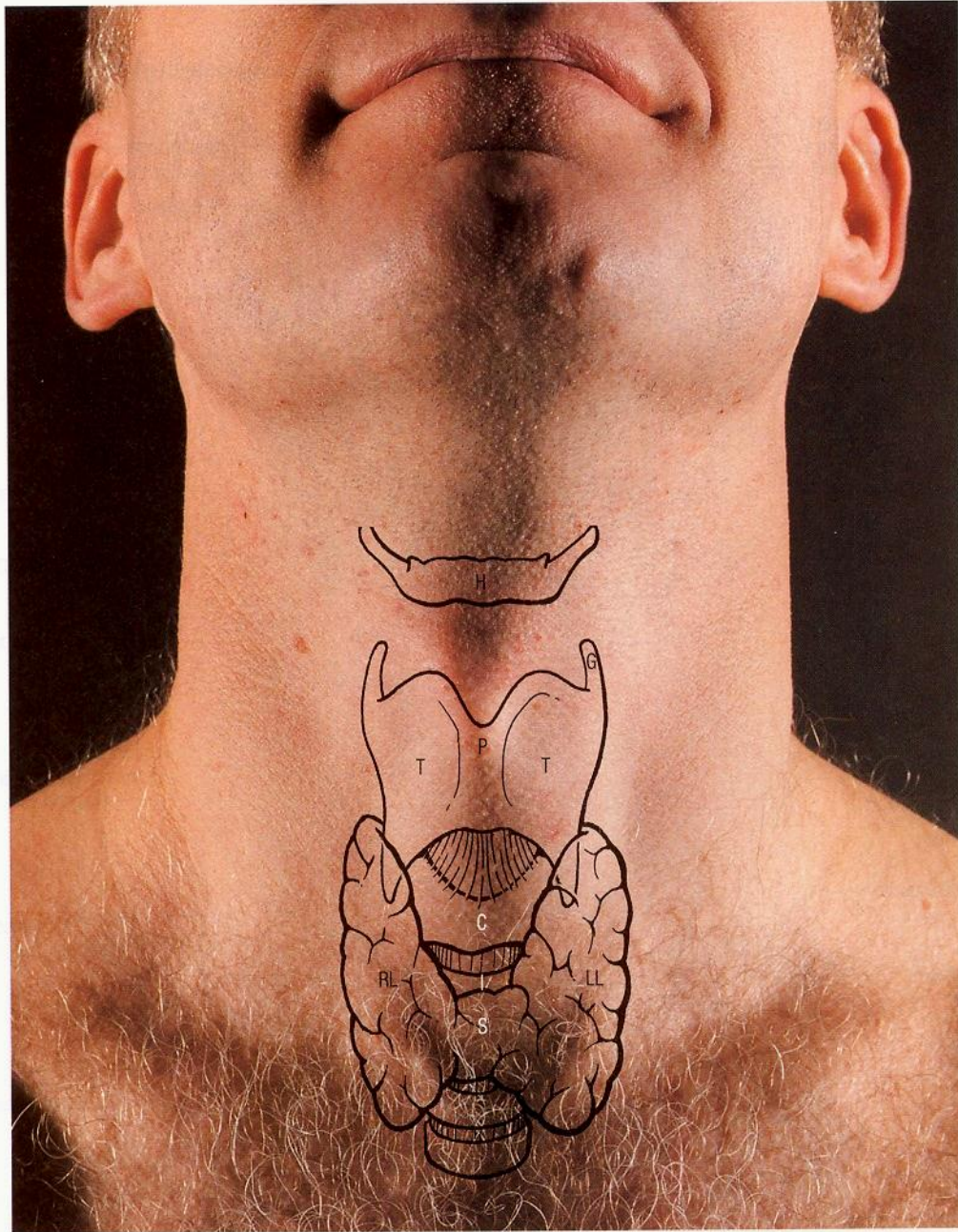
**3- Pharynx**

**4- Larynx**

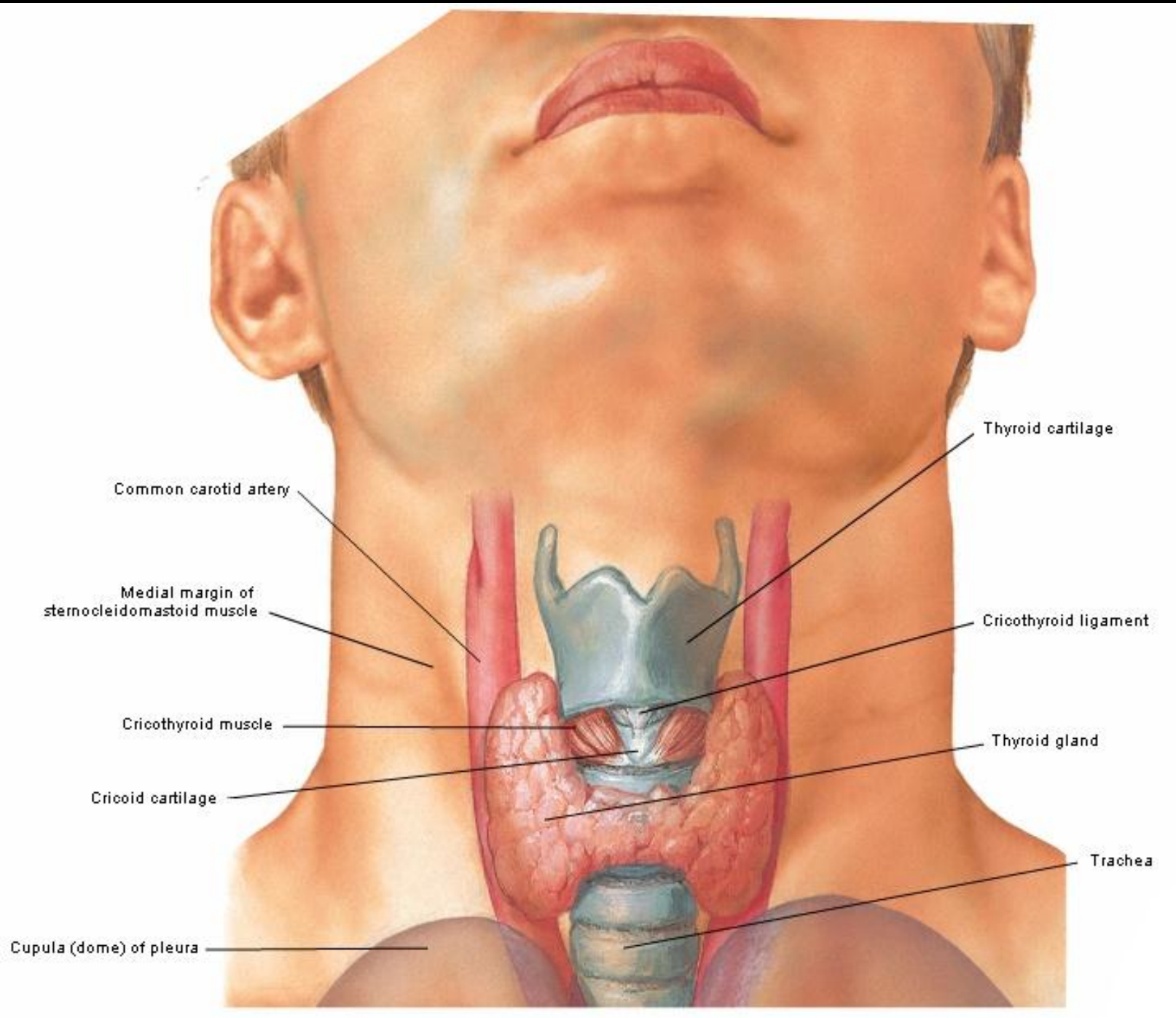
**5- Trachea and bronchi**

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8.23 Anterior neck—I, surface anatomy, anterior view



Common carotid artery

Medial margin of sternocleidomastoid muscle

Cricothyroid muscle

Cricoid cartilage

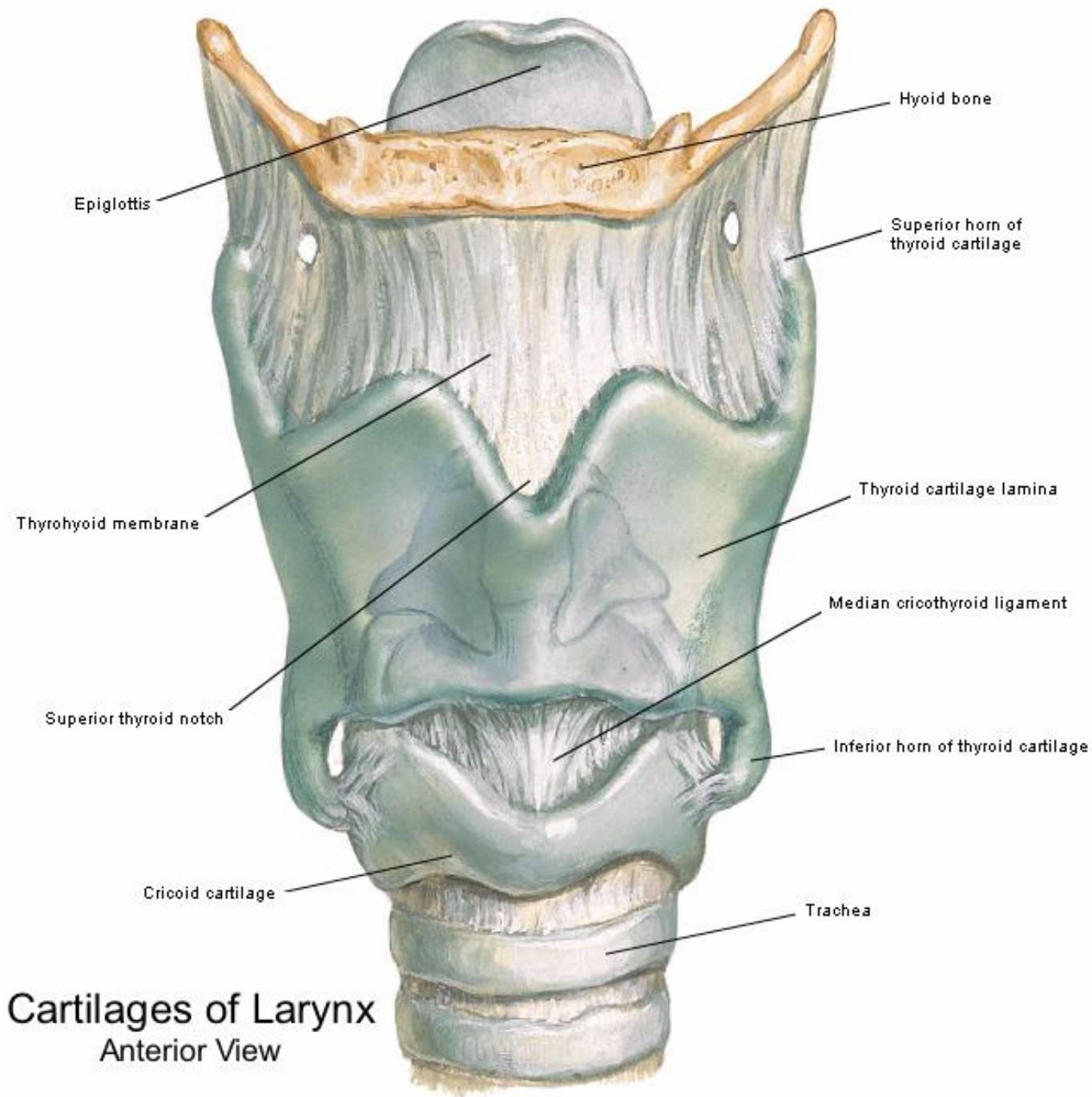
Cupula (dome) of pleura

Thyroid cartilage

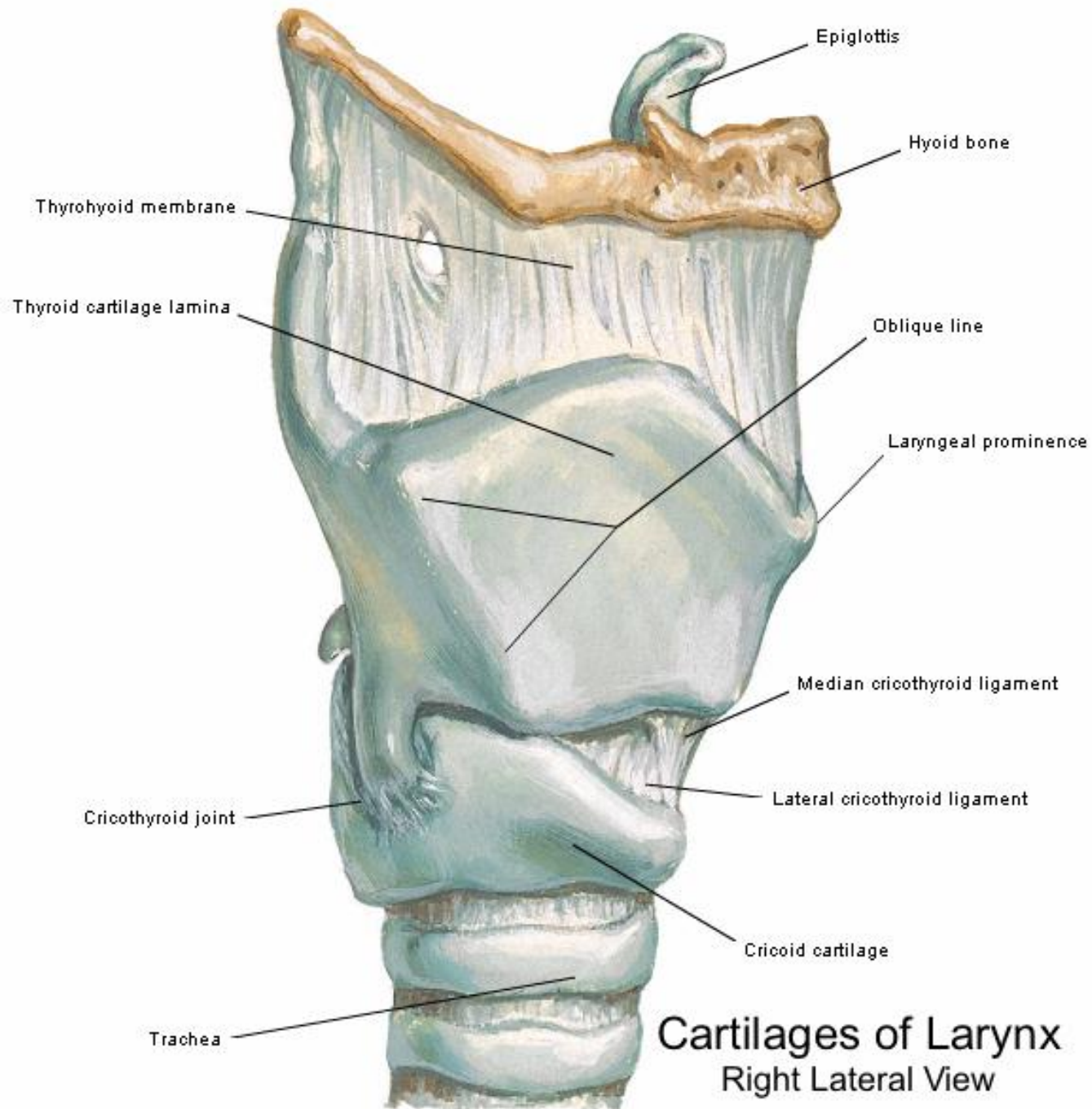
Cricothyroid ligament

Thyroid gland

Trachea



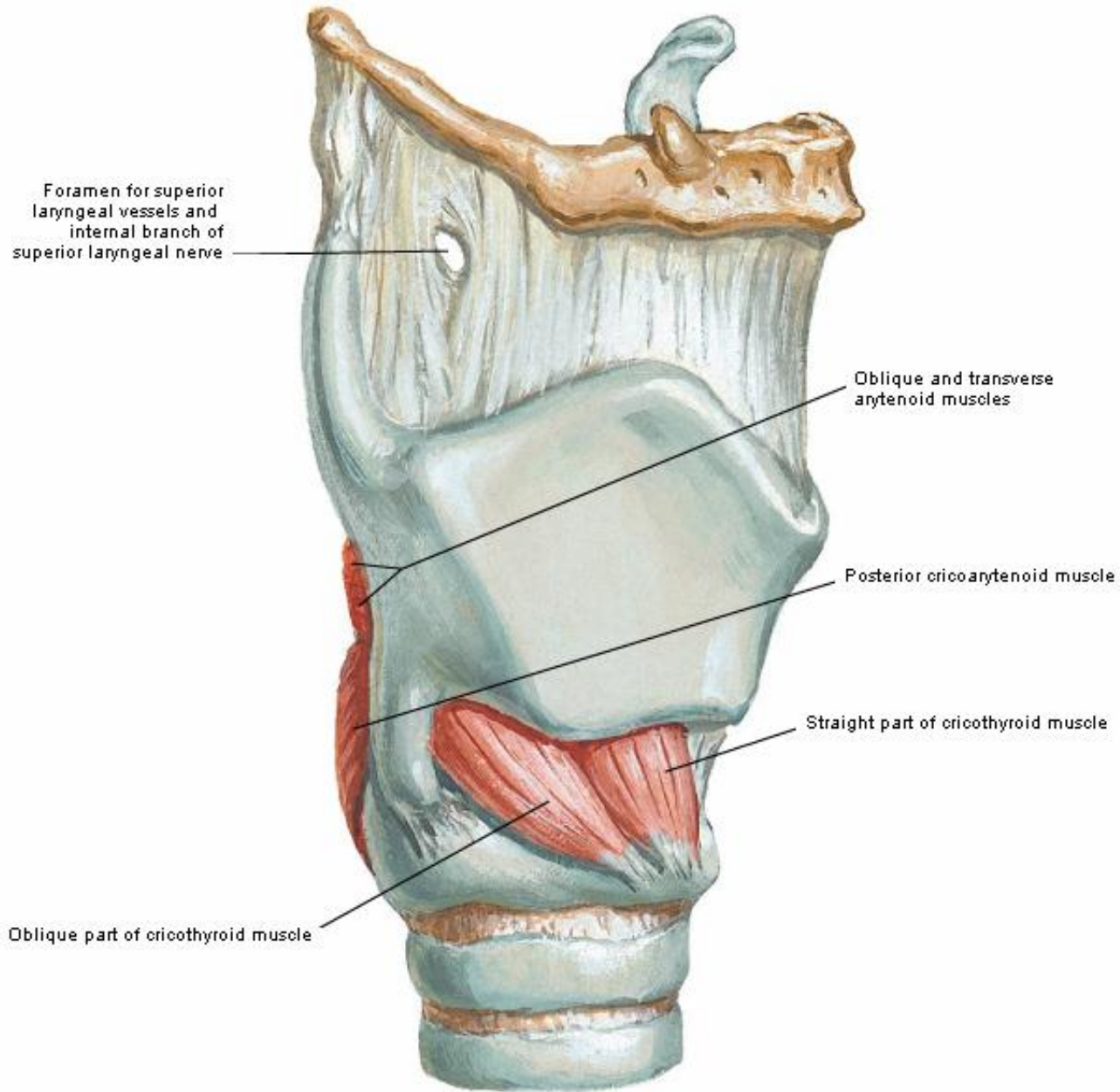
**Cartilages of Larynx**  
Anterior View



**Cartilages of Larynx**  
Right Lateral View

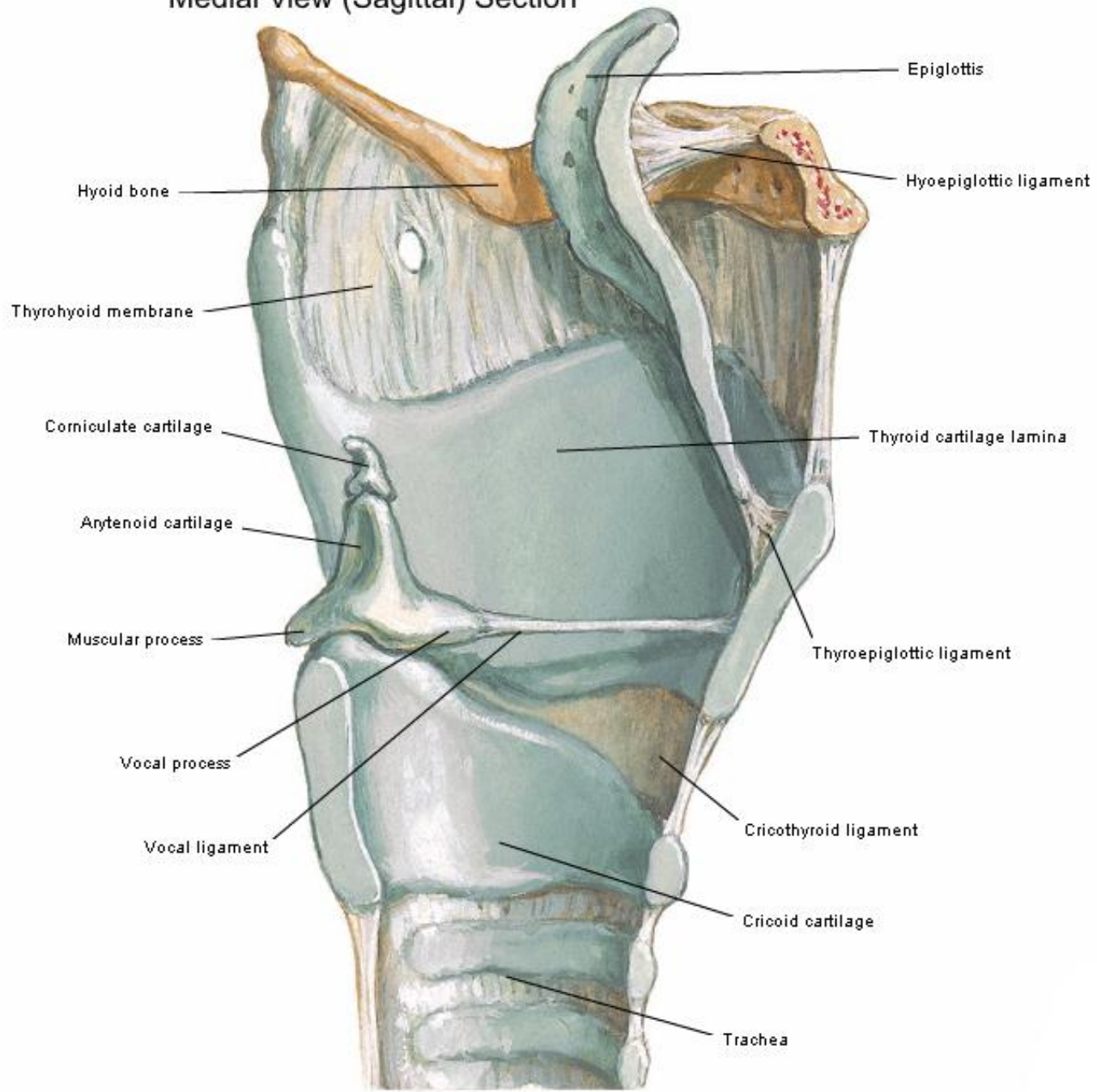
# Intrinsic Muscles of Larynx

## Right Lateral View



# Cartilages of Larynx

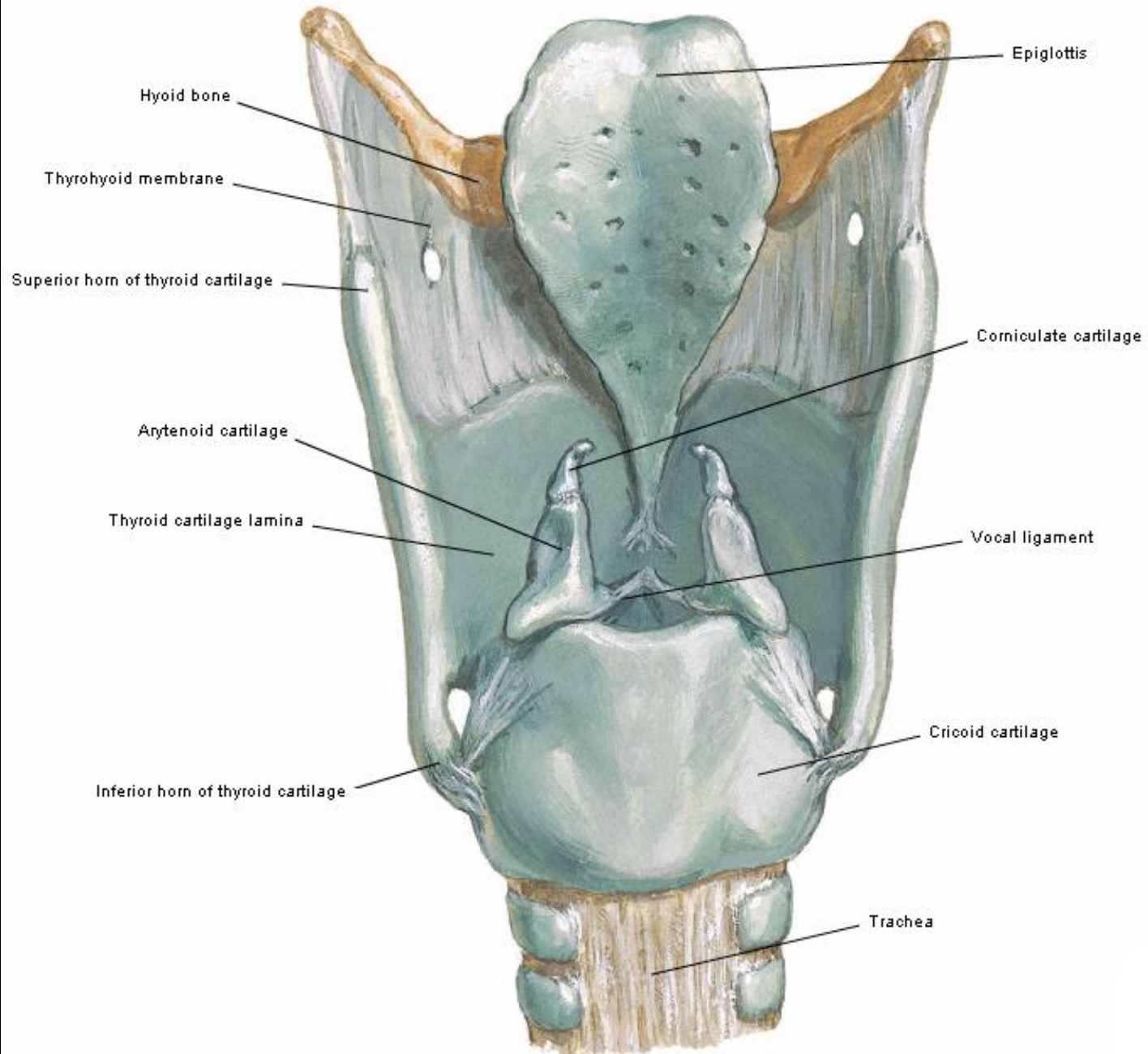
## Medial View (Sagittal) Section





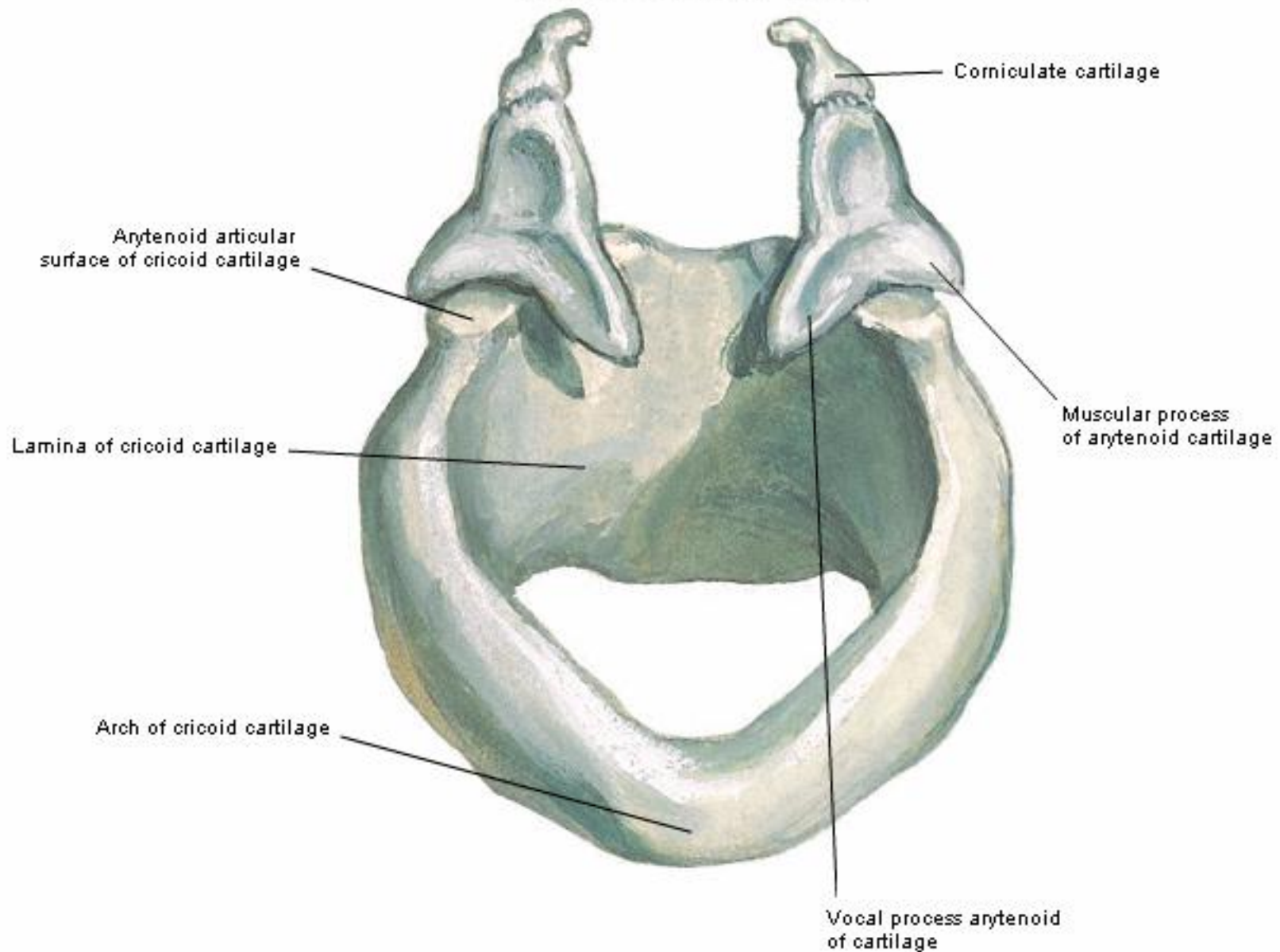
# Cartilages of Larynx

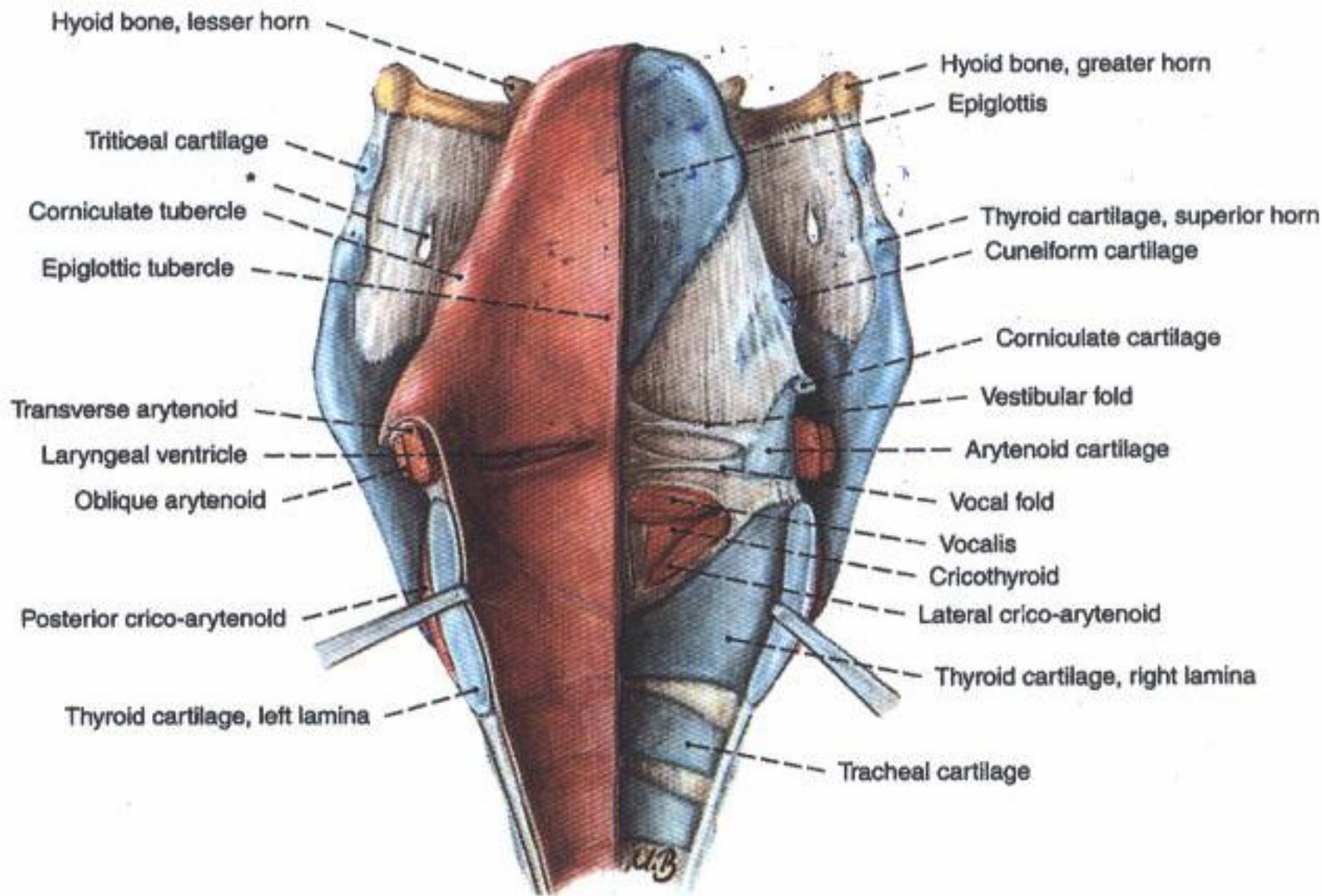
Posterior View

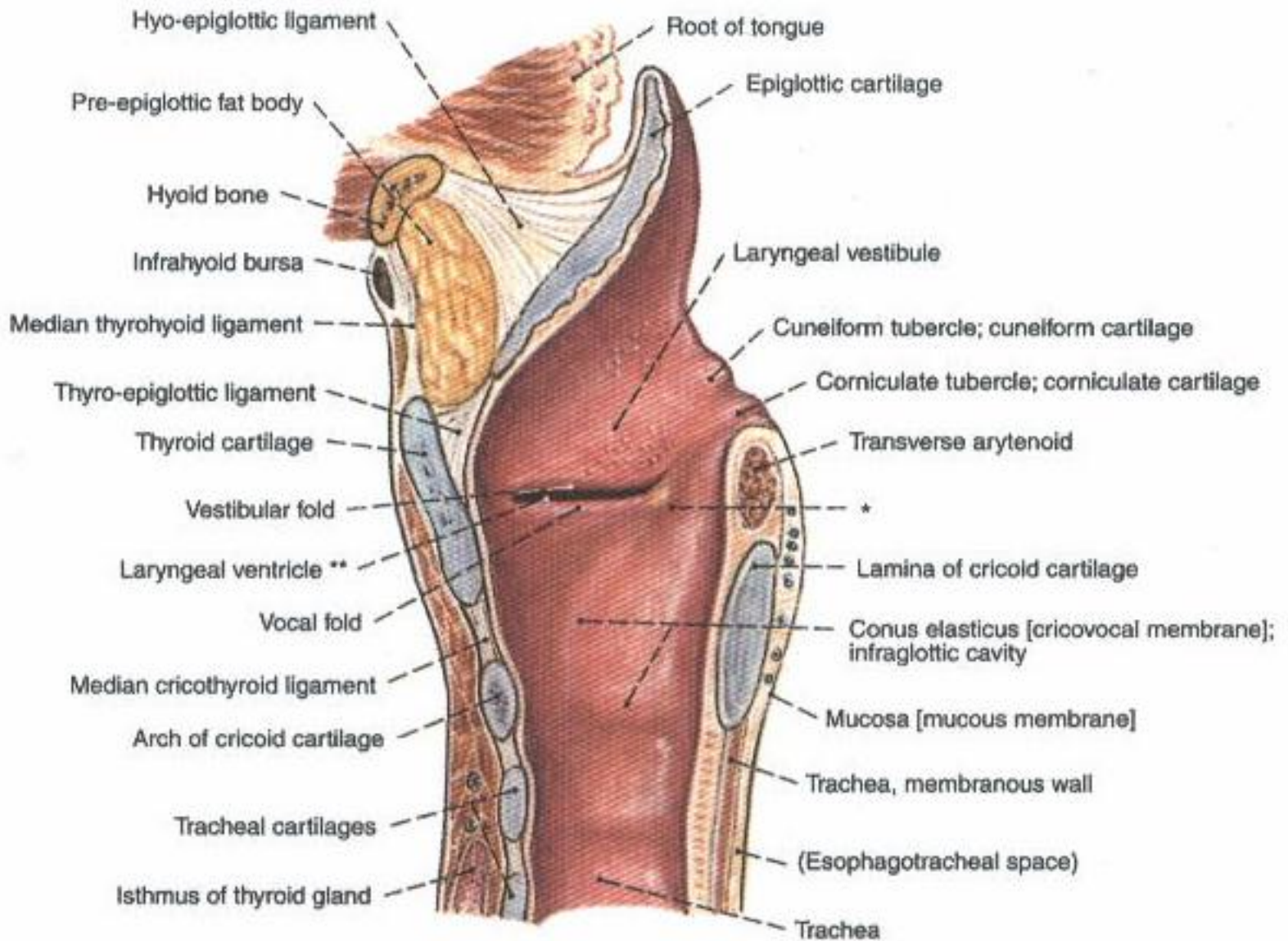


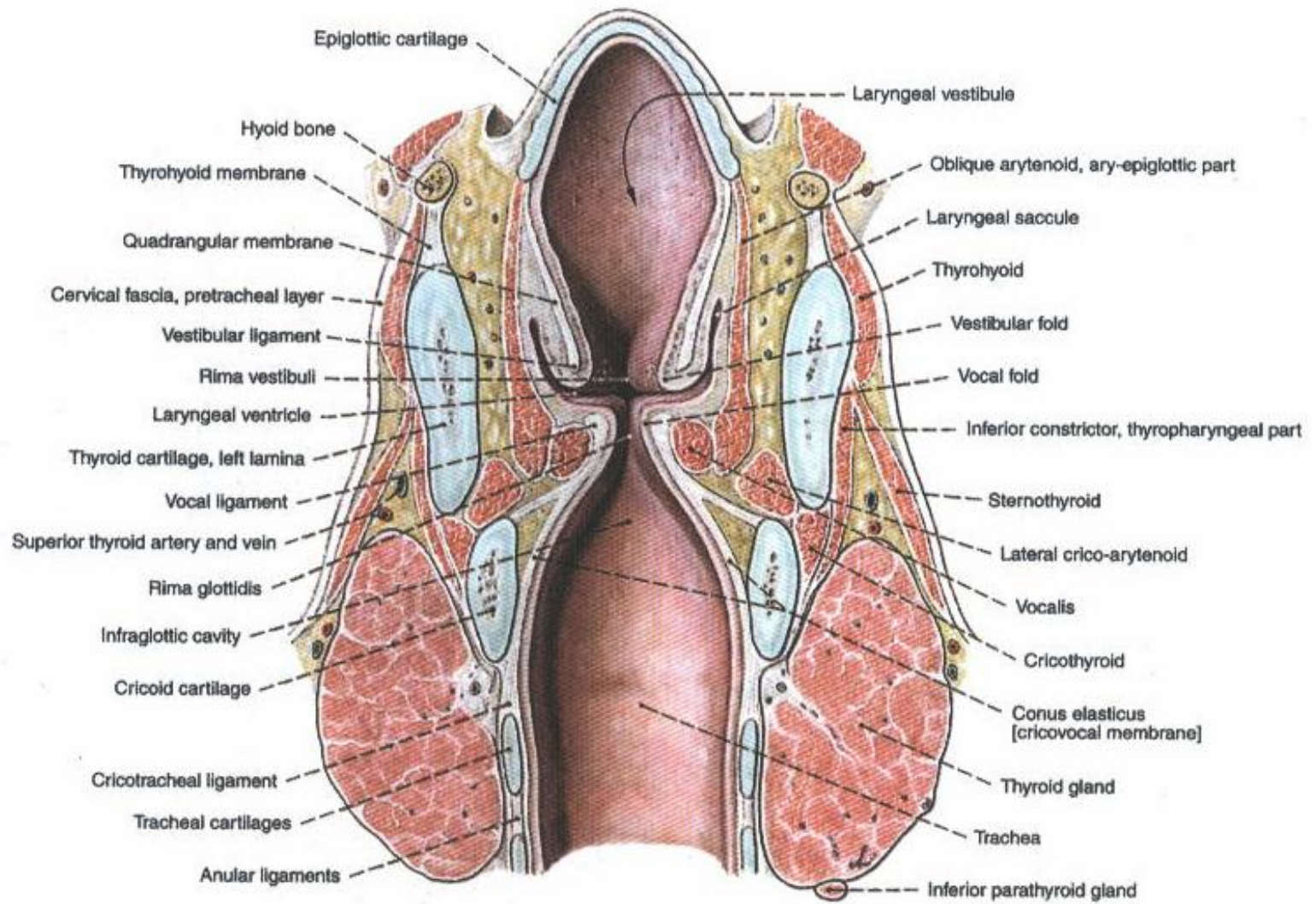
# Cartilages of Larynx

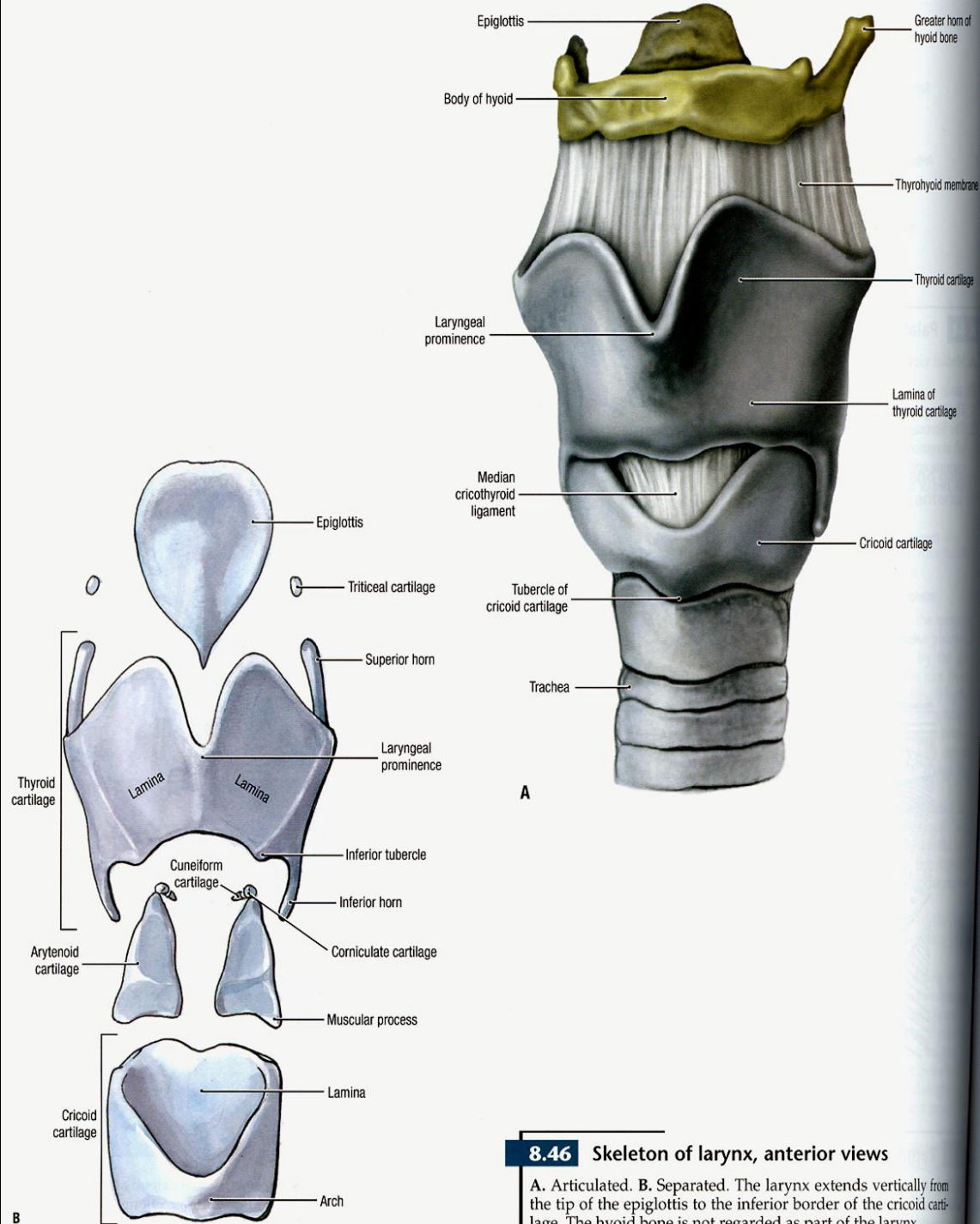
## Anterosuperior View





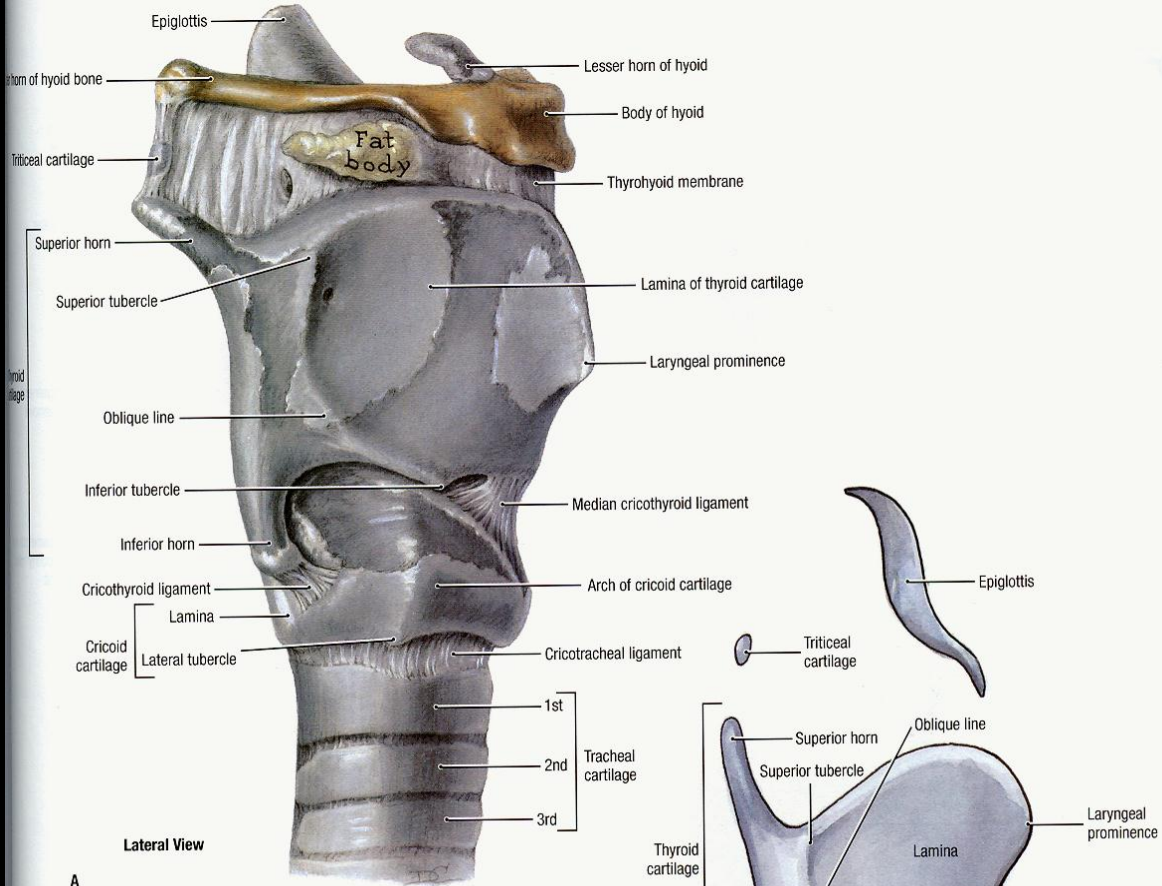






### 8.46 Skeleton of larynx, anterior views

**A.** Articulated. **B.** Separated. The larynx extends vertically from the tip of the epiglottis to the inferior border of the cricoid cartilage. The hyoid bone is not regarded as part of the larynx.



