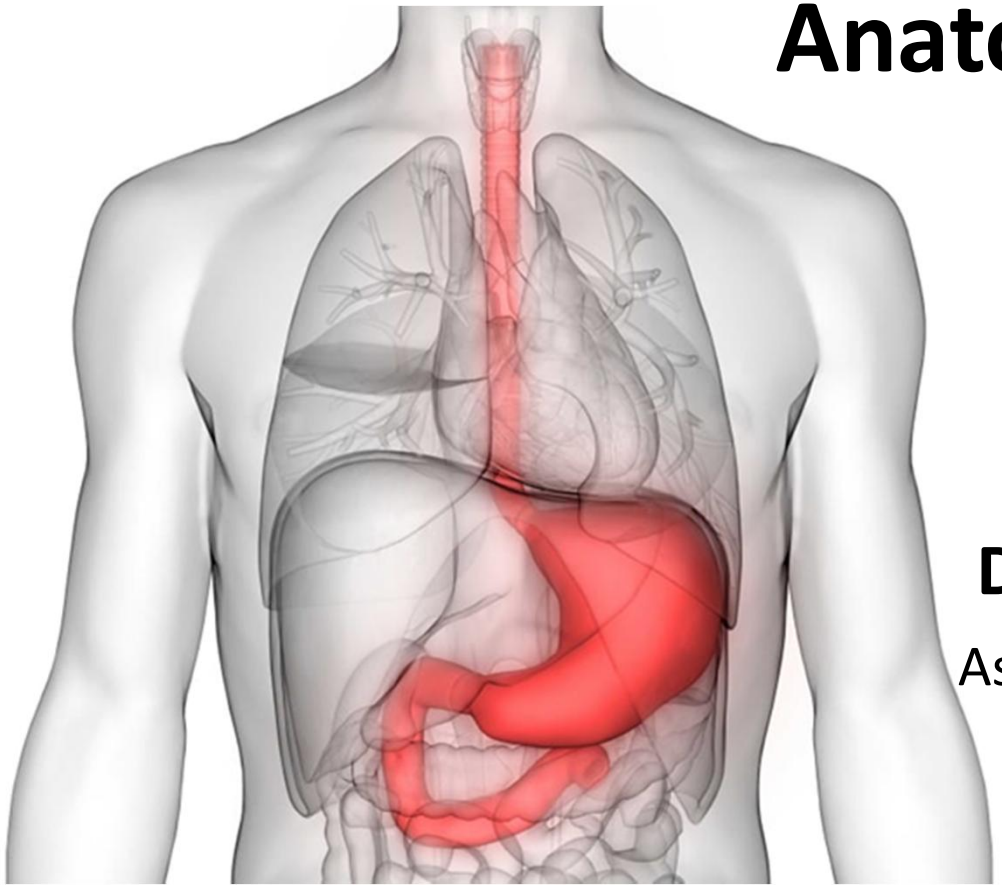

Anatomy of Esophagus

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Gen. Surgeon

INTRODUCTION

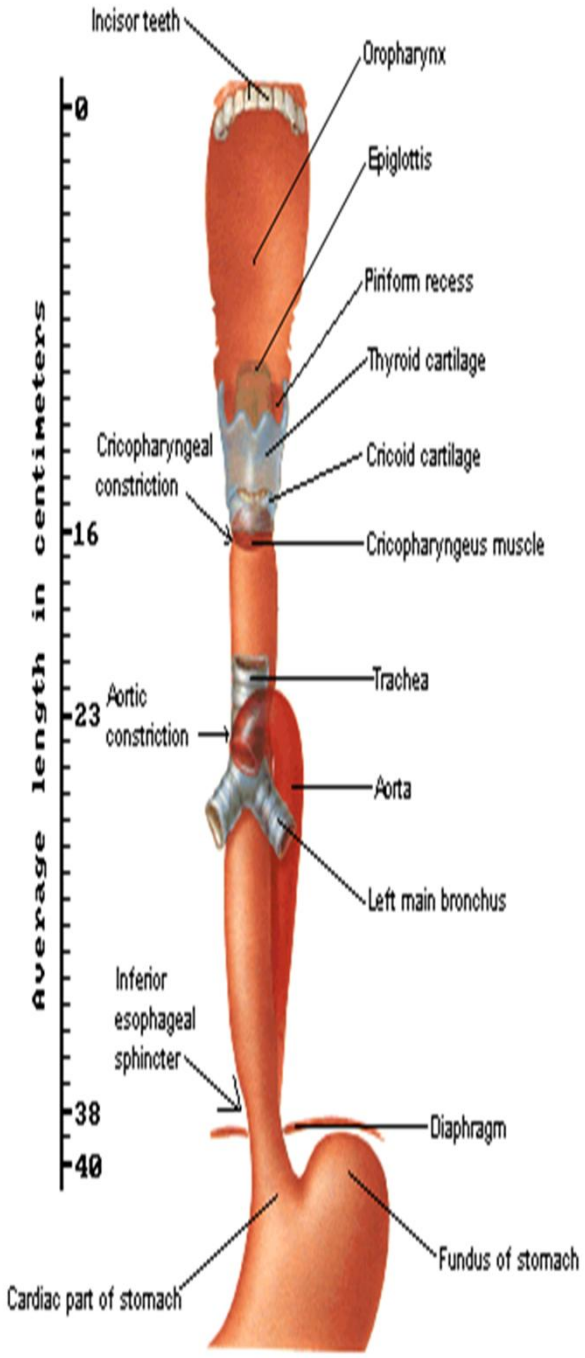
A narrow muscular tube, forming part of digestive tube extending from pharynx to stomach.