### 47 Skeleton of larynx, lateral views

A. Articulated. B. Separated.

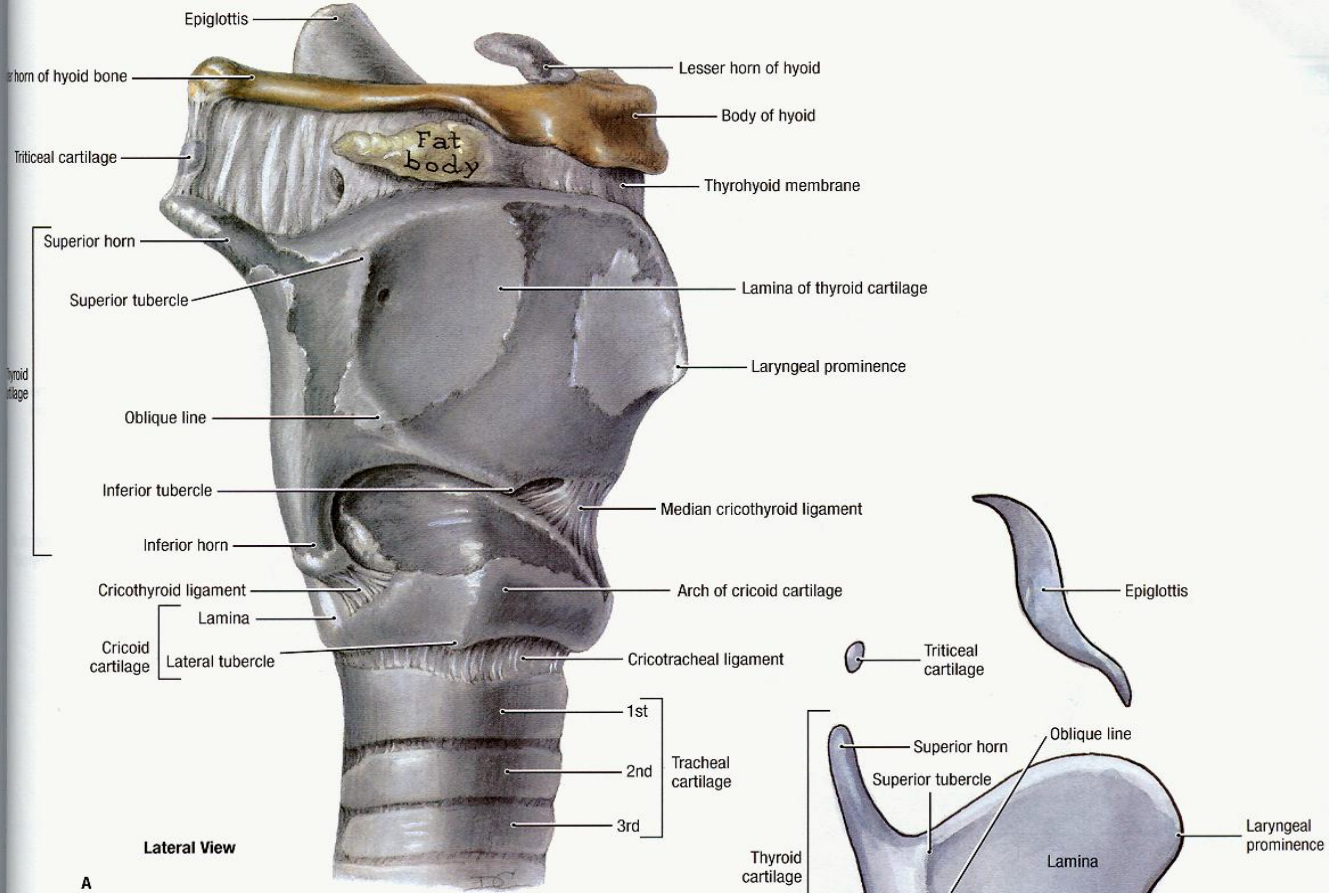
**OBSERVE:**

1. The lesser horn of the hyoid bone is partly cartilaginous; the thyroid and cricoid cartilages are partly ossified;
2. The lamina of the thyroid cartilage projects anteriorly to form the laryngeal prominence;
3. The cricoid cartilage has an arch anteriorly and a lamina posteriorly; the superior border of the arch is inclined, and the inferior border projects anteriorly beyond the trachea;
4. The thyrohyoid membrane attaches the entire length of the superior border of the thyroid lamina to the superior border of the body and greater horn of the hyoid bone; it is thickened posteriorly to form the thyrohyoid ligament and is pierced by the internal laryngeal nerve and vessels.

POSTERIOR

B

ANTERIOR



**8.47 Skeleton of larynx, lateral views**

A. Articulated. B. Separated.

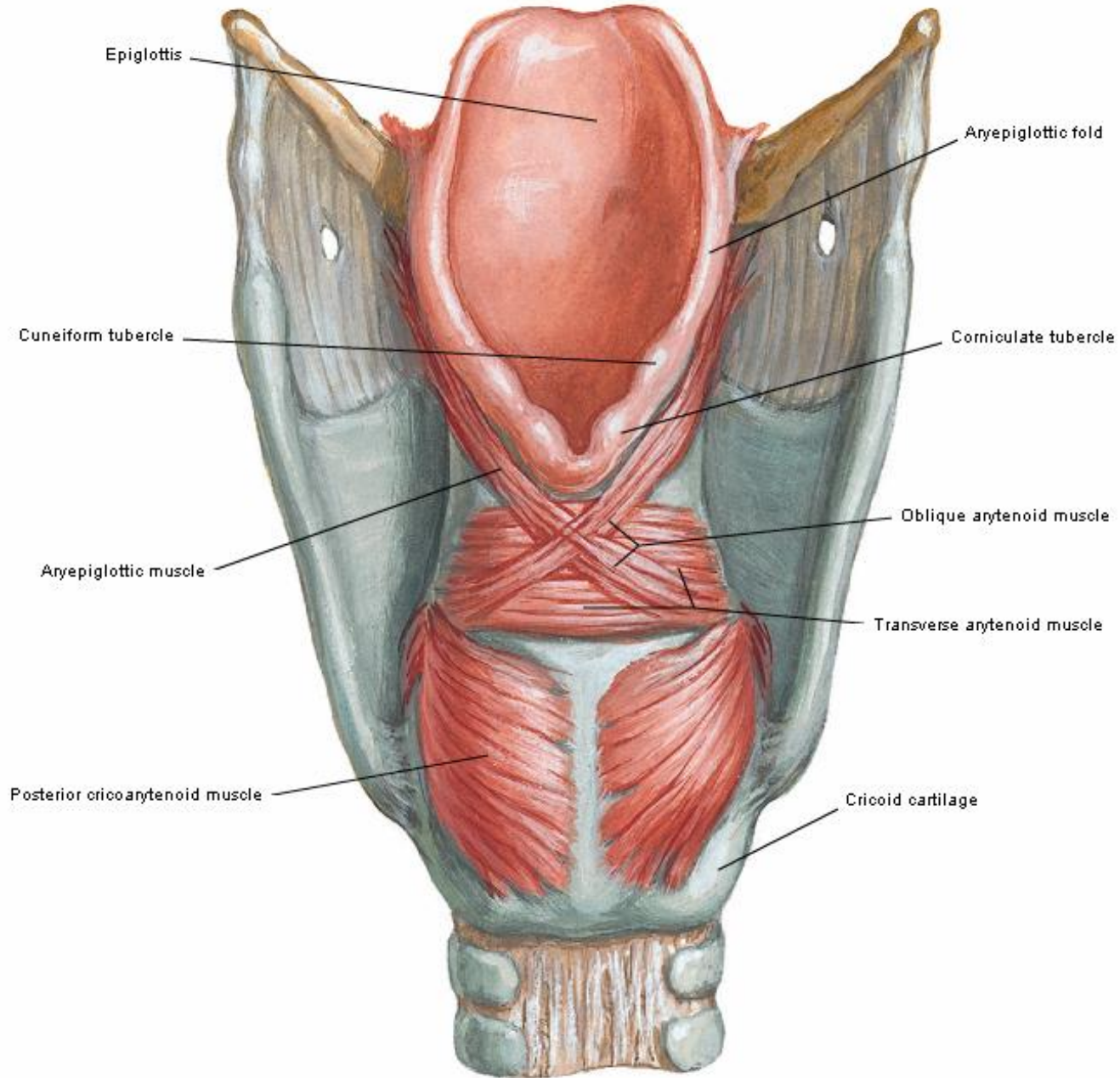
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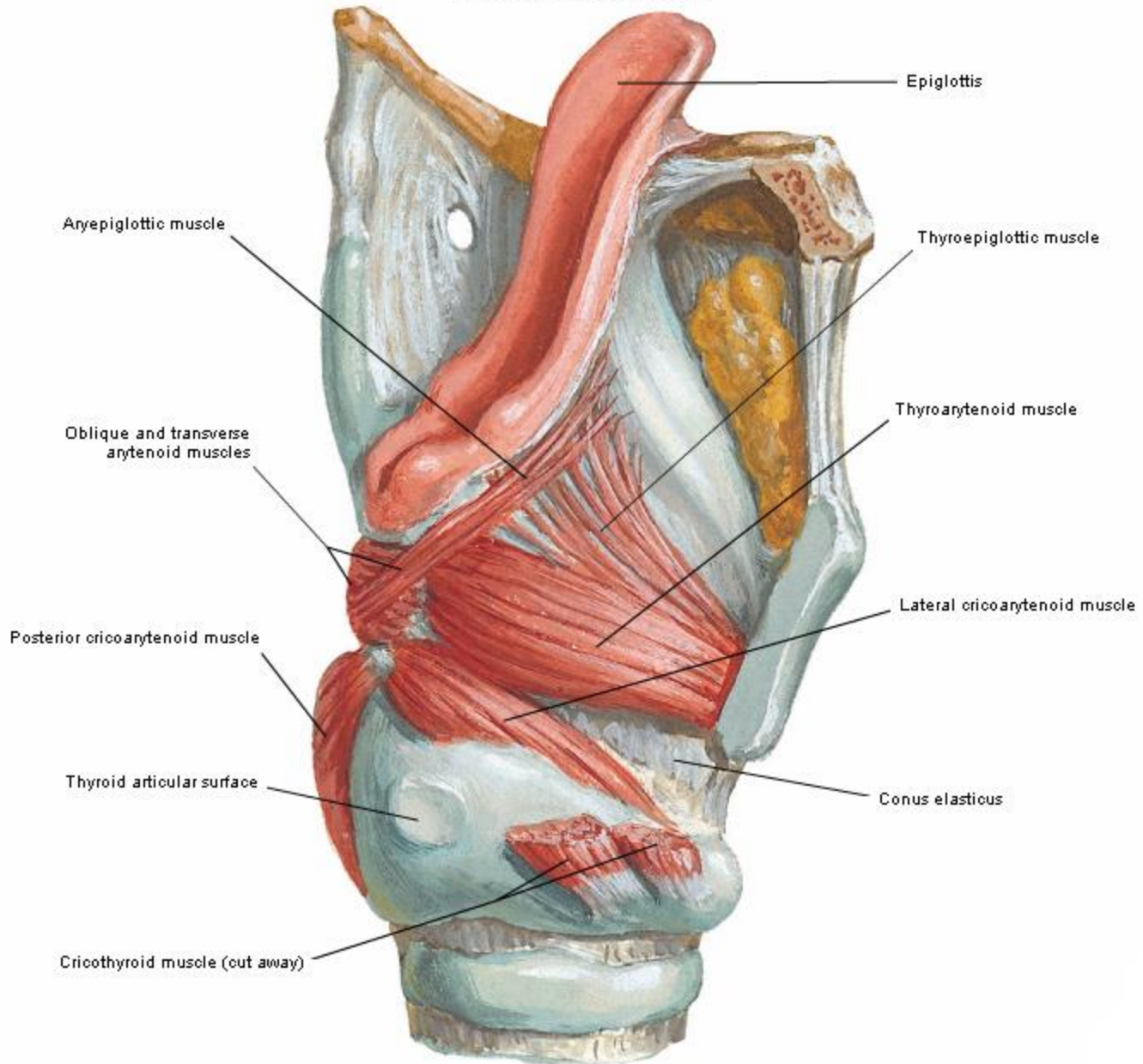
# Intrinsic Muscles of Larynx

## Posterior View



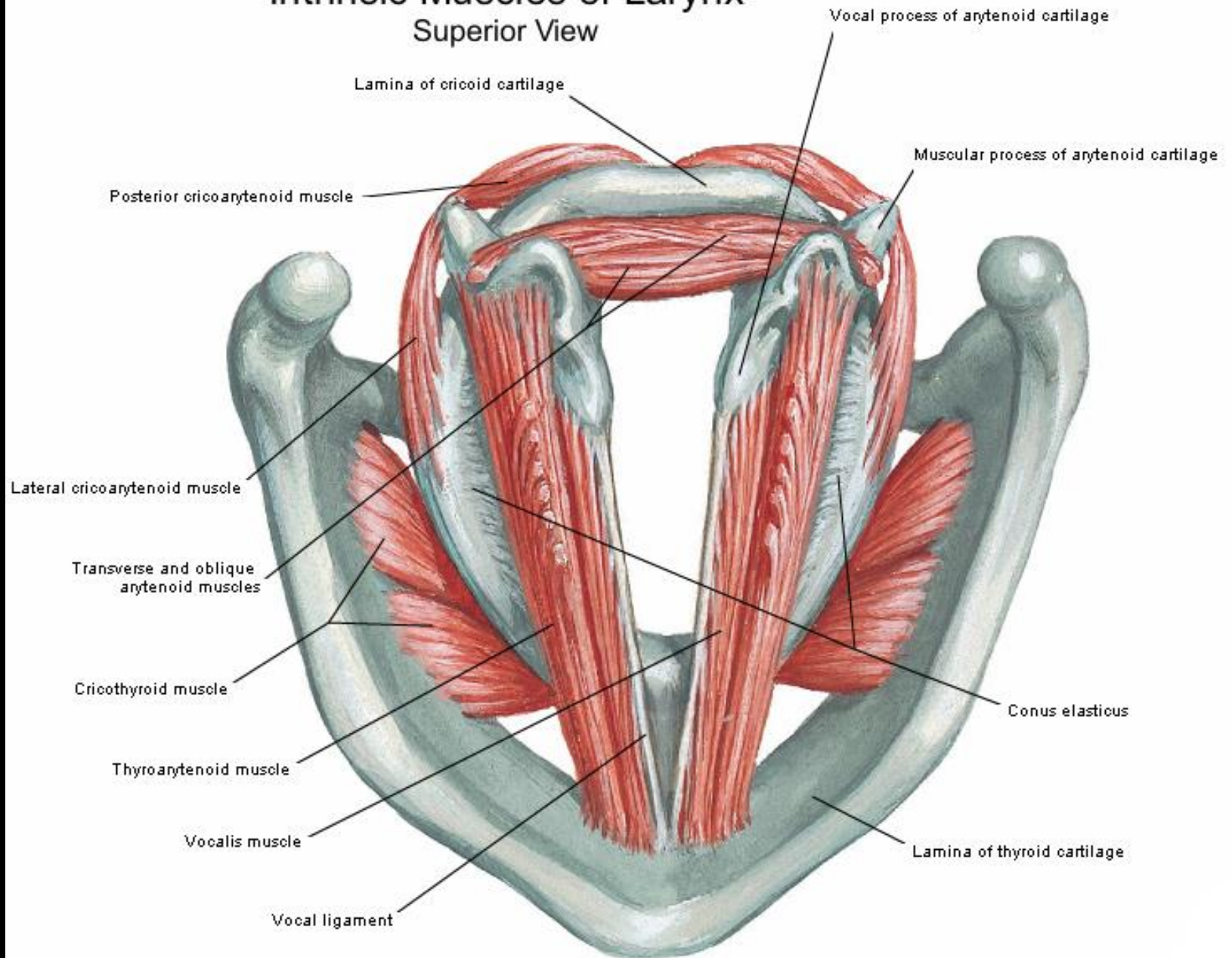
# Intrinsic Muscles of Larynx

## Lateral Dissection

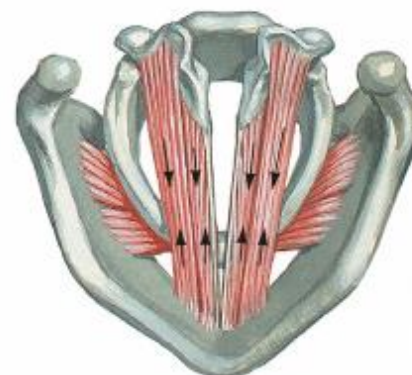
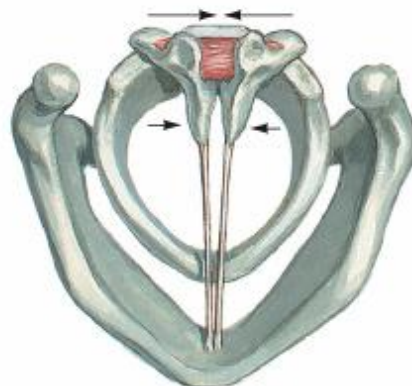
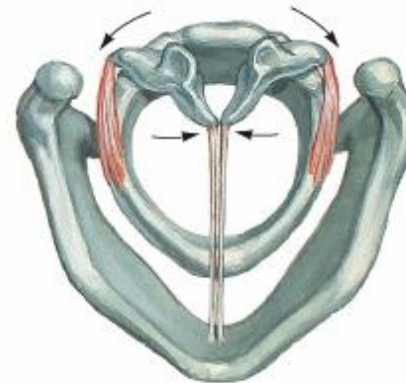
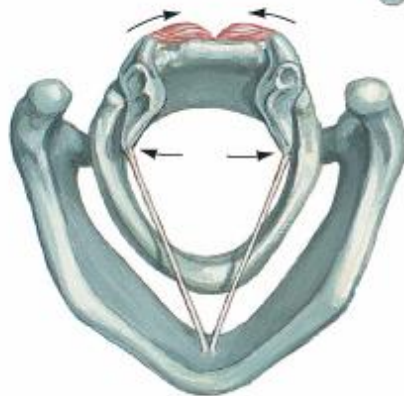
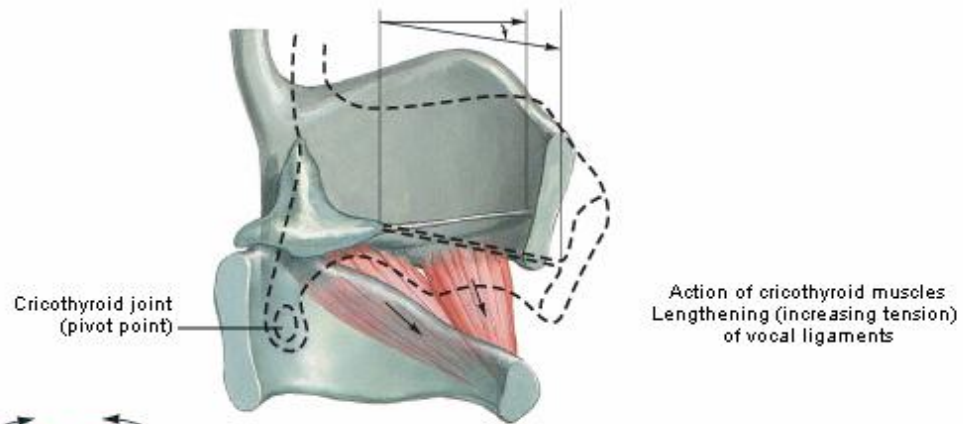


# Intrinsic Muscles of Larynx

## Superior View

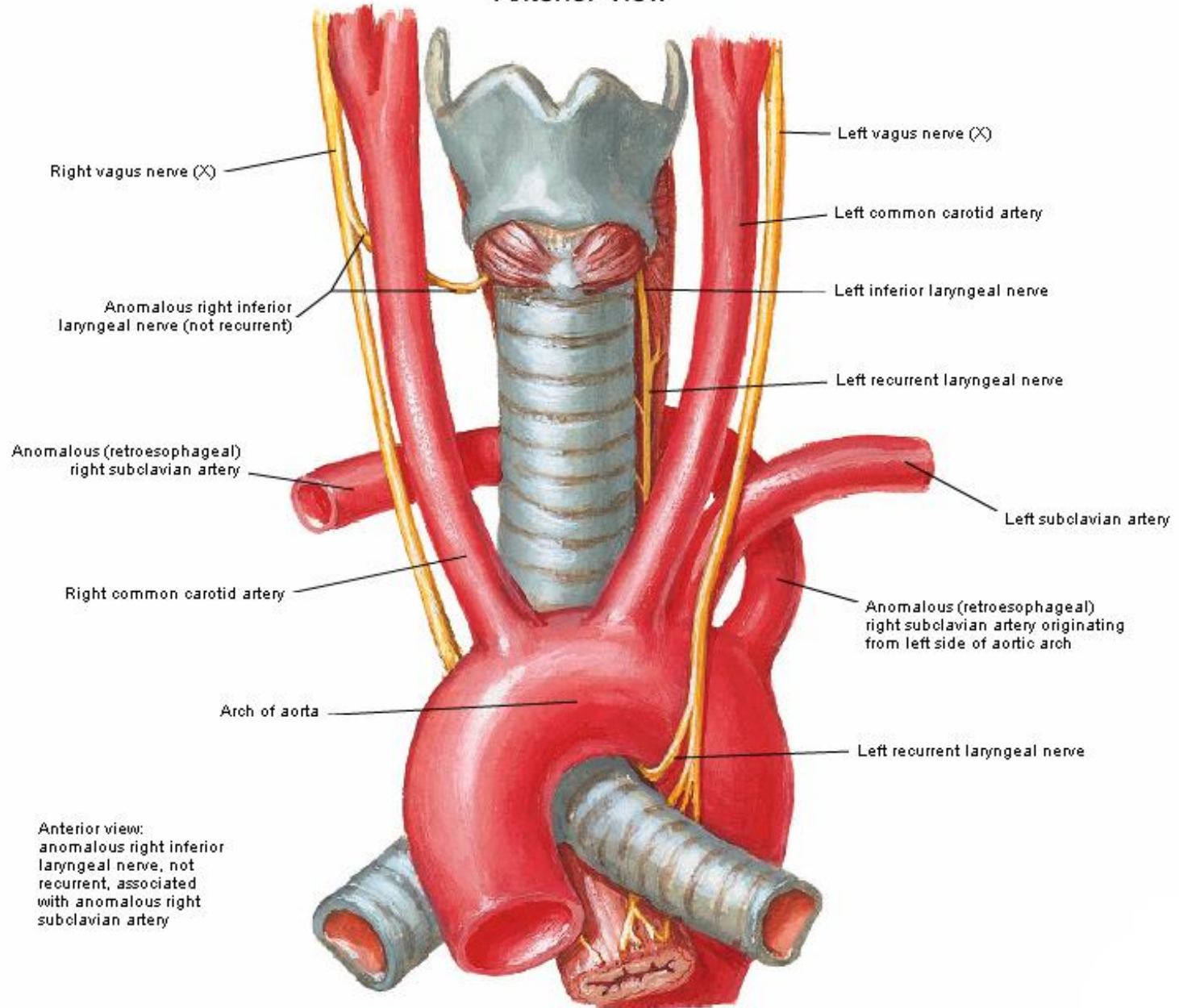


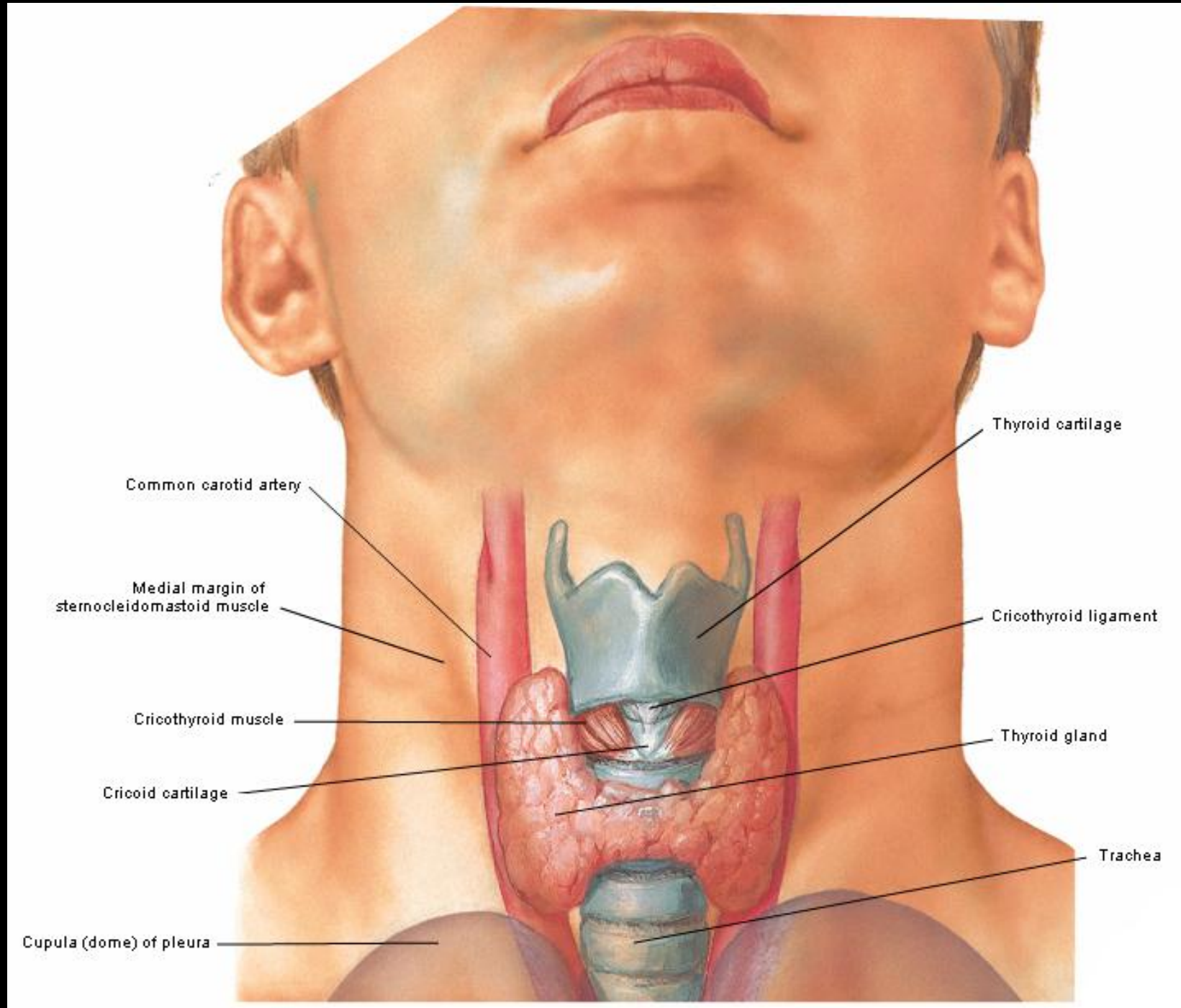
# Action of Intrinsic Muscles of Larynx

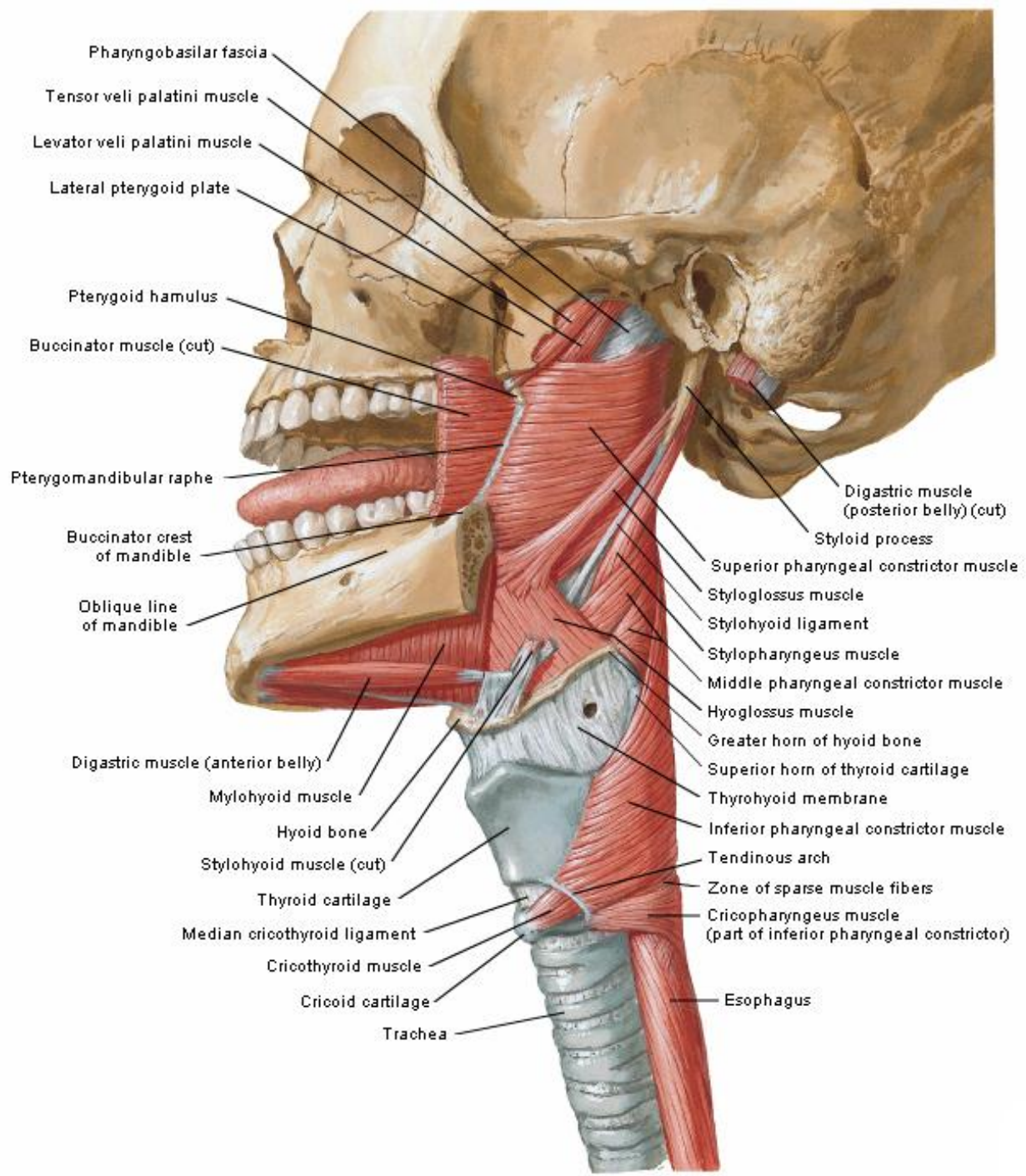


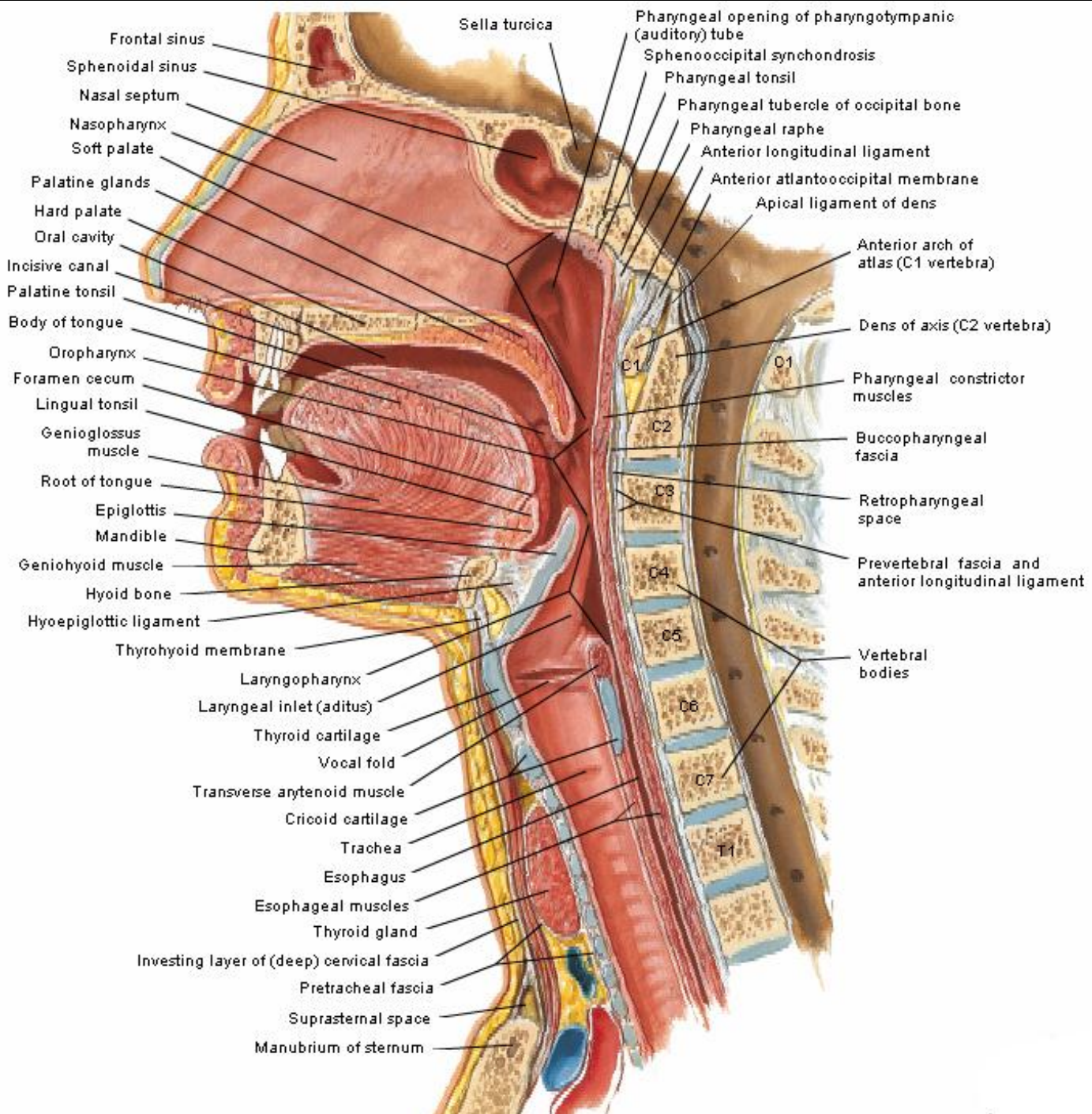
# Nerves of Larynx

## Anterior View





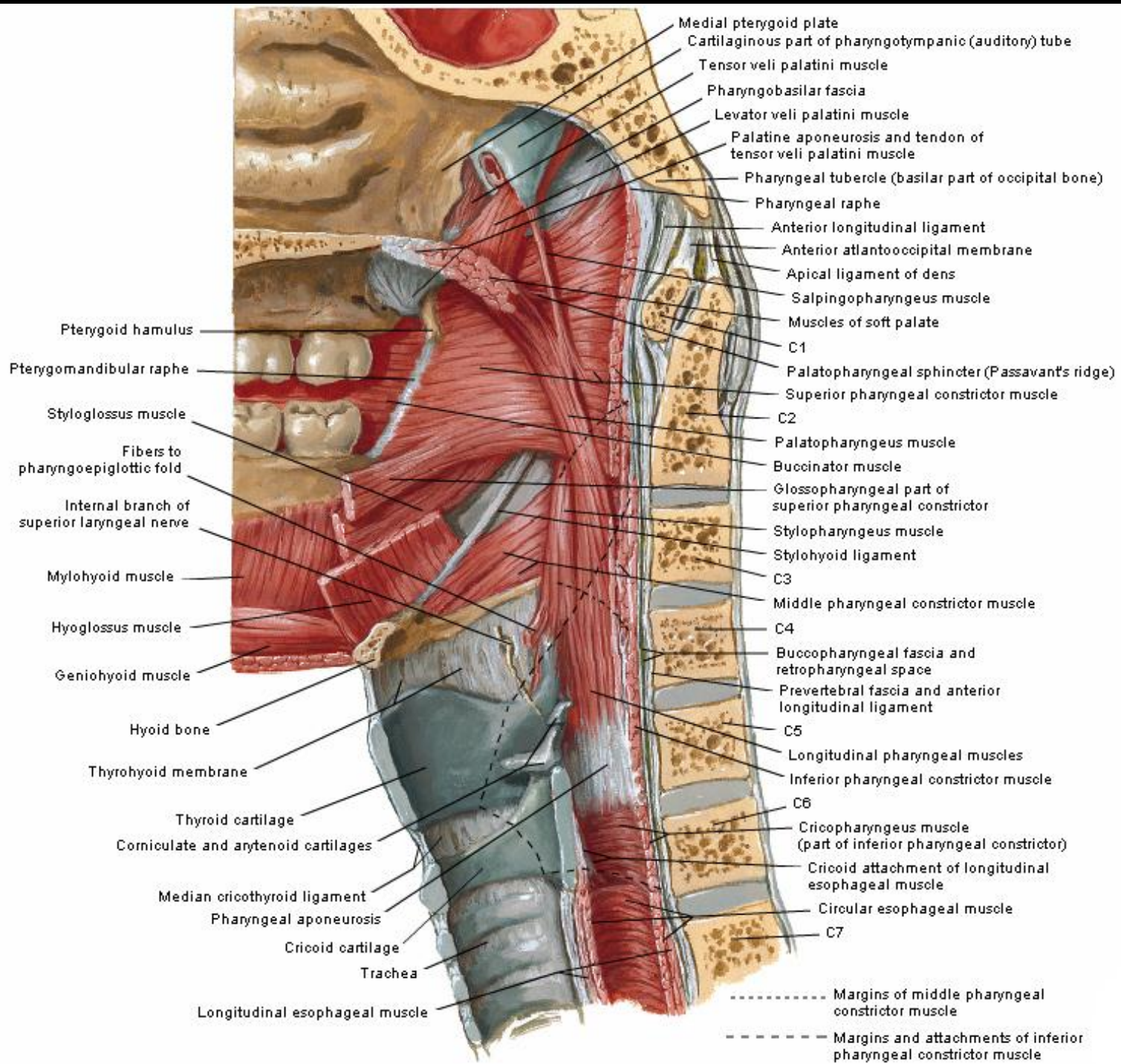


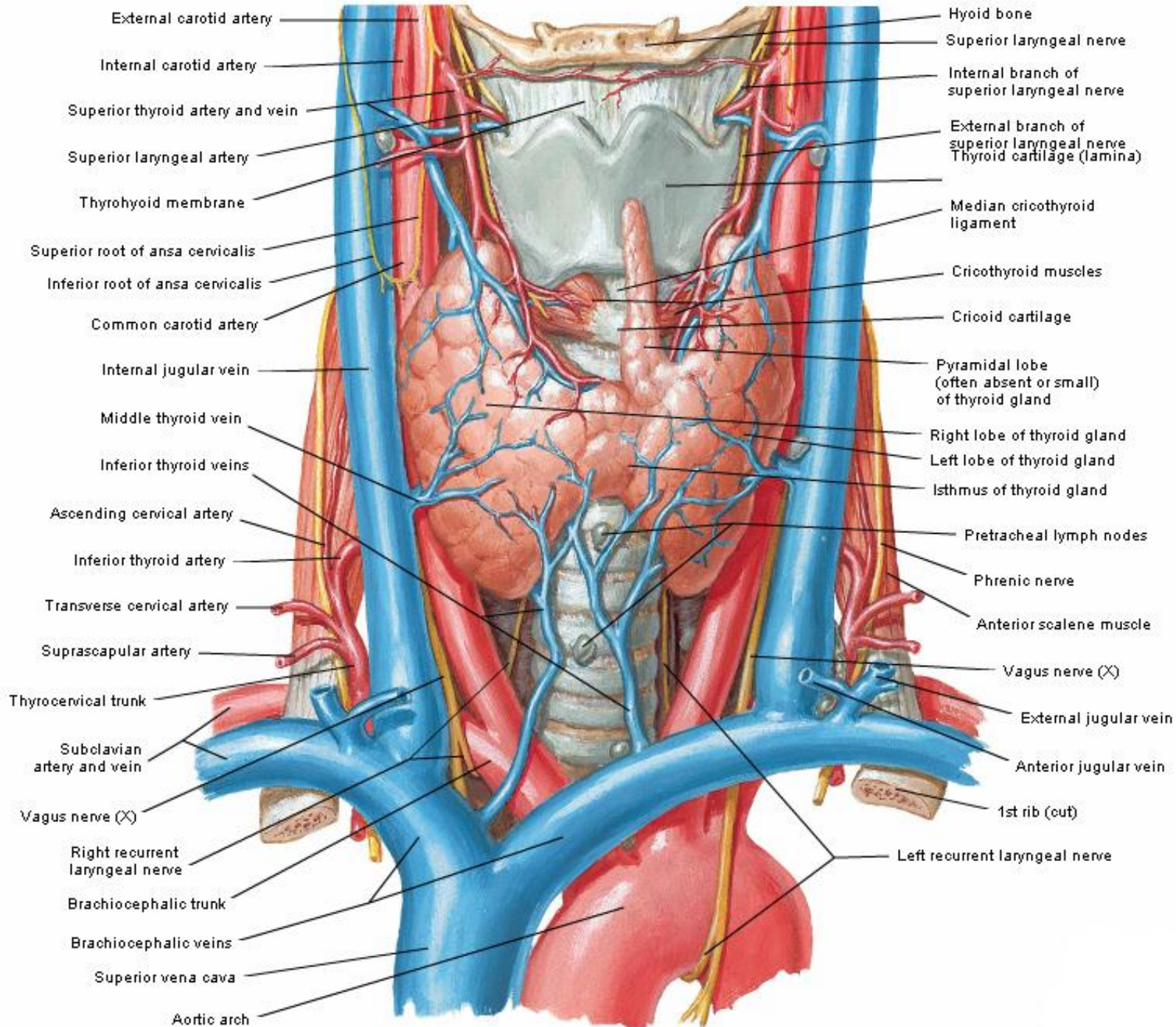


- Frontal sinus
- Sphenoidal sinus
- Nasal septum
- Nasopharynx
- Soft palate
- Palatine glands
- Hard palate
- Oral cavity
- Incisive canal
- Palatine tonsil
- Body of tongue
- Oropharynx
- Foramen cecum
- Lingual tonsil
- Genioglossus muscle
- Root of tongue
- Epiglottis
- Mandible
- Geniohyoid muscle
- Hyoid bone
- Hyoepiglottic ligament
- Thyrohyoid membrane
- Laryngopharynx
- Laryngeal inlet (aditus)
- Thyroid cartilage
- Vocal fold
- Transverse arytenoid muscle
- Cricoid cartilage
- Trachea
- Esophagus
- Esophageal muscles
- Thyroid gland
- Investing layer of (deep) cervical fascia
- Pretracheal fascia
- Suprasternal space
- Manubrium of sternum

- Sella turcica
- Pharyngeal opening of pharyngotympanic (auditory) tube
- Sphenooccipital synchondrosis
- Pharyngeal tonsil
- Pharyngeal tubercle of occipital bone
- Pharyngeal raphe
- Anterior longitudinal ligament
- Anterior atlantooccipital membrane
- Apical ligament of dens
- Anterior arch of atlas (C1 vertebra)
- Dens of axis (C2 vertebra)
- Pharyngeal constrictor muscles
- Buccopharyngeal fascia
- Retropharyngeal space
- Prevertebral fascia and anterior longitudinal ligament
- Vertebral bodies
- C1
- O1
- C2
- C3
- C4
- C5
- C6
- C7
- T1

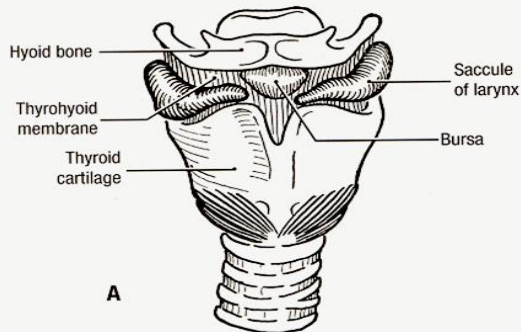
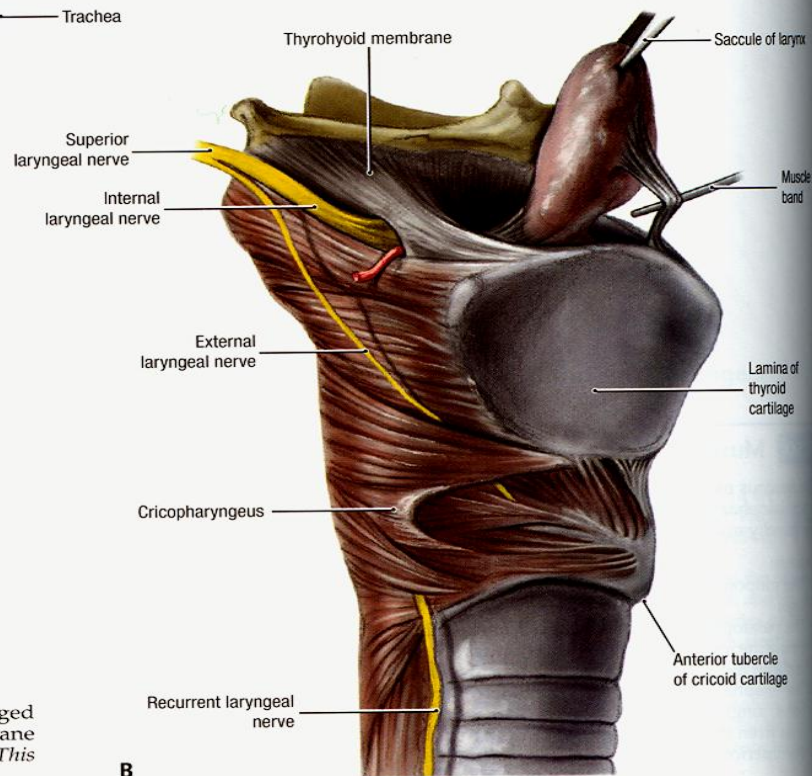
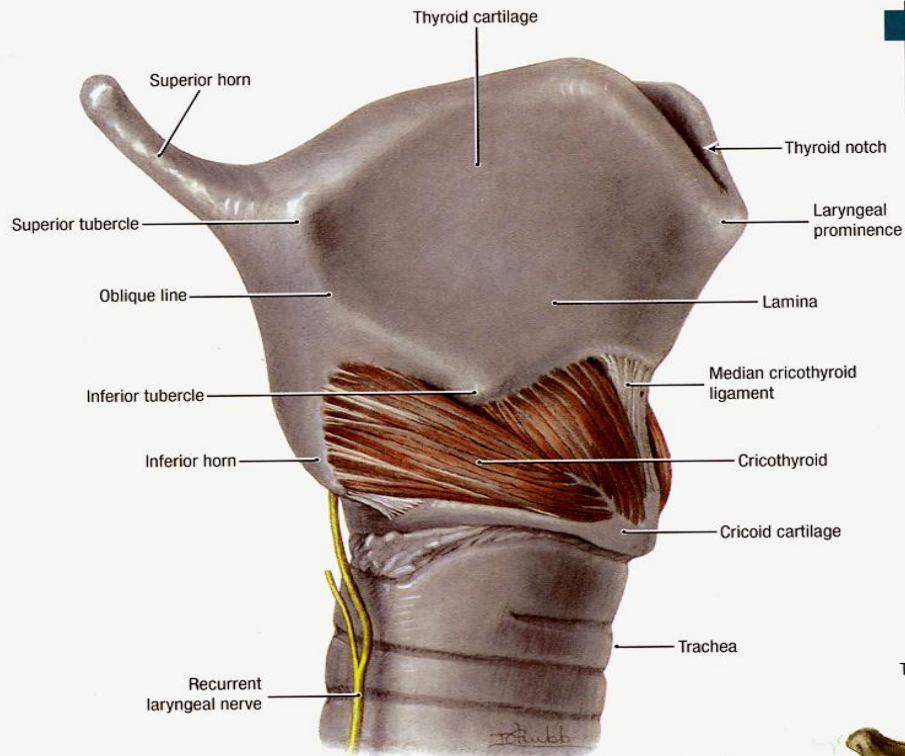






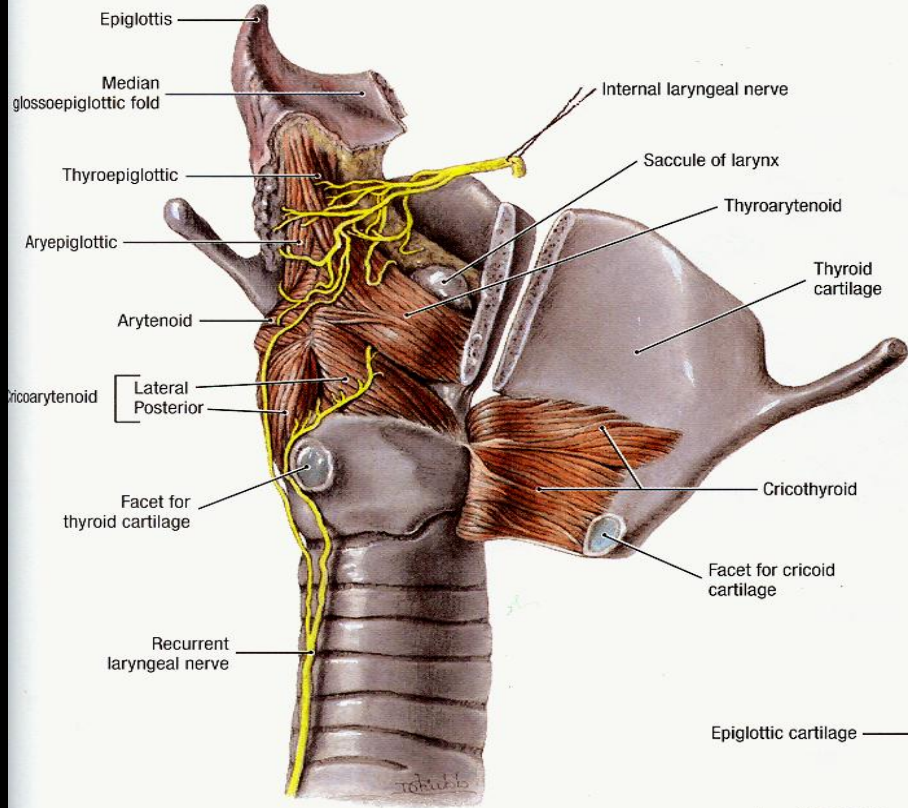
### 8.51 Thyroid cartilage and cricothyroid muscle, lateral view

The cricothyroid muscle arises from the outer surface of the arch of the cricoid cartilage and has two parts: the straight part inserts into the inferior border of the lamina of the thyroid cartilage, and the oblique part inserts into the anterior border of the inferior horn.



### 8.52 Laryngocele

**A.** Anterior view. **B.** Lateral view. The laryngocele (enlarged laryngeal saccule) projects through the thyrohyoid membrane and communicates with the larynx through the ventricle. This air sac can form a bulge in the neck, especially on coughing.



### 8.53 Muscles and nerves of larynx, and cricothyroid joint, lateral view

The thyroid cartilage was sawed through in the median plane, the cricothyroid joint was opened, and the right lamina of the thyroid cartilage was turned anteriorly, stripping the cricothyroid muscle off the arch of the cricoid cartilage.

#### OBSERVE:

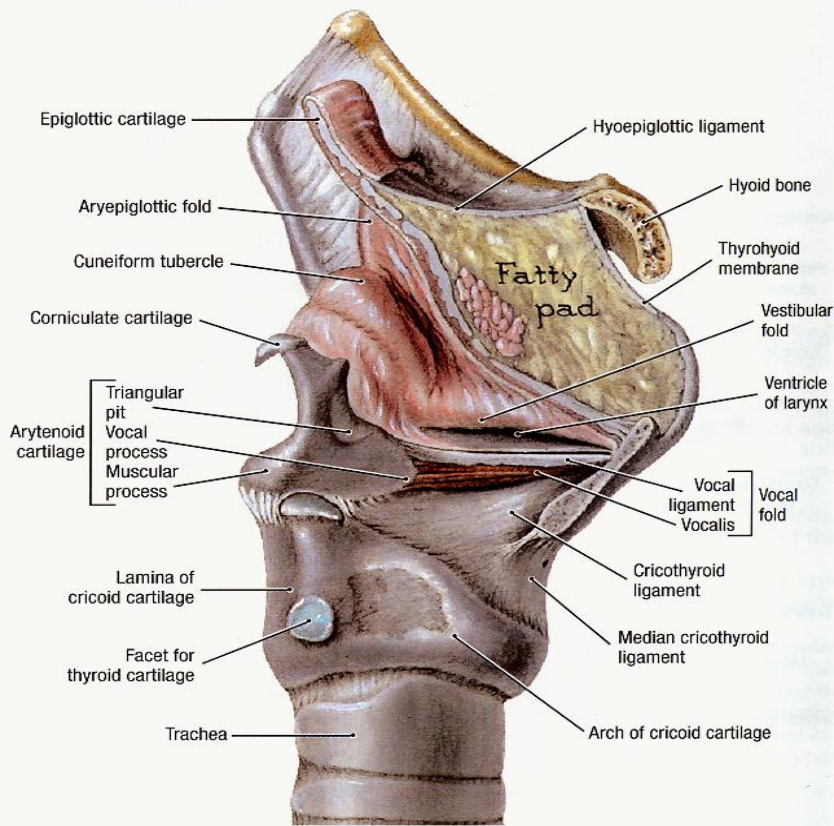
1. The lateral cricoarytenoid muscle;
2. The thyroarytenoid muscle inserts with the arytenoid muscle into the lateral border of the arytenoid cartilage; its superior fibers continue to the epiglottis as the thyroepiglottic muscle;
3. The internal and recurrent laryngeal nerves.

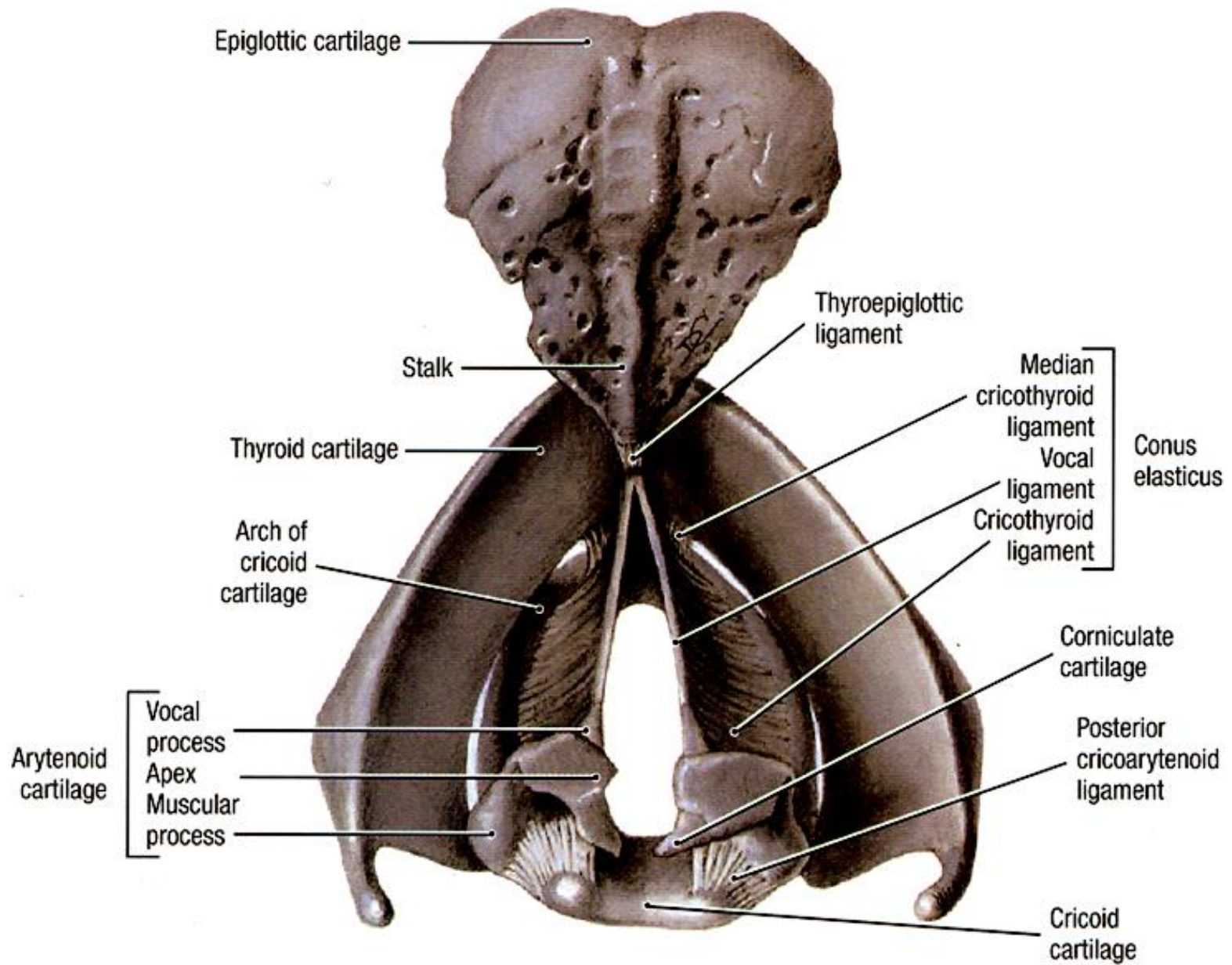
### 8.54 Larynx, lateral view

Superior to the vocal folds, the larynx was sectioned near the median plane to reveal the interior of its left side. Inferior to this level, the right side of the larynx was dissected.

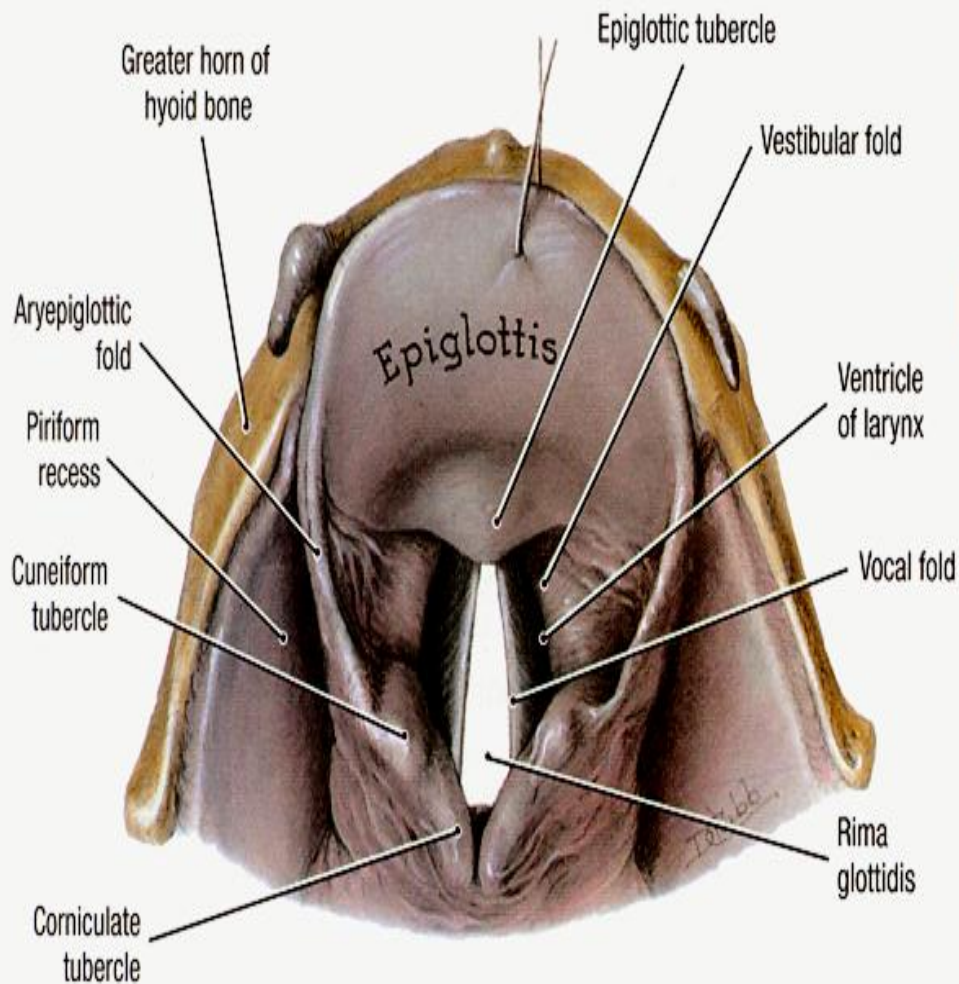
#### OBSERVE:

- A fat pad and glands fill the triangular space between the hyoepiglottic ligament, thyrohyoid membrane, and epiglottic cartilage;
- The raised, circular facet on the lateral aspect of the cricoid cartilage for the inferior horn of the thyroid cartilage; superior to this is the sloping facet for the arytenoid cartilage.
- The vocal fold (true vocal cord) consists of the vocal ligament and vocalis (vocal muscle), which is part of the thyroarytenoid muscle.





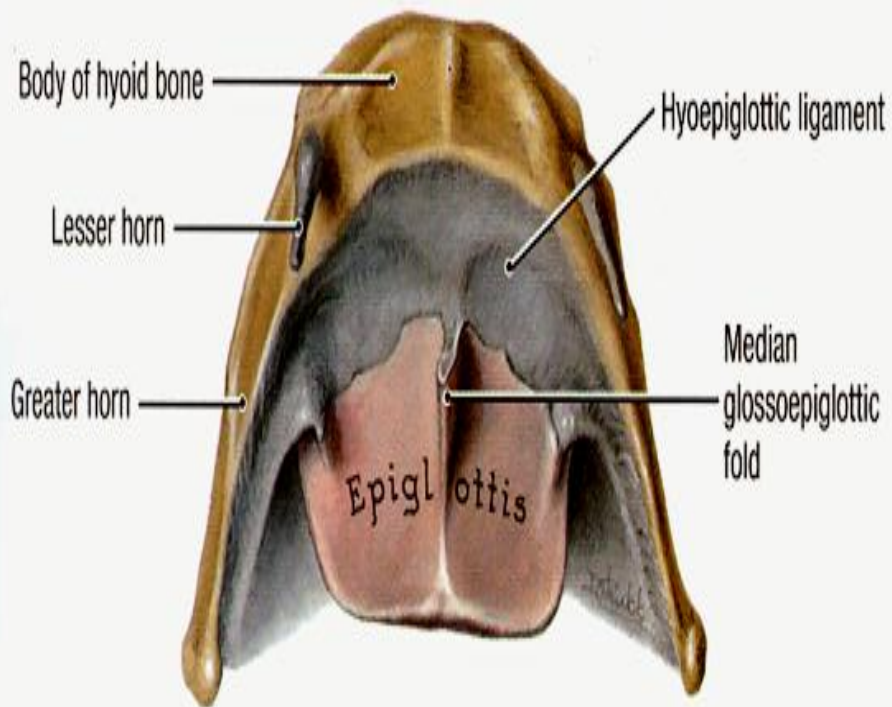
**8.55** Skeleton of larynx, superior view



## 8.56 Larynx, superior view

### OBSERVE:

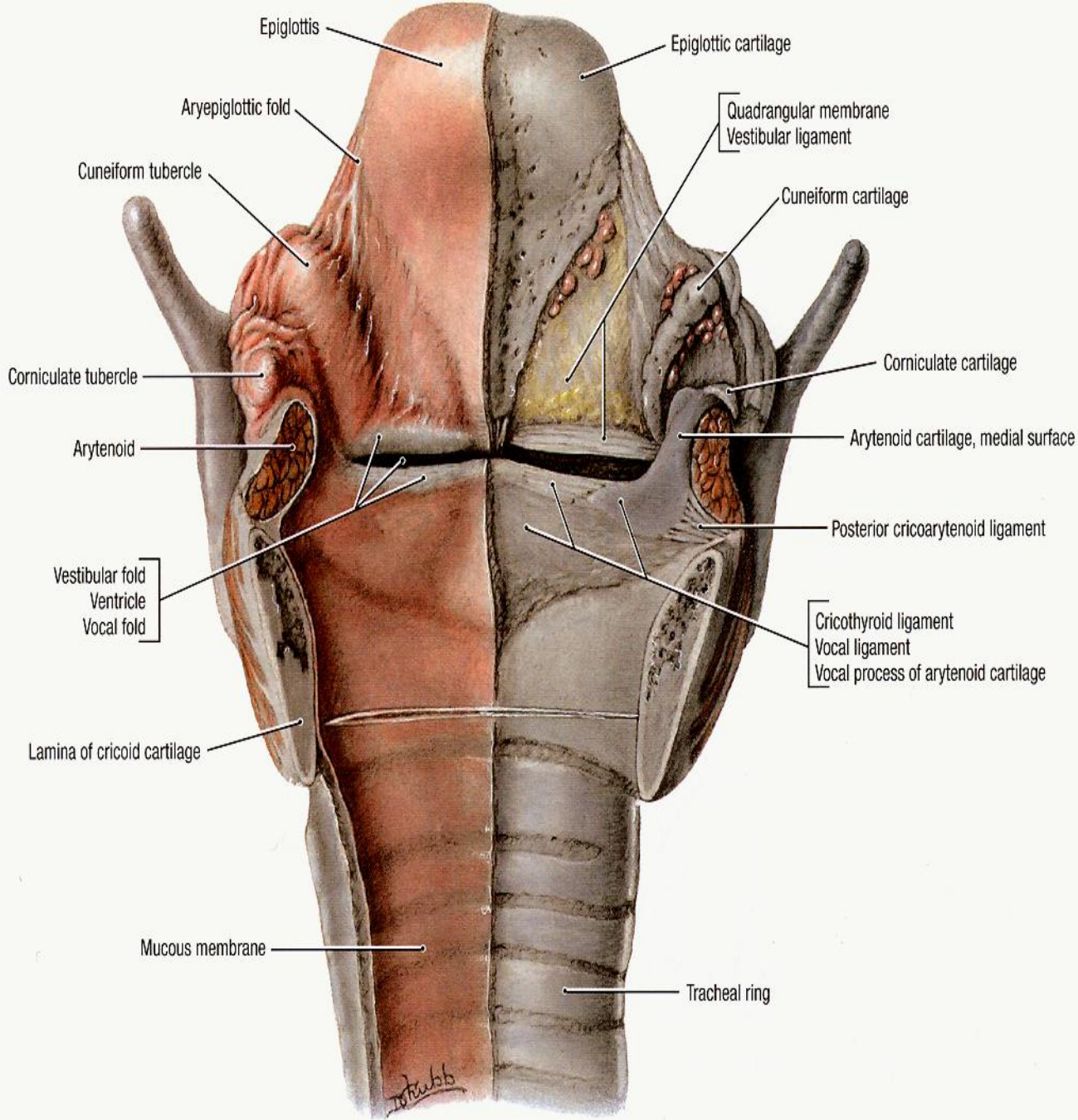
1. The inlet, or aditus, to the larynx is bounded anteriorly by the epiglottis; posteriorly by the arytenoid cartilages, the corniculate cartilages that cap them, and the interarytenoid fold that unites them; and on each side by the aryepiglottic fold, which contains the superior end of the cuneiform cartilage;
2. The vocal folds are closer together than the vestibular folds;
3. The rima glottidis is the aperture between the vocal folds. *During normal respiration, it is narrow and wedge shaped; during forced respiration, it is wide. Variation in the tension and length of the vocal folds, in the width of the rima glottidis, and in the intensity of the expiratory effort produce changes in the pitch of the voice.*



## 8.57 Epiglottis and hyoepiglottic ligament, superior view

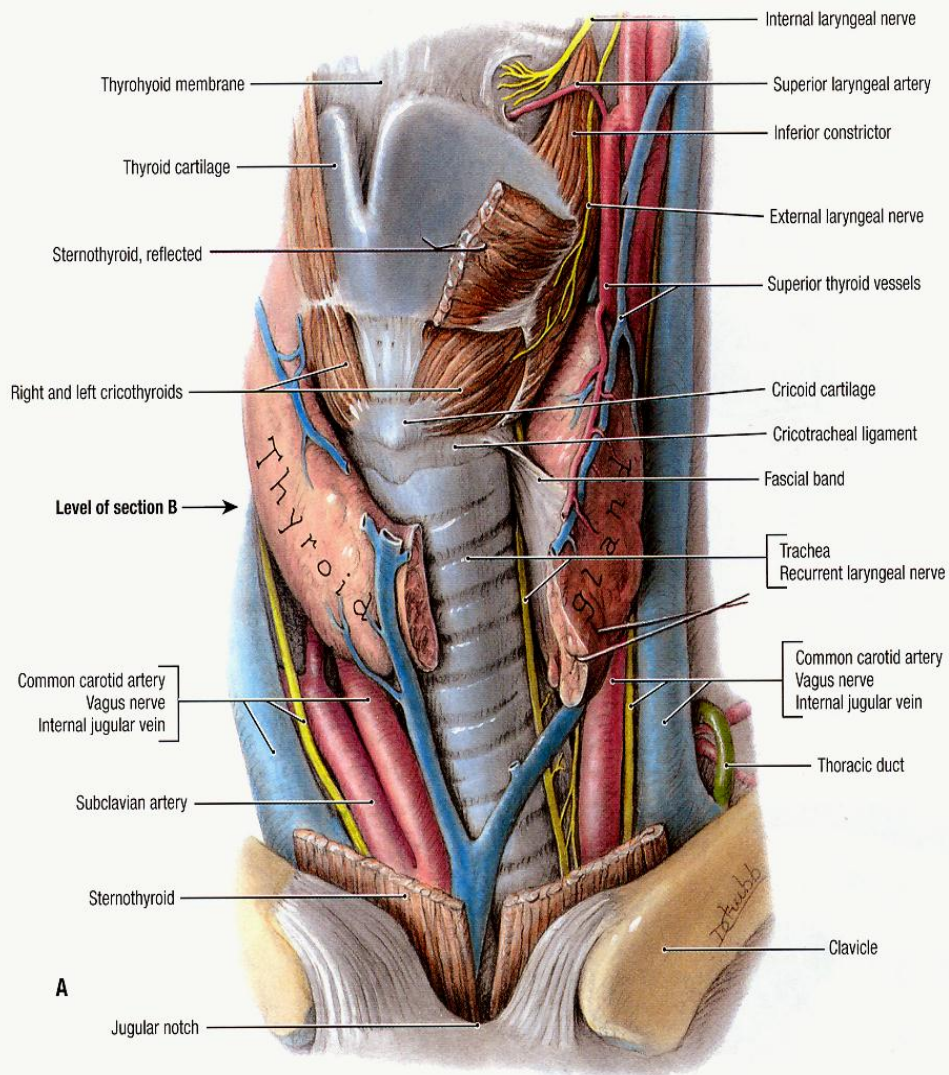
OBSERVE:

1. The hyoepiglottic ligament unites the epiglottic cartilage to the hyoid bone;
2. The body, lesser, and greater horns of the hyoid bone.



8.58 Interior of larynx, posterior view





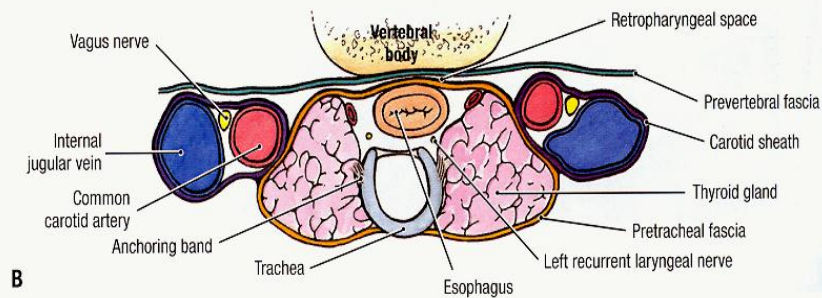
### 1.27 Anterior neck—V

A. Thyroid gland retracted, anterolateral view. The isthmus of the thyroid gland is divided, and the left lobe is retracted. B. Relations of thyroid gland, transverse section.

**REMEMBER:**

The retaining fascial band attaches the capsule of the thyroid gland to the cricotracheal ligament and cricoid cartilage;

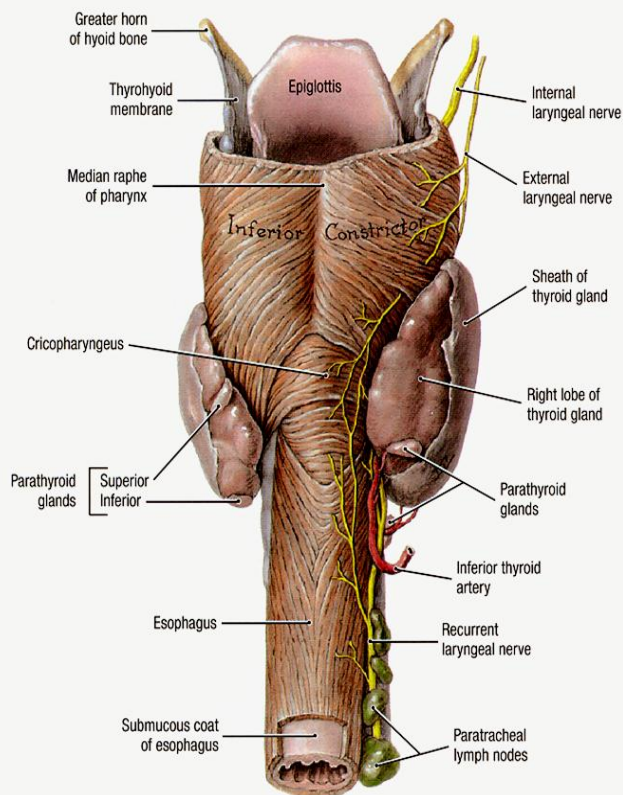
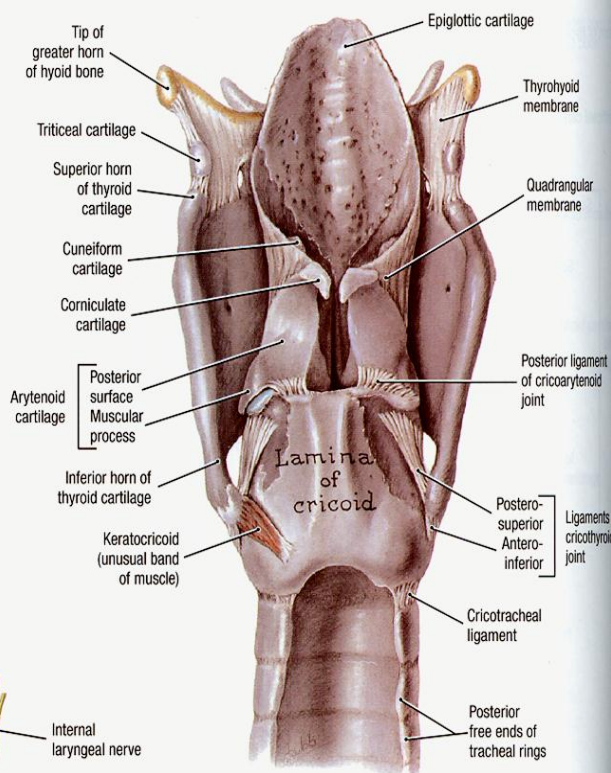
The left recurrent laryngeal nerve ascends on the lateral aspect of the trachea, just anterior to the angle between the trachea and



## 8.48 Skeleton of larynx, posterior view

### OBSERVE:

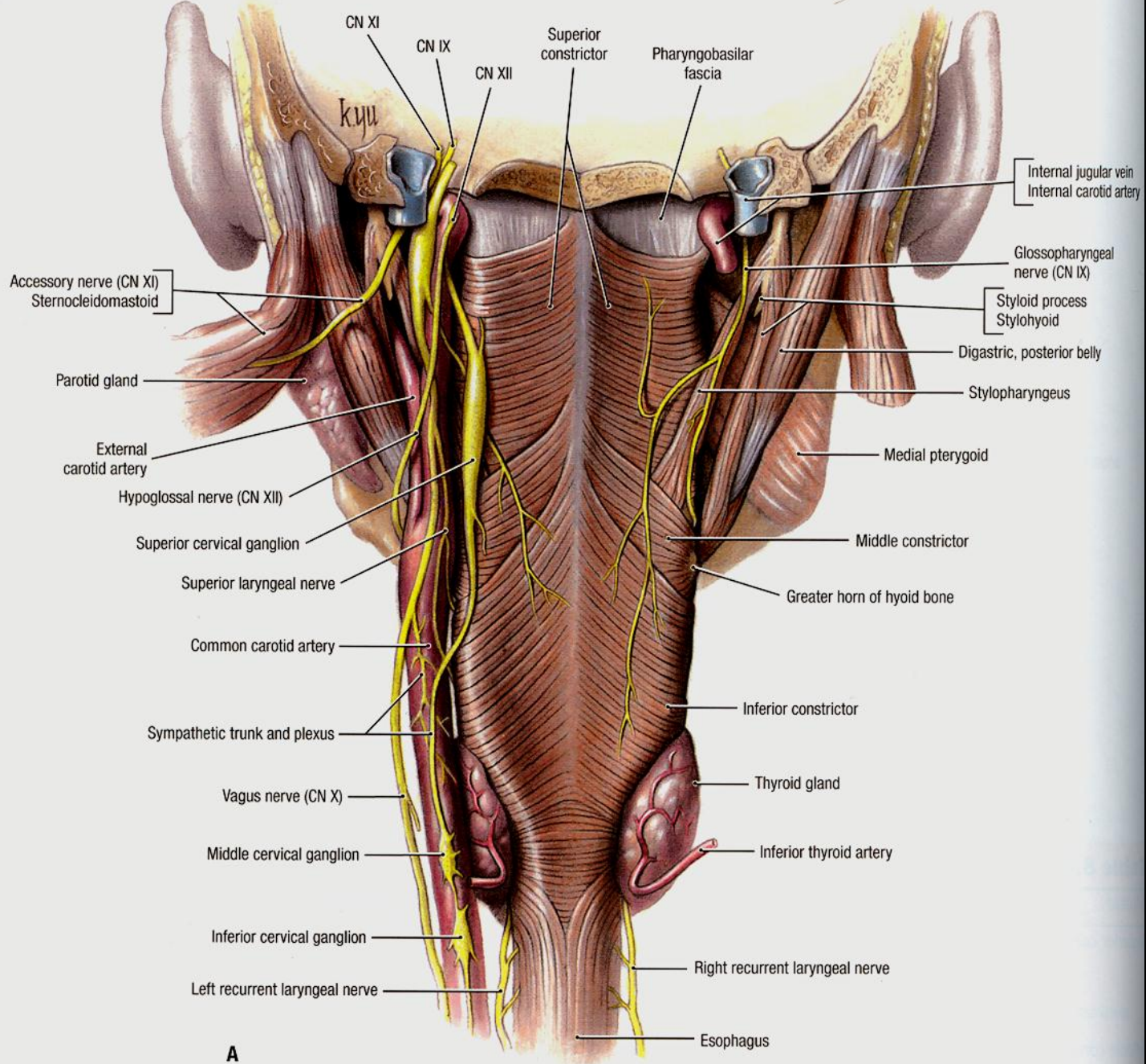
1. The thyroid cartilage shields the smaller cartilages of the larynx (epiglottic, arytenoid, corniculate, and cuneiform);
2. The rounded posterior border of the thyroid cartilage and its superior and inferior horns; the inferior horn articulates with the cricoid cartilage at the cricothyroid joint;
3. The quadrangular membrane connects the border of the epiglottic cartilage to the arytenoid and corniculate cartilages.



## 8.49 Thyroid gland and laryngeal nerves, posterior view

### OBSERVE:

1. The superior parathyroid gland lies in a crevice of the posterior border of the lobes of the thyroid gland. On the right side of the specimen, both parathyroid glands are low;
2. The internal laryngeal nerve innervates the mucosa superior to the vocal folds, and the external laryngeal nerve supplies the inferior constrictor and cricothyroid muscles. The recurrent laryngeal nerve supplies the esophagus, trachea, and inferior constrictor muscle, and then continues into the larynx. At the larynx, it supplies sensory innervation to the area inferior to the vocal folds (cord) and motor innervation to all of the intrinsic muscles of the larynx, except the cricothyroid.



A

# Respiratory system

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# Respiratory system

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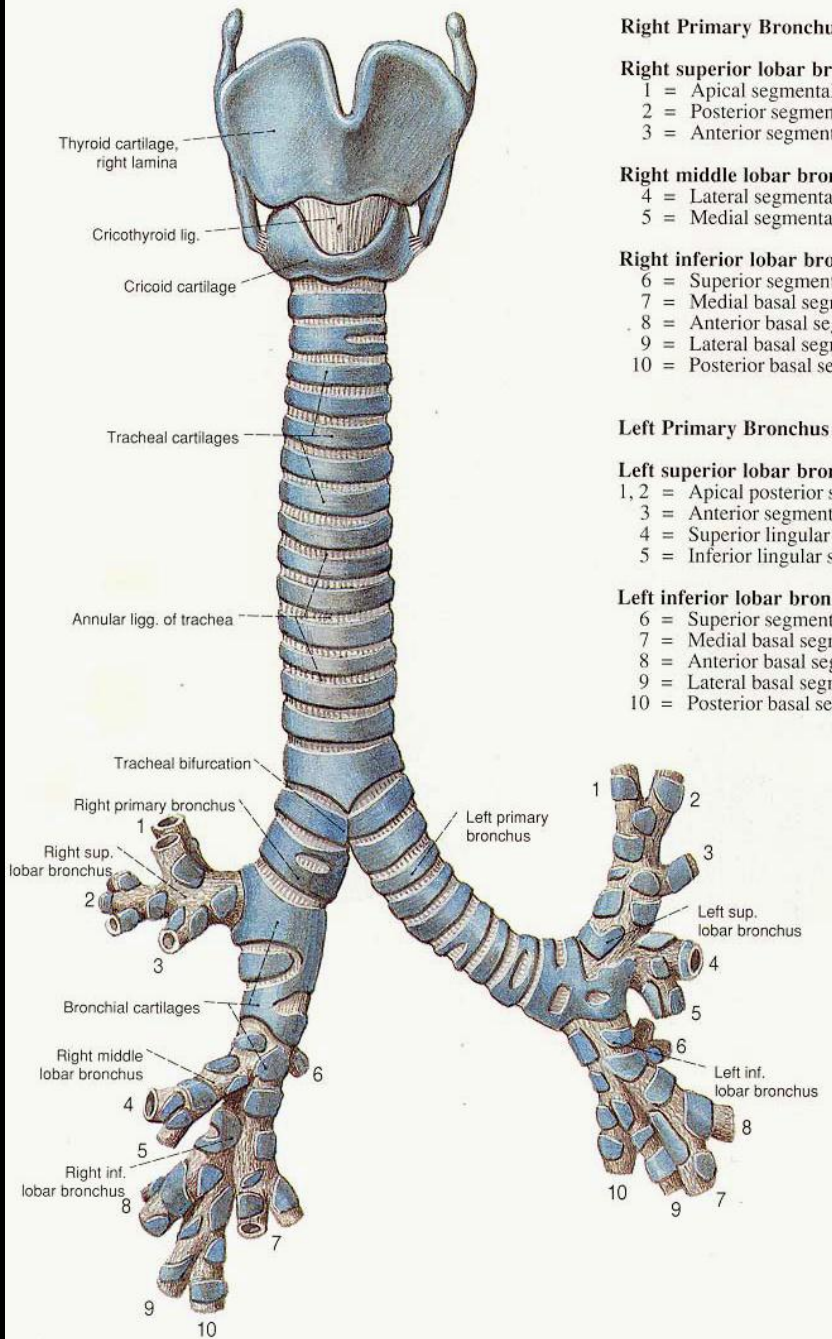
**3- Pharynx**

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**Right Primary Bronchus**

**Right superior lobar bronchus**

- 1 = Apical segmental bronchus (B<sup>1</sup>)
- 2 = Posterior segmental bronchus (B<sup>2</sup>)
- 3 = Anterior segmental bronchus (B<sup>3</sup>)

**Right middle lobar bronchus**

- 4 = Lateral segmental bronchus (B<sup>4</sup>)
- 5 = Medial segmental bronchus (B<sup>5</sup>)

**Right inferior lobar bronchus**

- 6 = Superior segmental bronchus (B<sup>6</sup>)
- 7 = Medial basal segmental bronchus (B<sup>7</sup>)
- 8 = Anterior basal segmental bronchus (B<sup>8</sup>)
- 9 = Lateral basal segmental bronchus (B<sup>9</sup>)
- 10 = Posterior basal segmental bronchus (B<sup>10</sup>)

**Left Primary Bronchus**

**Left superior lobar bronchus**

- 1, 2 = Apical posterior segmental bronchus (B<sup>1</sup>, B<sup>2</sup>)
- 3 = Anterior segmental bronchus (B<sup>3</sup>)
- 4 = Superior lingular segmental bronchus (B<sup>4</sup>)
- 5 = Inferior lingular segmental bronchus (B<sup>5</sup>)

**Left inferior lobar bronchus**

- 6 = Superior segmental bronchus (B<sup>6</sup>)
- 7 = Medial basal segmental bronchus (B<sup>7</sup>)
- 8 = Anterior basal segmental bronchus (B<sup>8</sup>)
- 9 = Lateral basal segmental bronchus (B<sup>9</sup>)
- 10 = Posterior basal segmental bronchus (B<sup>10</sup>)