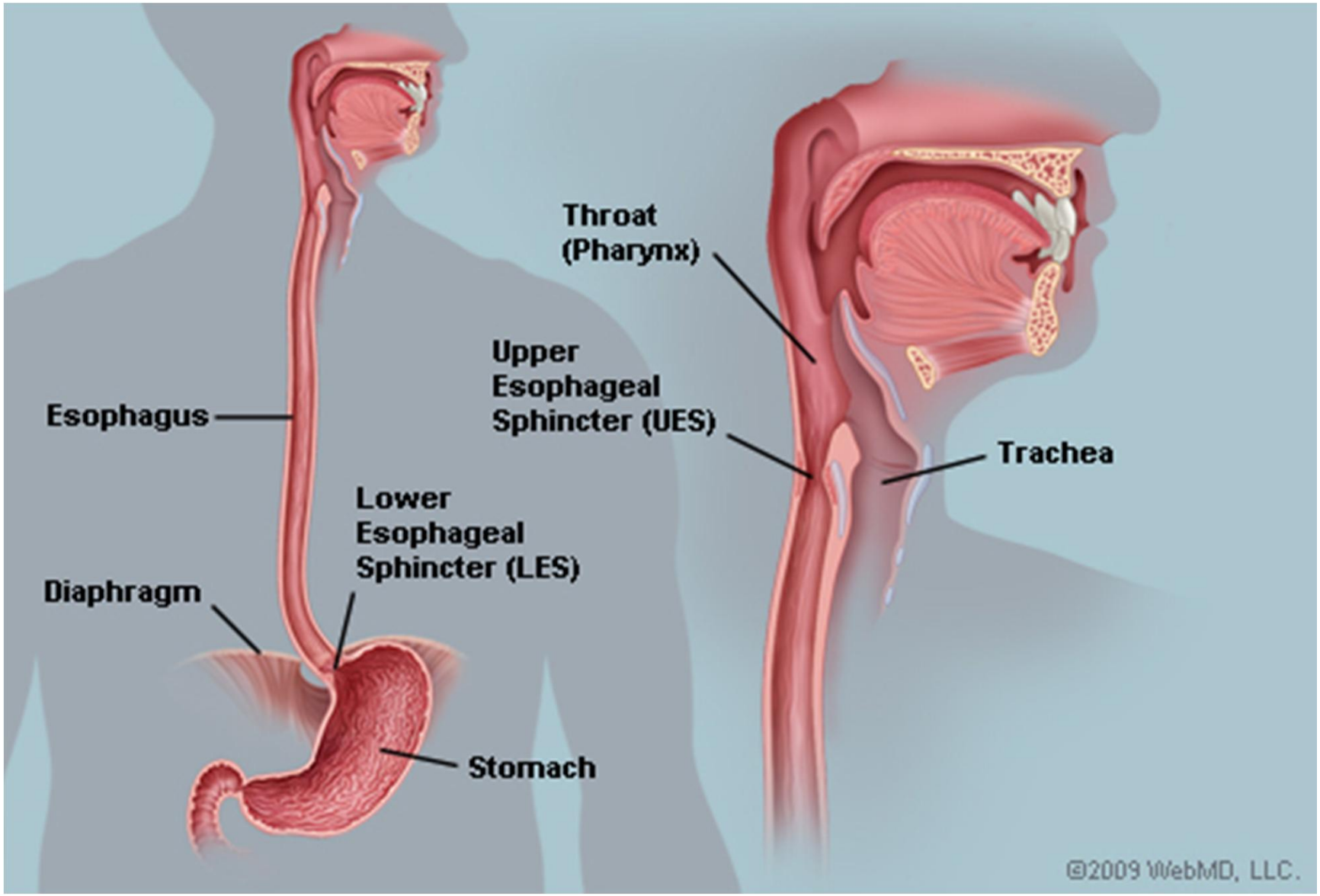
Dimensions

A) Length- 25cm
Cervical-4cm
Thoracic-20cm
Abdominal-1.25cm

B) Width-2cm

- Lumen - Usually collapsed but during the passage of food it becomes dilated.
- It is the narrowest part of the alimentary canal, being most contracted at its commencement i.e. pharyngo-oesophageal junction, and at the point where it passes through the Diaphragm




Throat
(Pharynx)
Upper
Esophageal
Sphincter (UES)
Trachea
Esophagus
Lower
Esophageal
Sphincter (LES)
Diaphragm
Stomach
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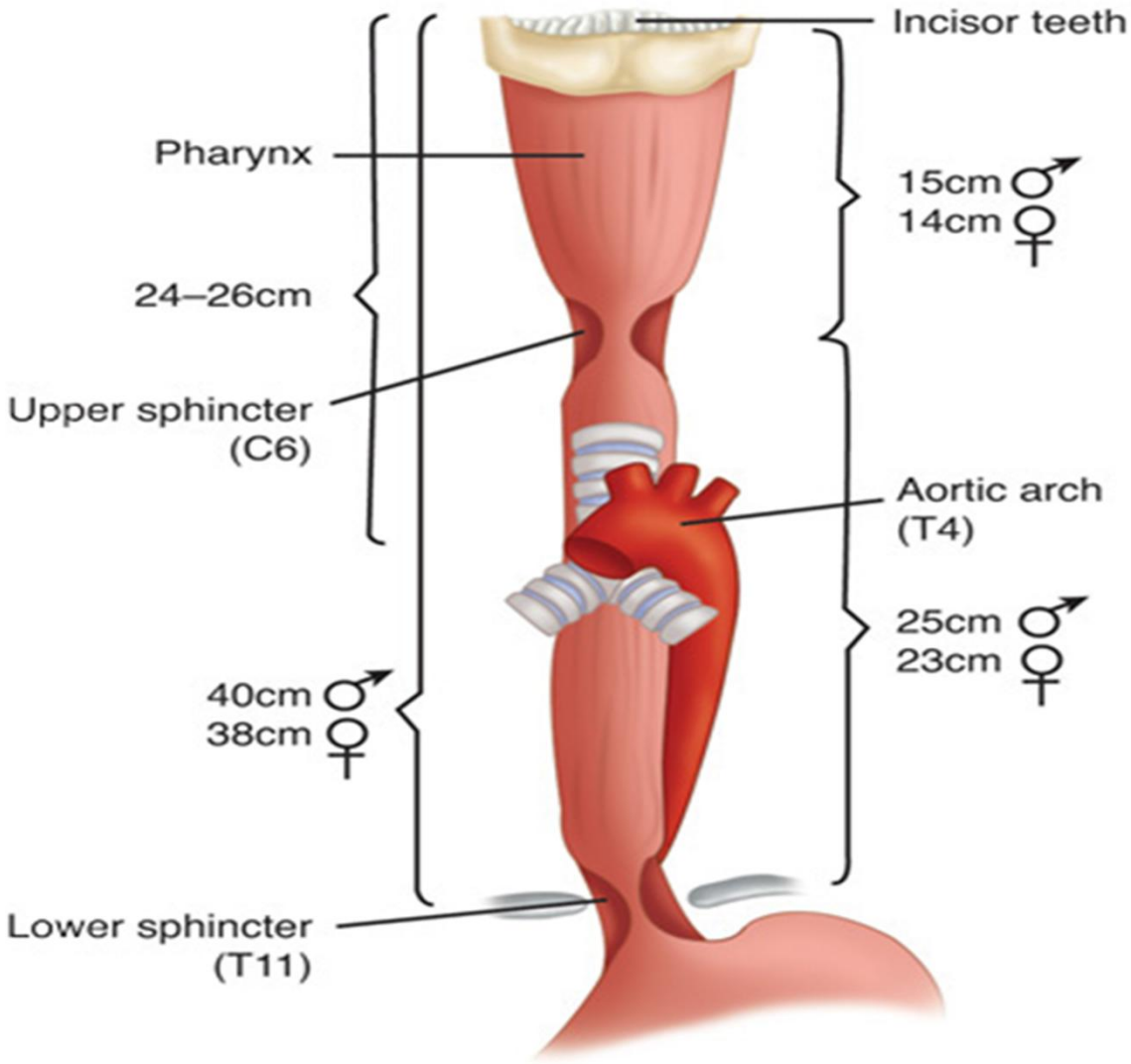
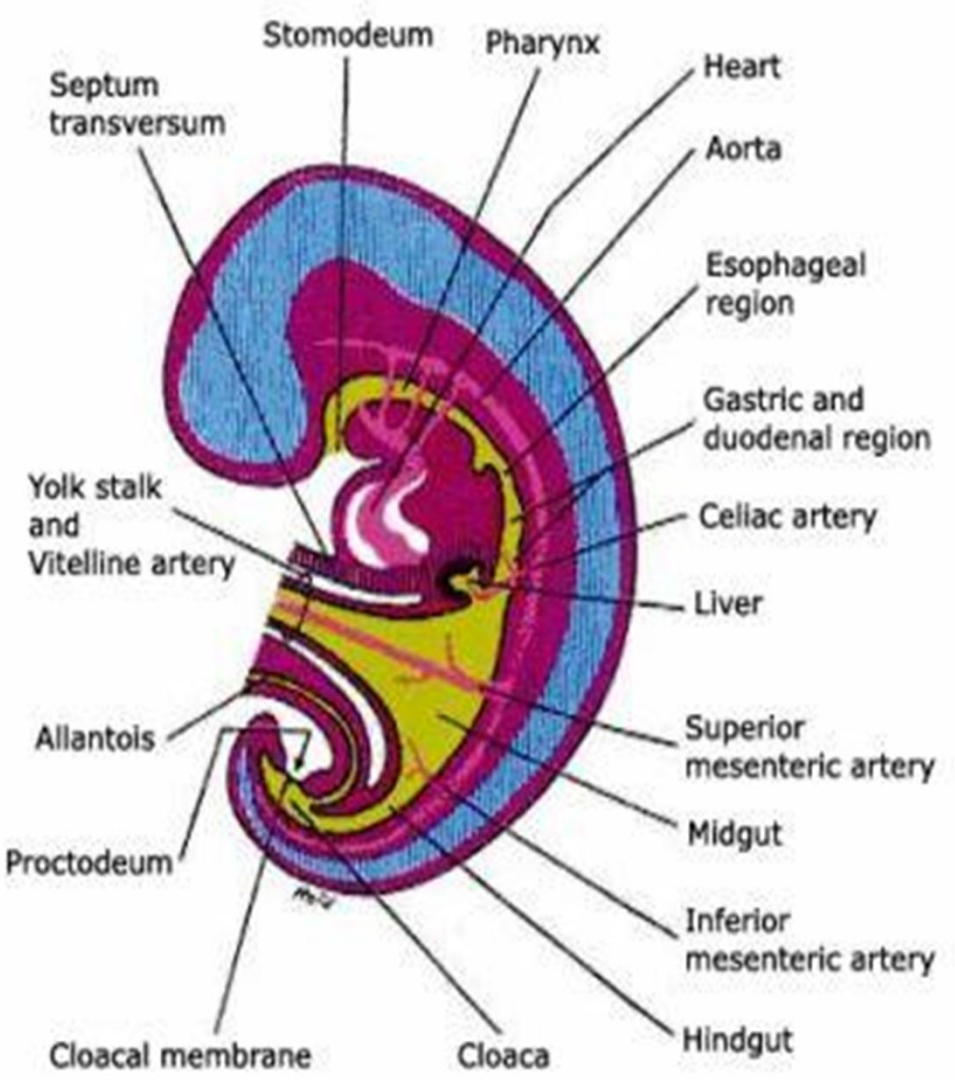


Source: Brunicardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Matthews JB, Pollock RE: *Schwartz's Principles of Surgery, 9th Edition:* http://www.accessmedicine.com

DEVELOPMENT OF THE OESOPHAGUS

At a very early period the stomach is separated from pharynx by a mere constriction from primitive pharynx. This constriction is future esophagus.

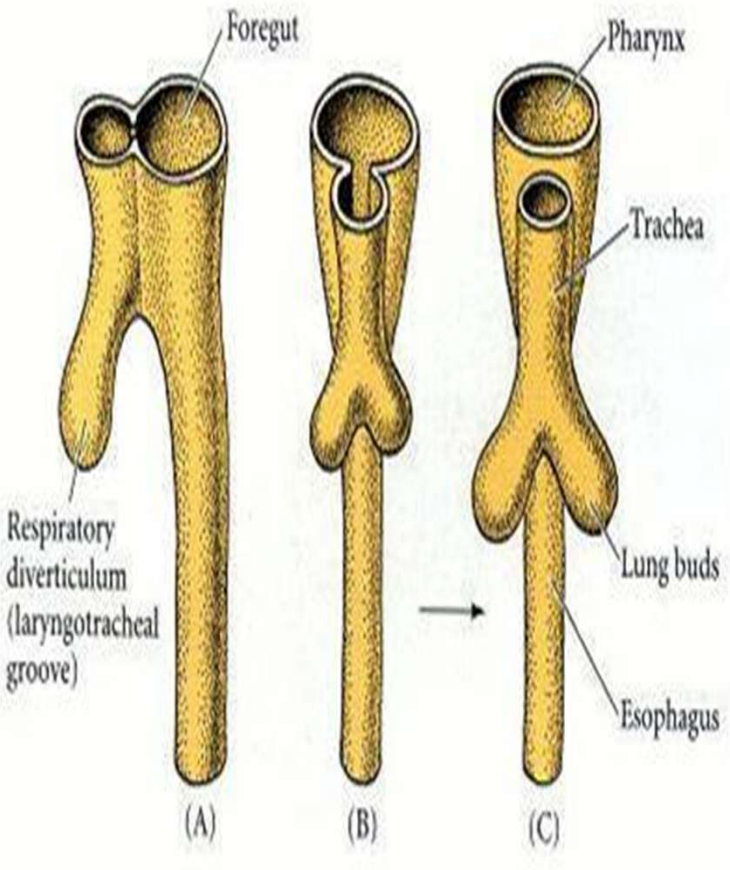


- Previous to this elongation, the trachea and oesophagus form a single structure.

- This becomes divided into two by the in growth of two lateral septa, which fuse giving rise to trachea in front and oesophagus behind.

- At this stage the oesophagus becomes converted into a solid rod of cells, losing its tubular nature.

- This eventually becomes canalised to form a tube.