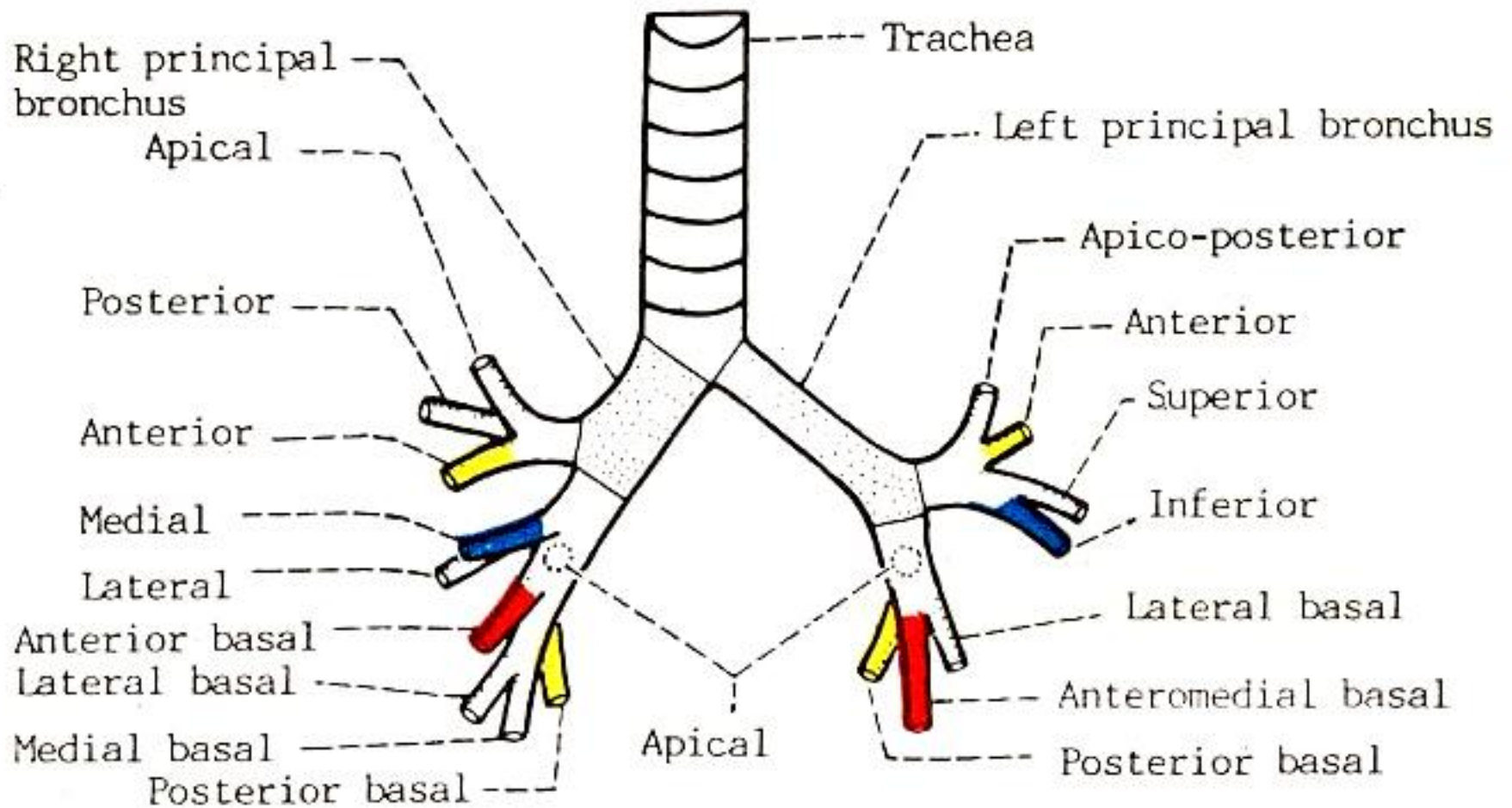
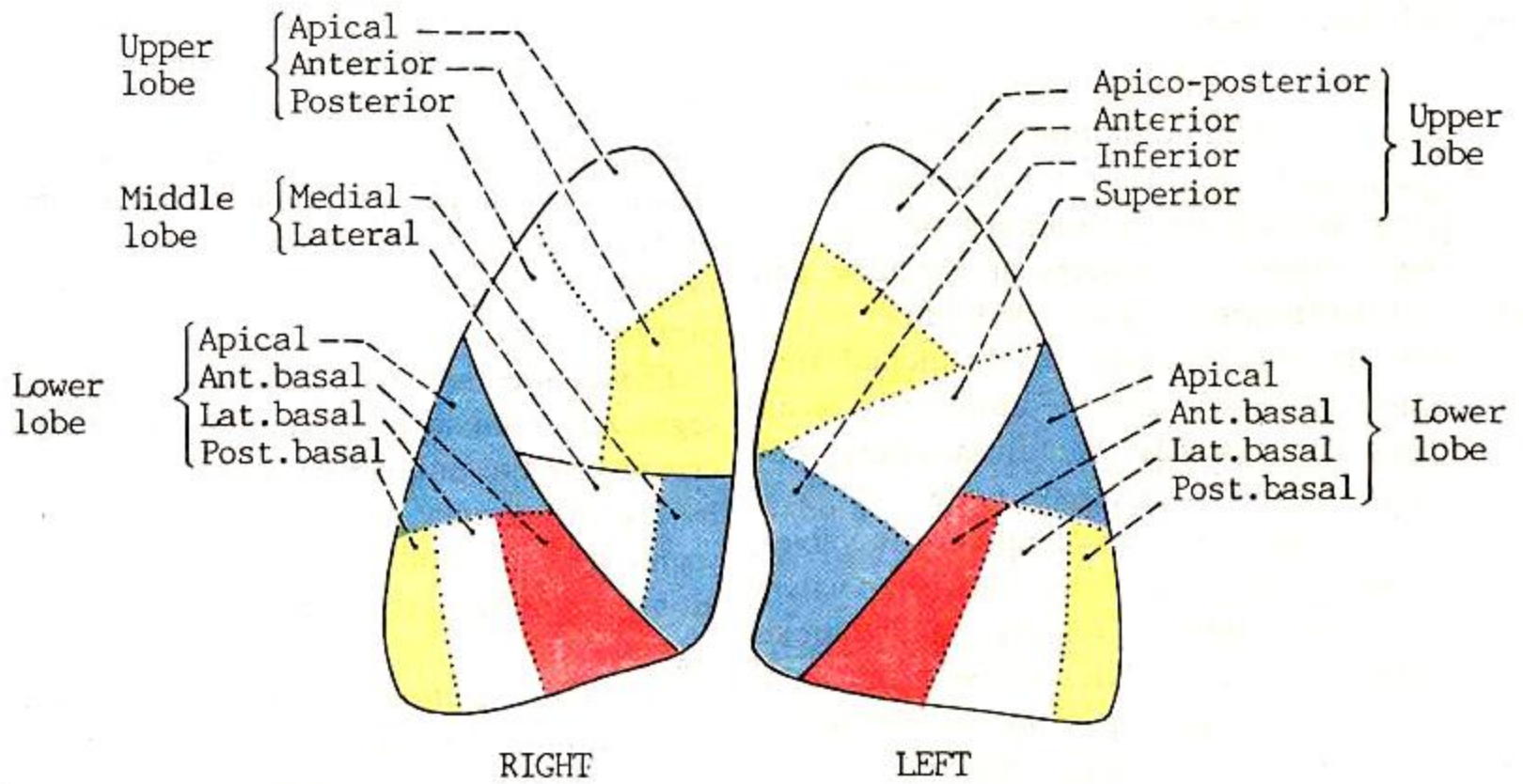
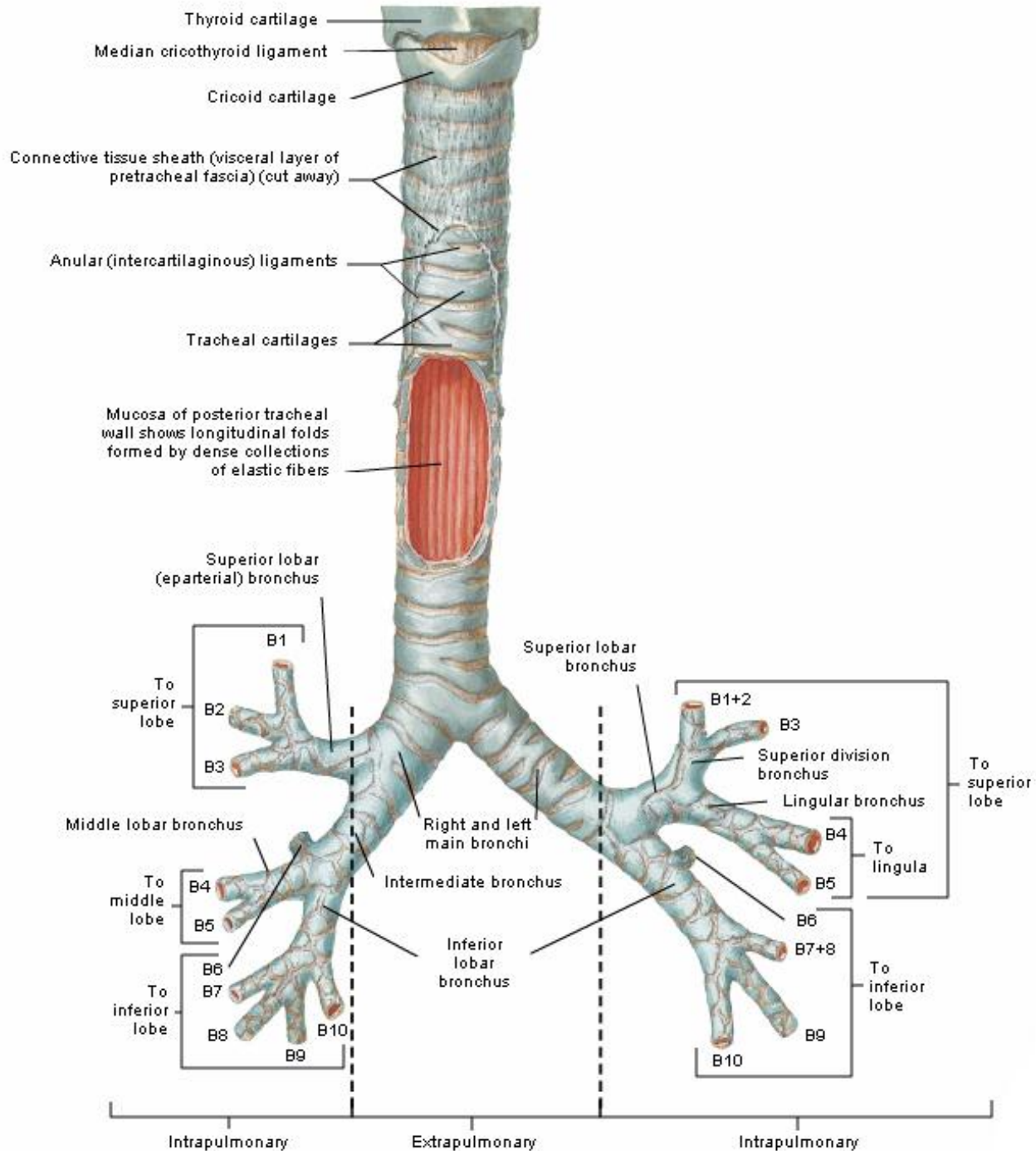
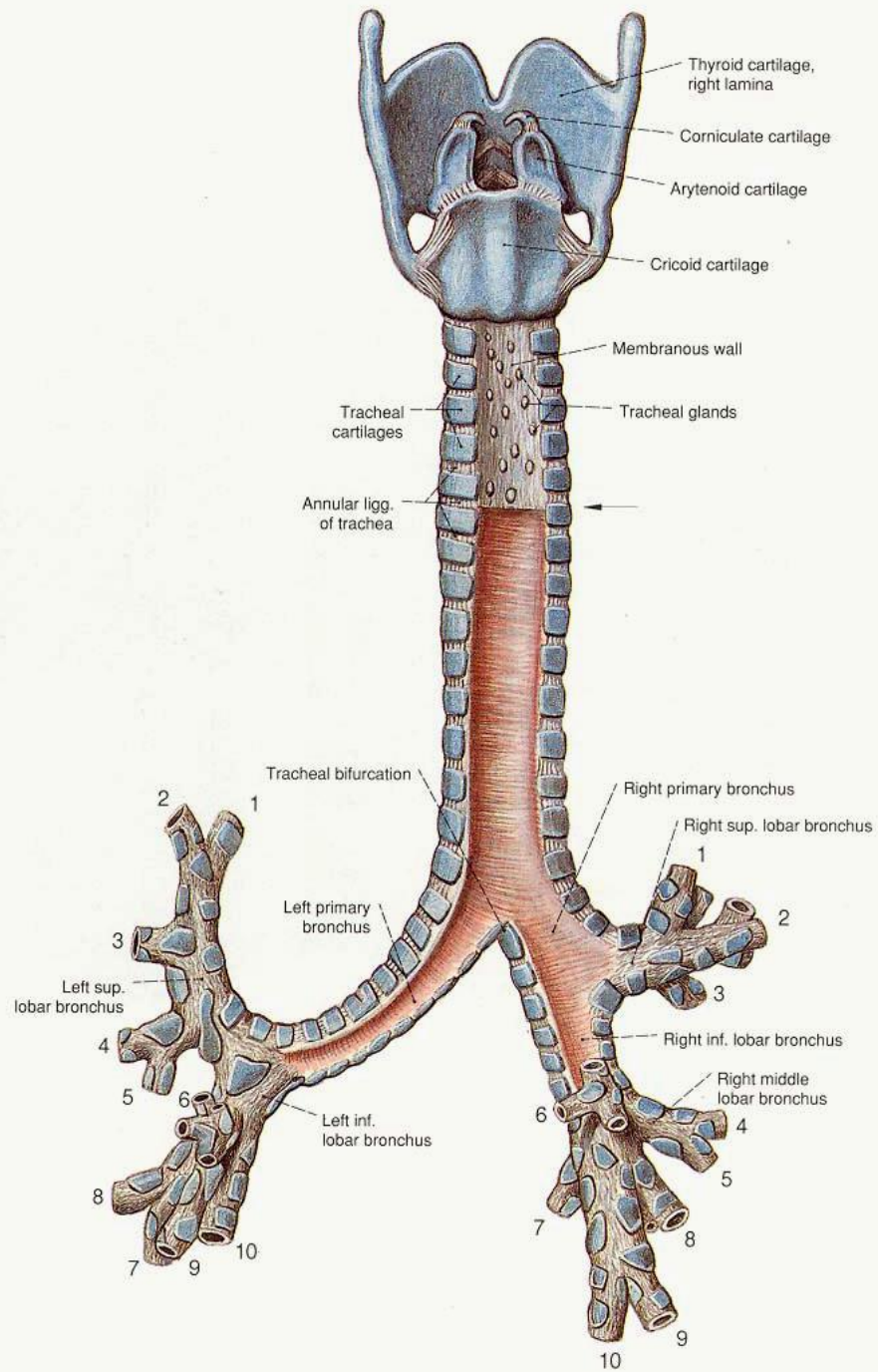


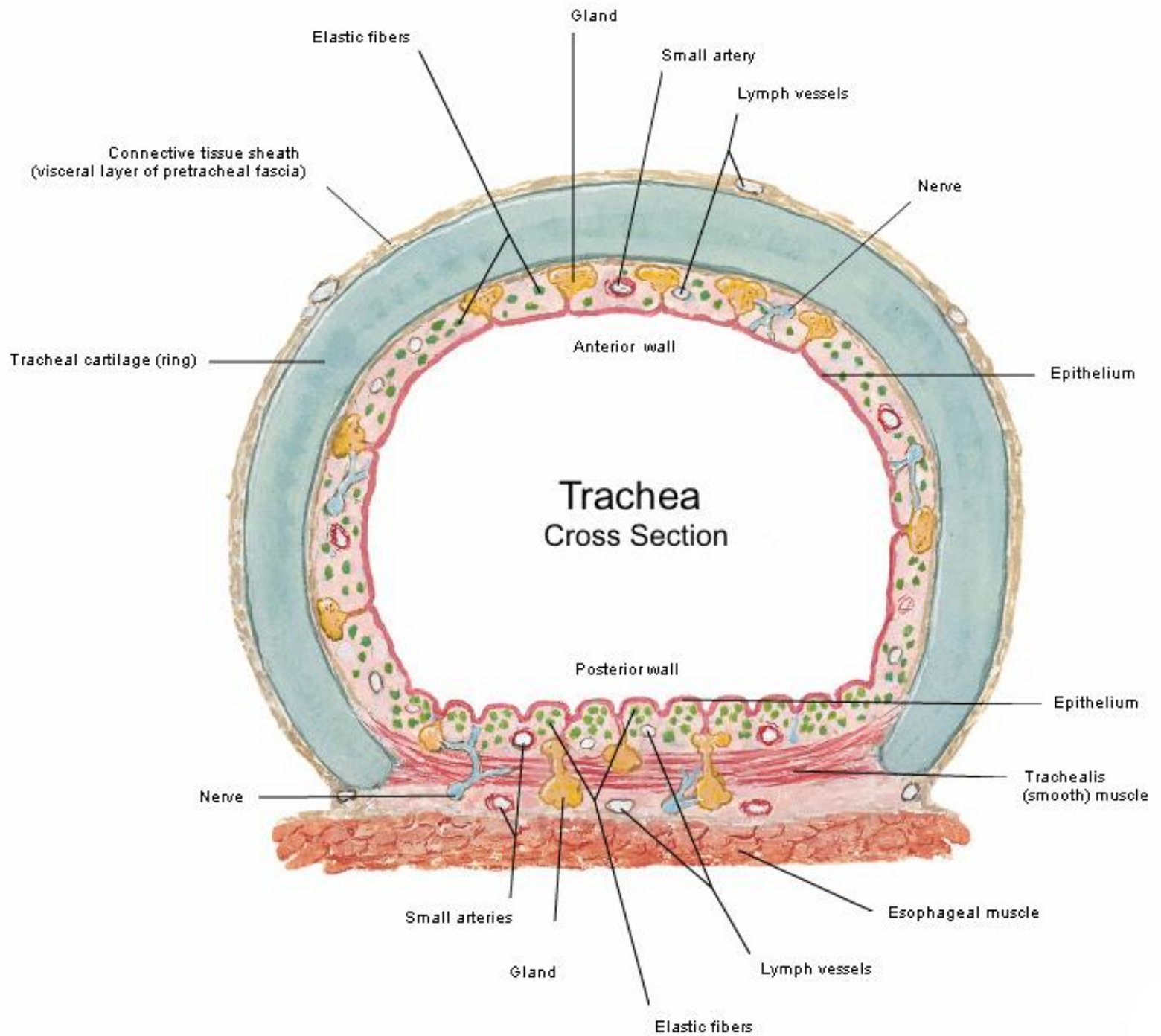
Fig. 16.7. The bronchial tree.

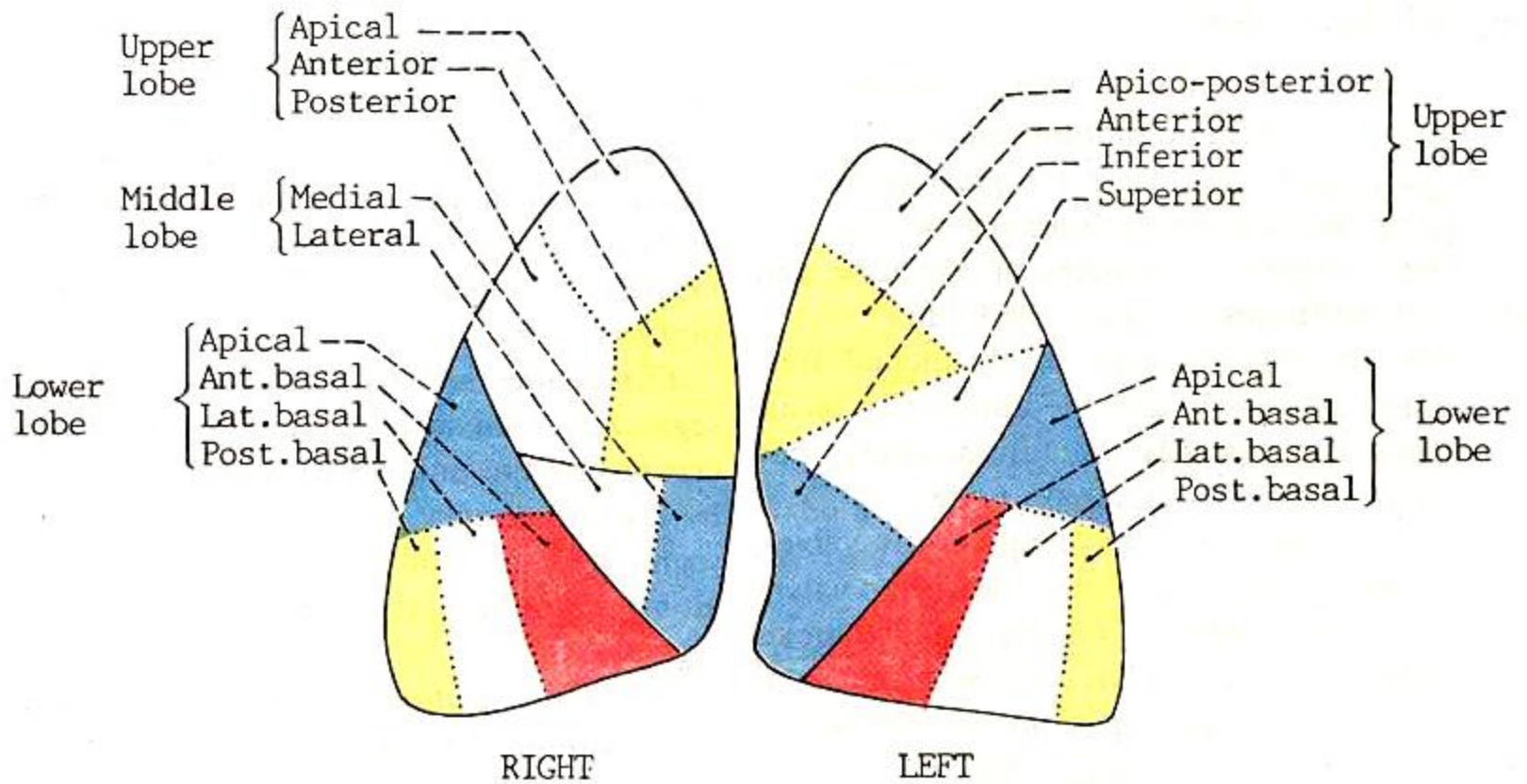


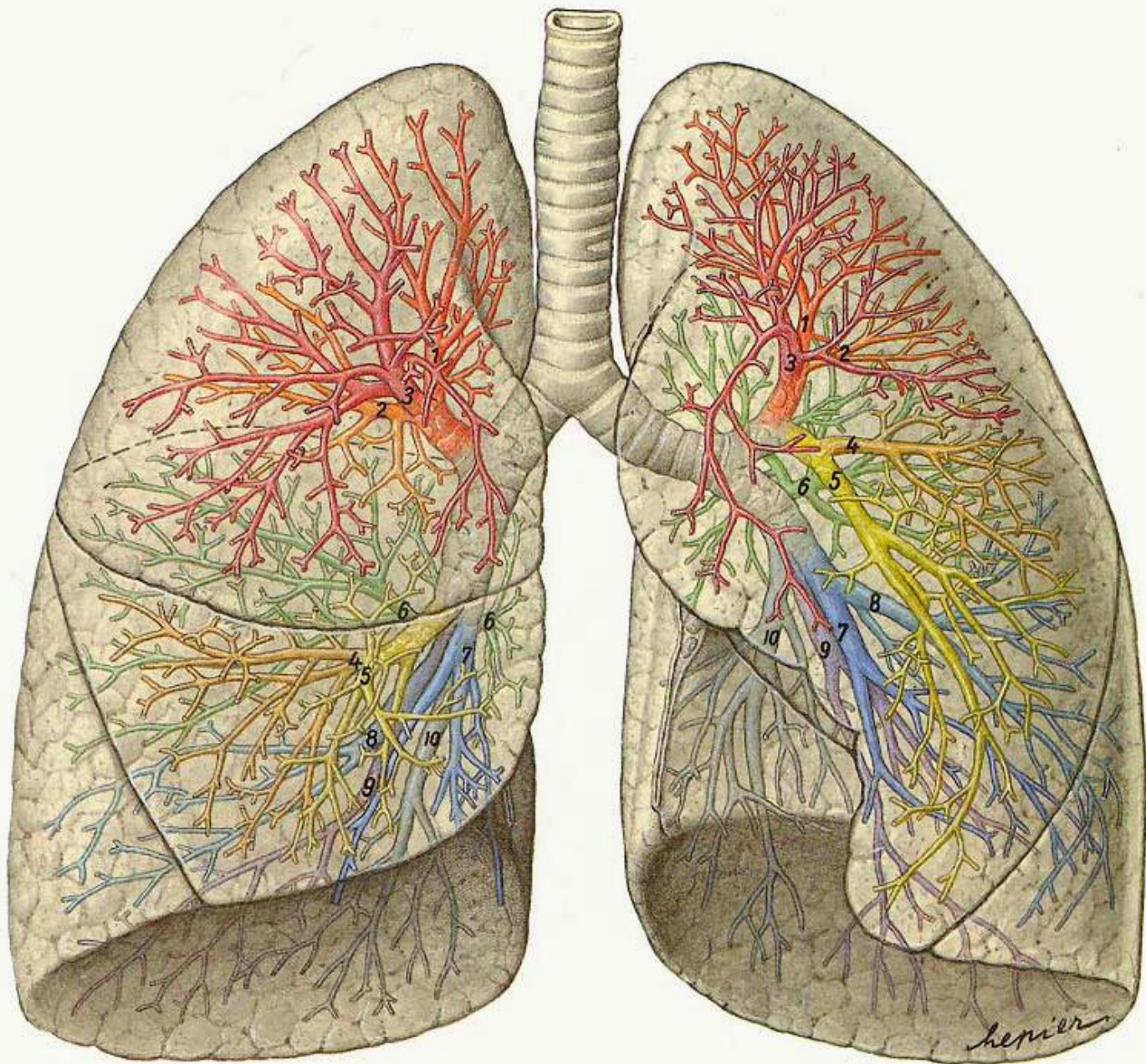


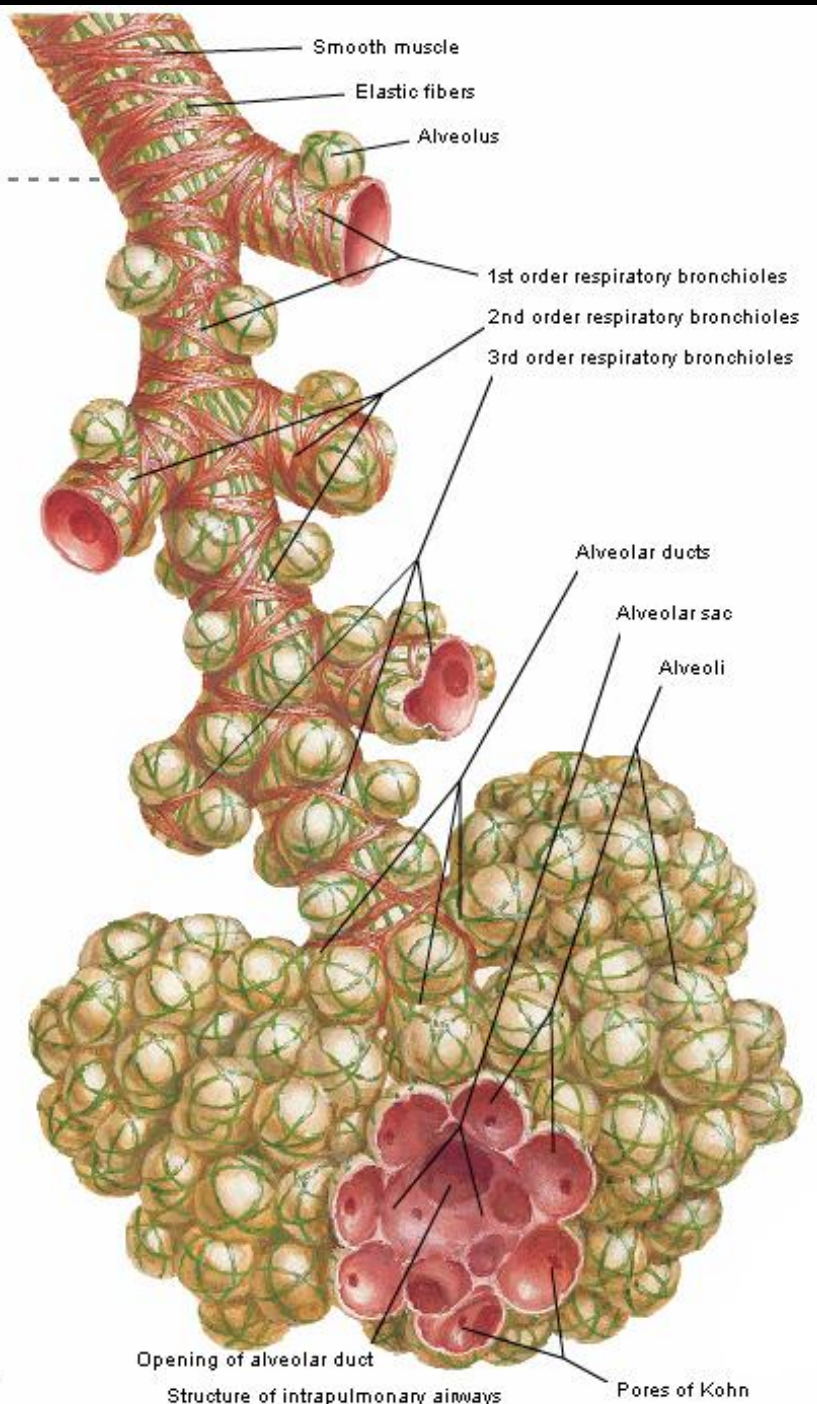
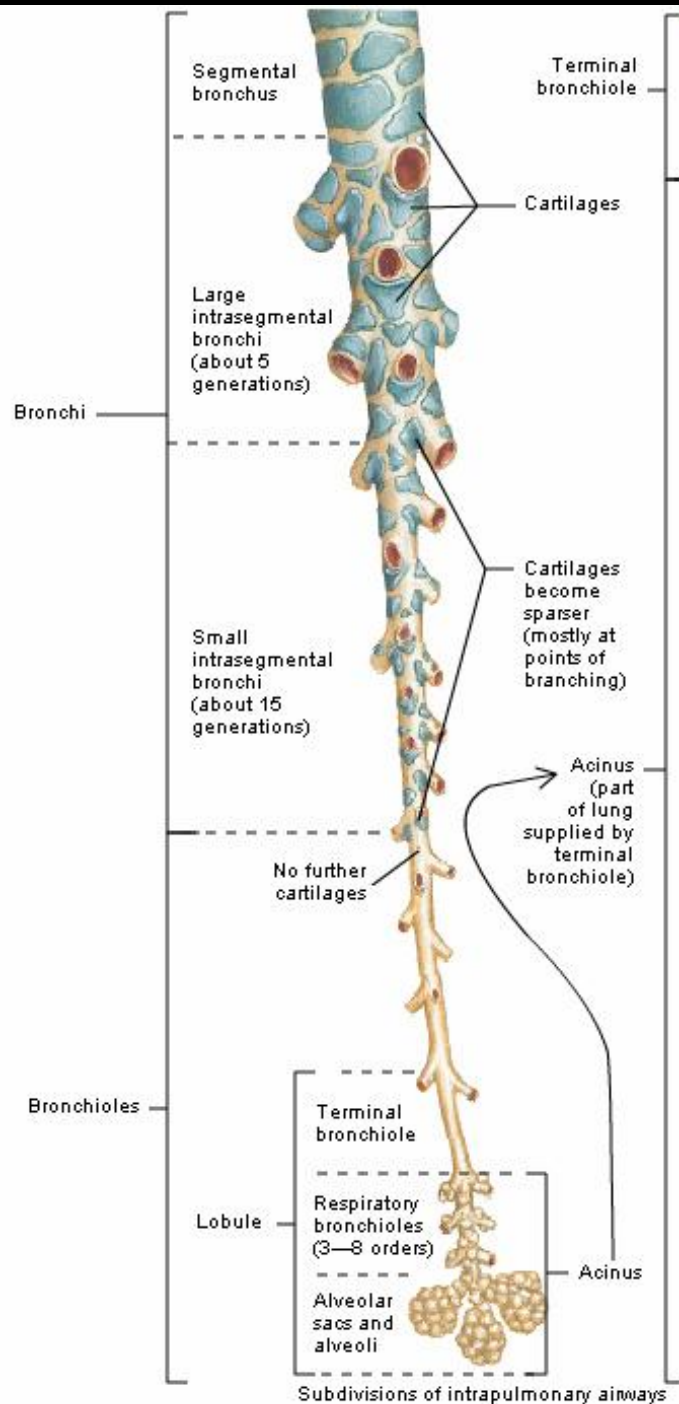












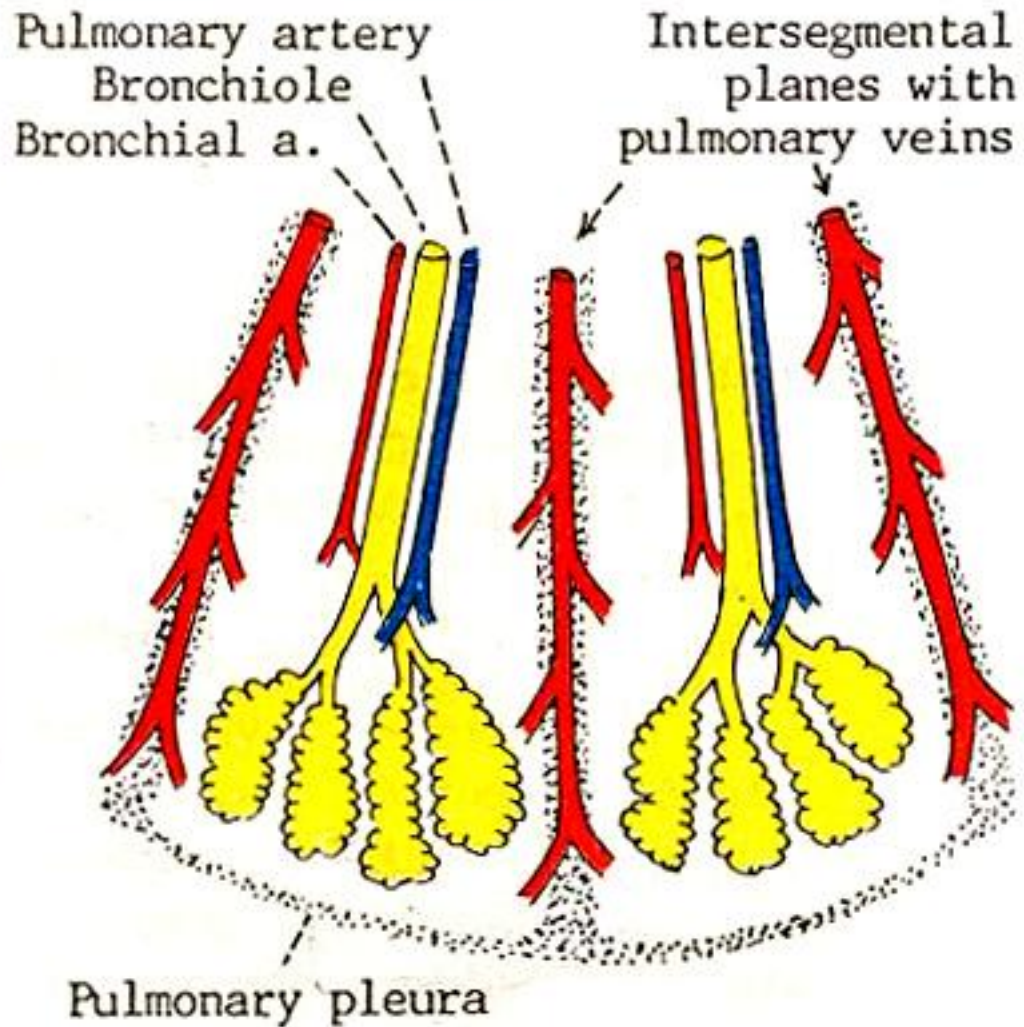
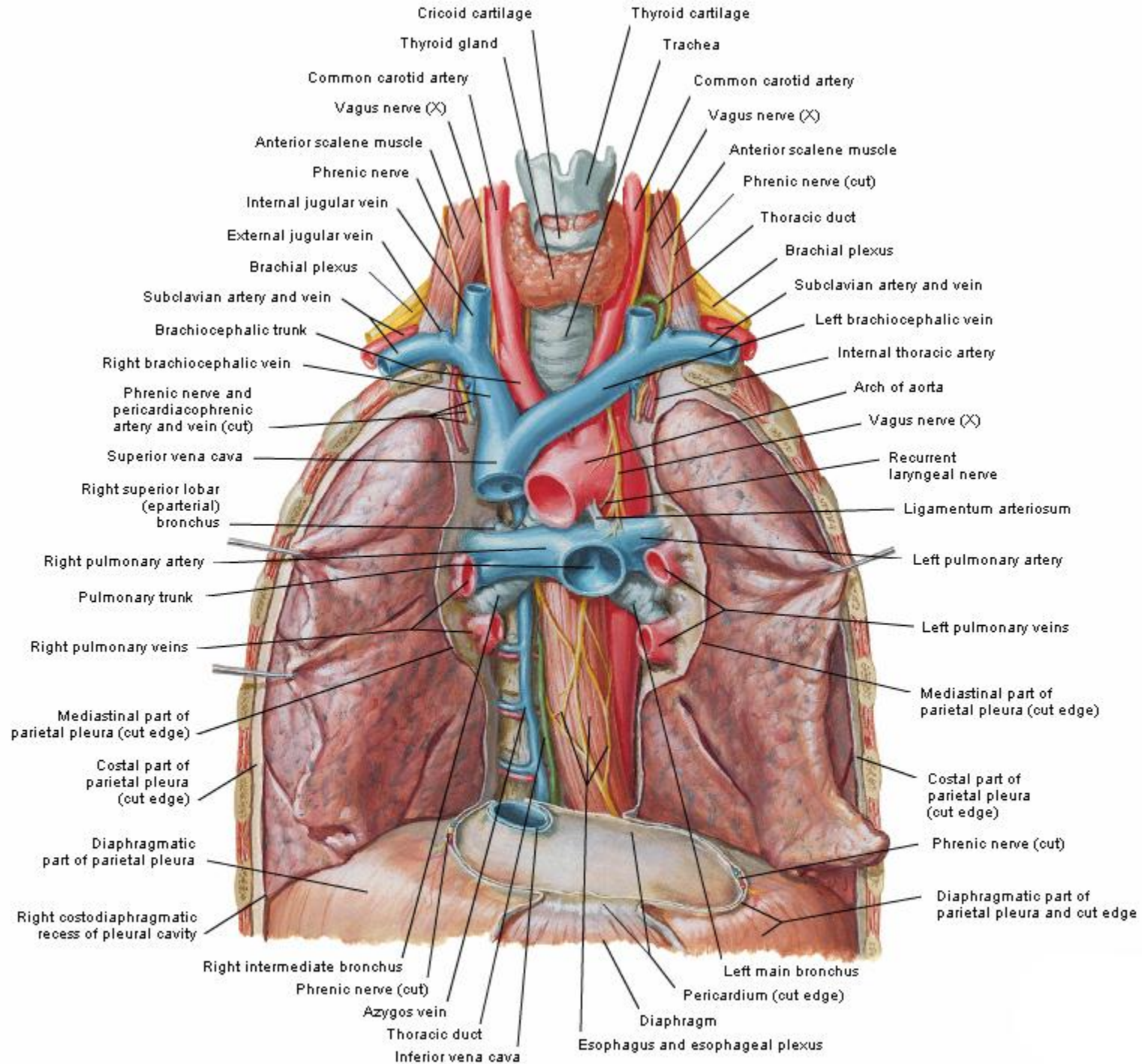
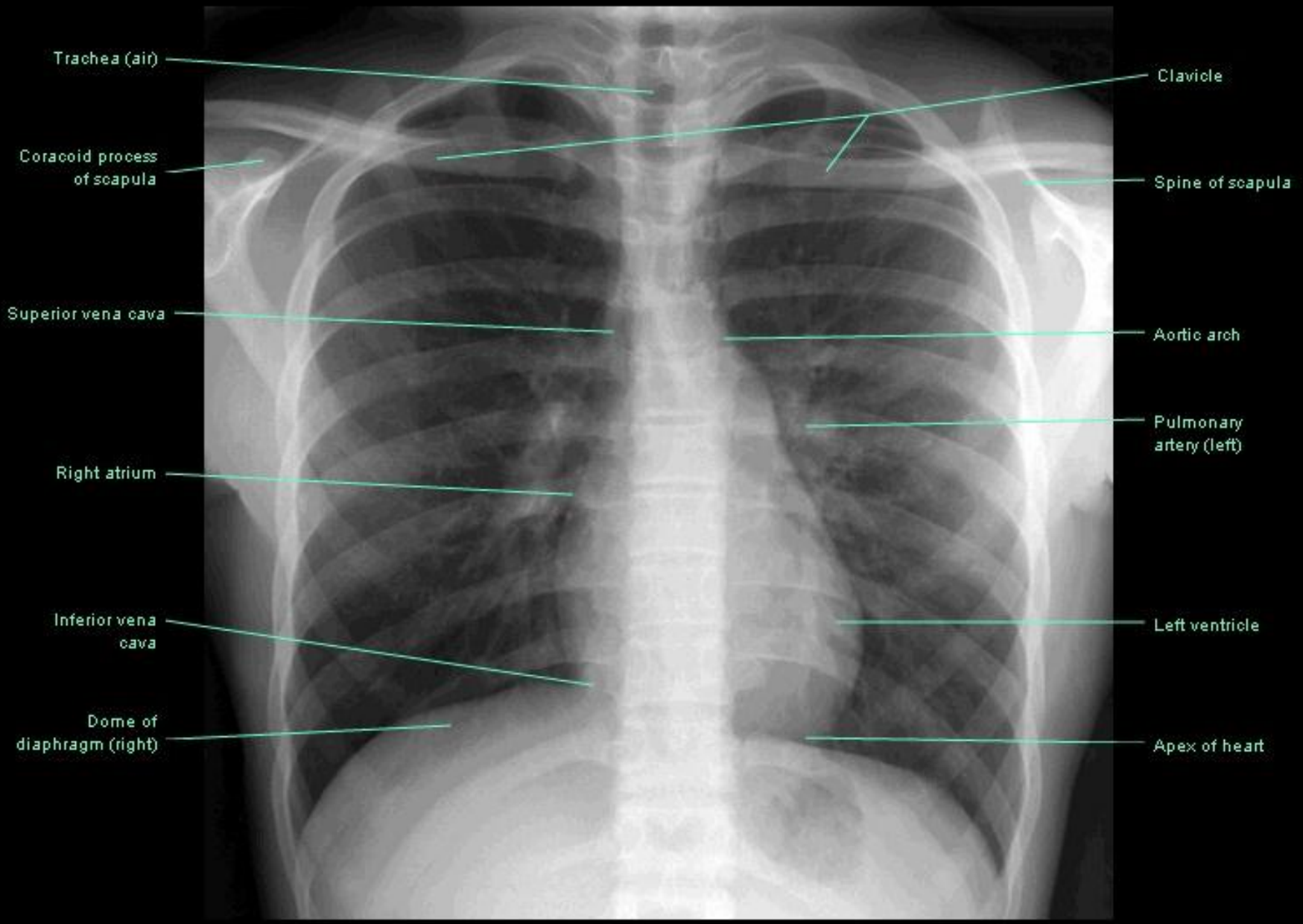
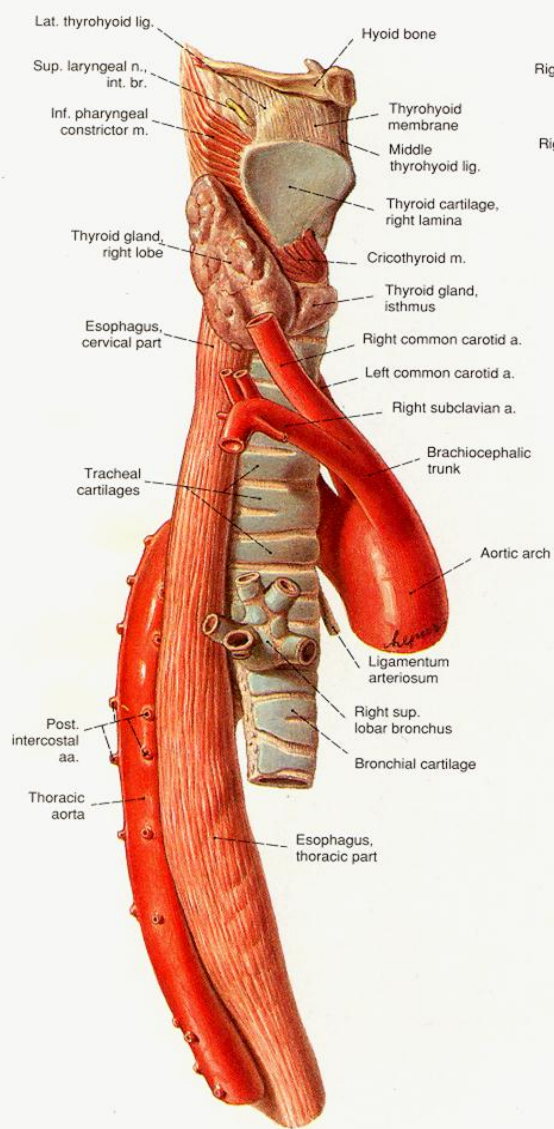


Diagram showing the internal structure of two adjacent bronchopulmonary segments.

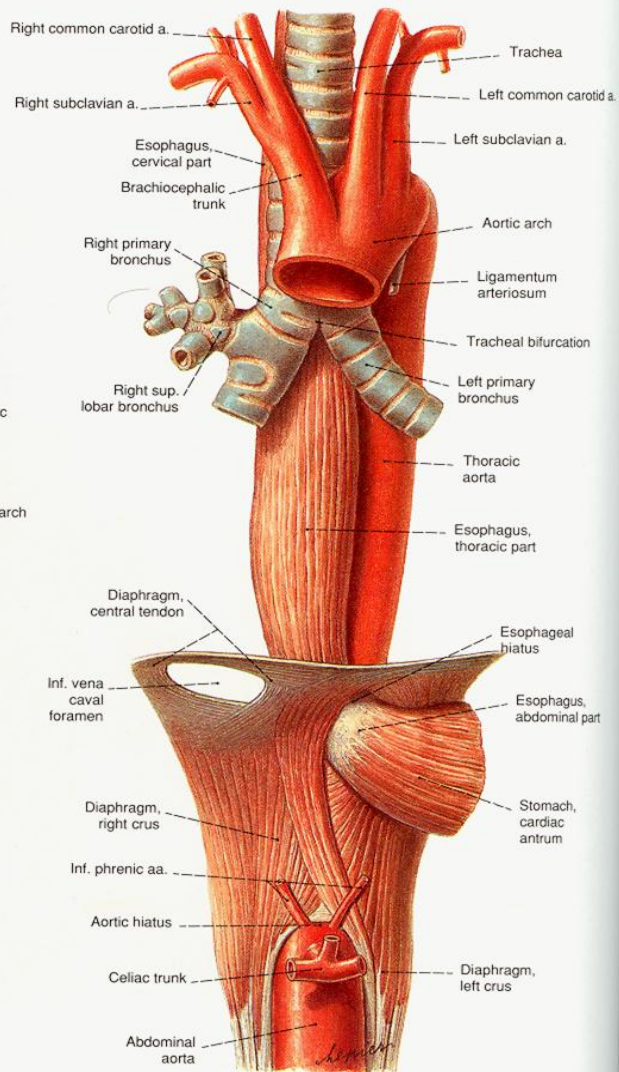




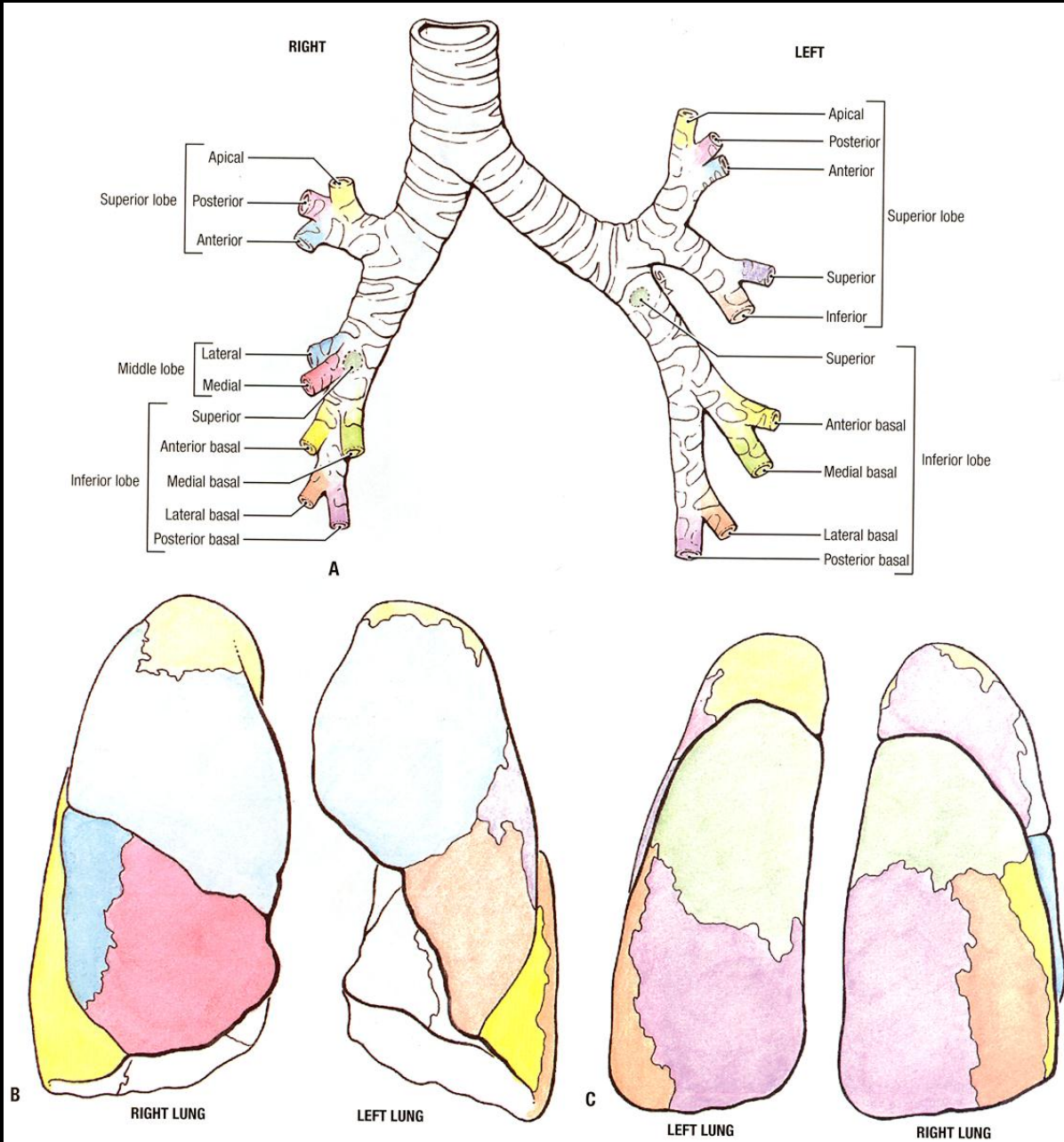




**Fig. 219.** The air and food passageways in the cervical and thoracic regions and their relationship to several neighboring organs, viewed from the right side.