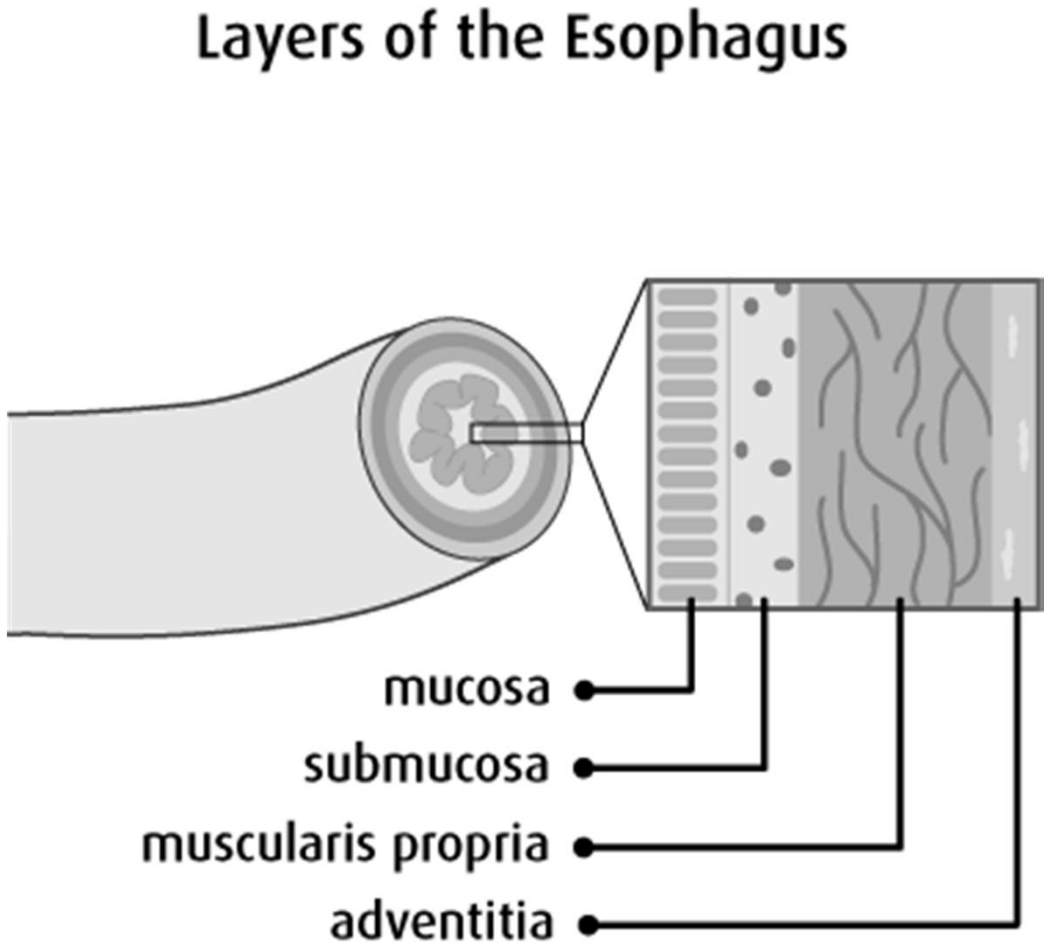


STRUCTURE OF ESOPHAGUS

The oesophageal wall has four layers: From within outwards:

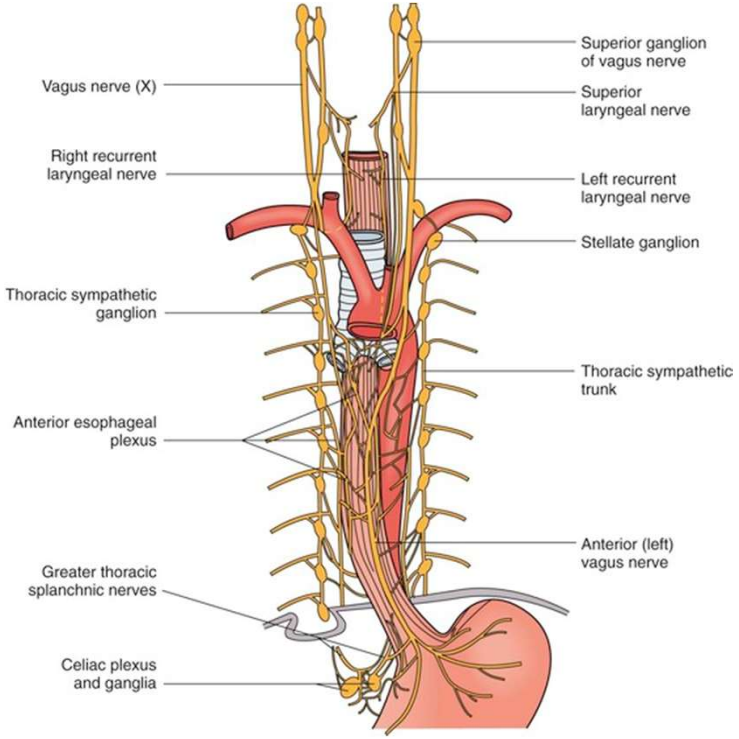
- Mucous Membrane,
- Sub-mucosa,
- Muscle coat and
- Outer most fibrous layer.

Unlike other areas of the gut, it does not have a distinct serosal covering, but is covered by a thin layer of loose connective tissue



COURSE OF OESOPHAGUS

- In thorax, it is at first situated at lower part of neck as a continuation of pharynx at the lower border of cricoid cartilage at the level of 6th cervical vertebra.
- Runs downwards behind trachea & in front of vertebral column little to the left of the median line.
- It passes across the left side of the transverse part of the aortic arch, descends in the posterior mediastinum.
- Pierces the diaphragm at the level of 10th thoracic vertebra.
- End at the cardiac end at the level of T11 vertebra



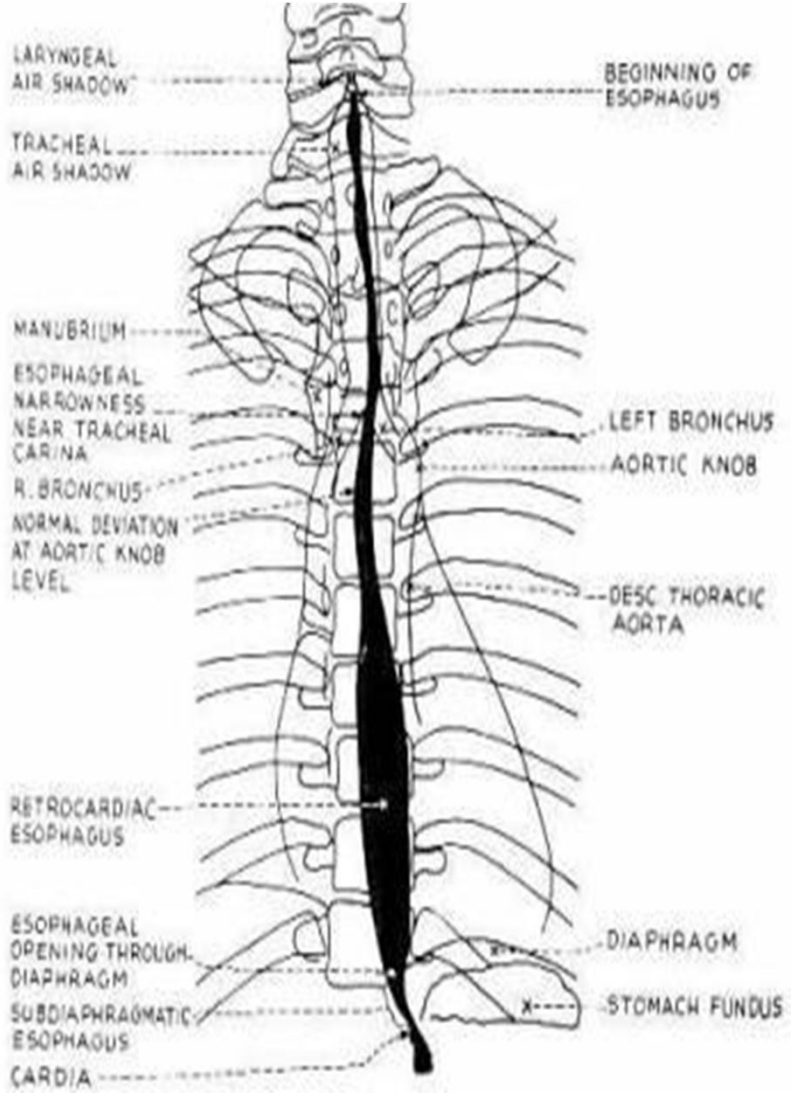
CURVATURES

1. **Antero-posterior** – these corresponds to cervical and thoracic curvatures of vertebral column

2. Lateral – Two in number and they are to the left

a) One at the level of C6(root of the neck)

b) At T5 - T7

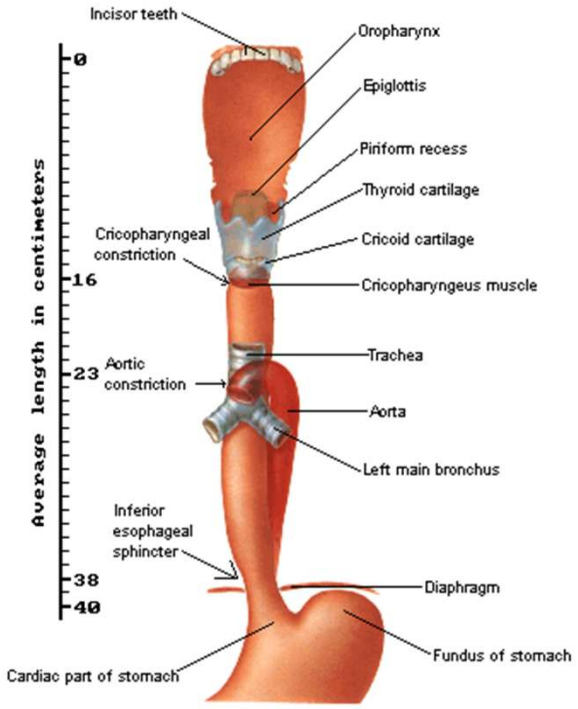


CONSTRICTIONS

Oesophagus is the narrowest region of alimentary tract except vermiform appendix. During its course, it has four constrictions:

- At the beginning 6 inches distal from incisor teeth
- At the level of aortic arch, 9 inches from incisor teeth
- At the level of left bronchus, 11 inches from incisor teeth
- At the level of diaphragm,15 inches from incisor teeth

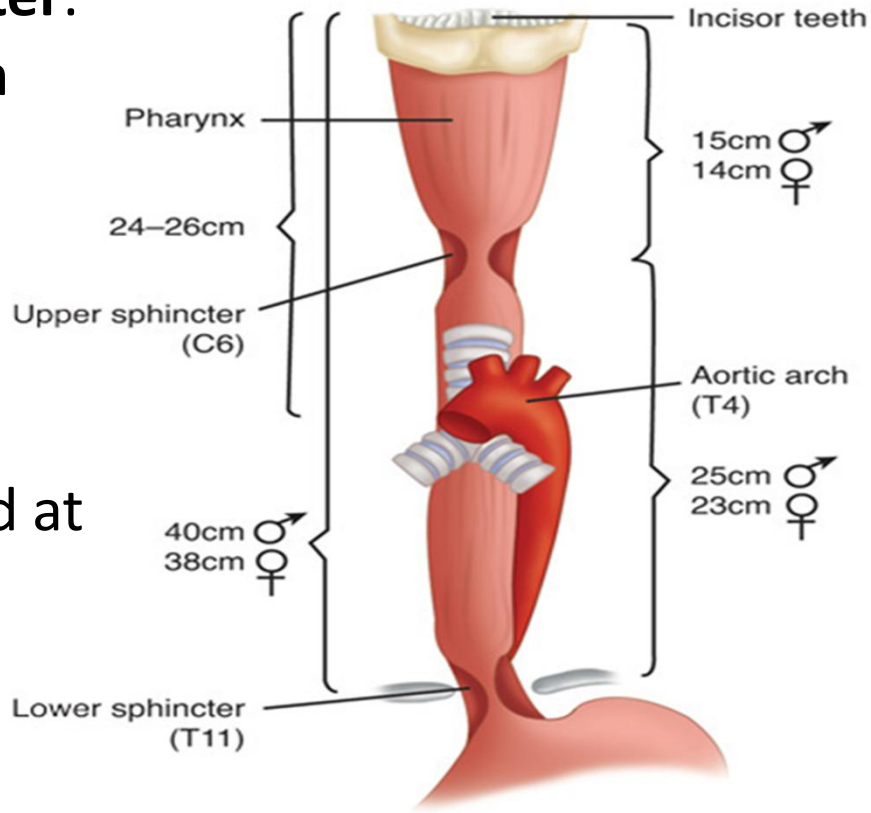
➢ The distance from incisor teeth are important in passing instruments like endoscope into the oesophagus.



SPHINCTERS

Upper Oesophageal Sphincter: It is a 2-3 mm zone between pharynx & oesophagus. It relates to crico-pharyngeal muscle.

Lower Oesophageal Sphincter: The LES is located at the junction between the esophagus and stomach, usually localized at or just below the diaphragmatic hiatus. Despite its distinct physiological function, it is not easily distinguished anatomically.

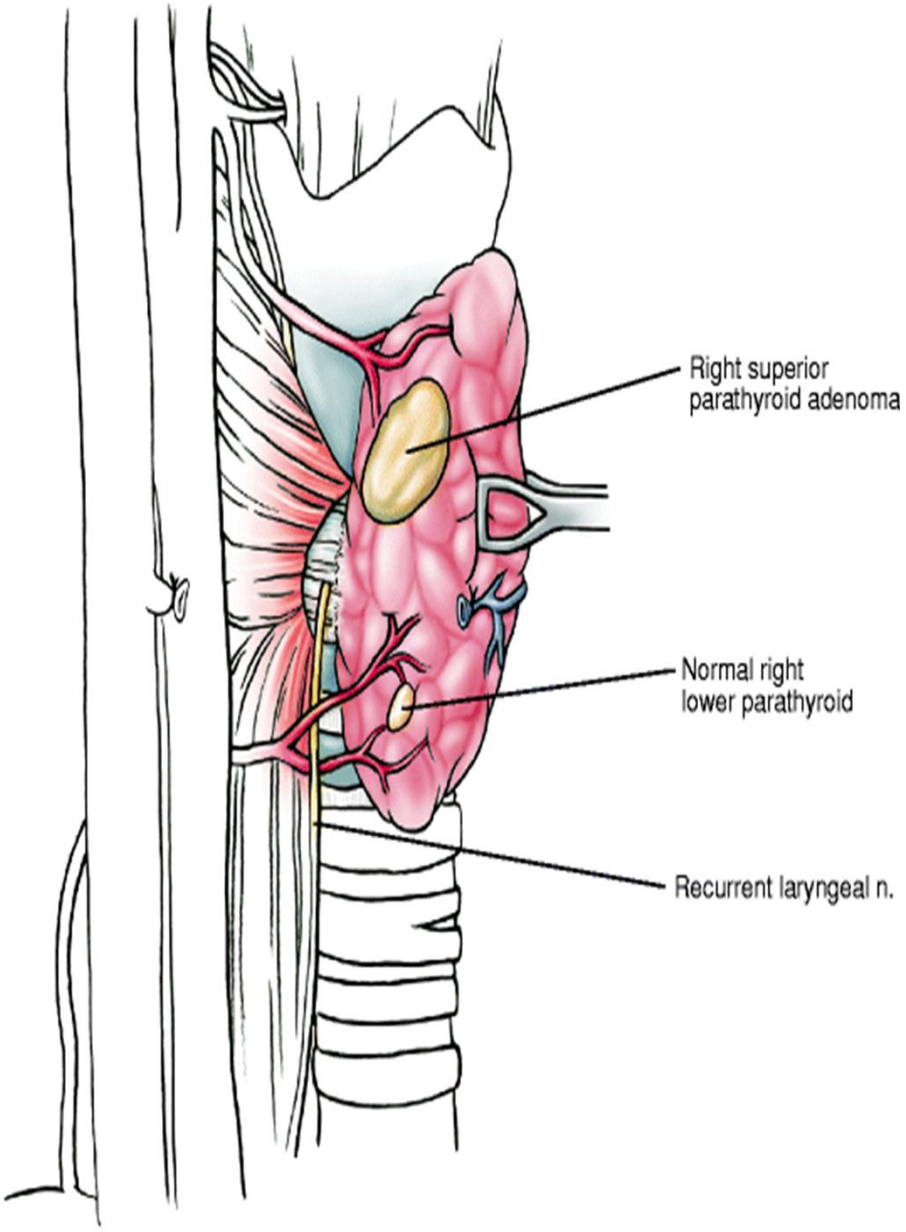


RELATIONS

In the neck, the oesophagus is in relation with:

- **In Front**, with the trachea; and, at the lower part of the neck, where it projects to the left side, with **the thyroid gland and thoracic duct.**

- **Behind,** it rests upon the **vertebral column** and Longus colli muscle;
- On each side, it is in relation with the **common carotid artery** (especially the left, as it inclines to that side), and part of the lateral lobes of the thyroid gland;
- The **recurrent laryngeal nerves** ascend between it and the trachea.