**Fig. 220.** The esophagus, trachea, aorta and part of the diaphragm with its openings for passage of the aorta, esophagus and inferior vena cava. Ventral view.

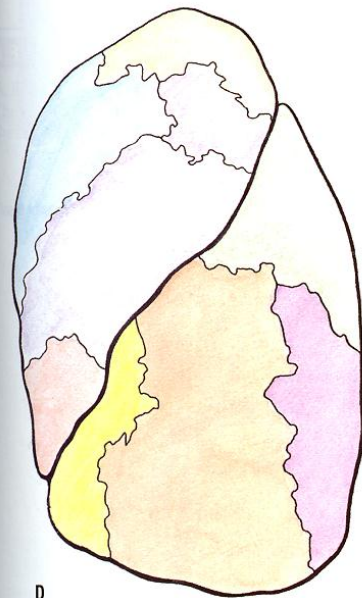
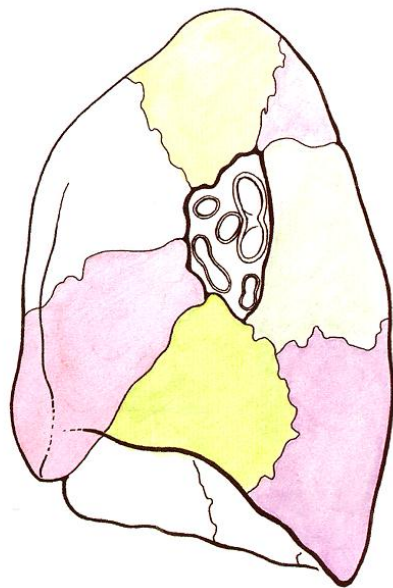


### 1.32 Segmental bronchi and bronchopulmonary segments

A. Segmental bronchi, anterior view. There are 10 tertiary or segmental bronchi on the right, and 8 on the left. Note that on the left, the apical and posterior bronchi arise from a single stem, as do the anterior basal and medial basal. B. Anterior view. C. Posterior view.

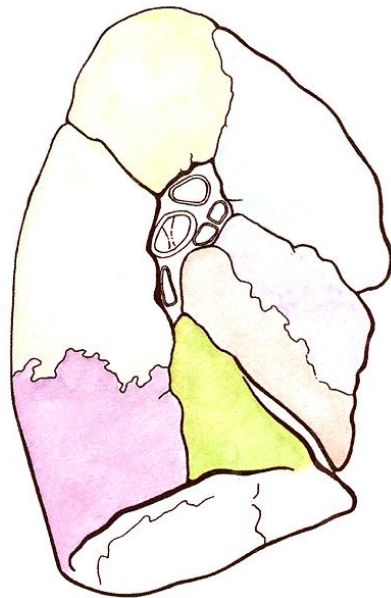


RIGHT LUNG

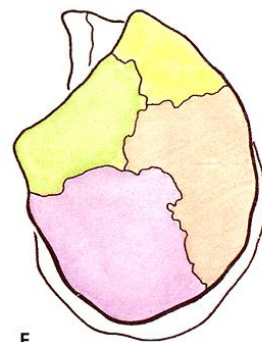


D

LEFT LUNG

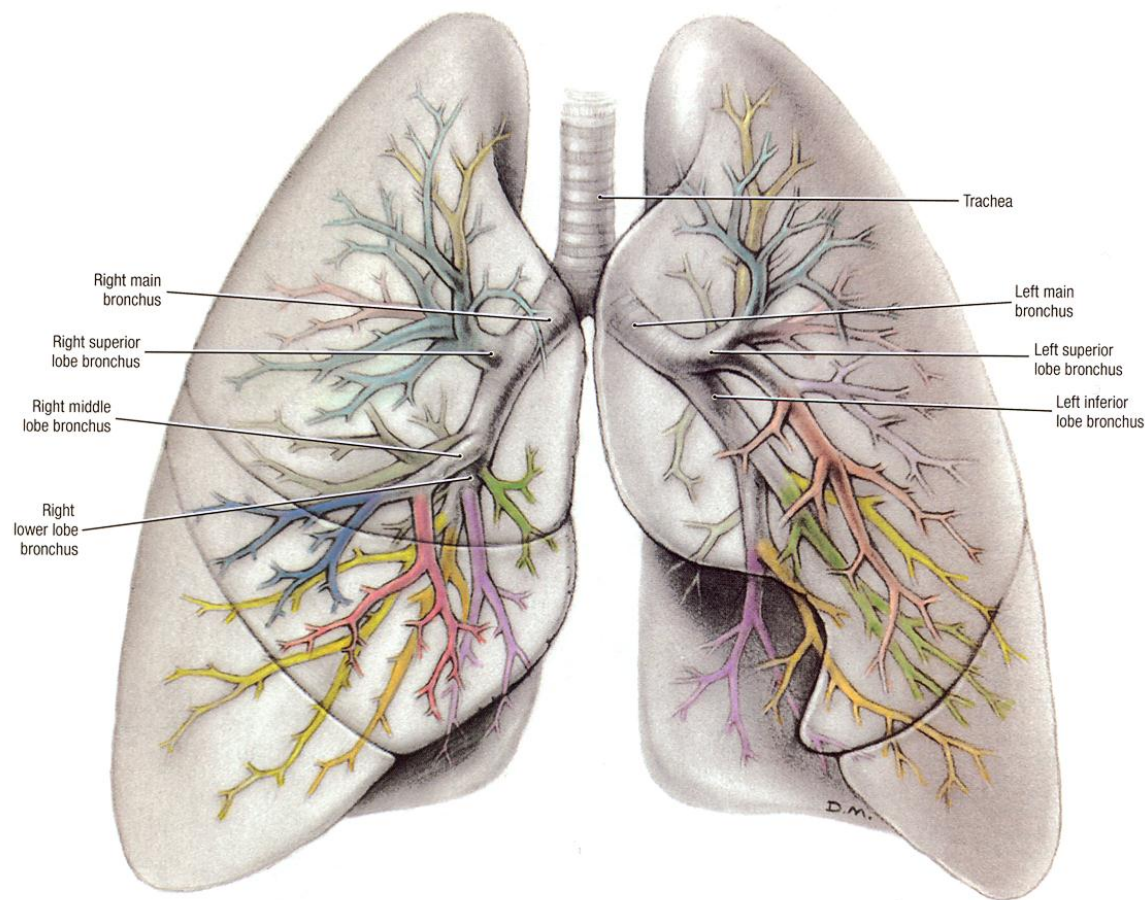


E



F

D. Lateral view. E. Medial view. F. Inferior view. Portions of lung ventilated by tertiary bronchi. A bronchopulmonary segment consists of a tertiary bronchus, the portion of lung it ventilates, an artery, and a vein. *These structures are surgically separable to allow segmental resection of the lung.* To prepare these specimens, the tertiary bronchi of fresh lungs were isolated within the hilus and injected with latex of various colors. Minor variations in the branching of the bronchi result in variations in the surface patterns.



### 1.30 Trachea and bronchi in situ, anterior view

**OBSERVE:**

1. The trachea bifurcates into right and left main (primary) bronchi;
2. The right main bronchus is shorter, wider, and more vertical than the left. *Therefore, it is more likely that foreign objects will become lodged in the right main bronchus;*
3. The right main bronchus gives off the right superior lobe bronchus (eparterial bronchus) before entering the hilum (hilus) of the lung; after entering the hilum, the right middle and inferior lobe bronchi branch off;
4. The left main bronchus divides into the left superior and left inferior lobe bronchi; the left superior lobe bronchus also supplies the lingula (Fig. 1.29).
5. The lobar bronchi further divide into segmental (tertiary) bronchi. The segmental bronchi are color coded.

RIGHT LUNG		LEFT LUNG	
<b>Superior Lobe</b>		<b>Superior Lobe</b>	
Apical	Apical	Apical	Apical
Posterior	Posterior	Posterior	Posterior
Anterior	Anterior	Anterior	Anterior
<b>Middle Lobe</b>		<b>Inferior Lobe</b>	
Lateral	Lateral	Superior	Superior
Medial	Medial	Anterior basal	Anterior basal
<b>Inferior Lobe</b>		Medial basal	Medial basal
Superior	Superior	Lateral basal	Lateral basal
Anterior basal	Anterior basal	Posterior basal	Posterior basal
Medial basal	Medial basal		
Lateral basal	Lateral basal		
Posterior basal	Posterior basal		

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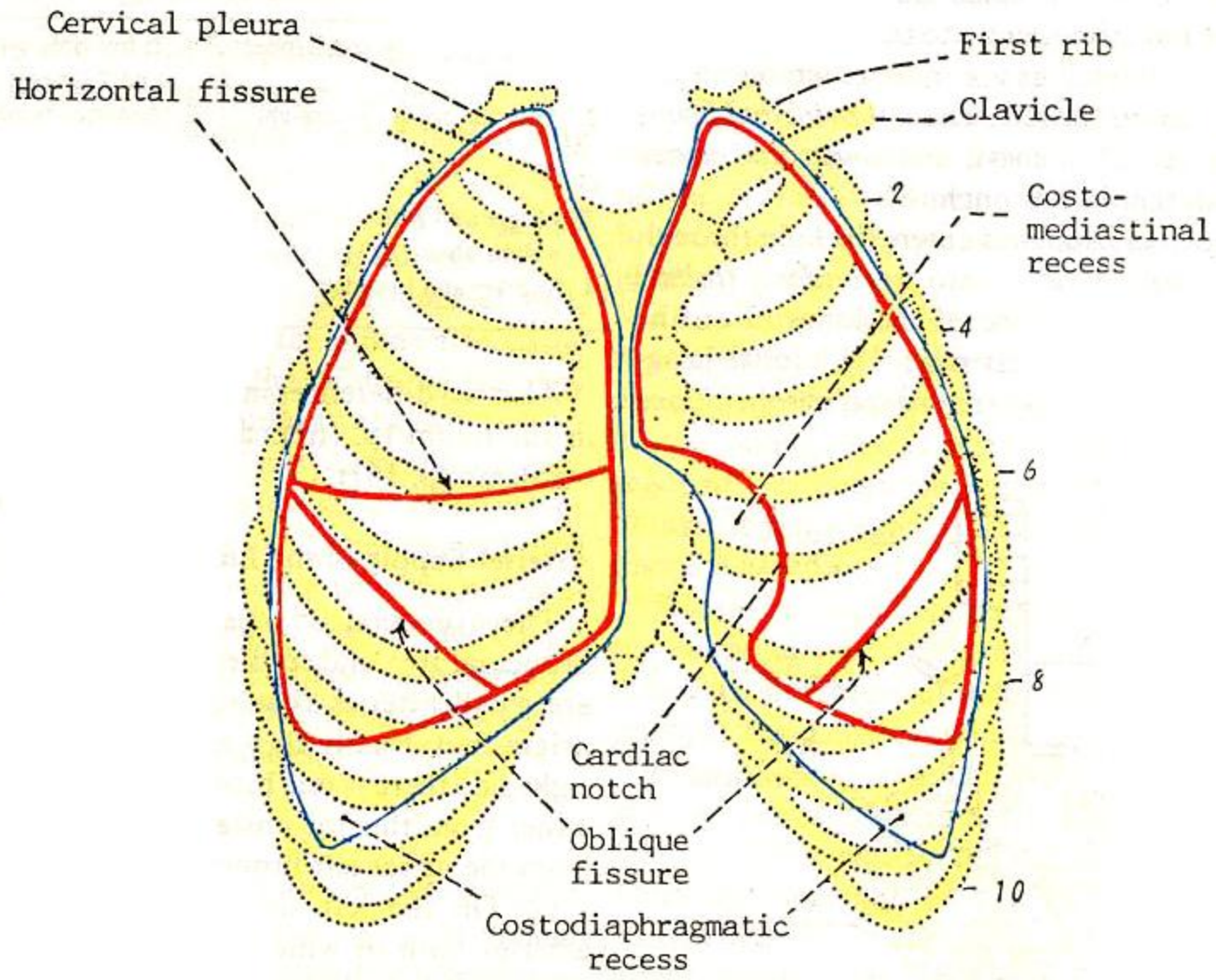
**3- Pharynx**

**4- Larynx**

**5- Trachea and bronchi**

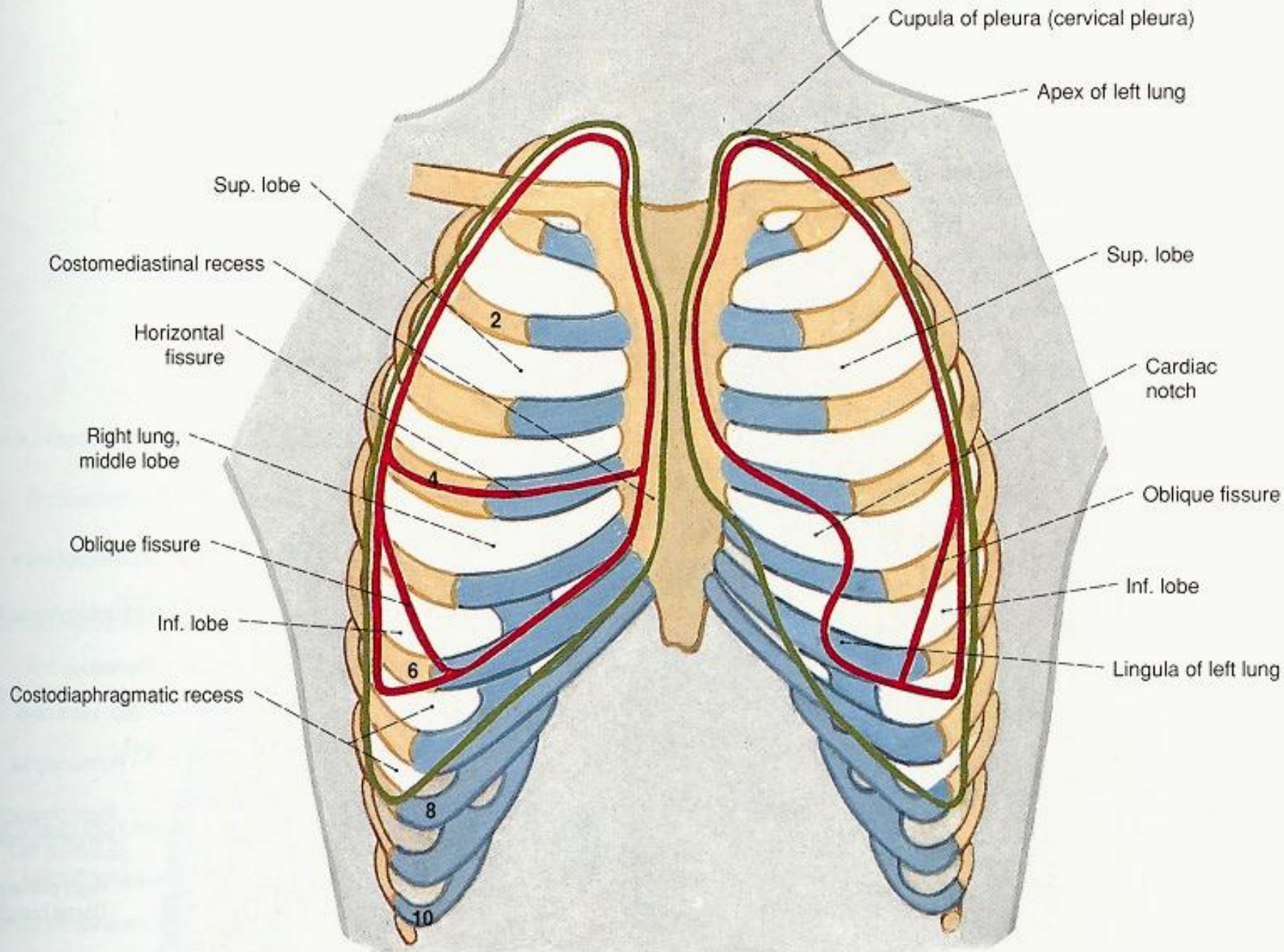
**6- Pleurae**

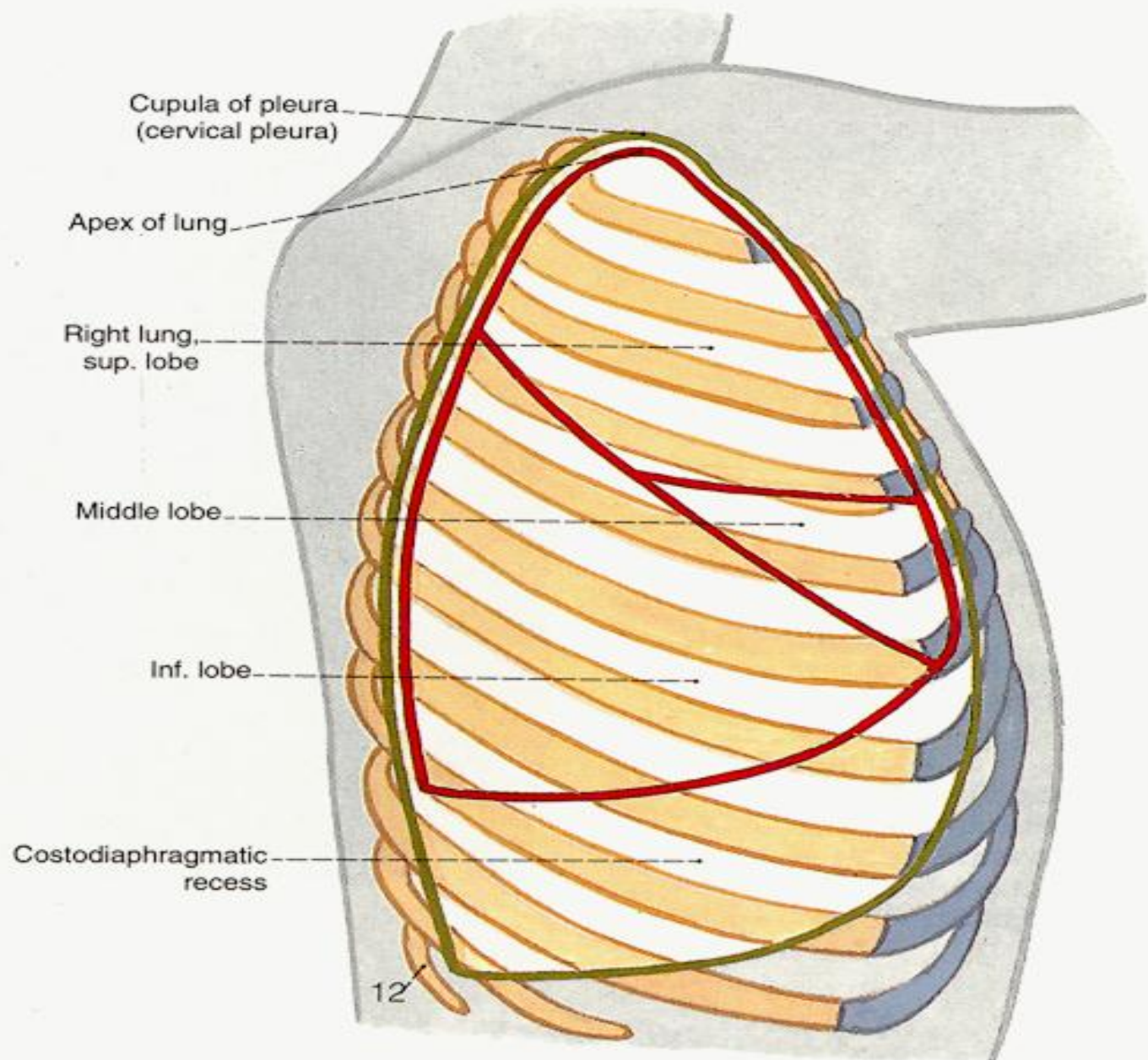
**7- Pulmons**



Surface projection of the pleurae and lungs on the front of the thorax.



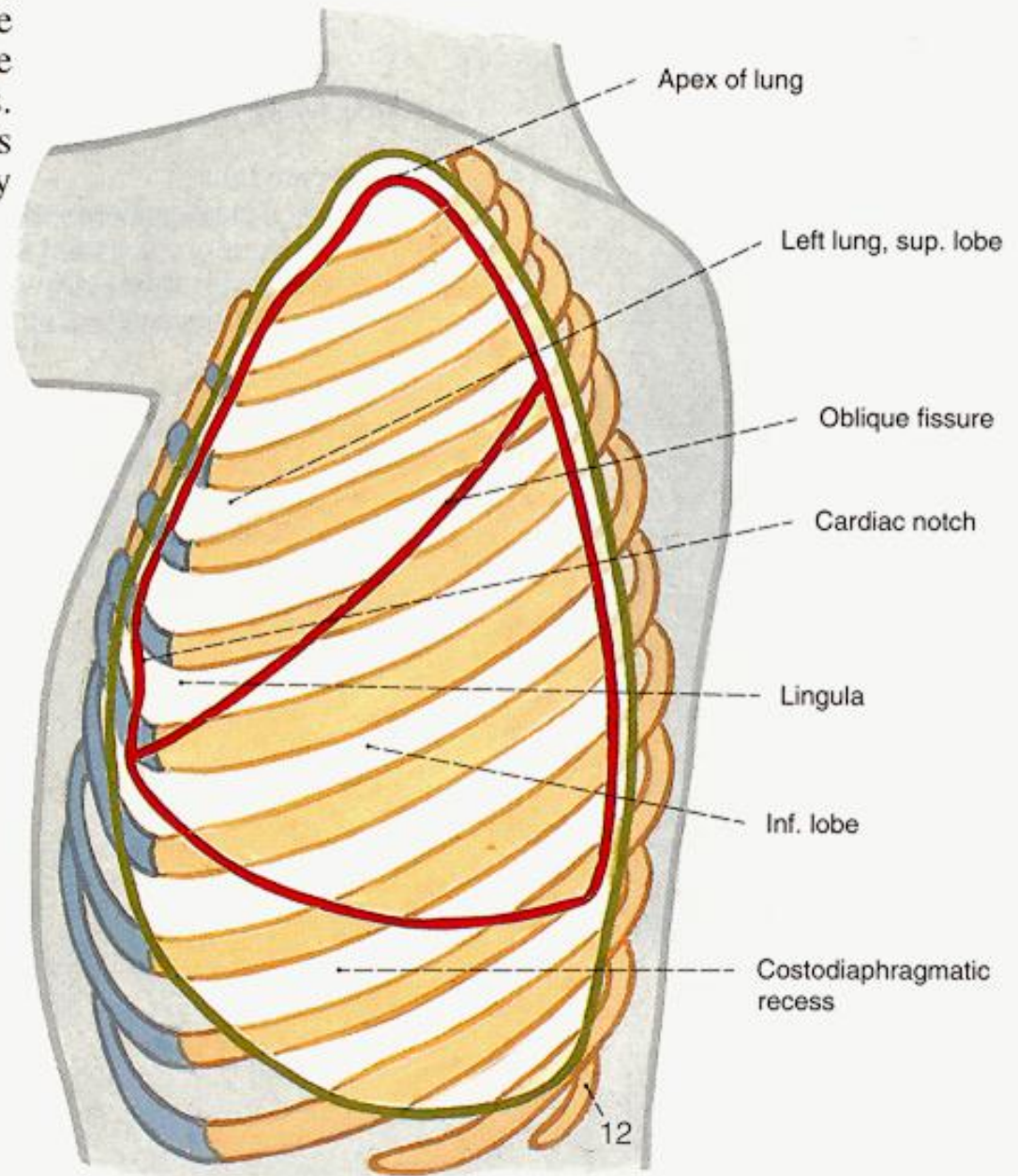


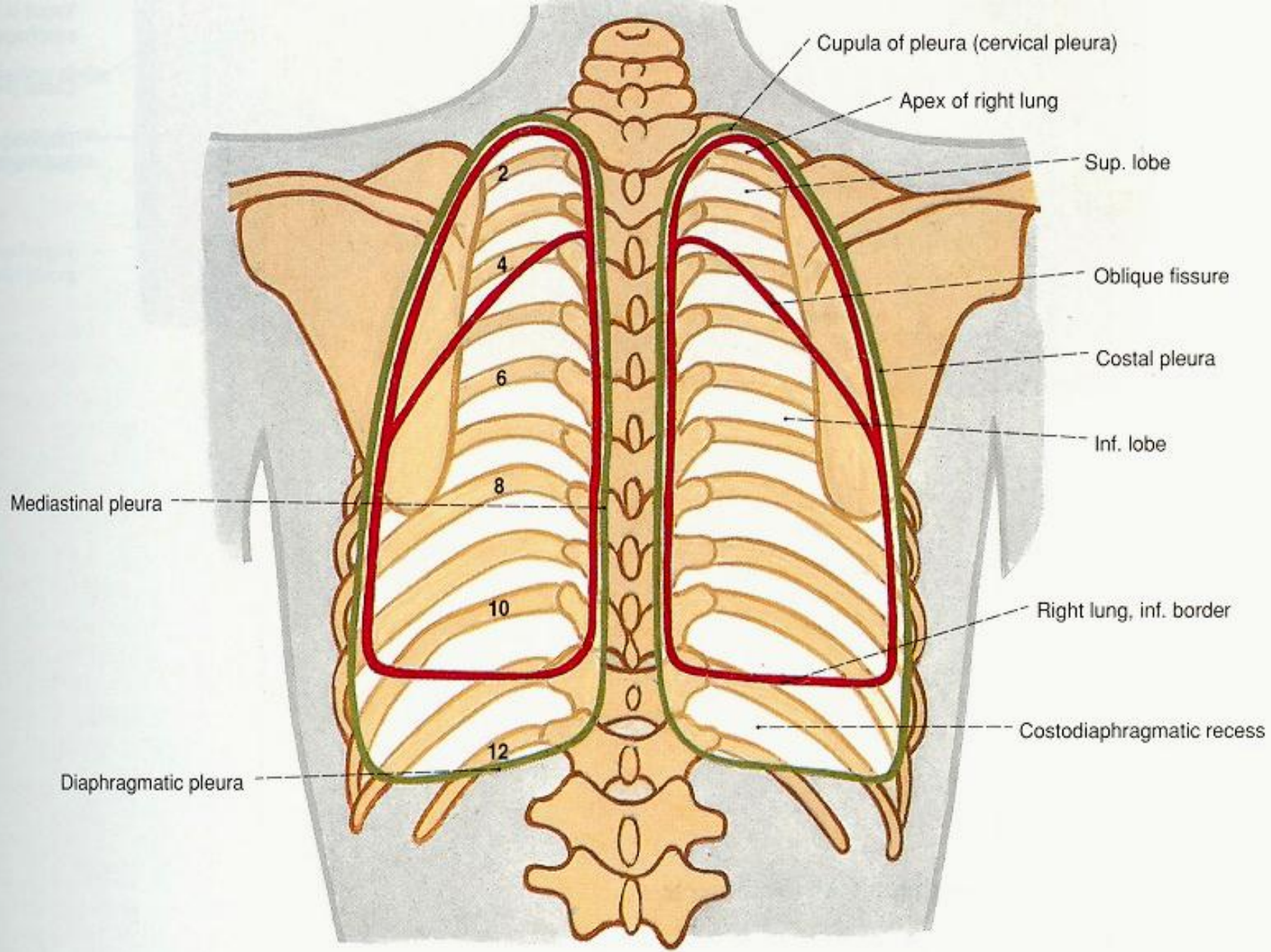


**Fig. 205.** Right lateral view.

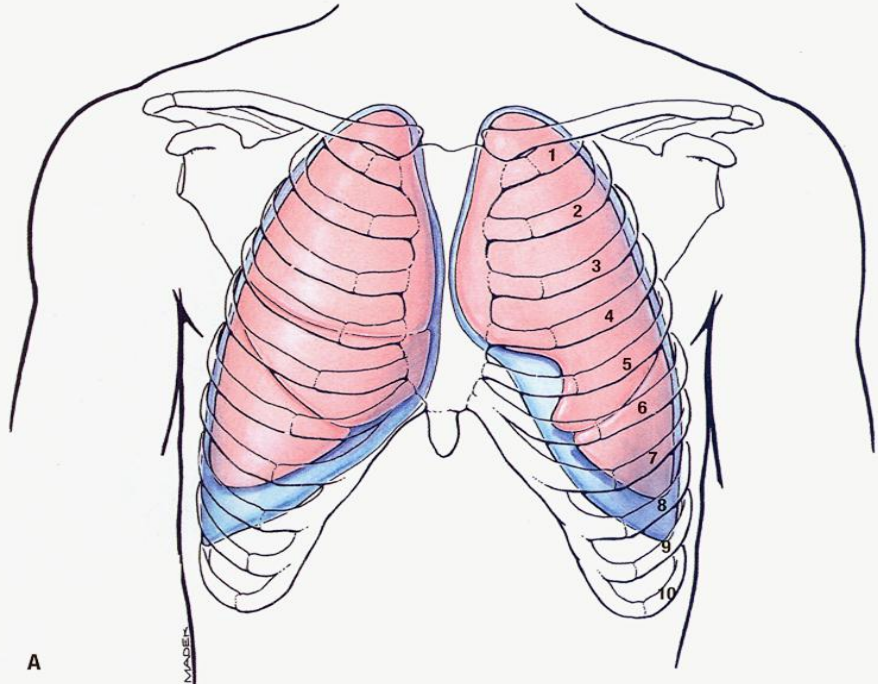
**Figs. 205-208.** The boundaries of the lungs (red) and pleural reflections (green) projected onto the ribs, sternum and vertebral column. Note the difference in the outline of the lungs and the pleural boundaries. They are farthest apart (hand's breadth) in the region of the axillary line.

2-12 = 2nd-12th ribs





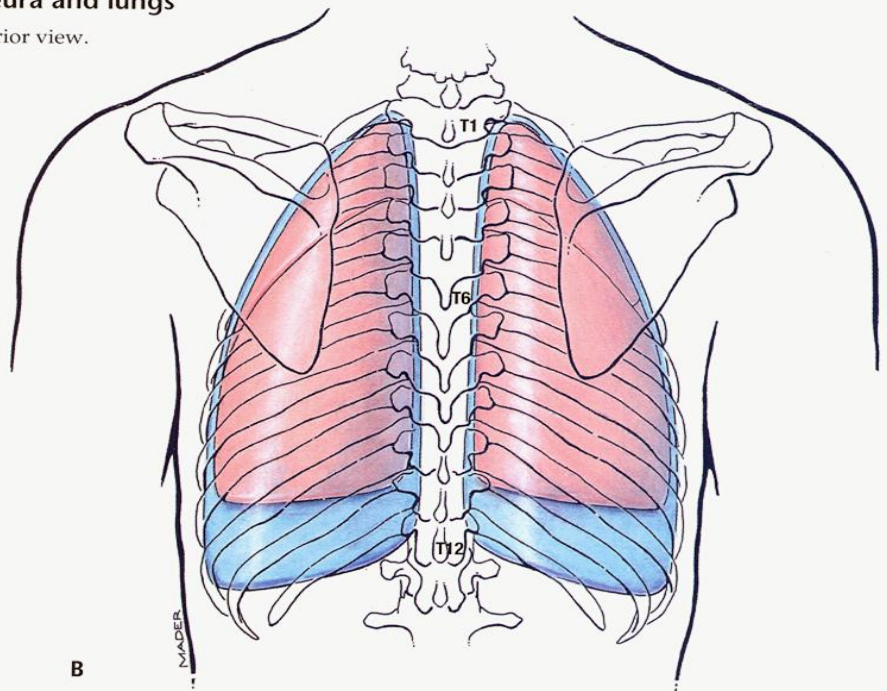
**Fig. 208.** Posterior view.



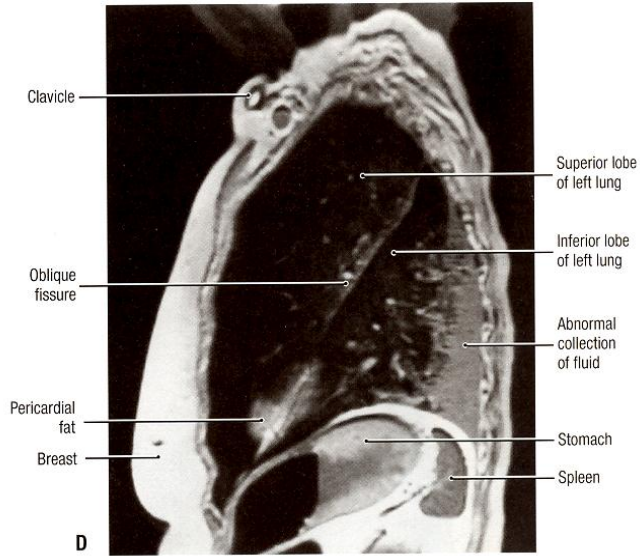
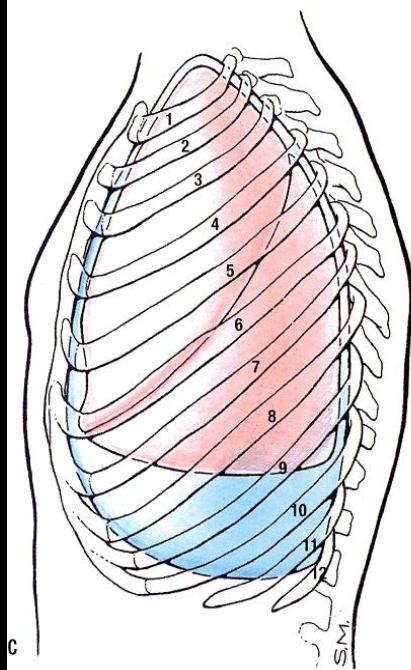
A

**1.25** Outline of pleura and lungs

A. Anterior view. B. Posterior view.



B

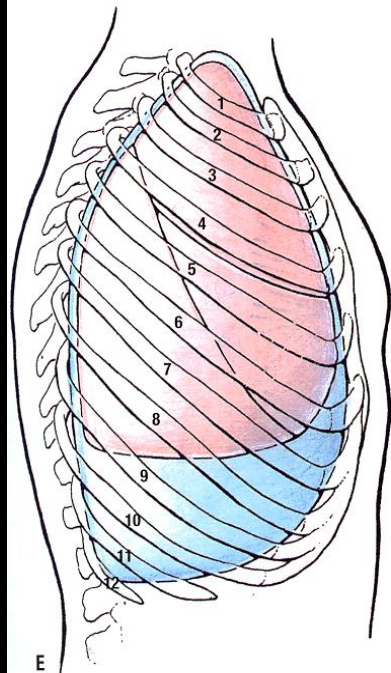


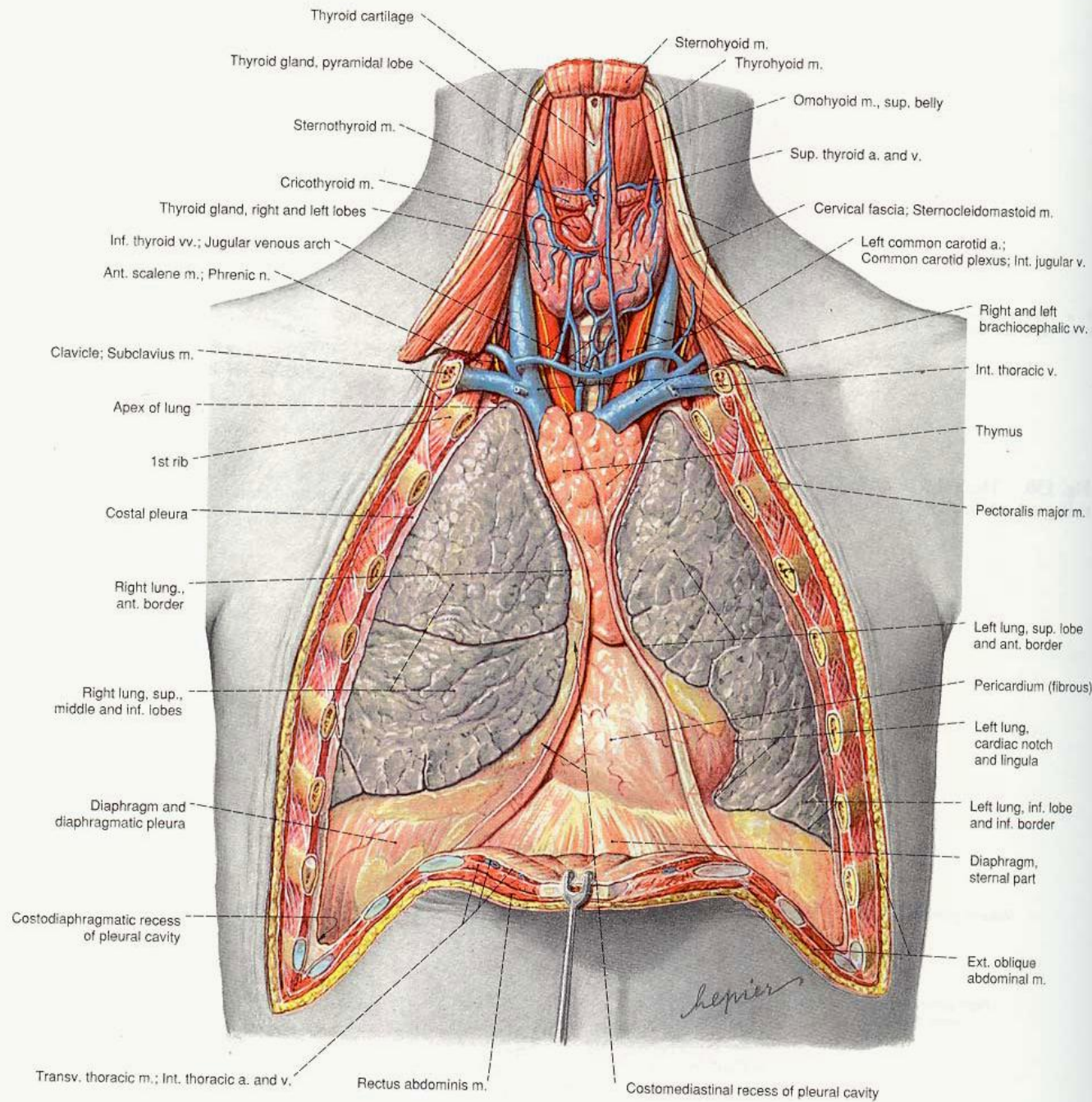
C. Left lateral view. D. MRI. E. Right lateral view.

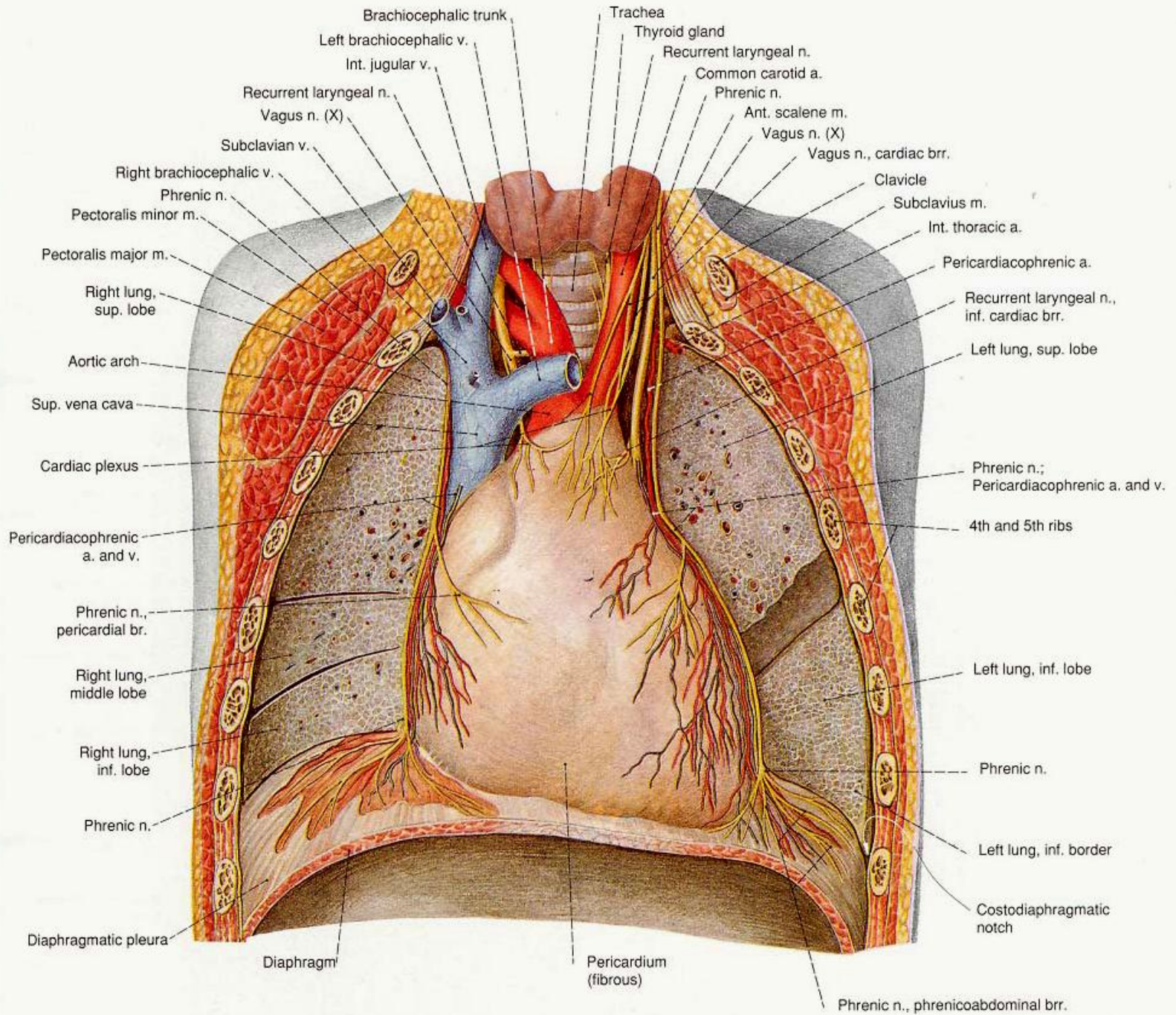
Trace the outline of the lung covered with visceral pleura (pink) and the outline of the parietal pleura (blue) as observed in quiet respiration.