Thoracic Part

- Anteriorly:

1. Trachea
2. Right pulmonary artery
3. Left bronchus
4. Pericardium with left atrium

- To Right:

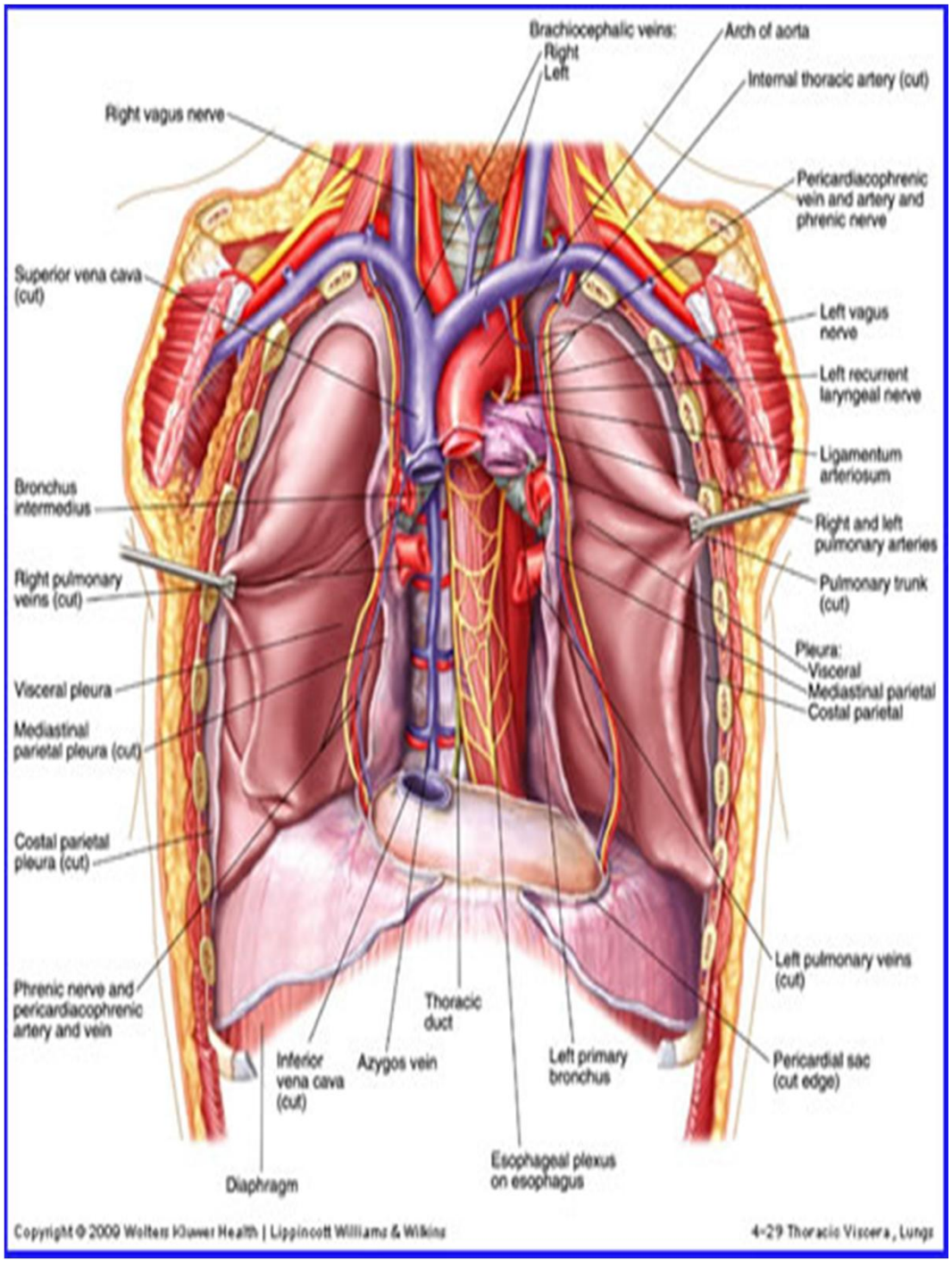
1. Right lung & pleura
2. Azygos vein
3. Right vagus

- Posteriorly:

1. Vertebral column
2. Right posterior costal arteries
3. Thoracic duct
4. Azygos vein
5. Thoracic aorta

- To Left:

1. Aortic arch
2. Left subclavian artery
3. Thoracic duct
4. Left lung and pleura


Brachiocephalic veins:
Right
Left
Arch of aorta
Internal thoracic artery (cut)
Right vagus nerve
Pericardiacophrenic vein and artery and phrenic nerve
Superior vena cava (cut)
Left vagus nerve
Left recurrent laryngeal nerve
Ligamentum arteriosum
Bronchus intermedius
Right and left pulmonary arteries
Right pulmonary veins (cut)
Pulmonary trunk (cut)
Pleura:
Visceral
Mediastinal parietal
Costal parietal
Visceral pleura
Mediastinal parietal pleura (cut)
Costal parietal pleura (cut)
Left pulmonary veins (cut)
Phrenic nerve and pericardiacophrenic artery and vein
Thoracic duct
Inferior vena cava (cut)
Azygos vein
Left primary bronchus
Pericardial sac (cut edge)
Esophageal plexus on esophagus
Diaphragm
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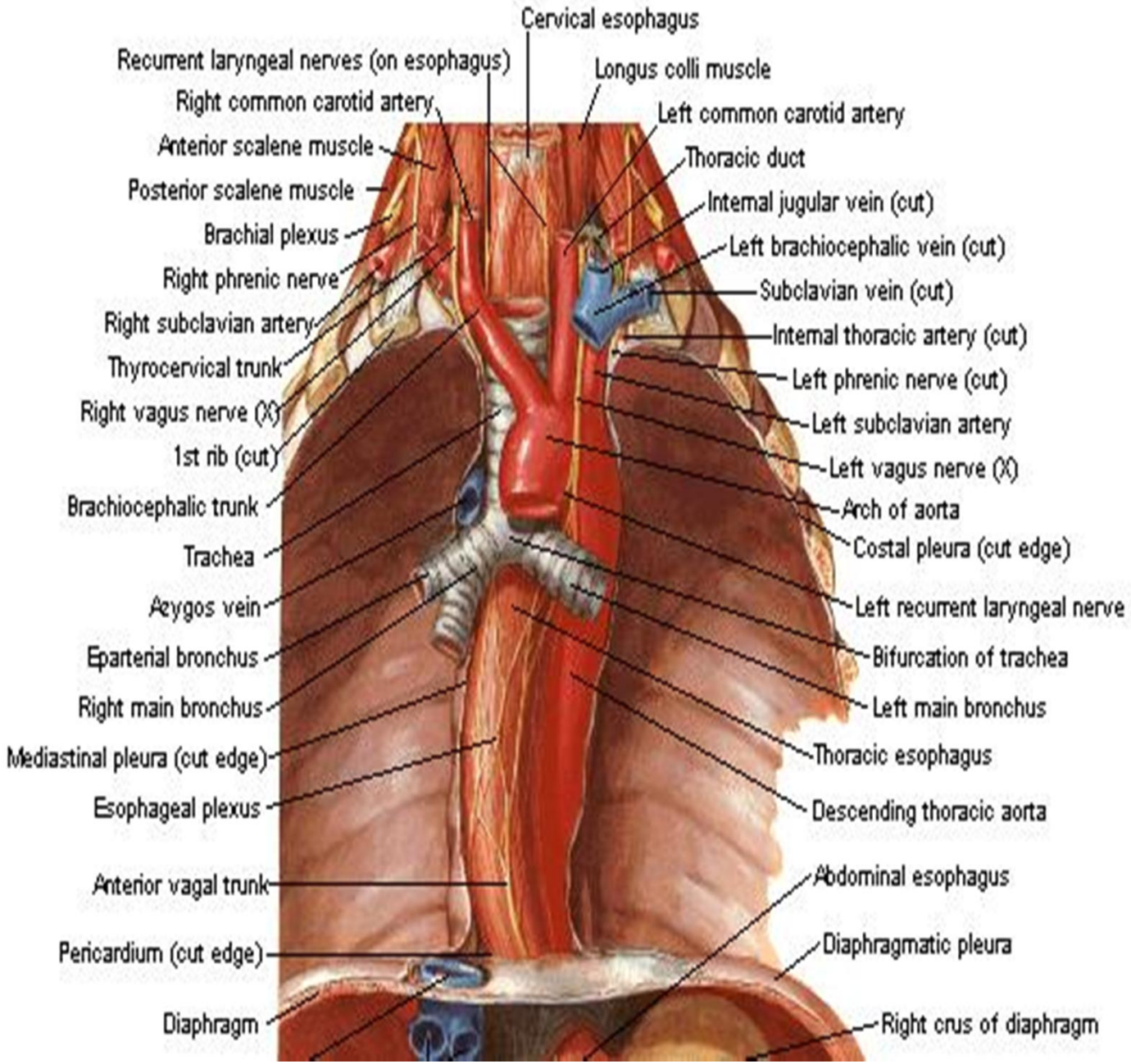
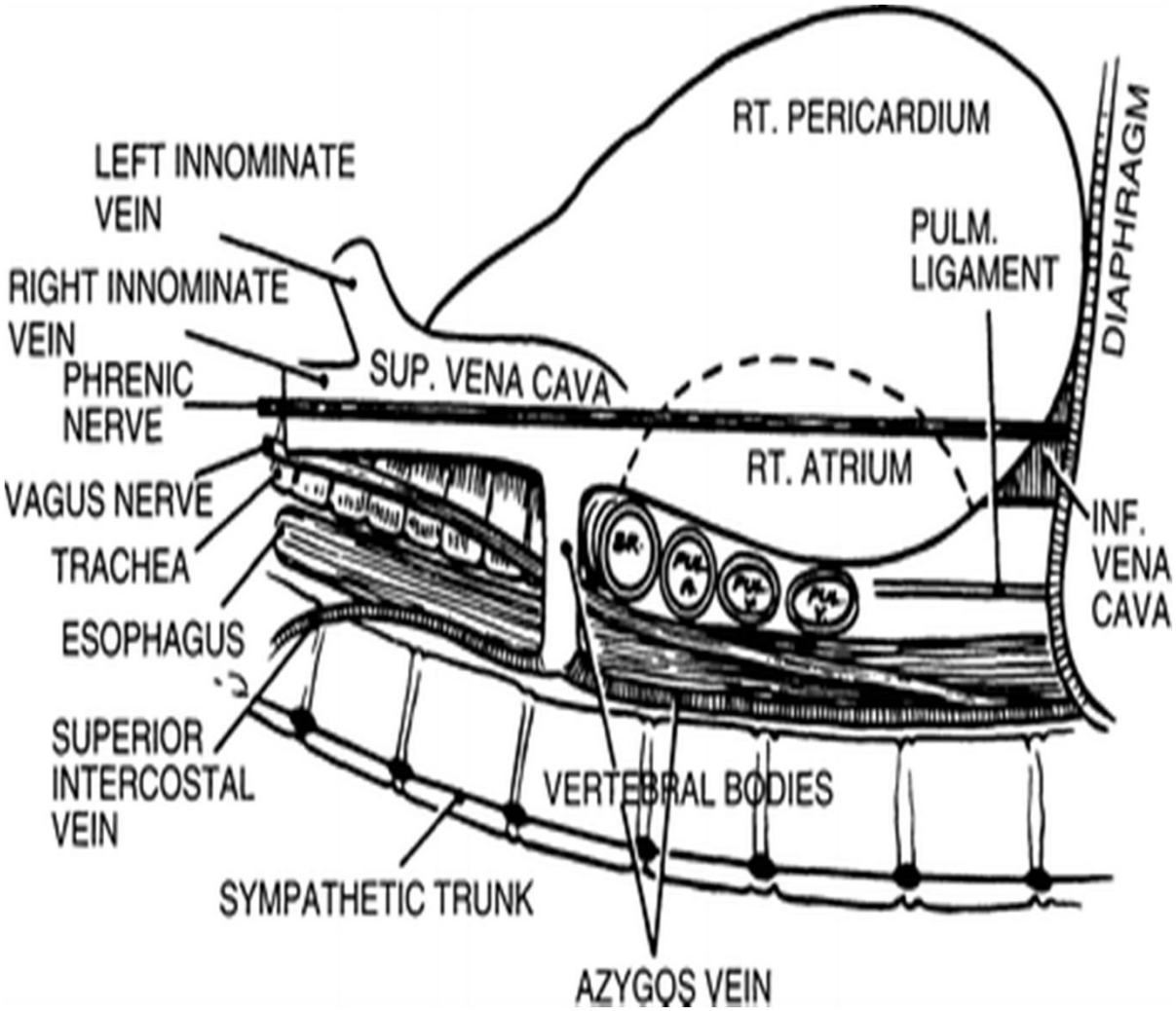
4-29 Thoracic Viscera, Lungs