**OBSERVE:**

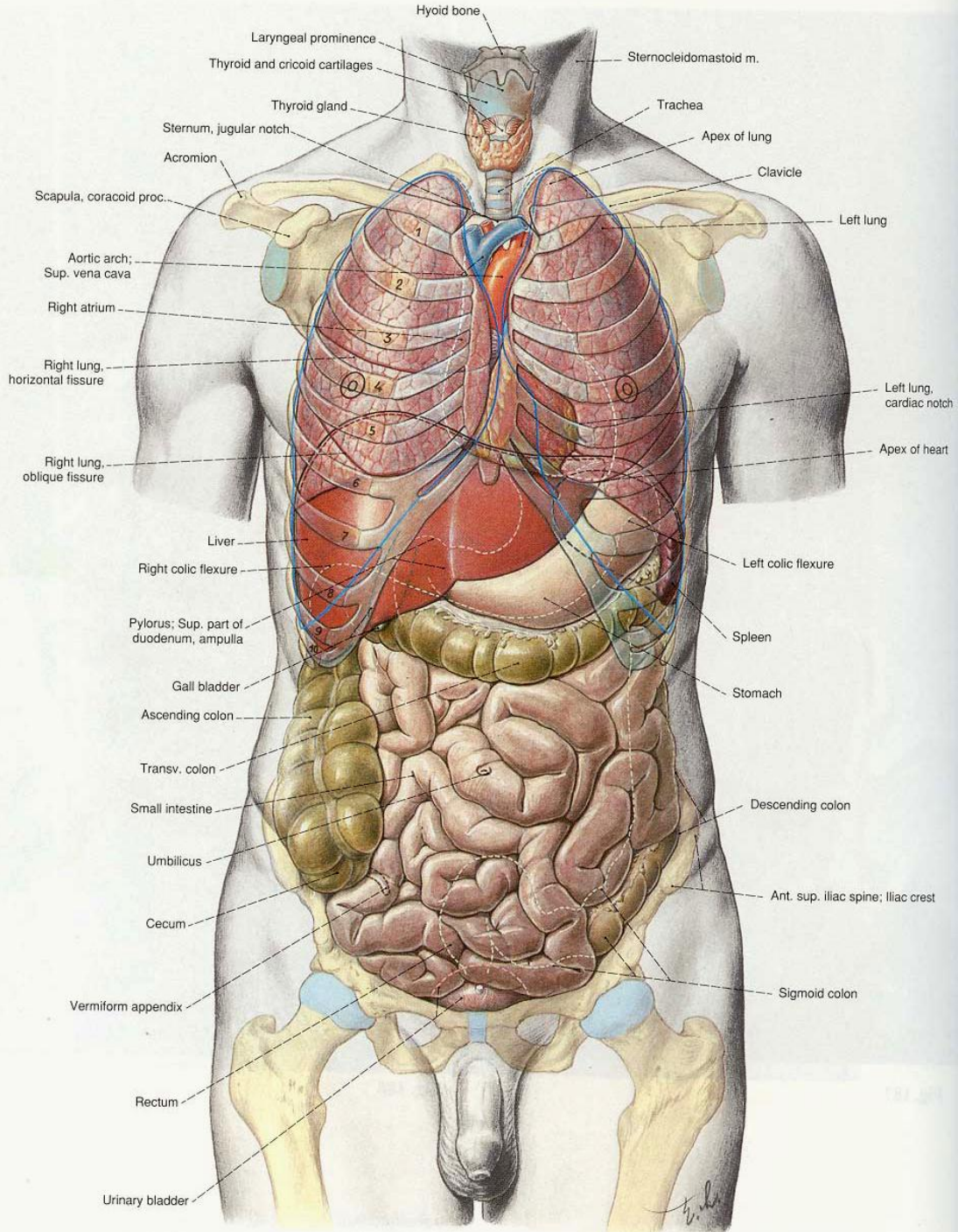
1. The apices of the lungs and cervical pleura extend to the neck of the 1st rib;
2. The apices and anterior borders of the lungs lie directly adjacent to the parietal pleura as far as the 4th costal cartilage. At this level, the left lung has a well-defined cardiac notch spanning horizontally along the 4th costal cartilage and rib to the midclavicular line and then curving inferiorly to the 6th rib or costal cartilage;
3. At the 6th costal cartilage, the parietal pleura passes laterally to reach the midclavicular line at the level of the 8th costal cartilage, the 10th rib at the midaxillary line, the 12th rib at the midscapular line, and the spinous process of T12;
4. The parietal pleura extends approximately two ribs inferior to the lung;
5. The oblique fissure of the right and left lungs extends from the level of the spinous process of T2 posteriorly to the 6th costal cartilage anteriorly; the horizontal fissure of the right lung extends from the oblique fissure along the 4th rib and costal cartilage anteriorly. Compare the left lateral view (C) to the MRI (D).

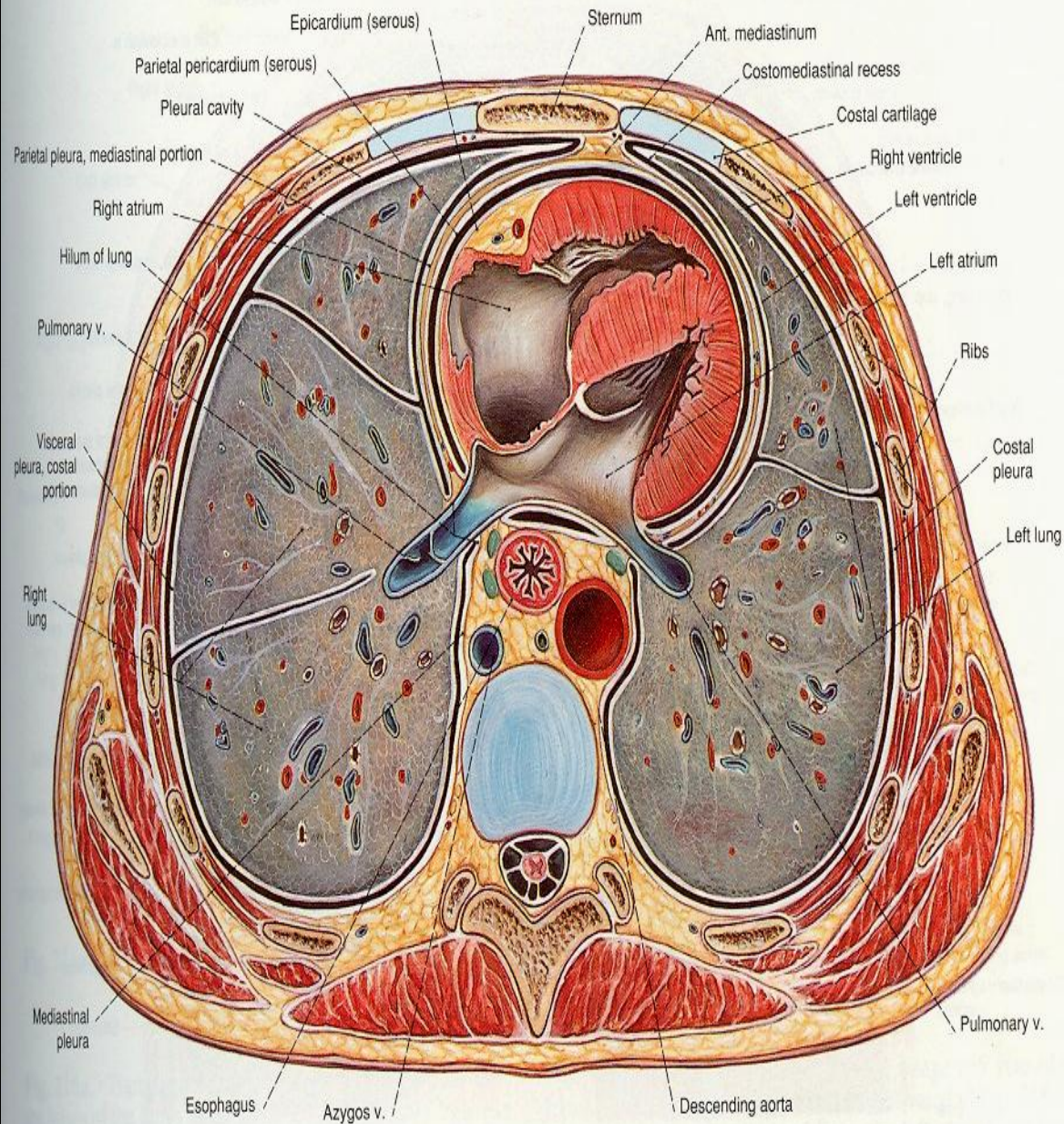




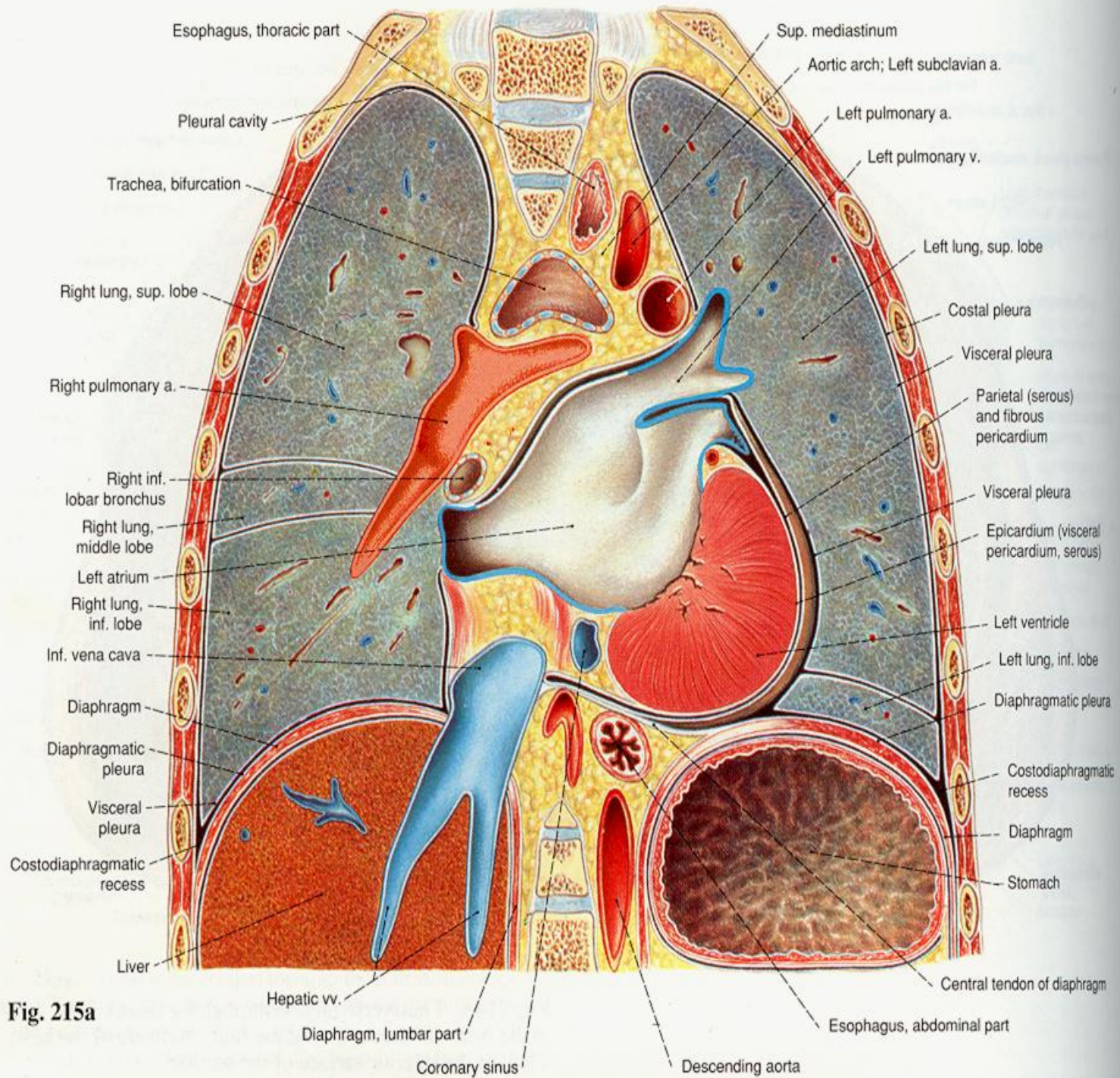








**Fig. 214a.** Transverse section through the thorax at the level of the hilum of the lungs and the four chambers of the heart. View of the inferior surface of the section.



**Fig. 215a**

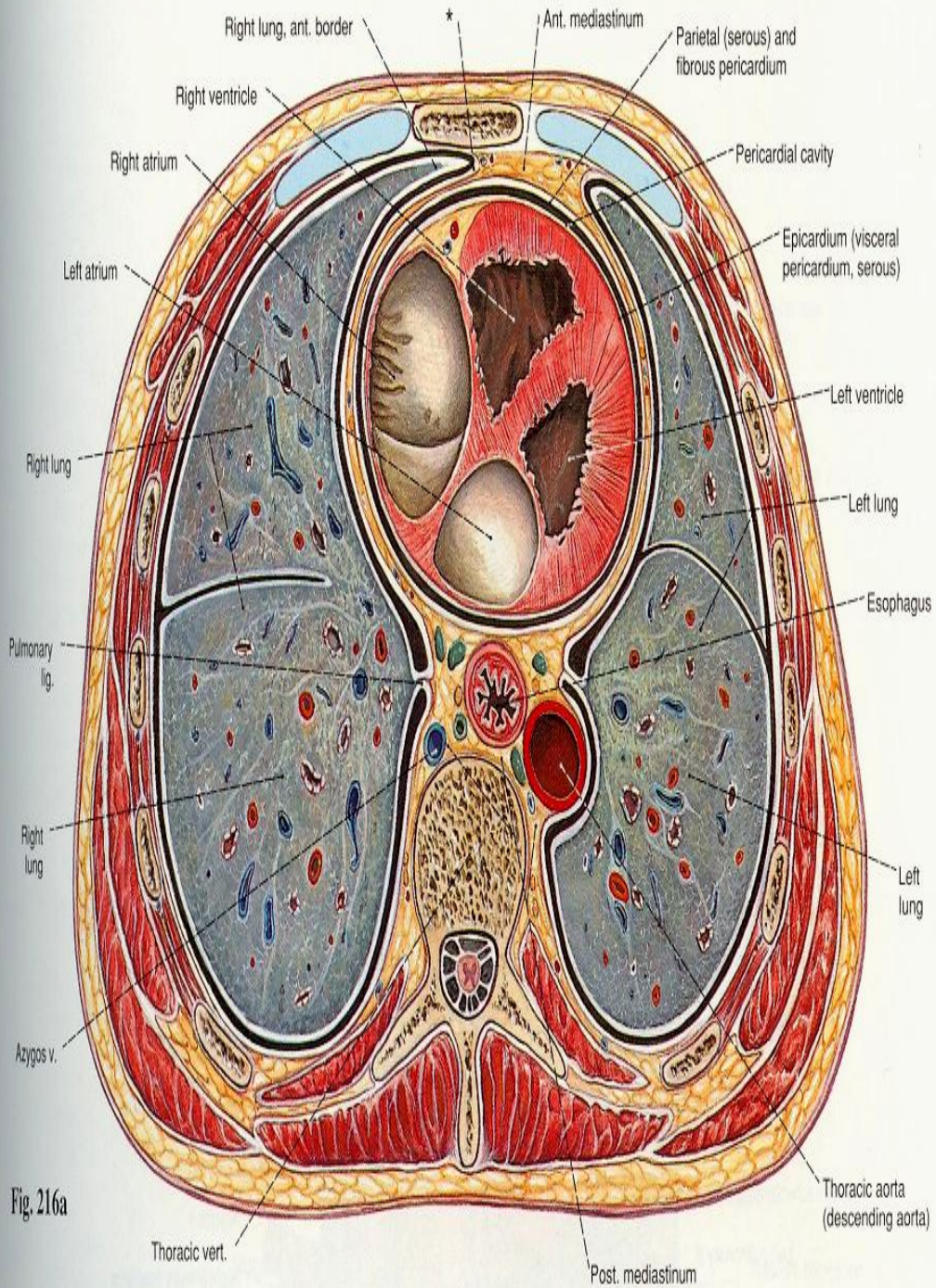


Fig. 216a

# Respiratory system

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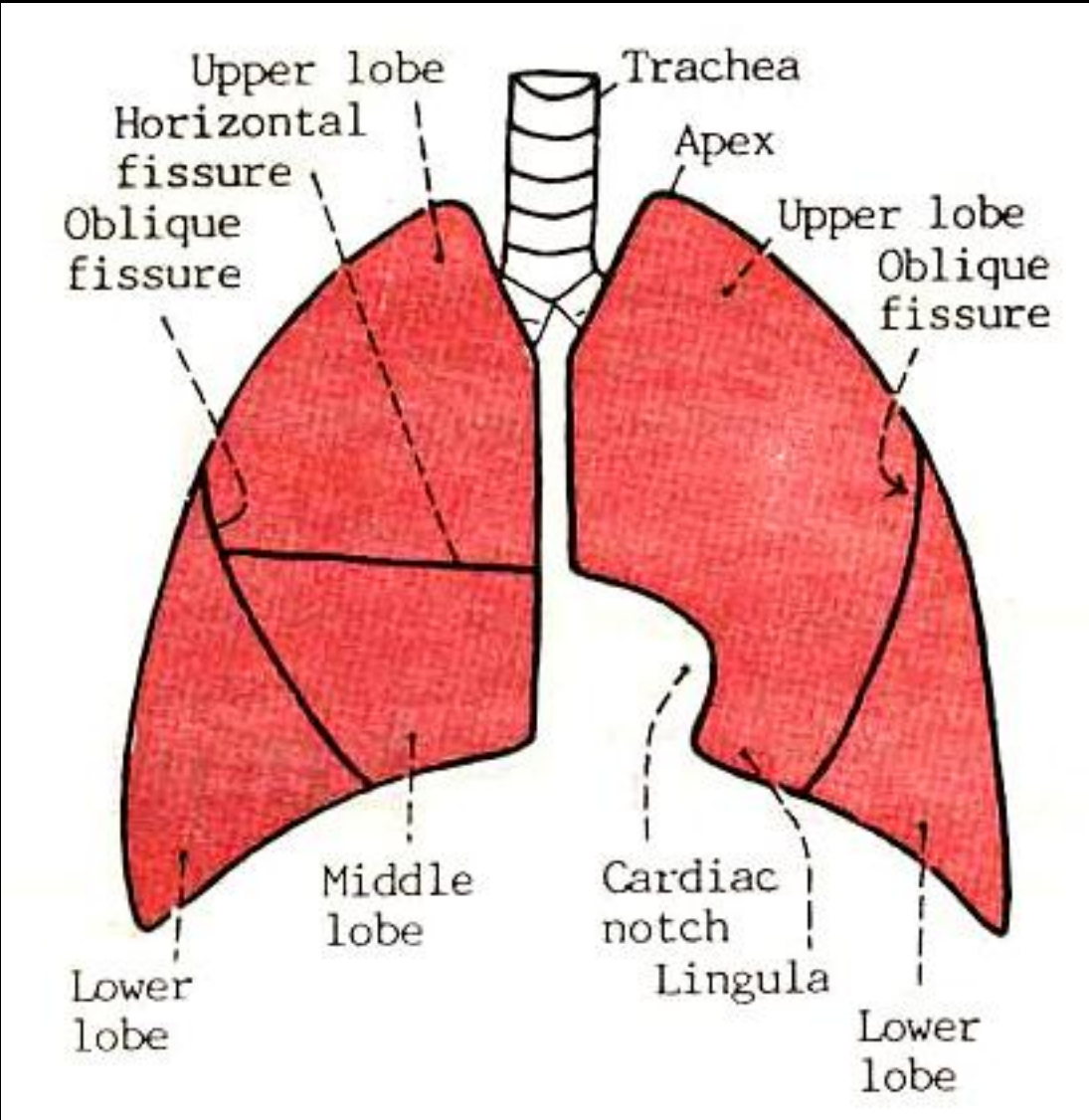
**3- Pharynx**

**4- Larynx**

**5- Trachea and bronchi**

**6- Pleurae**

**7- Pulmons**

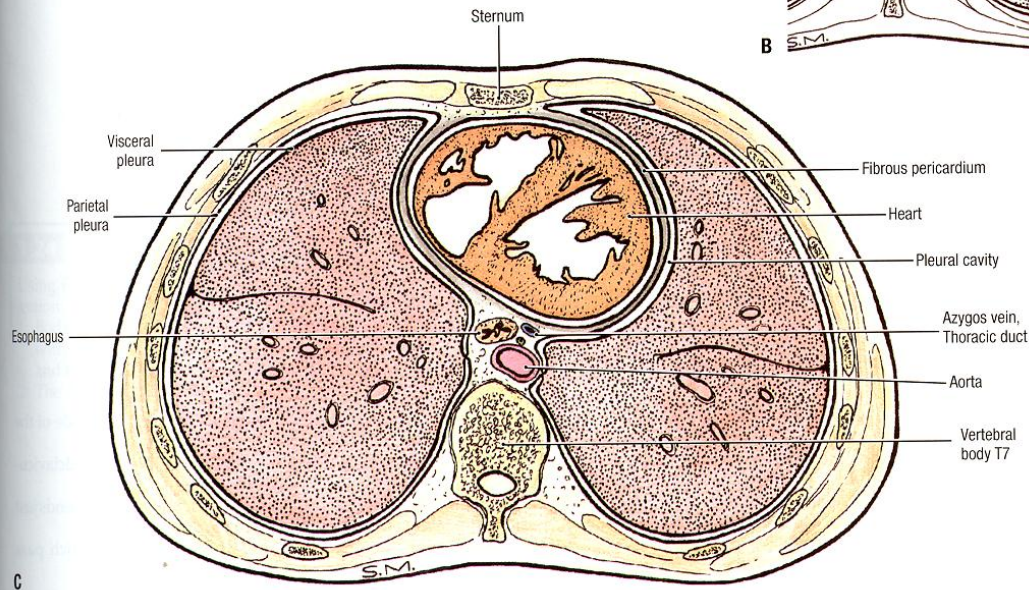
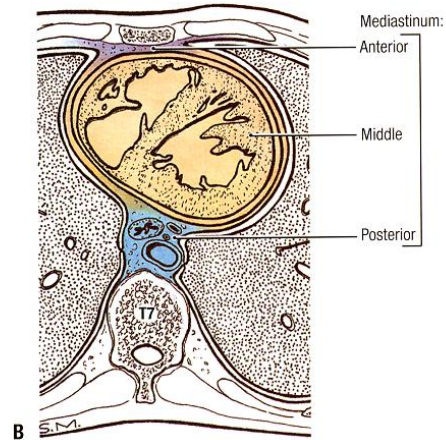
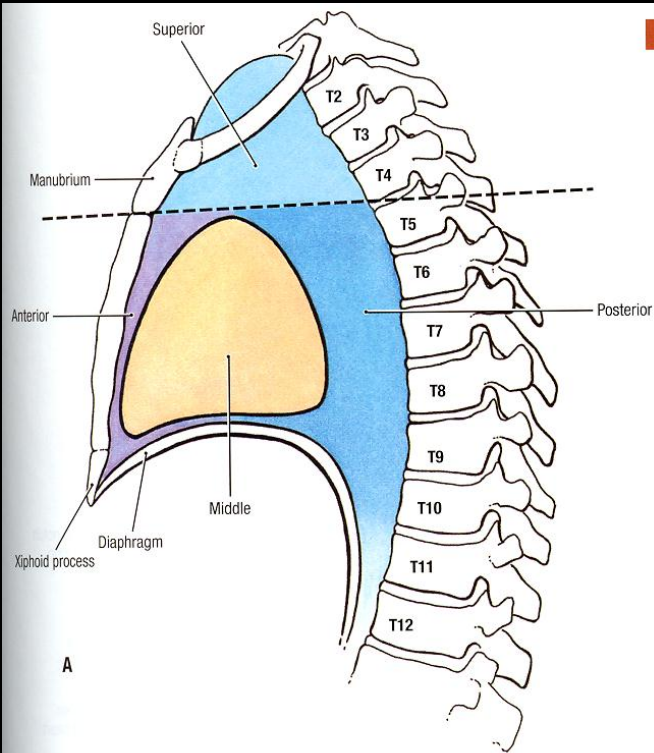


## 1.22 Mediastinum

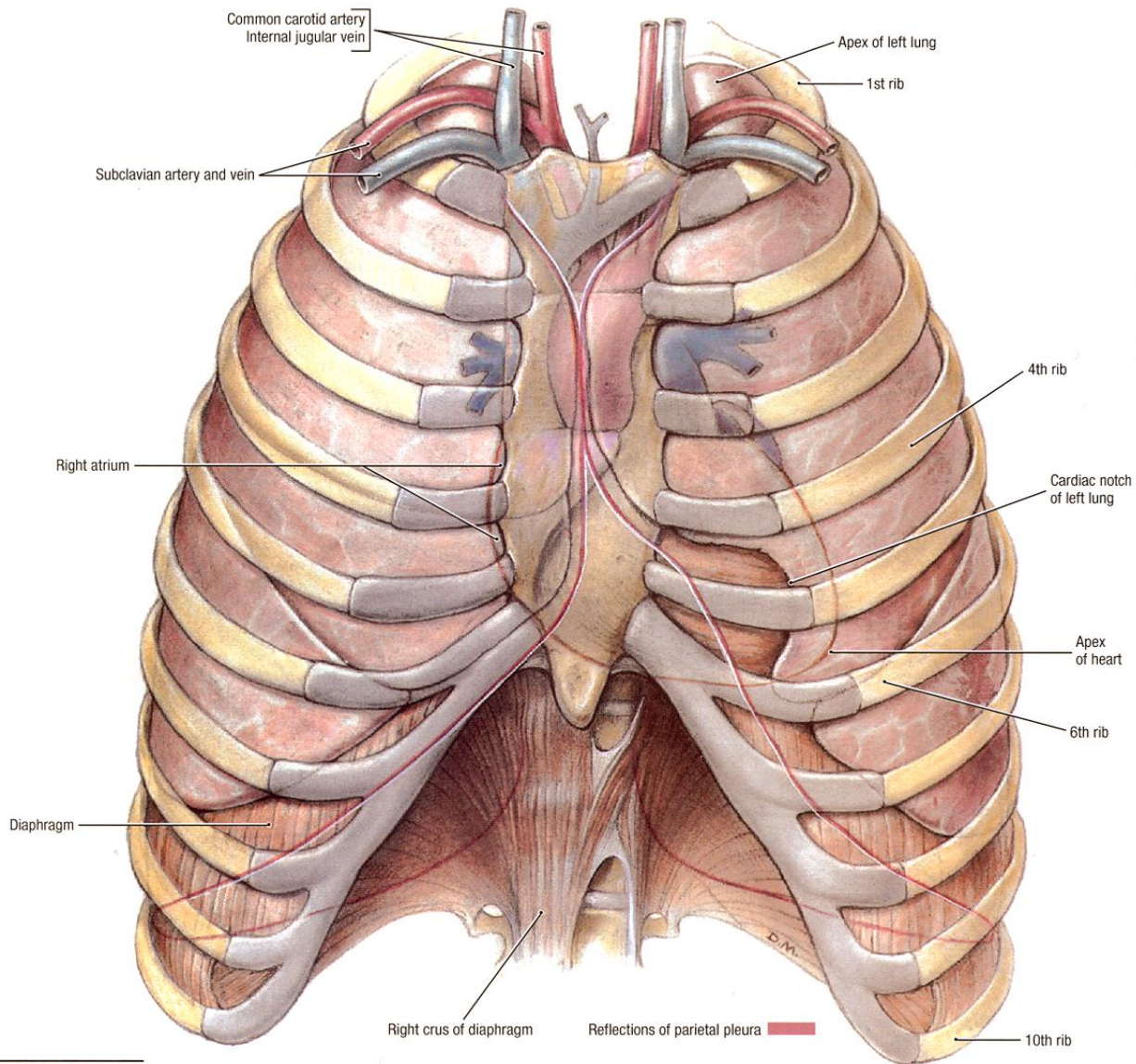
A. Subdivisions of mediastinum, lateral view. B and C. Transverse sections through heart and lungs.

### OBSERVE:

1. The mediastinum is located between the right and left pleural sacs;
2. The anterior mediastinum is between the body of the sternum anteriorly and fibrous pericardium posteriorly;
3. The posterior mediastinum is between the vertebral bodies and posterior surface of the fibrous pericardium;
4. The middle mediastinum is between the anterior and posterior subdivisions;
5. The superior mediastinum is bounded superiorly by the superior thoracic aperture (thoracic inlet), inferiorly by a horizontal plane through the sternal angle and the inferior border of the T4 vertebra, anteriorly by the manubrium of the sternum, and posteriorly by the superior four thoracic vertebrae.





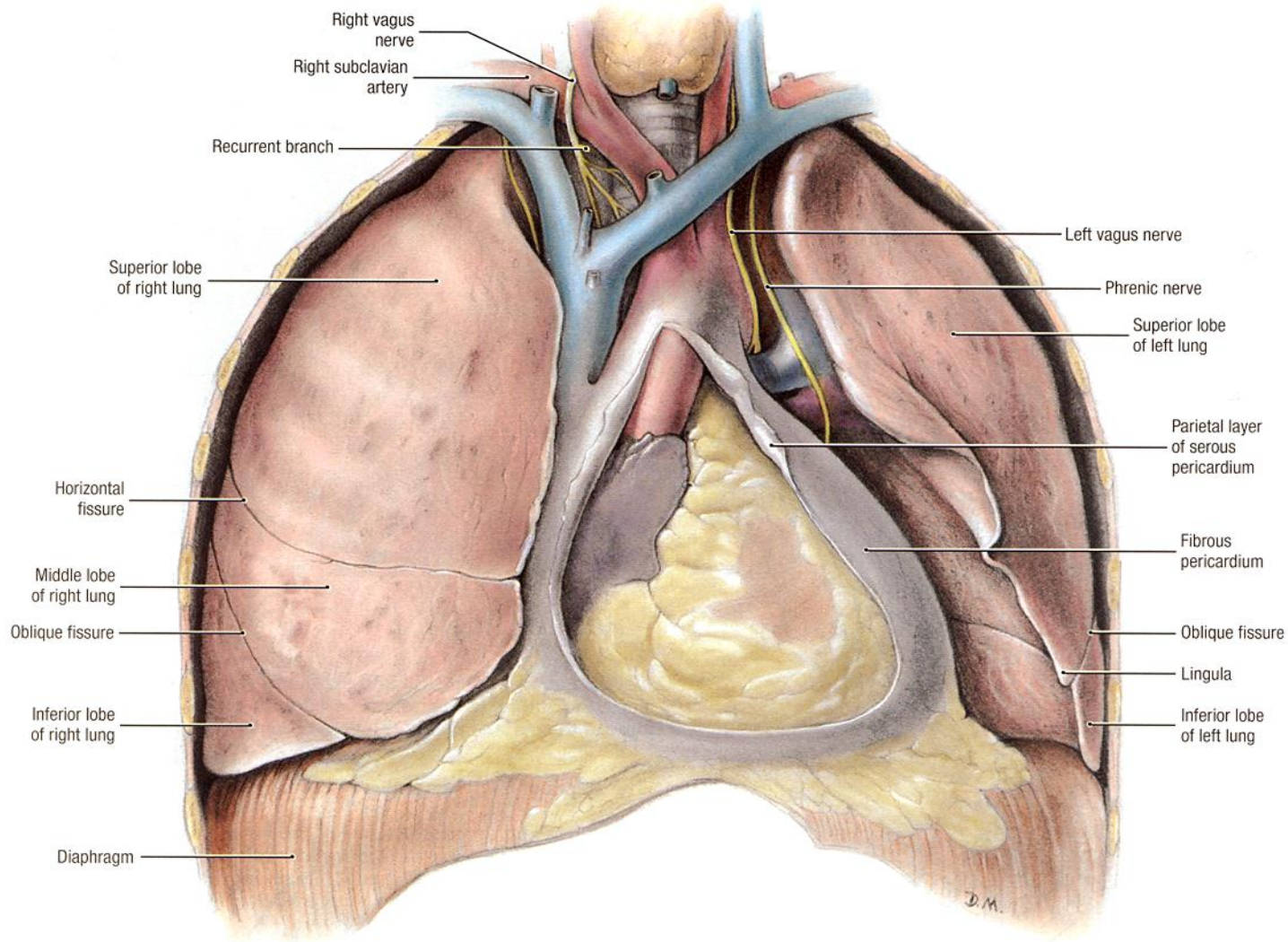


### 1.23 Thoracic contents, anterior view

#### OBSERVE:

1. The apex of the lungs is at the level of the neck of the 1st rib, and the inferior border of the lungs is the 6th rib in the left midclavicular line and the 8th rib at the lateral aspect of the bony thorax at the midaxillary line;
2. The cardiac notch of the left lung and the deviation of the parietal pleura away from the median plane toward the left side in the region of the notch;
3. The reflection of parietal pleura inferiorly at the 8th costochondral junction at the midclavicular line, at the 10th rib in the midaxillary

- line, and at the level of the neck of the 12th rib on each side of the vertebral column;
4. The apex of the heart is in the 5th interspace at the left midclavicular line;
5. The right atrium forms the right border of the heart and extends just beyond the lateral margin of the sternum;
6. The great vessels of the heart and their branches, which pass through the superior thoracic aperture.



### 1.26 Thoracic contents in situ, anterior view.

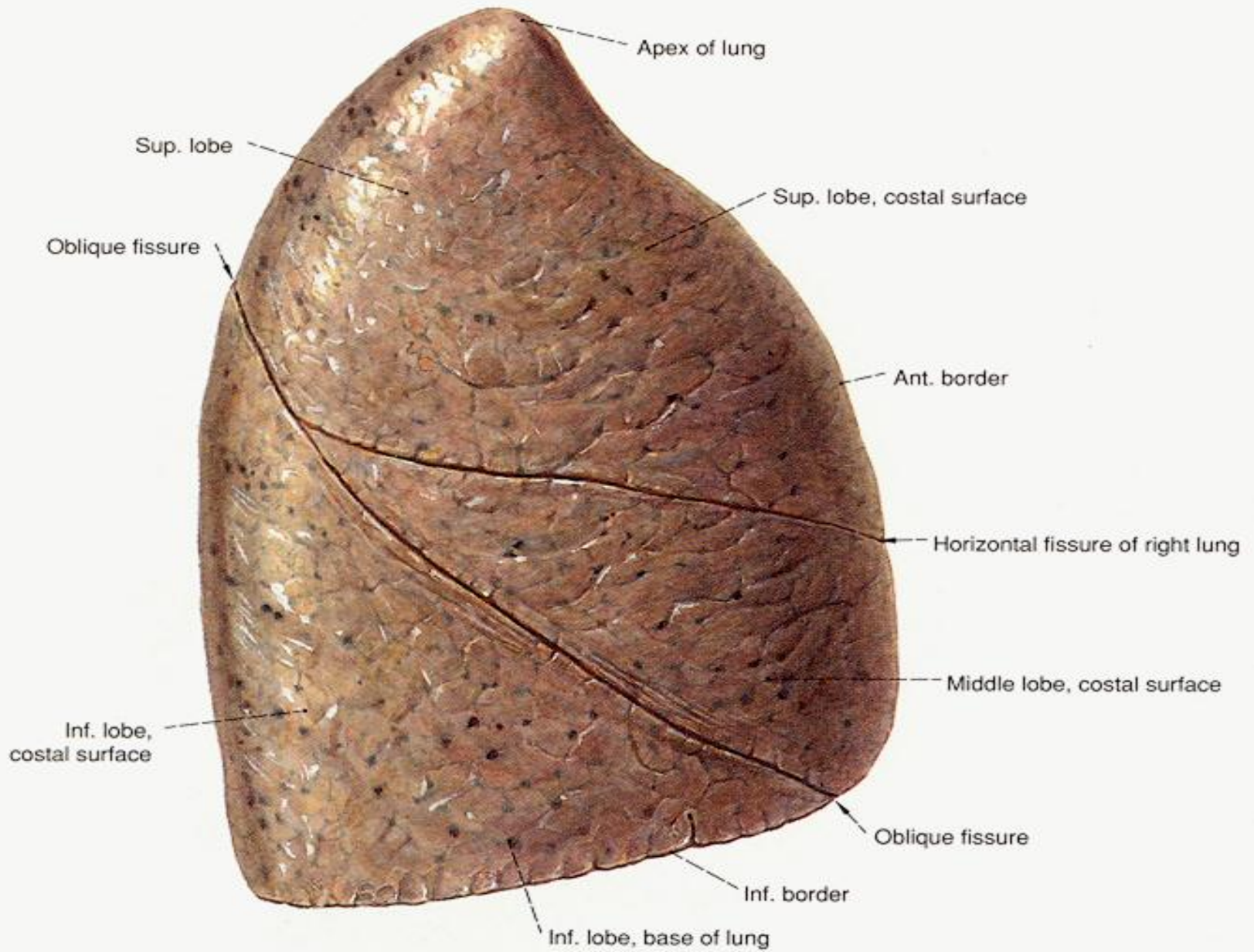
The fibrous pericardium, lined by the parietal layer of serous pericardium, is removed anteriorly to expose the heart and great vessels.

#### OBSERVE:

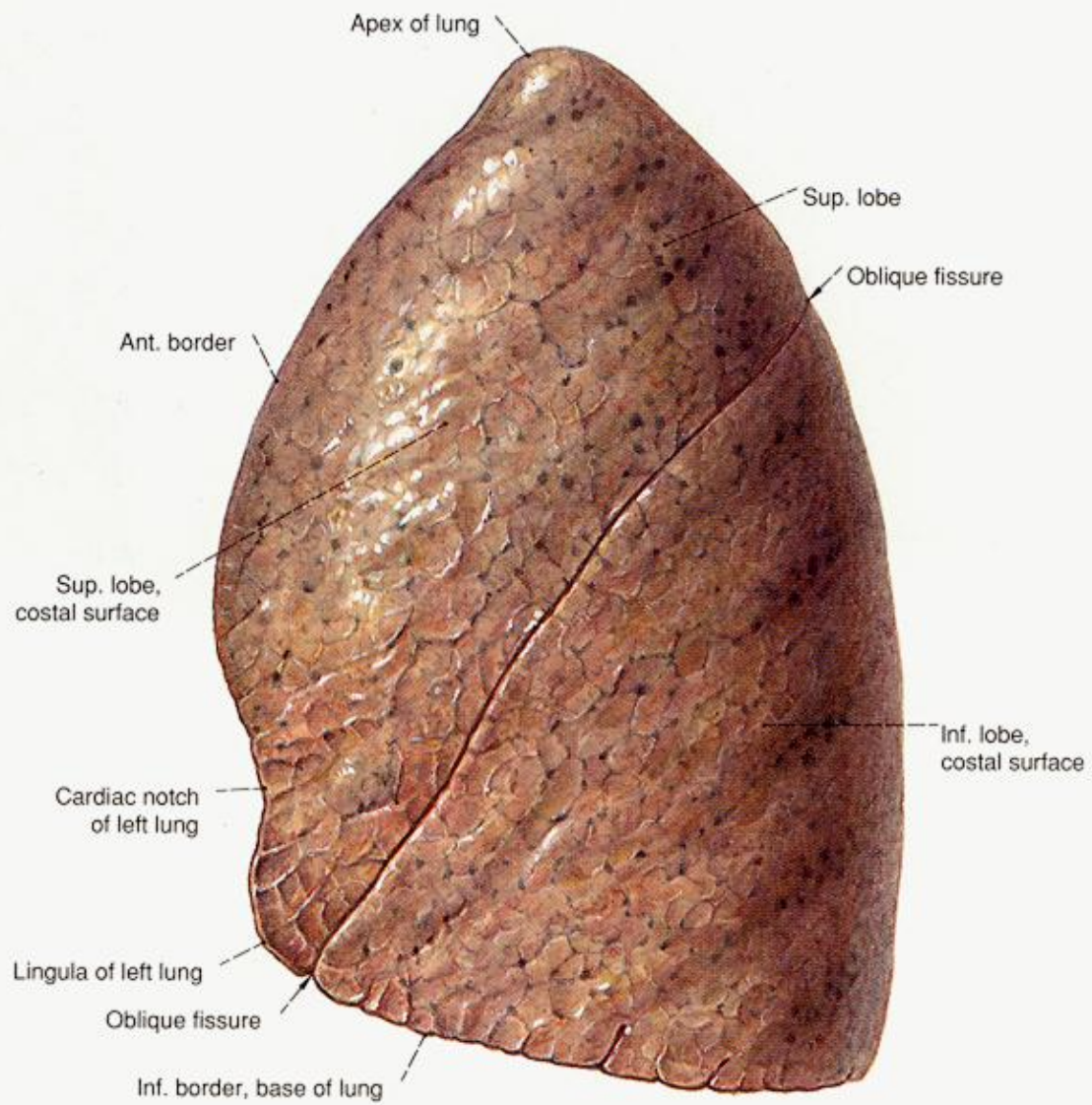
1. The right lung has three lobes; the superior lobe is separated from the middle lobe by the horizontal fissure, and the middle lobe is separated from the inferior lobe by the oblique fissure;
2. The left lung has two lobes, superior and inferior, separated by the oblique fissure. The anterior border of the left lung is reflected laterally to visualize the phrenic nerve passing anterior to the root of

the lung and the vagus nerve lying anterior to the arch of the aorta and then passing posterior to the root of the lung;

3. The right vagus nerve passes anterior to the right subclavian artery, where it gives off the recurrent branch and then divides to contribute fibers to the esophageal, cardiac, and pulmonary plexuses.

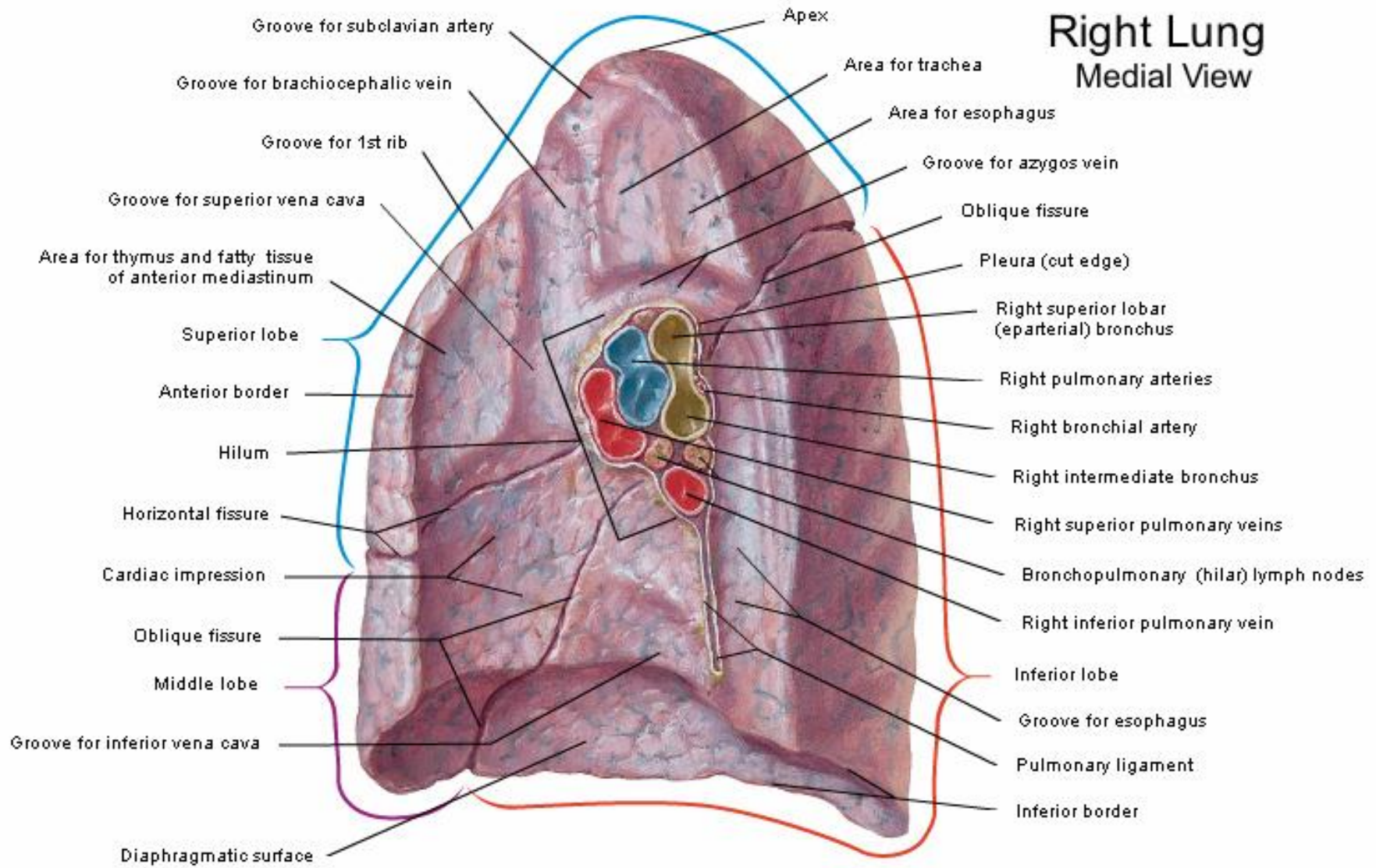


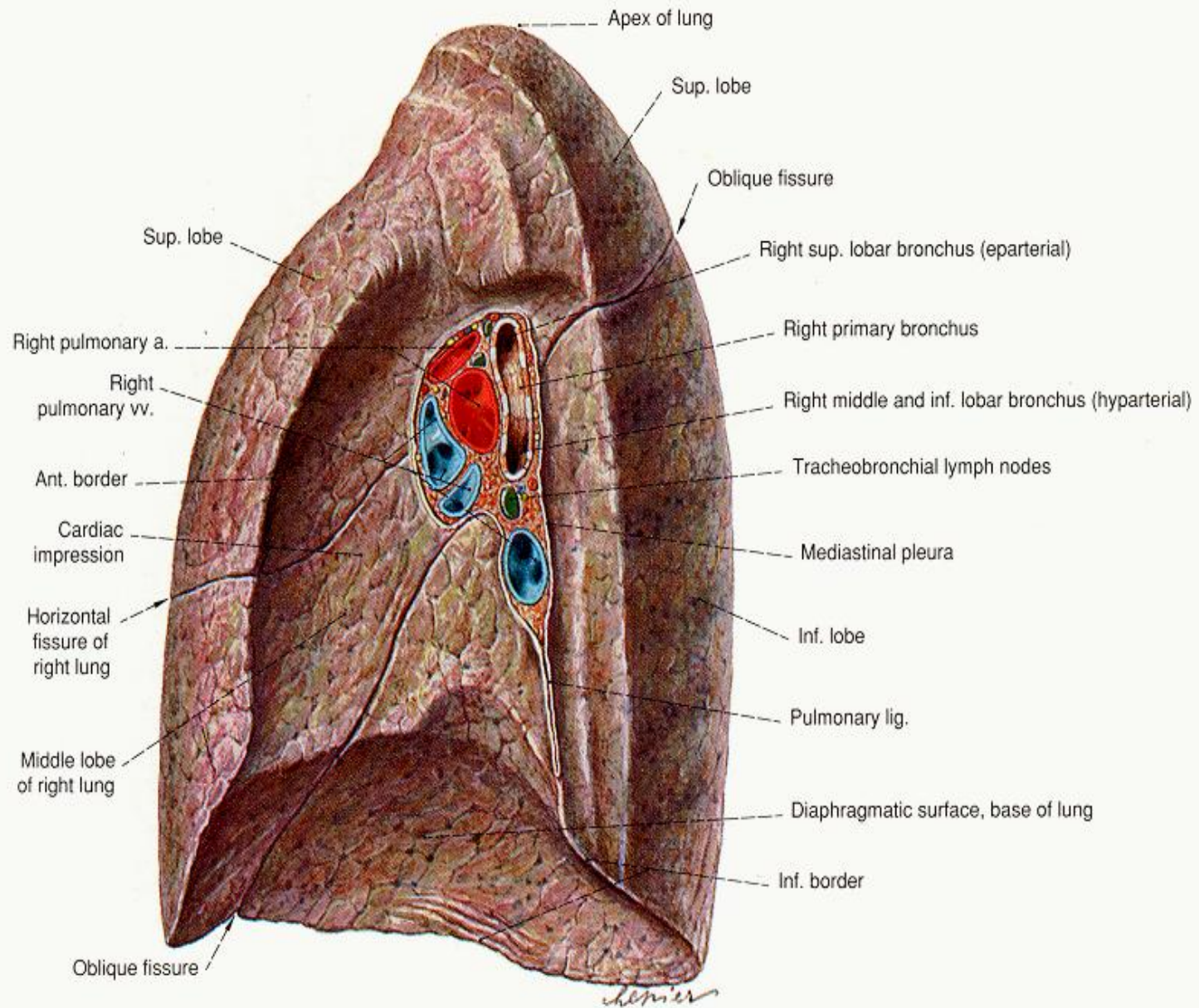
**Fig. 197.** Right lung, lateral view. The black spots are coal dust deposits (anthracotic pigment). The moist visceral pleura covering the surface of the lung gives it a shiny appearance.



**Fig. 198.** Left lung, lateral view.

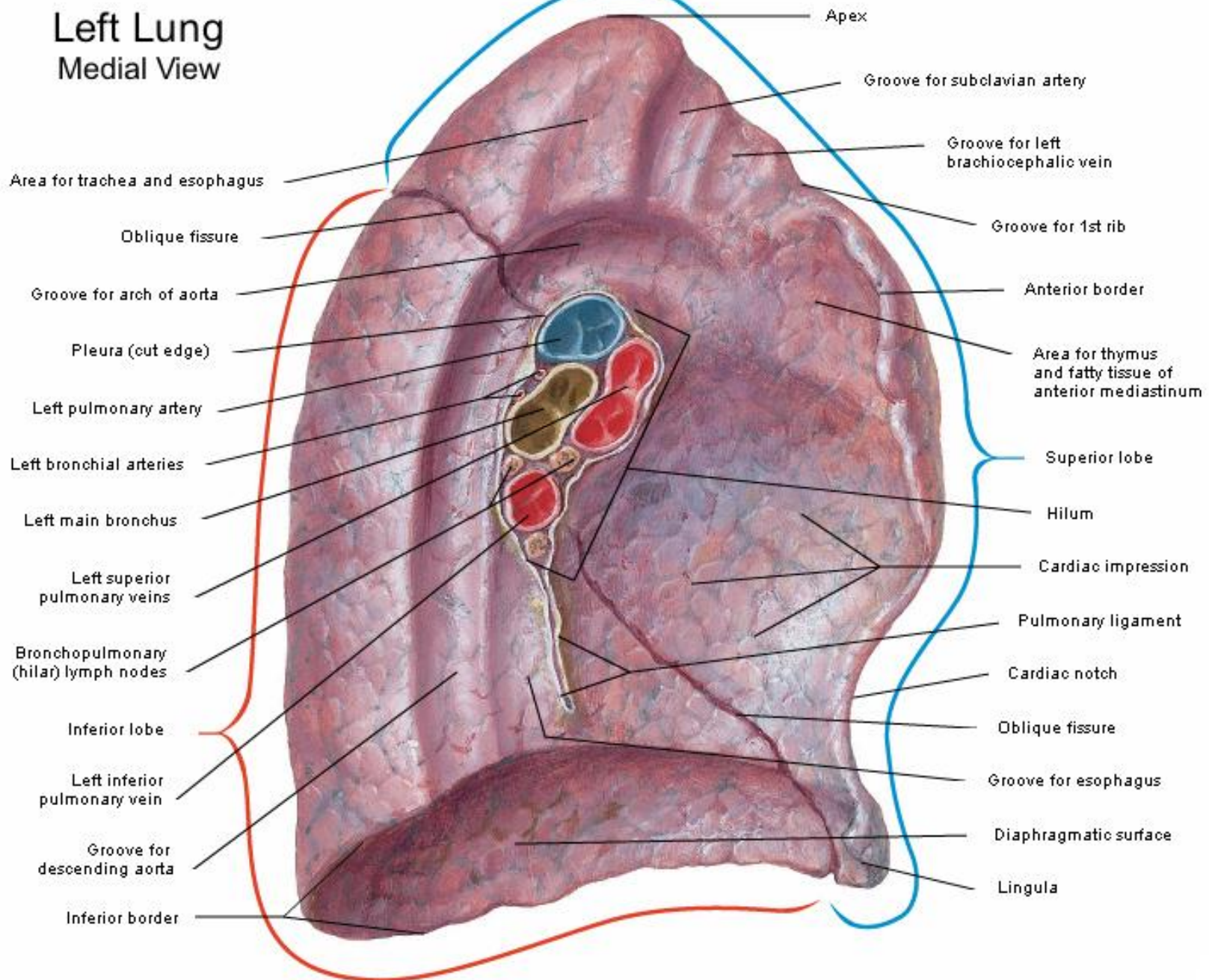
# Right Lung Medial View

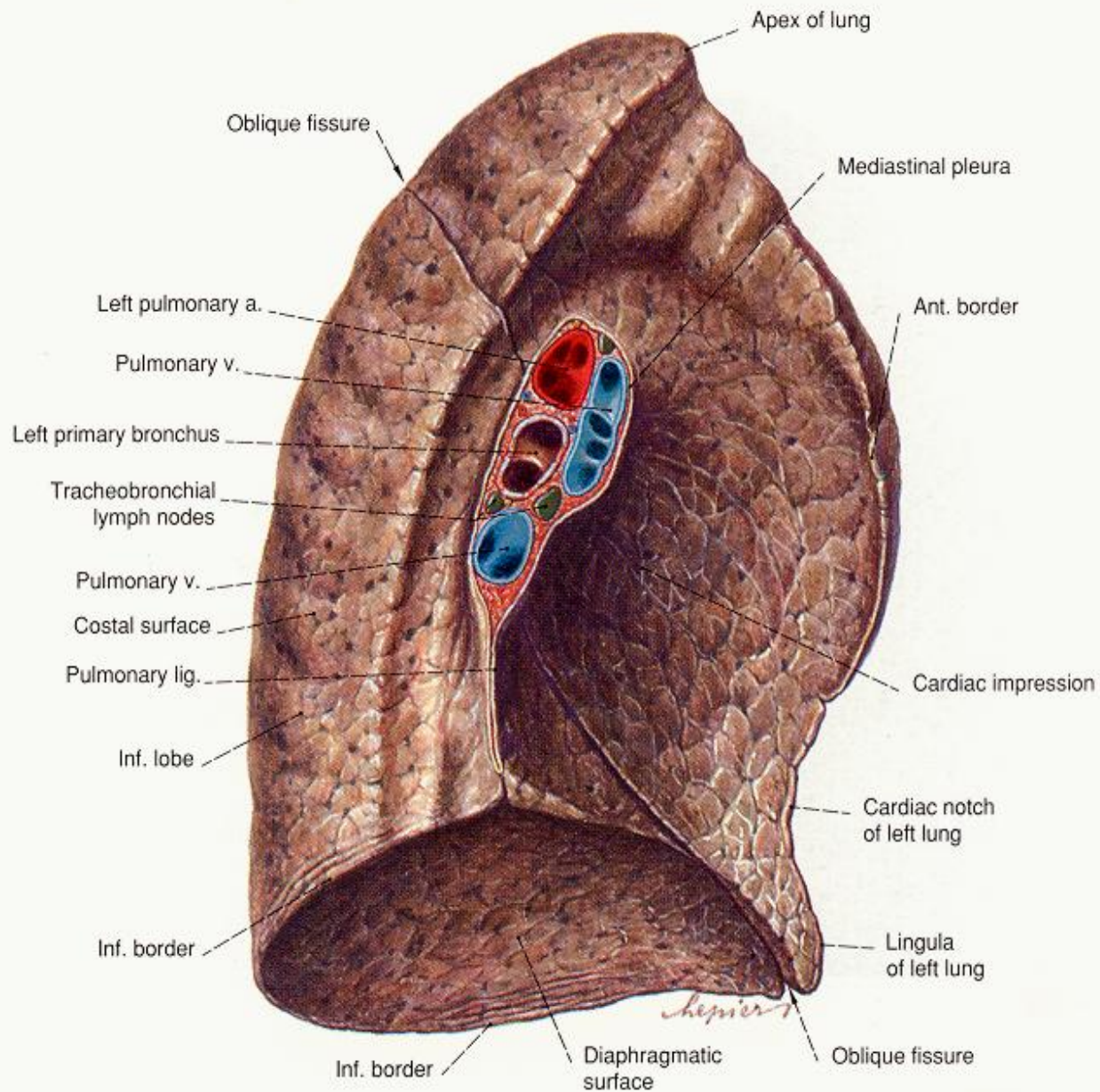




**Fig. 200.** Right lung, mediastinal surface.

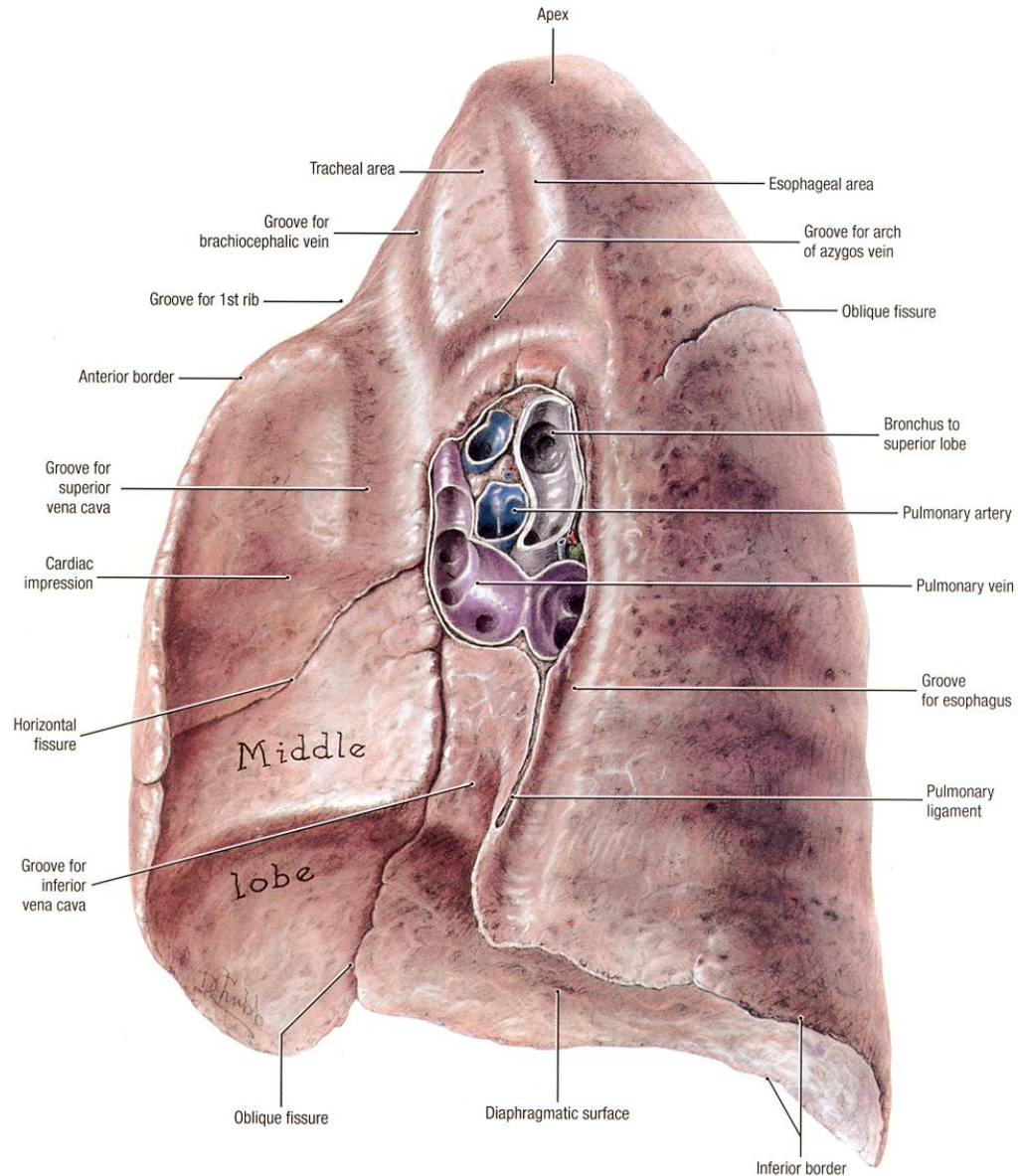
# Left Lung Medial View





**Fig. 199.** Left lung, mediastinal surface.





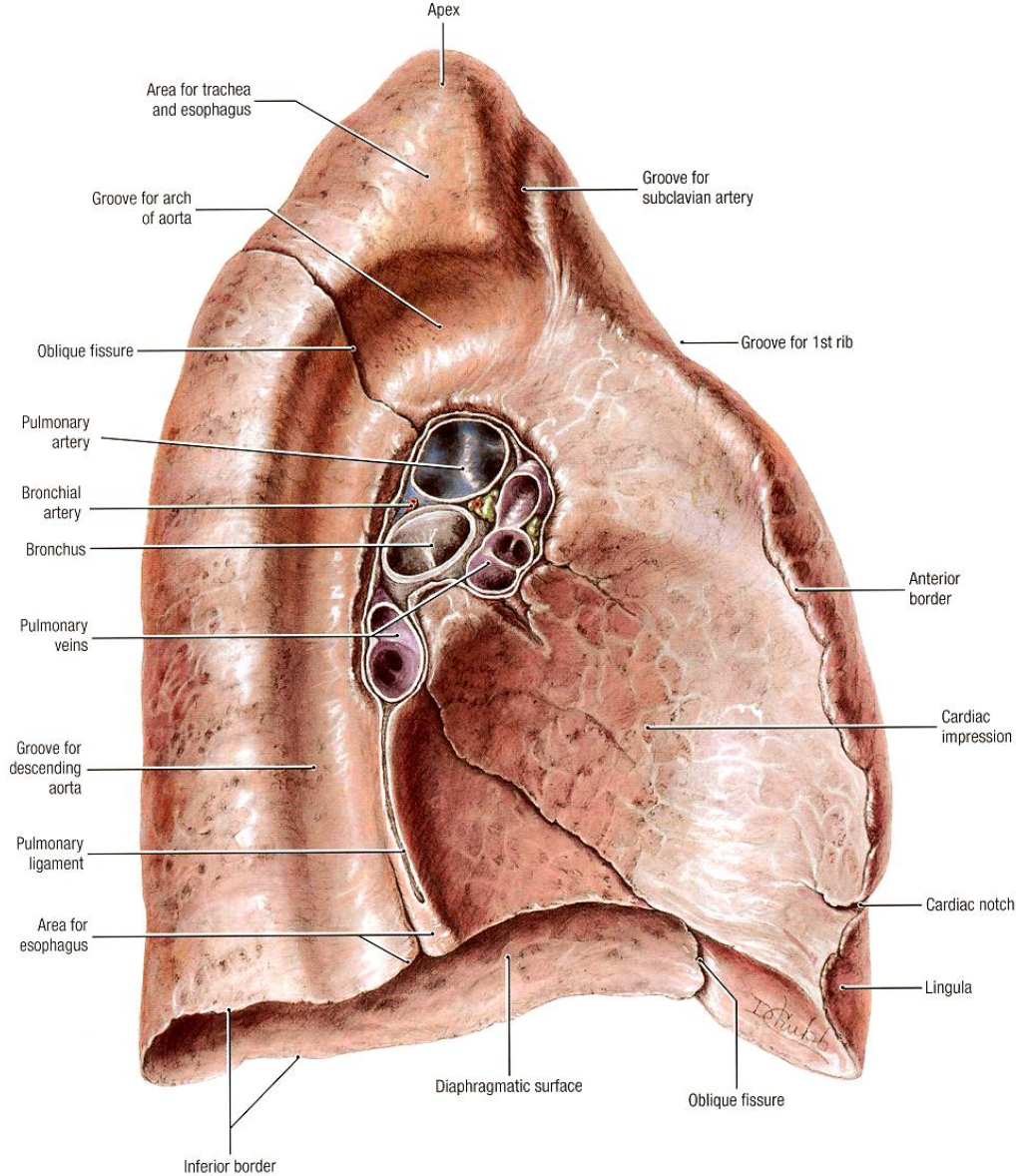
## 1.28 Mediastinal (medial) surface of right lung

### OBSERVE:

1. The embalmed lung shows impressions of the structures with which it comes into contact clearly demarcated as surface features; the base is contoured by the domes of the diaphragm; the costal surface bears the impressions of the ribs; distended vessels leave their mark, but nerves do not;
2. The somewhat pear-shaped root of the lung near the center of the

mediastinal surface, and the pulmonary ligament descending like a stalk from the root;

3. The groove for (or line of contact with) the esophagus throughout the length of the lung, except where the arch of the azygos vein intervenes; this groove passes posterior to the root and the pulmonary ligament, which separates it from the groove for the inferior vena cava;
4. The oblique fissure is incomplete here, but complete in Figure 1.29.



### 1.29 Mediastinal (medial) surface of left lung

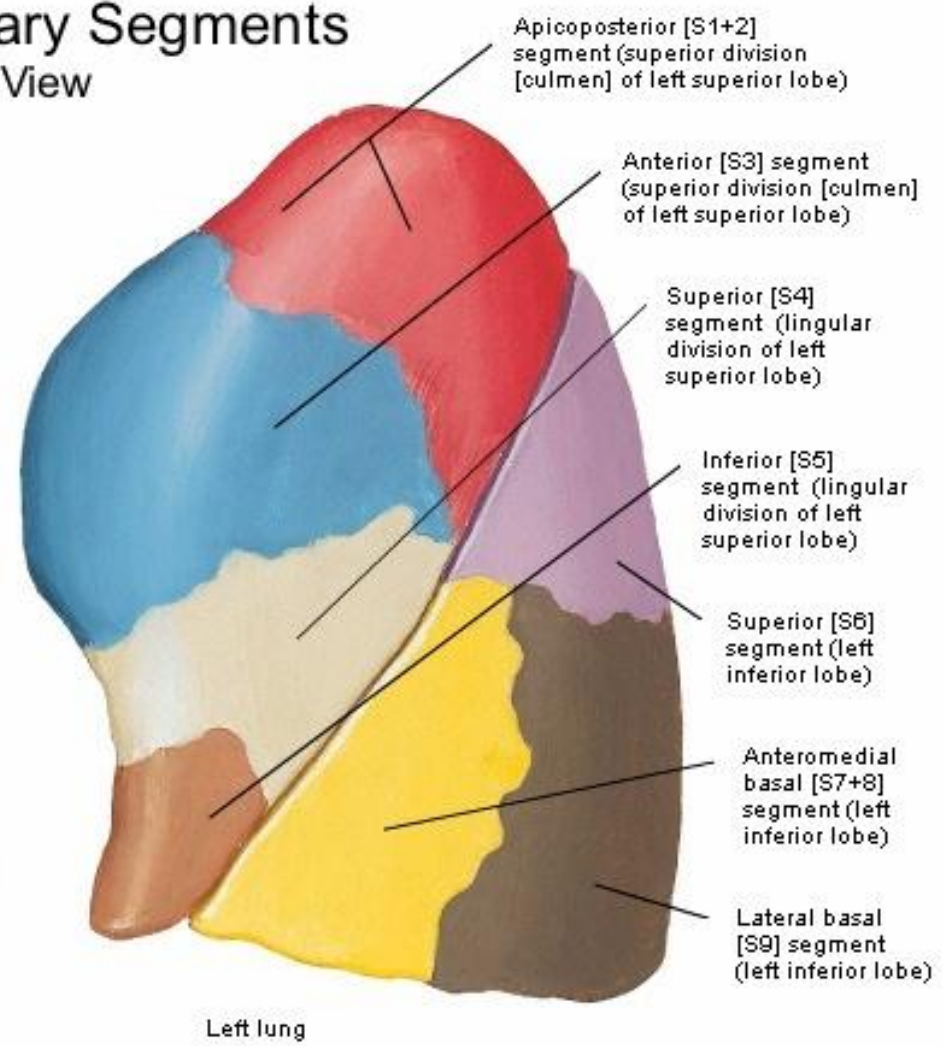
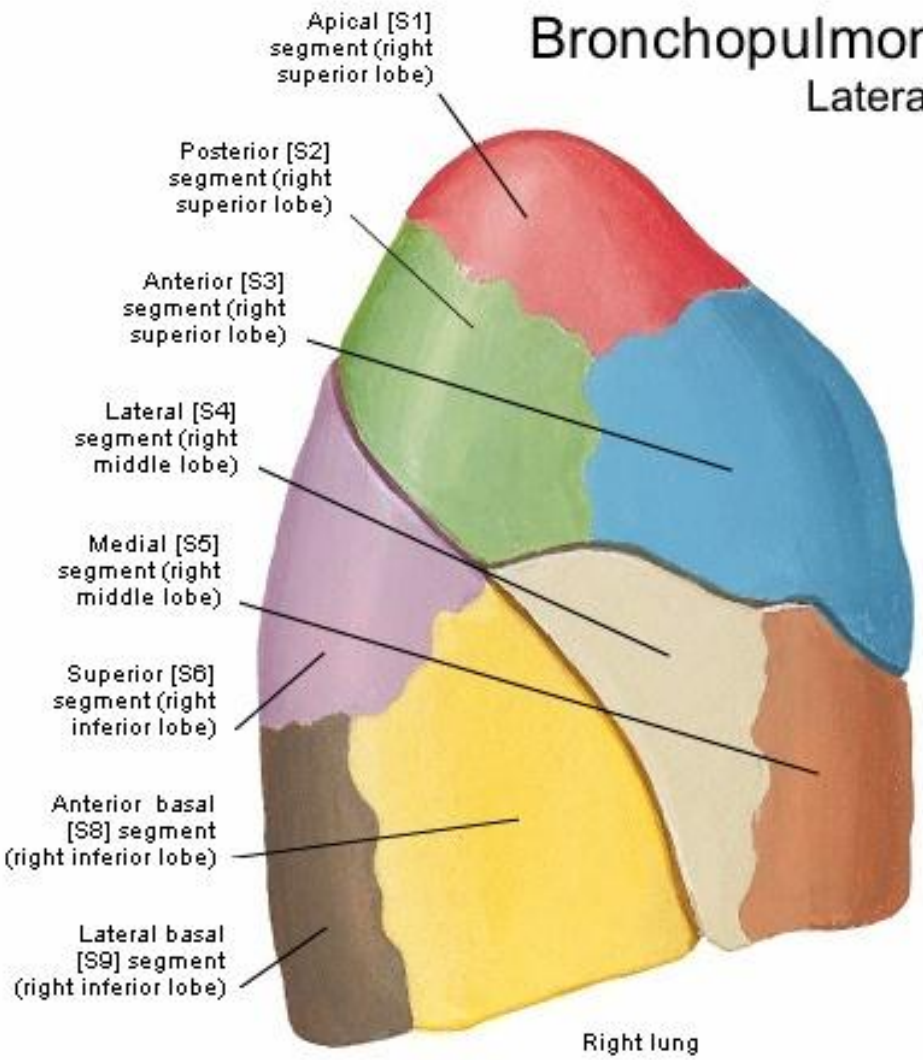
**OBSERVE:**

1. Near the center, the root of the lung and the pulmonary ligament descending from it;
2. The site of contact with the esophagus, between the descending aorta and the inferior end of the pulmonary ligament;
3. The oblique fissure, cutting completely through the lung substance;

4. In the right and left roots, the artery is superior, the bronchus is posterior, one vein is anterior, and the other is inferior; in the right root, the bronchus to the superior lobe, also called the eparterial bronchus, is the most superior structure.

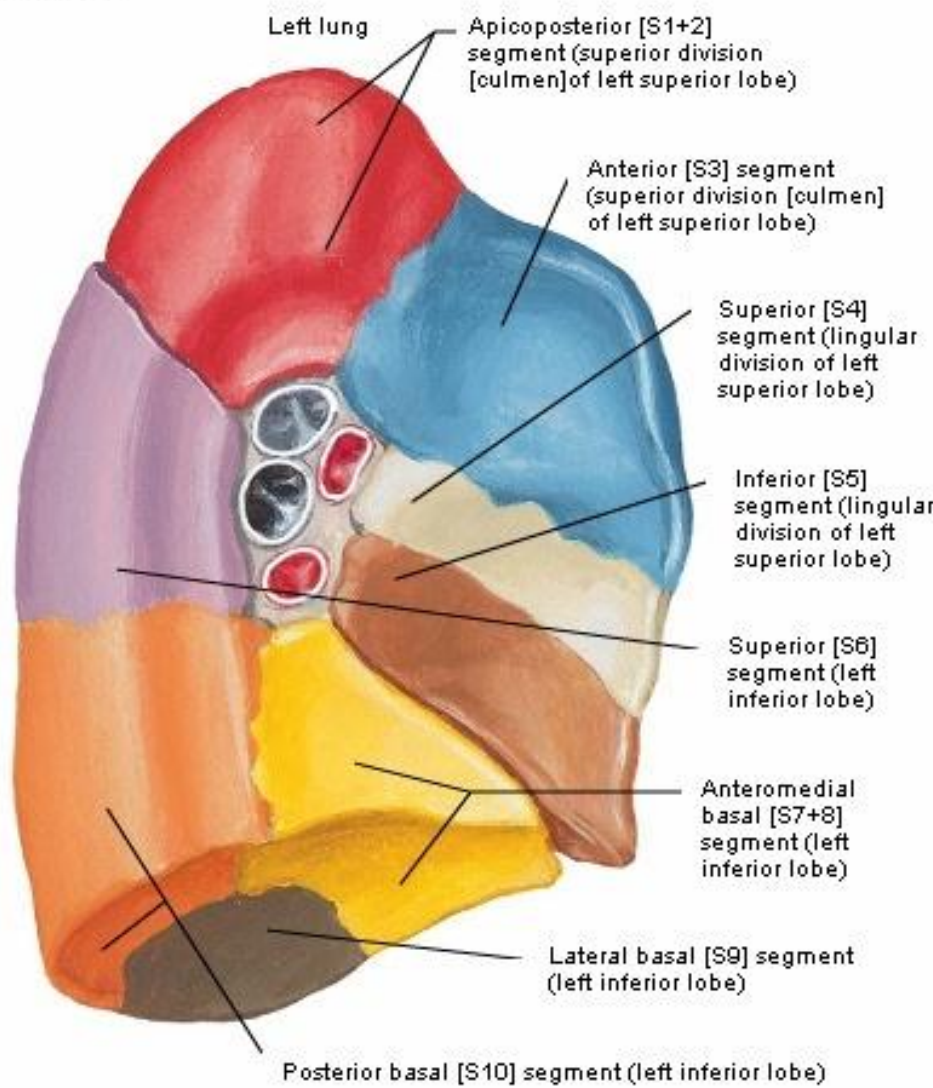
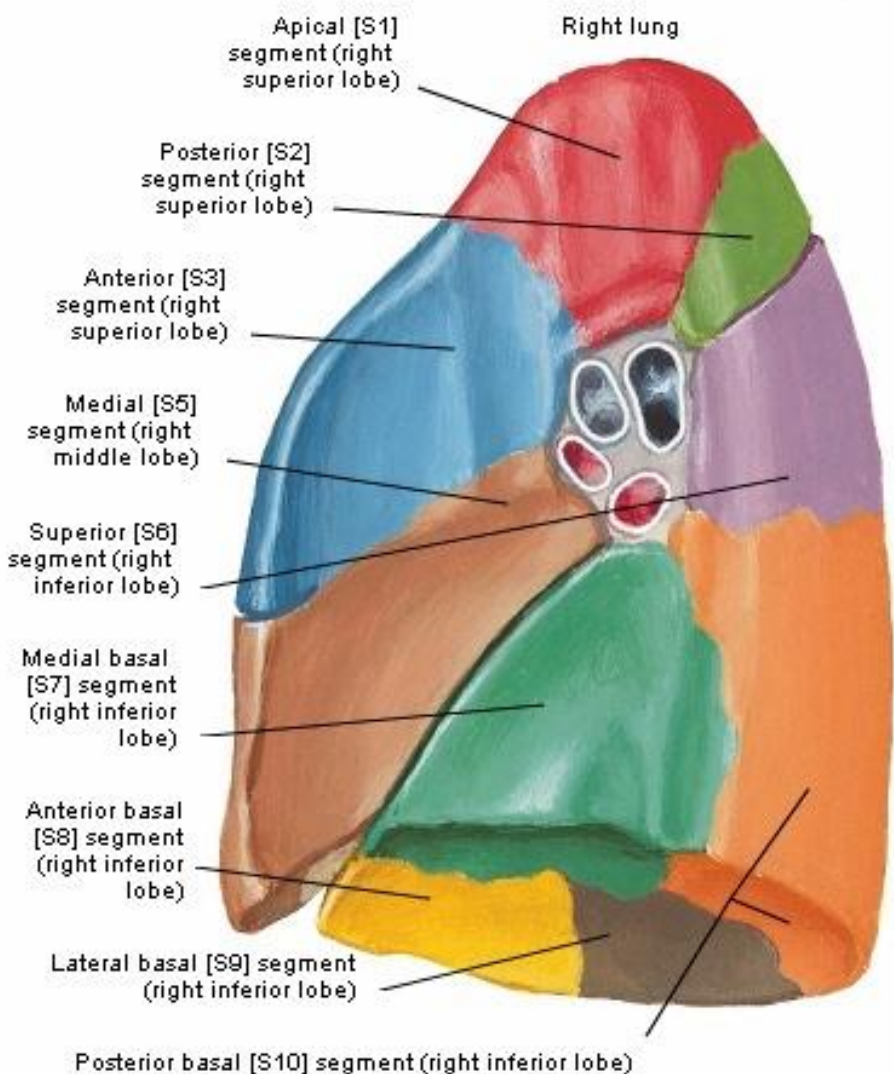
# Bronchopulmonary Segments

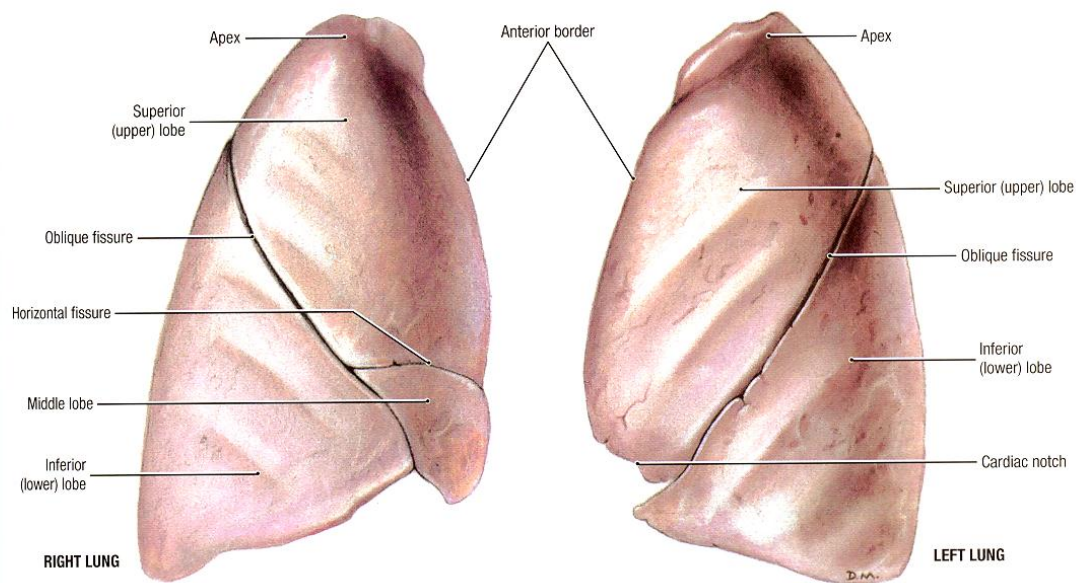
## Lateral View



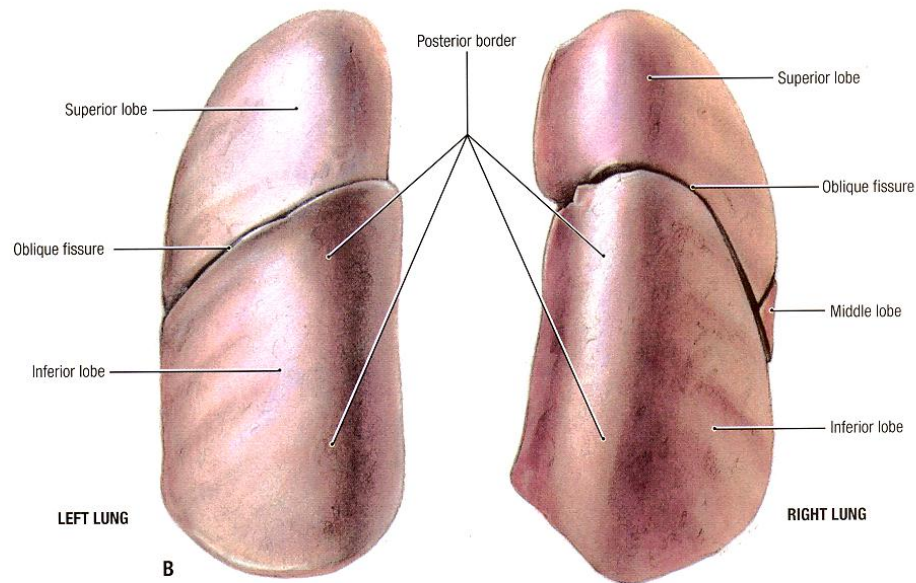
# Bronchopulmonary Segments

## Medial View





**A**



**B**

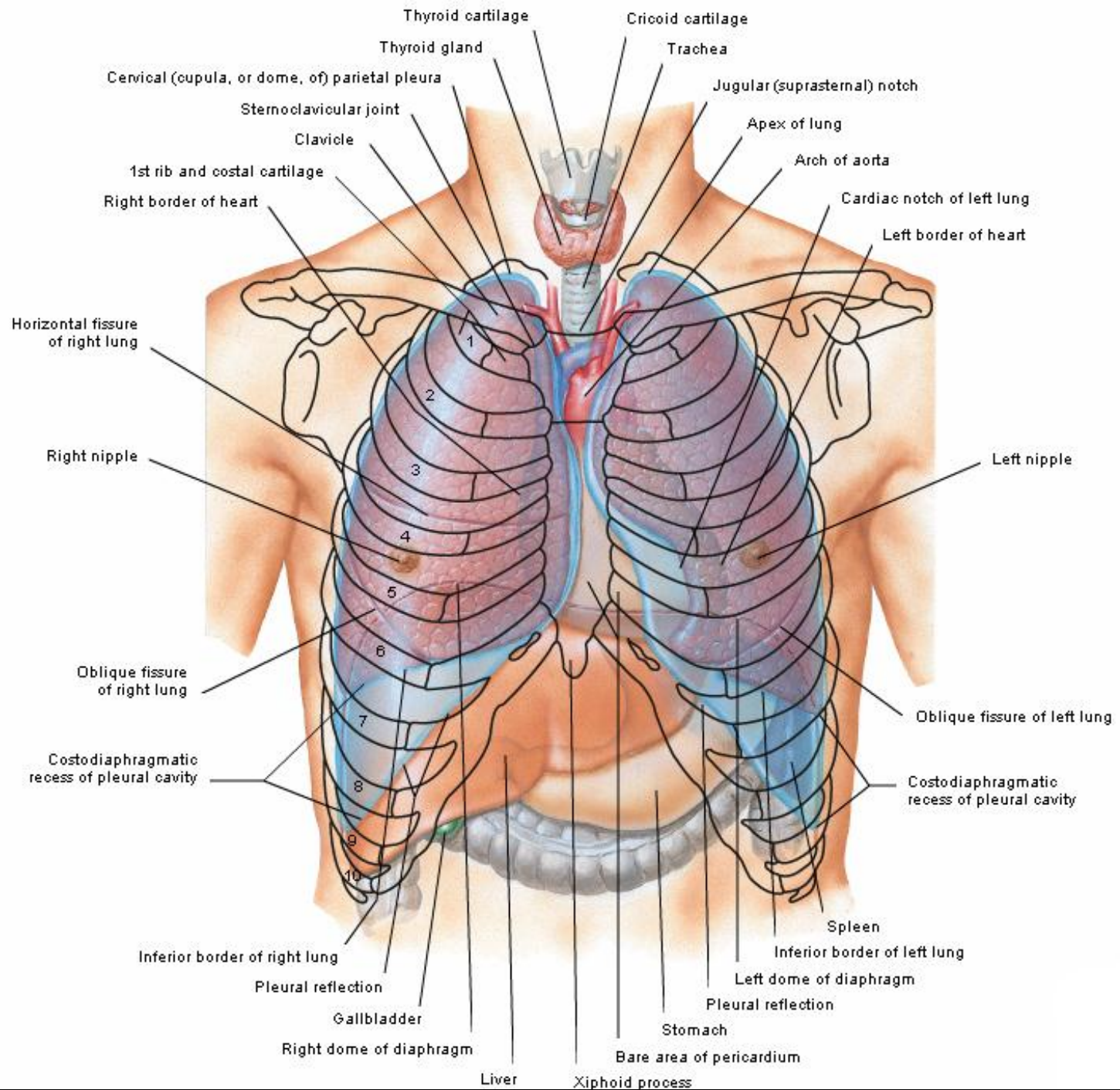
## 1.27 Lungs

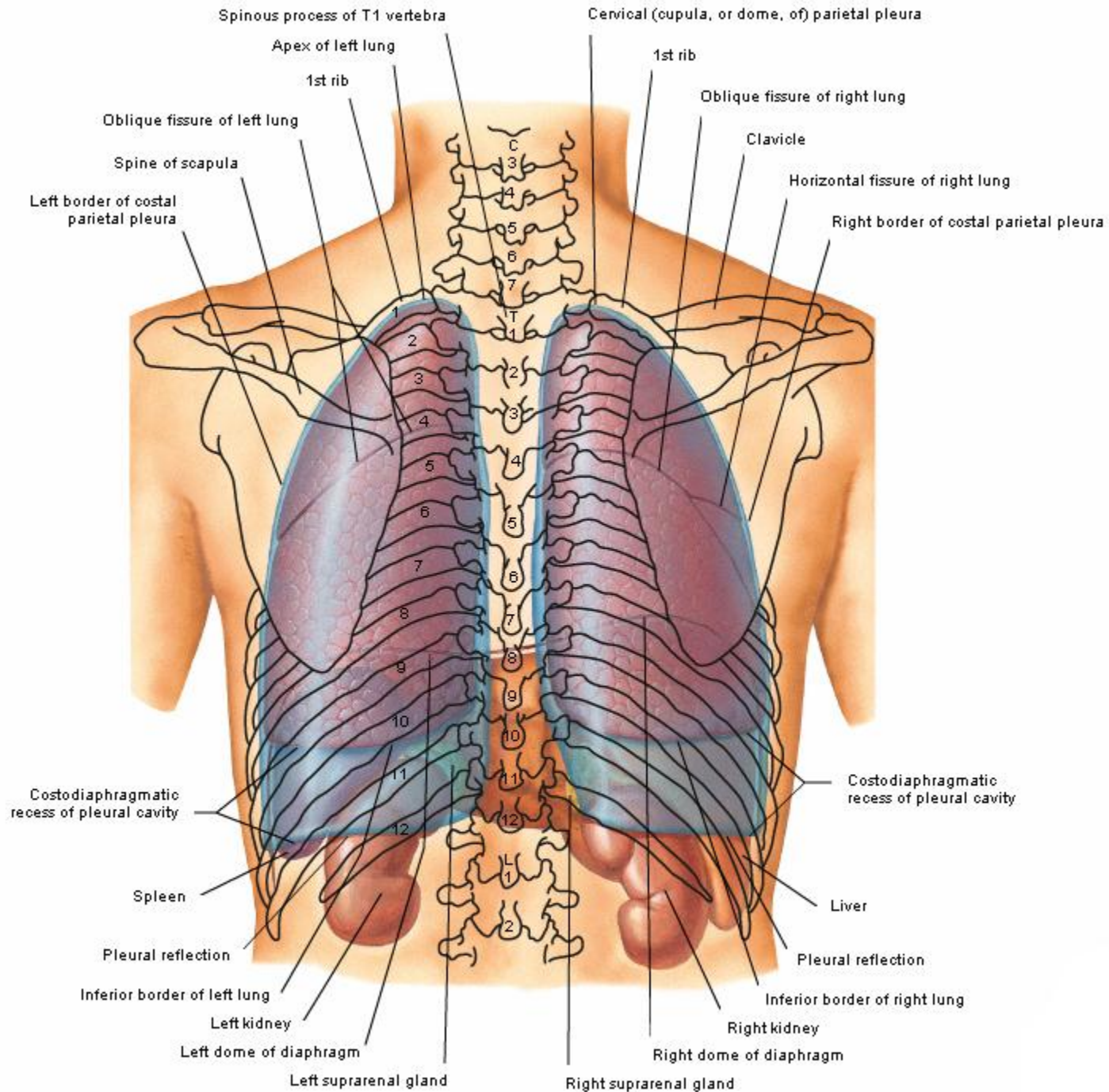
A. Lateral view. B. Posterior view.

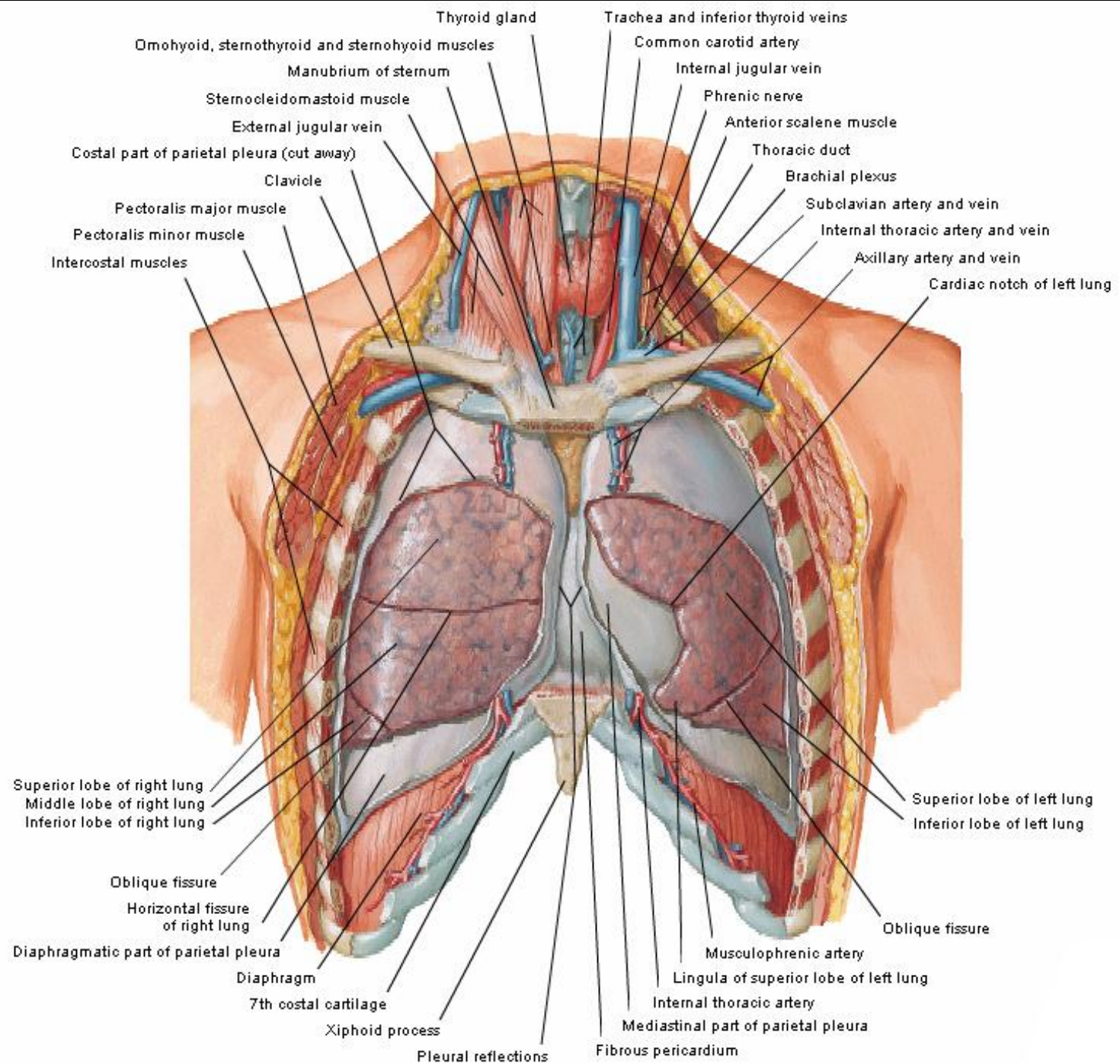
OBSERVE:

1. The three lobes of the right lung and two lobes of the left;
2. The deficiency of the superior (upper) lobe of the left lung, called the cardiac notch;

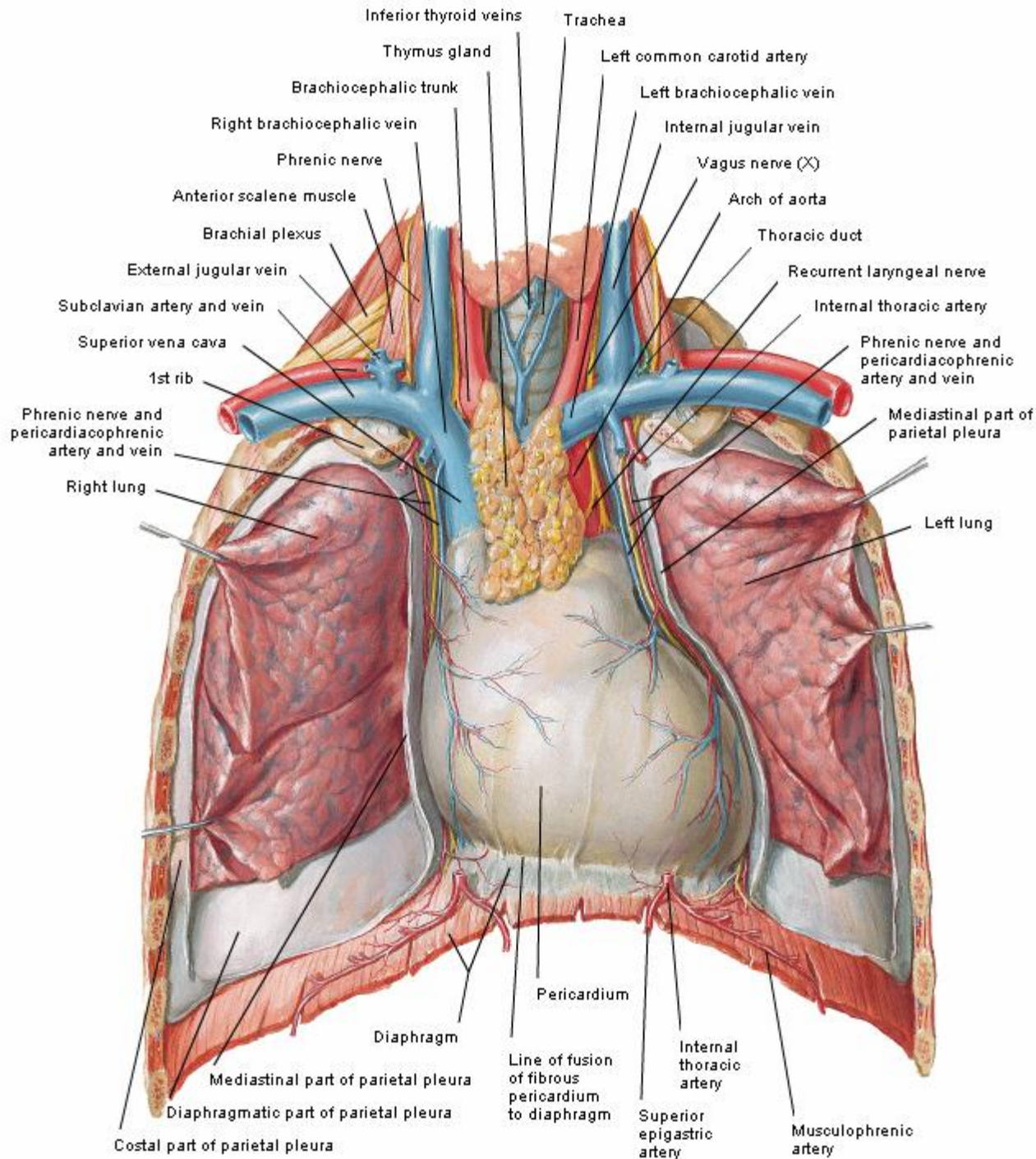
3. The oblique and horizontal fissures of the right lung, and the oblique fissure of the left lung; the fissures may be incomplete or absent on some specimens;
4. The sharp anterior border and rounded posterior border of the lungs;
5. The impressions of the ribs on the anterior and lateral aspects of the lung.

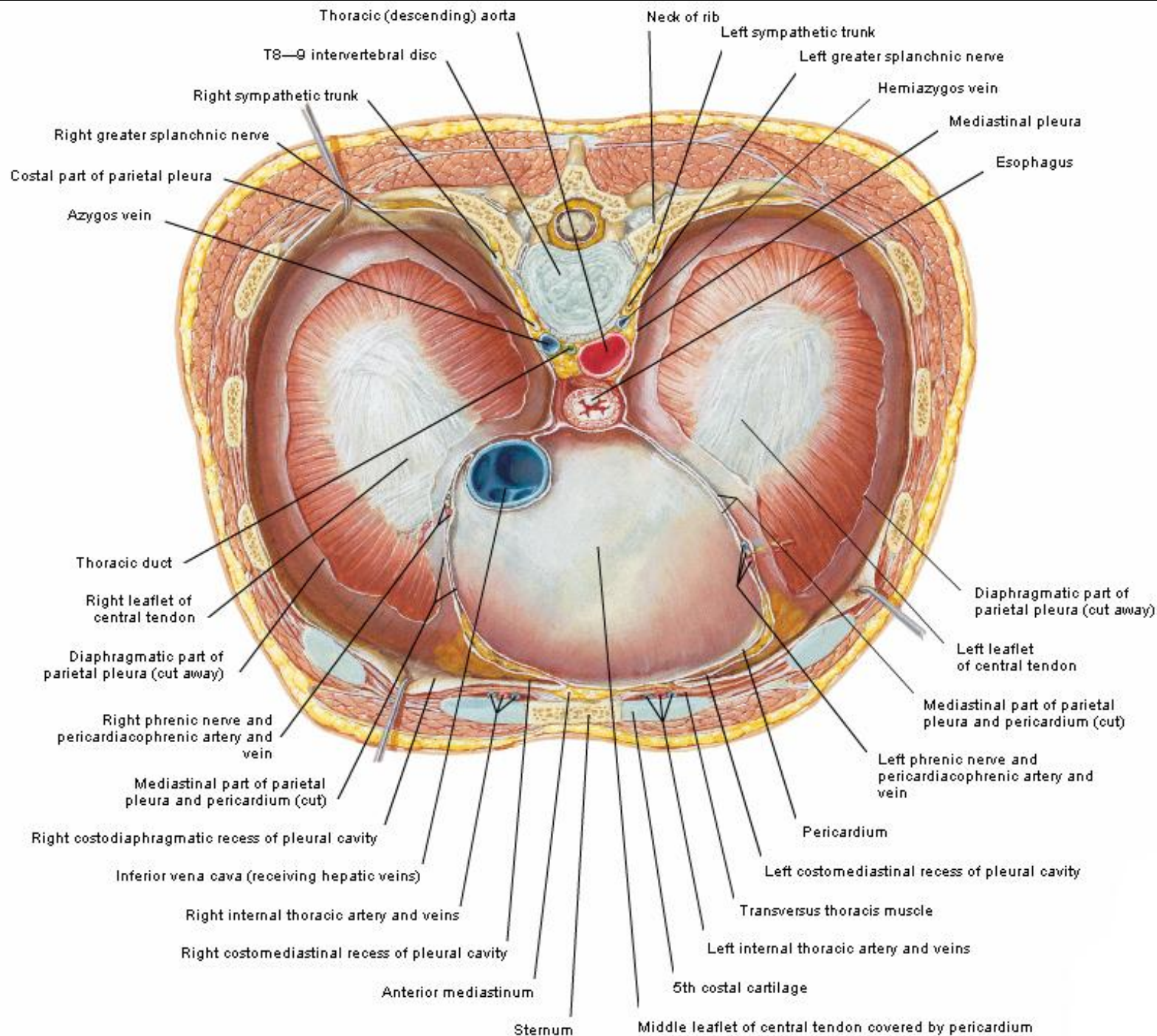






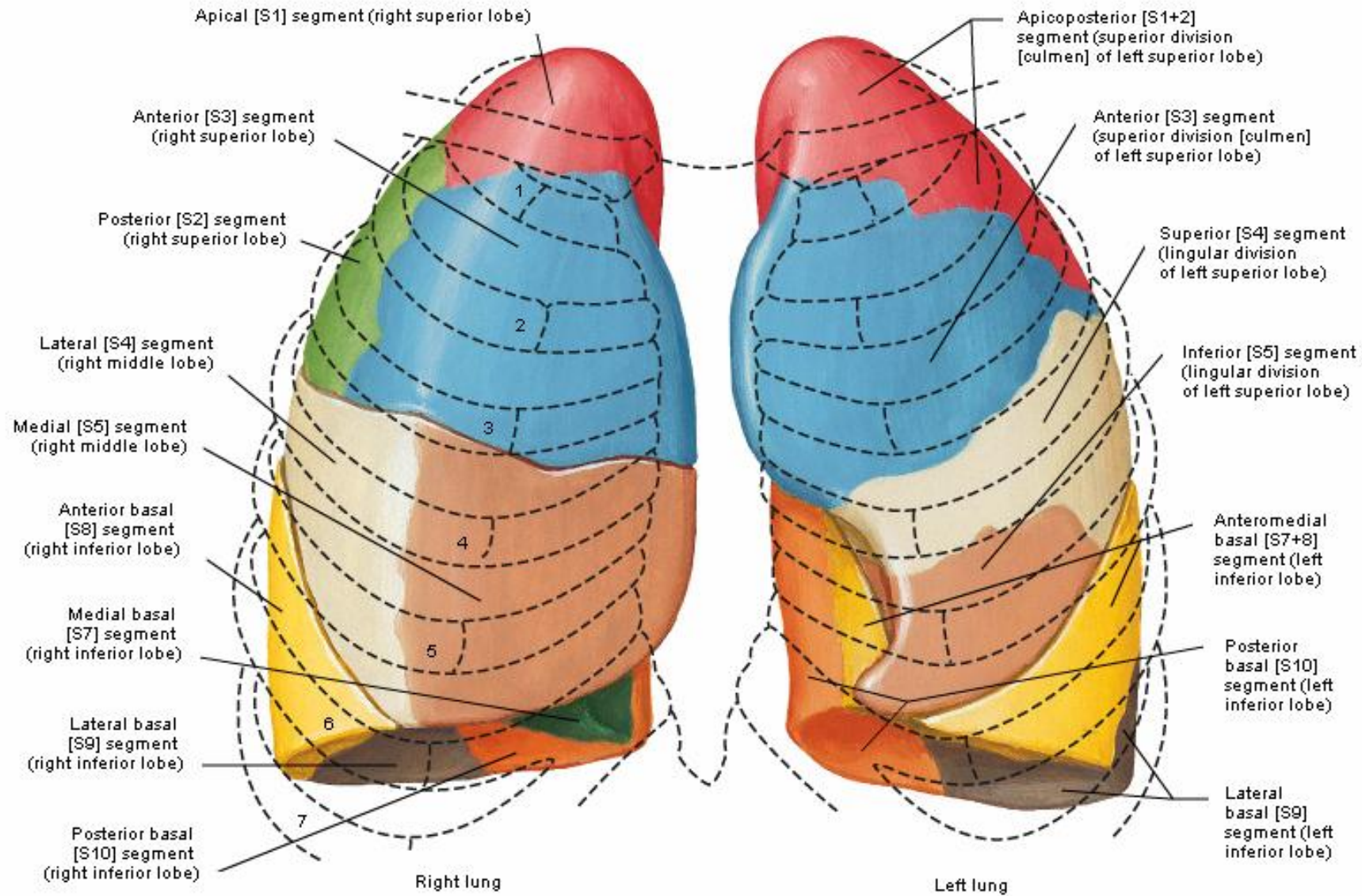






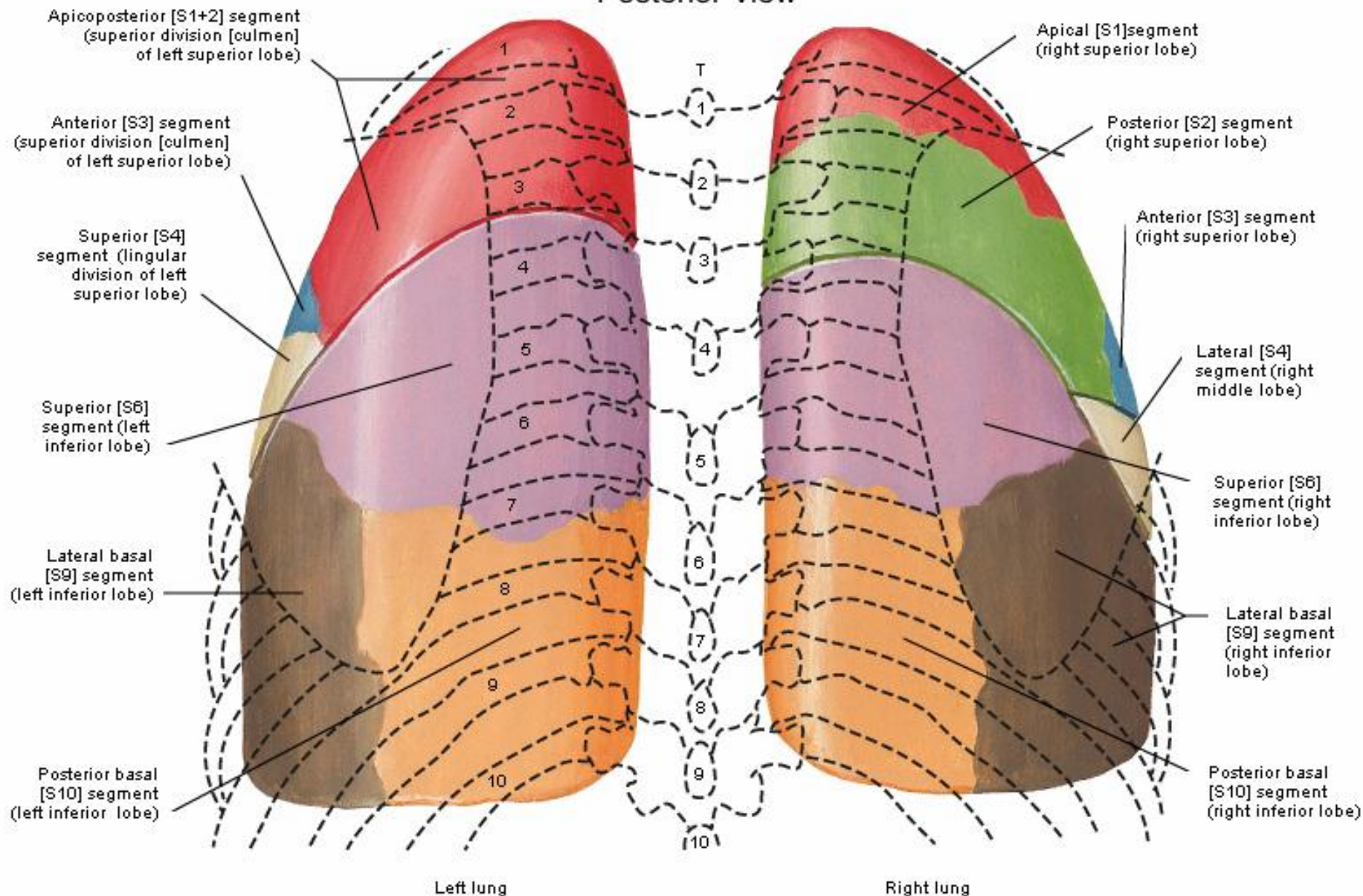
# Bronchopulmonary Segments

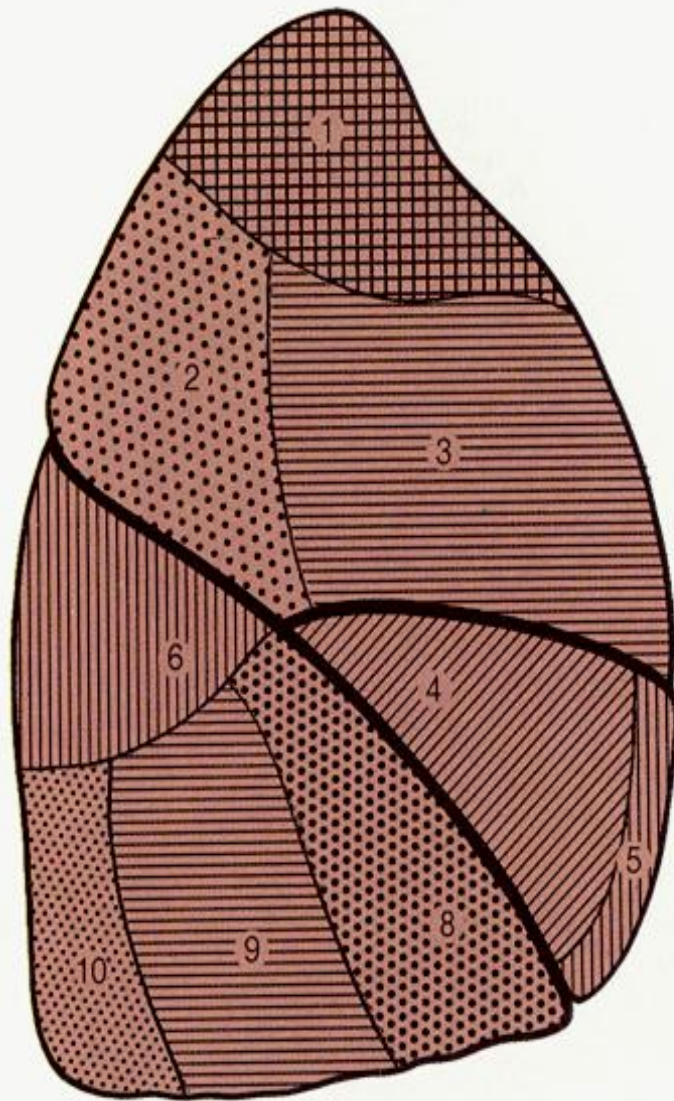
## Anterior View



# Bronchopulmonary Segments

## Posterior View





### Right Lung

#### Superior lobe

- 1 = Apical segment ( $S^1$ )
- 2 = Posterior segment ( $S^2$ )
- 3 = Anterior segment ( $S^3$ )

#### Middle lobe

- 4 = Lateral segment ( $S^4$ )
- 5 = Medial segment ( $S^5$ )

#### Inferior lobe

- 6 = Superior segment ( $S^6$ )
- 7 = Medial basal segment ( $S^7$ )
- 8 = Anterior basal segment ( $S^8$ )
- 9 = Lateral basal segment ( $S^9$ )
- 10 = Posterior basal segment ( $S^{10}$ )

**Fig. 201.** The bronchopulmonary segments of the right lung, lateral aspect.

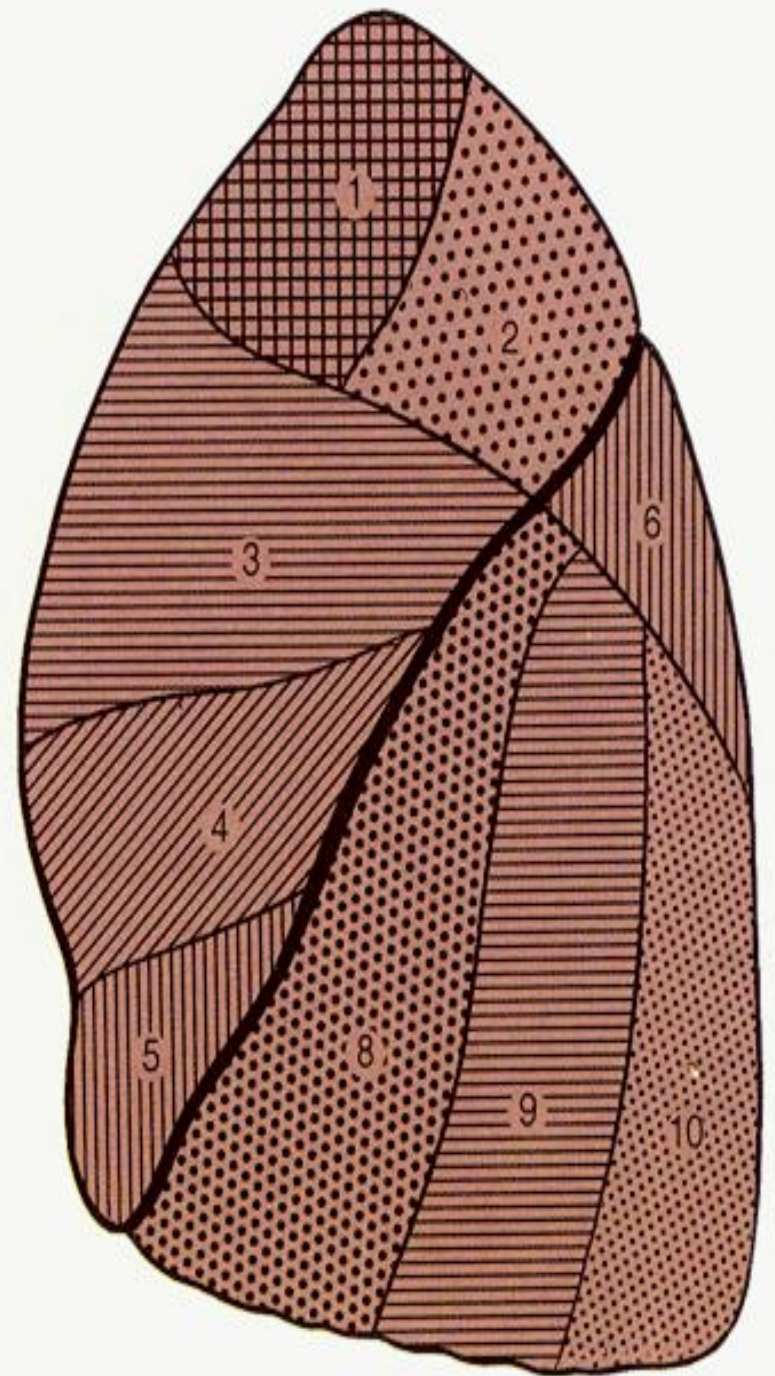
## Left Lung

### Superior lobe

- 1, 2 = Apical-posterior segment ( $S^1, S^2$ )
- 3 = Anterior segment ( $S^3$ )
- 4 = Superior lingular segment ( $S^4$ )
- 5 = Inferior lingular segment ( $S^5$ )

### Inferior lobe

- 6 = Apical segment ( $S^6$ )
- 7 = Medial basal segment\* ( $S^7$ )
- 8 = Anterior basal segment\* ( $S^8$ )
- 9 = Lateral basal segment ( $S^9$ )
- 10 = Posterior basal segment ( $S^{10}$ )



## Right Lung

### Superior lobe

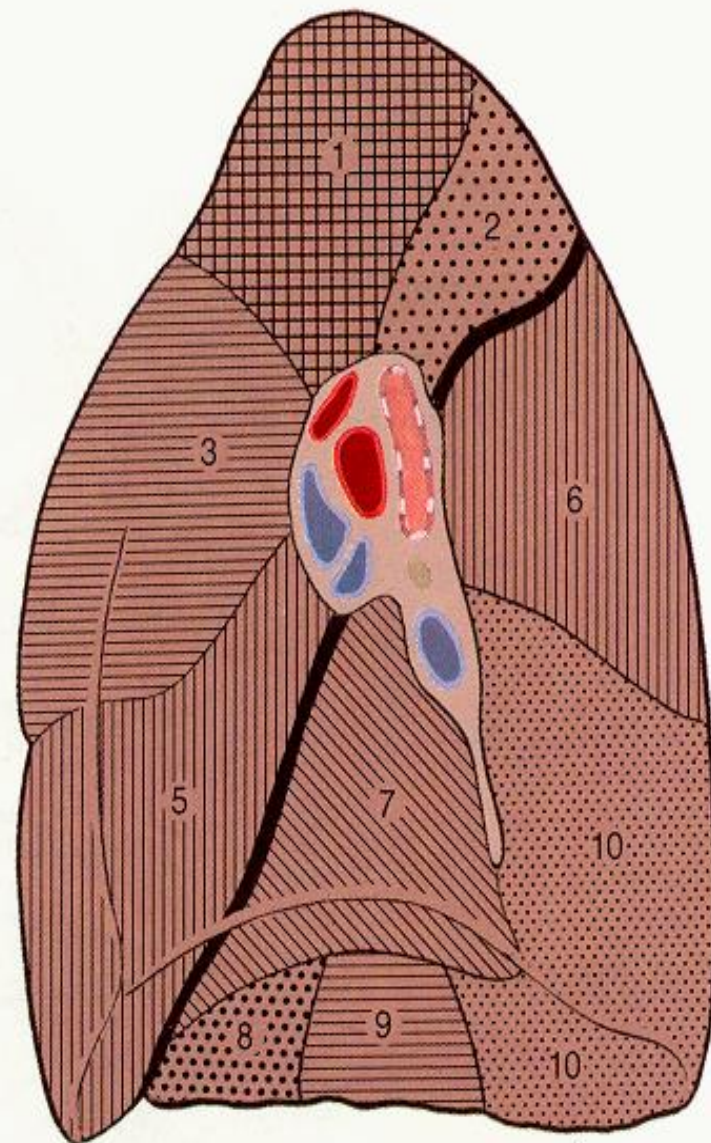
- 1 = Apical segment (S<sup>1</sup>)
- 2 = Posterior segment (S<sup>2</sup>)
- 3 = Anterior segment (S<sup>3</sup>)

### Middle lobe

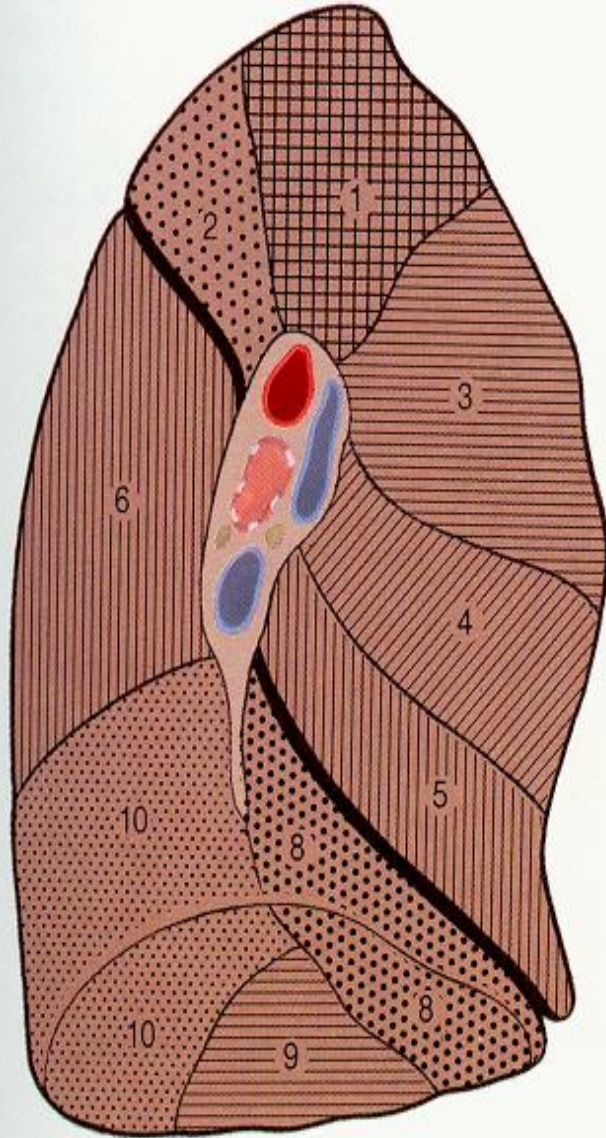
- 4 = Lateral segment (S<sup>4</sup>)
- 5 = Medial segment (S<sup>5</sup>)

### Inferior lobe

- 6 = Superior segment (S<sup>6</sup>)
- 7 = Medial basal segment (S<sup>7</sup>)
- 8 = Anterior basal segment (S<sup>8</sup>)
- 9 = Lateral basal segment (S<sup>9</sup>)
- 10 = Posterior basal segment (S<sup>10</sup>)



**Fig. 203.** The bronchopulmonary segments of the right lung, medial aspect.



## Left Lung

### Superior lobe

- 1, 2 = Apical-posterior segment ( $S^1, S^2$ )
- 3 = Anterior segment ( $S^3$ )
- 4 = Superior lingular segment ( $S^4$ )
- 5 = Inferior lingular segment ( $S^5$ )

### Inferior lobe

- 6 = Apical segment ( $S^6$ )
- 7 = Medial basal segment\* ( $S^7$ )
- 8 = Anterior basal segment\* ( $S^8$ )
- 9 = Lateral basal segment ( $S^9$ )
- 10 = Posterior basal segment ( $S^{10}$ )

Fig. 204. The bronchopulmonary segments of the left lung, medial aspect. Segment  $S^7$  is found in the left lung only as an exception.

\* Segments  $S^7$  and  $S^8$  are usually considered as a single segment.



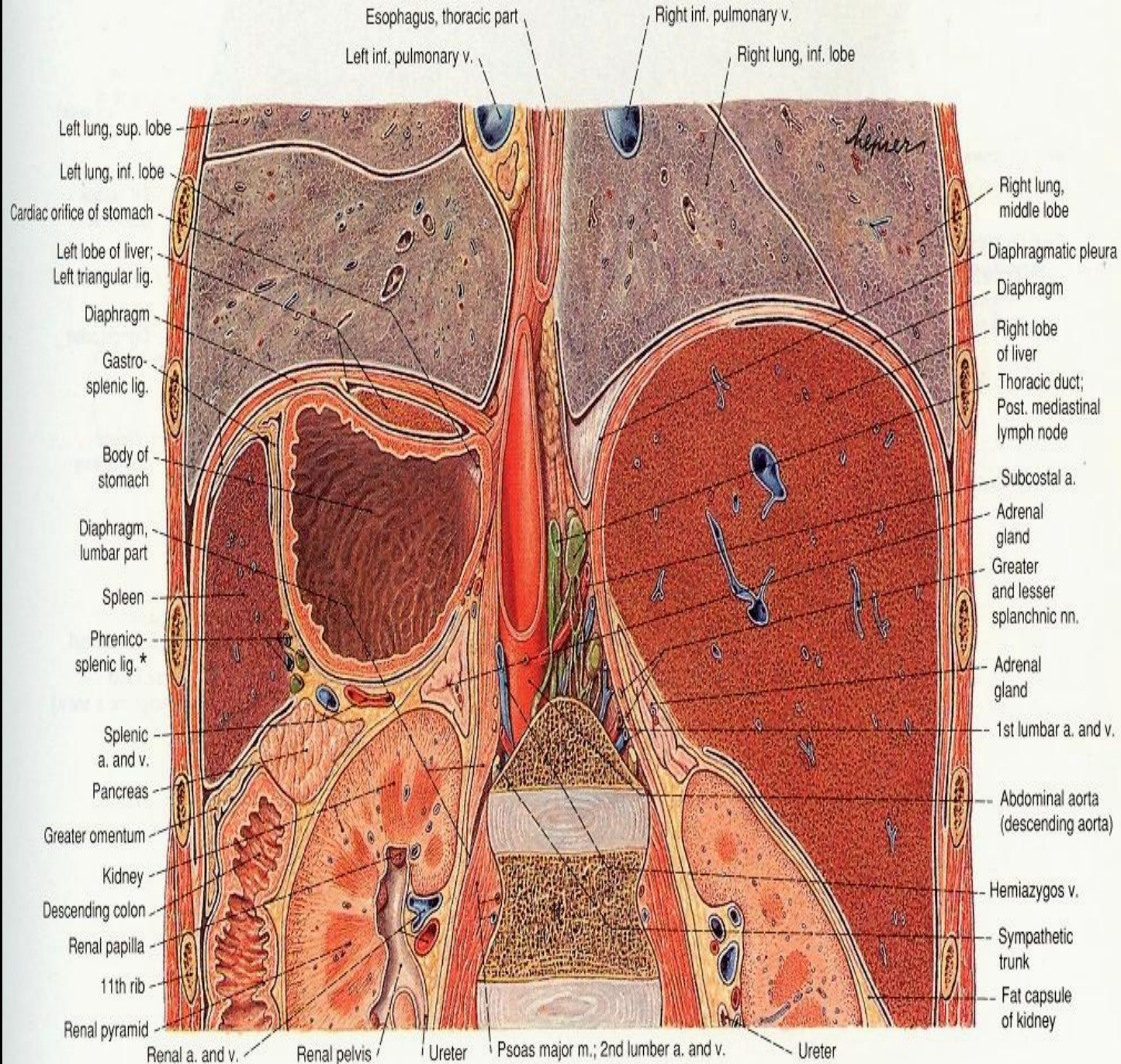
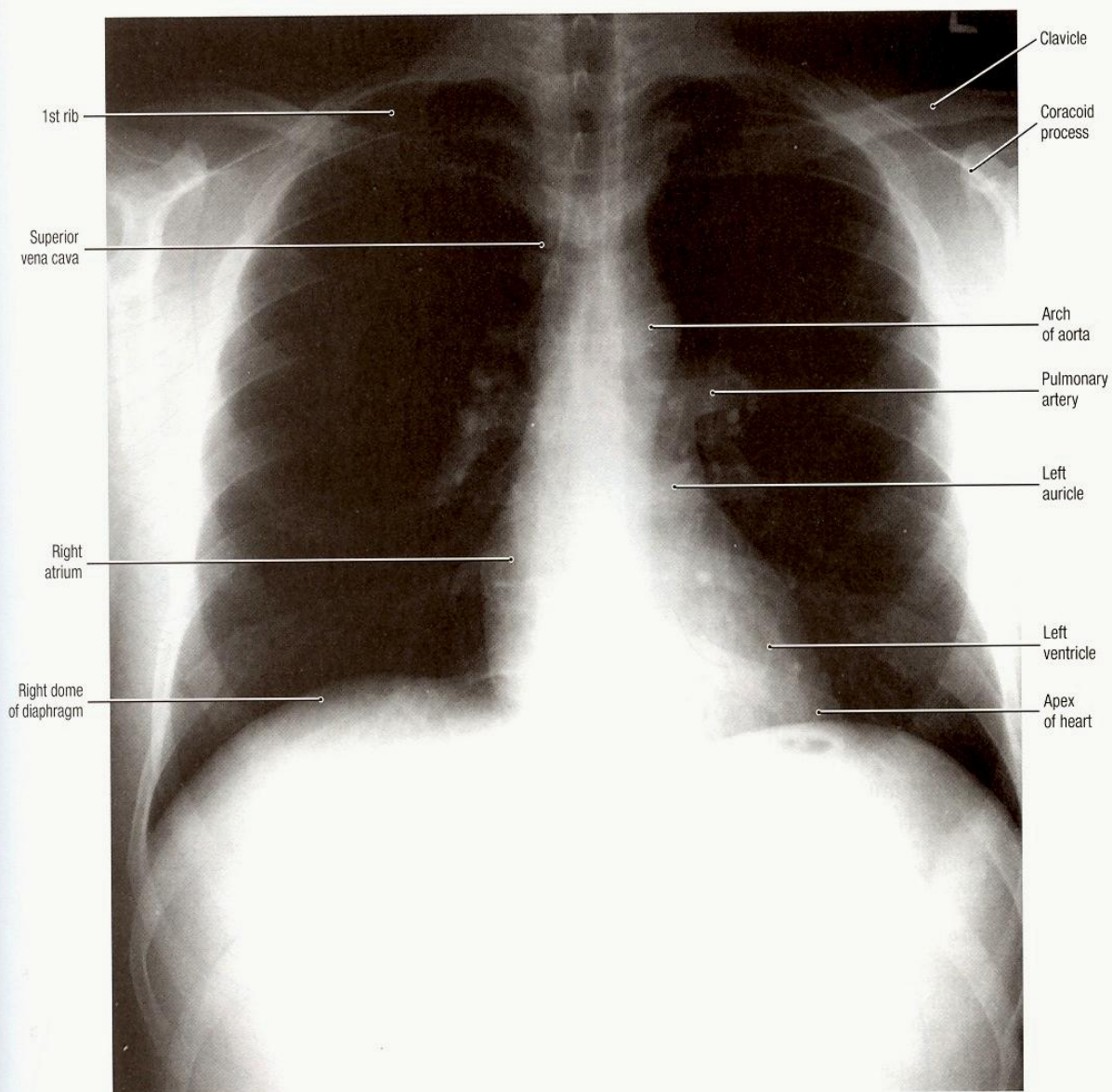


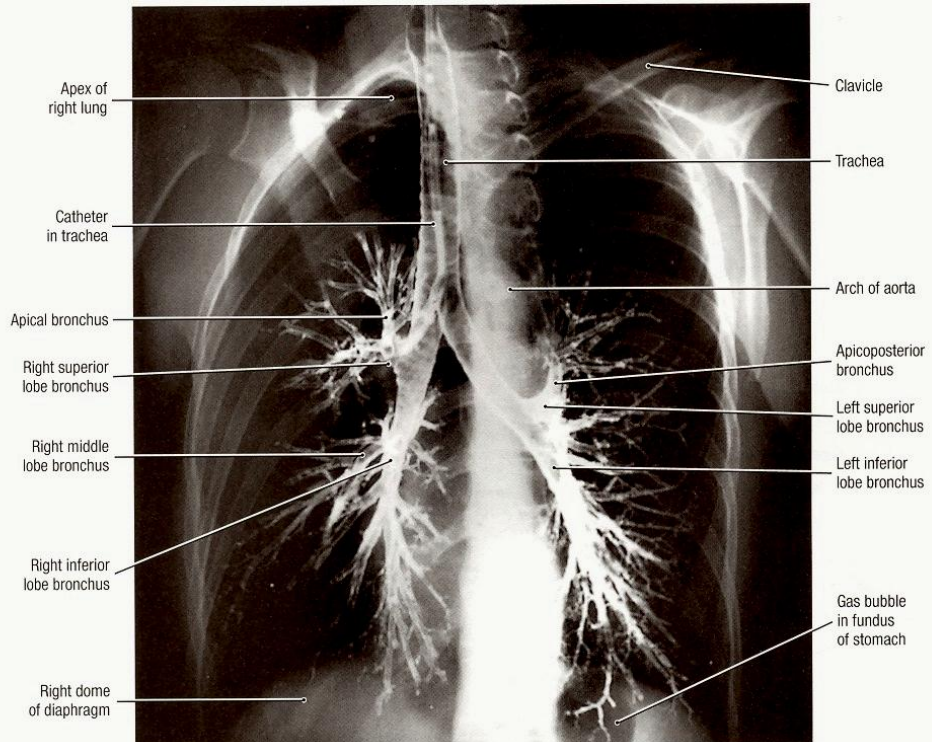
Fig. 226



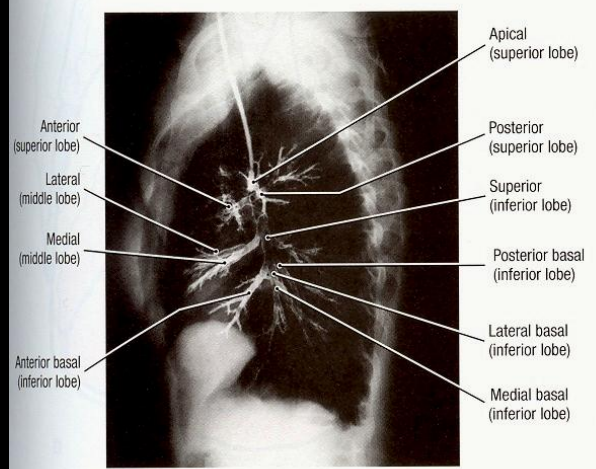
### 1.24 Radiograph of chest

Using Figure 1.23 for reference, observe in this posteroanterior projection:

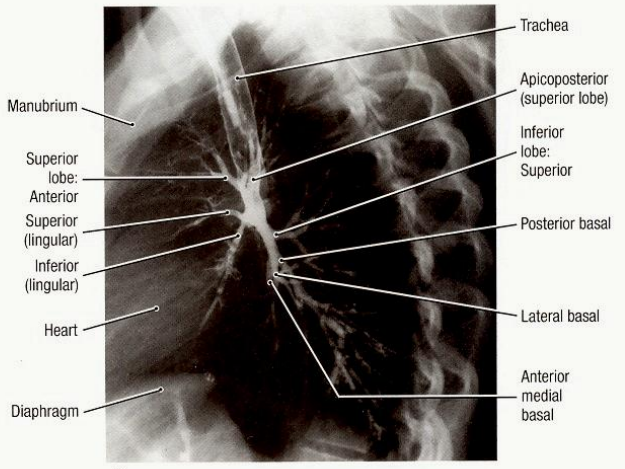
1. Body of the 1st thoracic vertebra (T1) and articulation of the 1st rib with the vertebral body; follow the 1st rib, which curves laterally and then medially to cross the clavicle;
2. The dome of the diaphragm is higher on the right;
3. The convexity of the right mediastinal border is formed by the right atrium; above this, the superior vena cava produces a less convex shape.
4. The left mediastinal border is formed by the arch of the aorta, pulmonary trunk, left auricle (not prominent on a normal chest radiograph), and left ventricle.



**A**



**B**

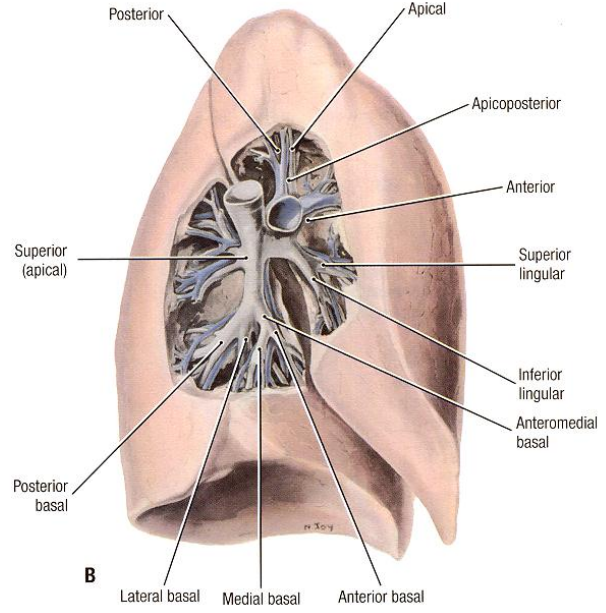
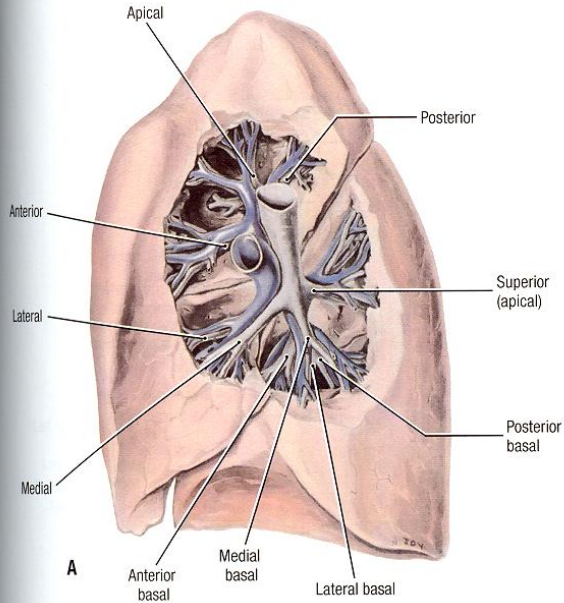


**C**

**1.31 Bronchograms**

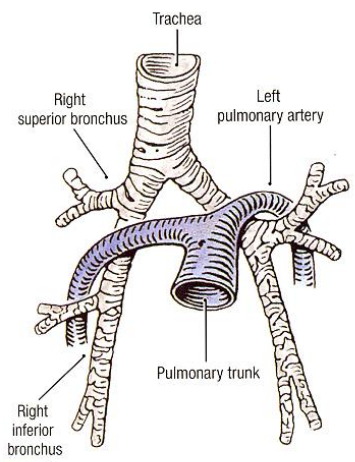
**A.** Bronchogram of right and left bronchial trees. This is a slightly oblique, posteroanterior view.

**B.** Right lateral bronchogram, showing segmental bronchi. **C.** Left lateral bronchogram, showing segmental bronchi.



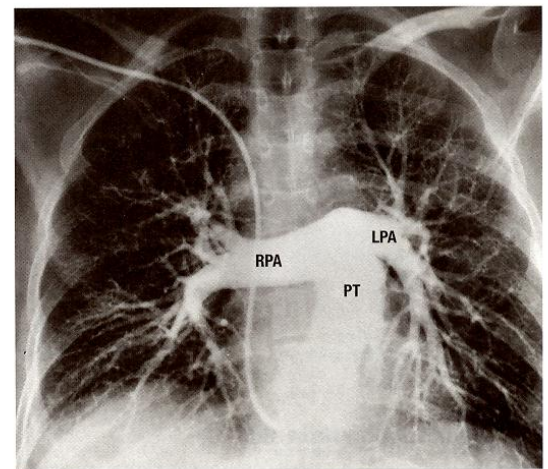
**1.34** Bronchi and pulmonary arteries, medial view

A. Right lung. B. Left lung. The pulmonary arteries (blue) of the lungs were filled with latex, and the bronchi (gray) were kept inflated and treated, as for Figure 1.33.



**1.35** Relationship of bronchi and pulmonary arteries, anterior view

The right pulmonary artery at the root of the lung lies between the secondary bronchi to the upper and middle lobes; the left pulmonary artery arches anterior to the left primary bronchus.



**1.36** Pulmonary angiogram

Observe the catheter located in the right ventricle and pulmonary trunk (PT); the pulmonary trunk dividing into a longer right pulmonary artery (RPA) and shorter left pulmonary artery (LPA); and the branches of the right and left pulmonary arteries following the corresponding segmental bronchi.

**The End**