Esophagus in Situ



Thoracic Part

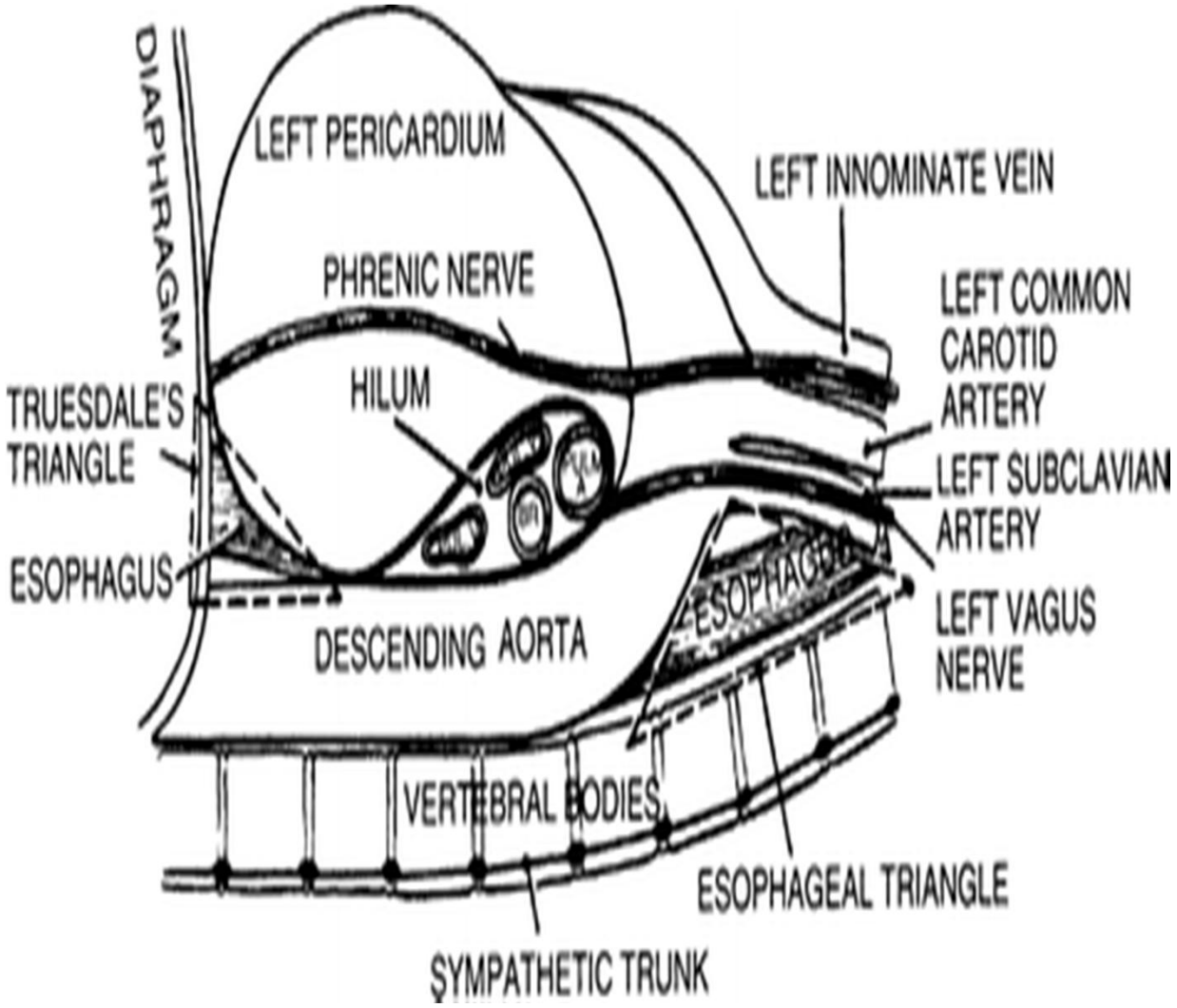
- **RIGHT SIDE**
  - i. Pleura
  - ii. Innominate vein
  - iii. ΔΕ κύριο βρόγχο
  - iv. Right Lung Hilar
  - v. Posterior Vagus nerve
  - vi. Esophageal plexus nerve



Thoracic part

- **LEFT SIDE**

i. Aortic arch
ii. Left subclavian artery
iii. Left inferior laryngal nerve
iv. Anterior vagus nerve
v. Major Thoracic Duct (Θ4-A7)
vi. Descending aorta

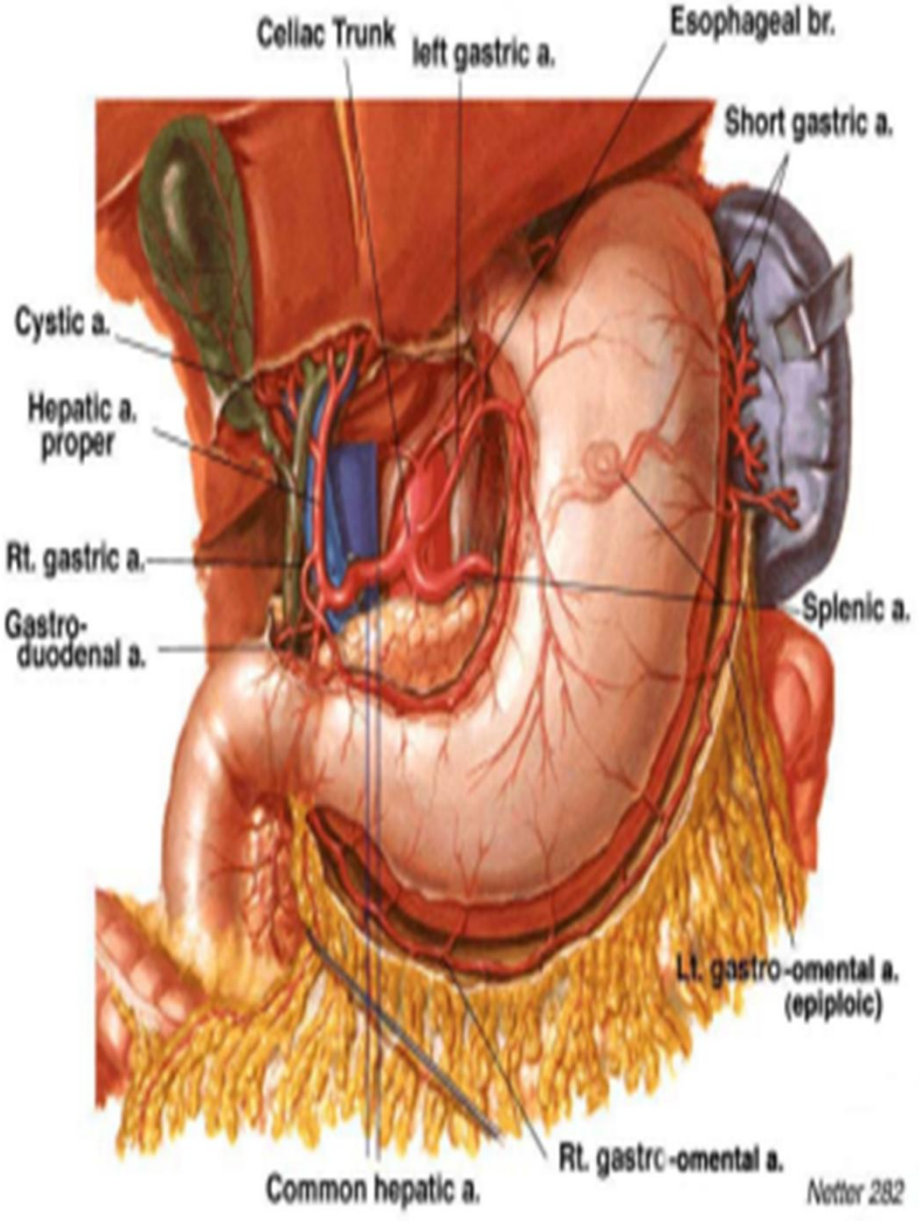


Abdominal Part

- **Adbominal esophagus'** length 0,5-2,5εκ
- Located in 11th or 12th thoracic vertebra and is partialy covered form peritoneum (anteriorly and in the left lateral side)

AvAnatomica relations:

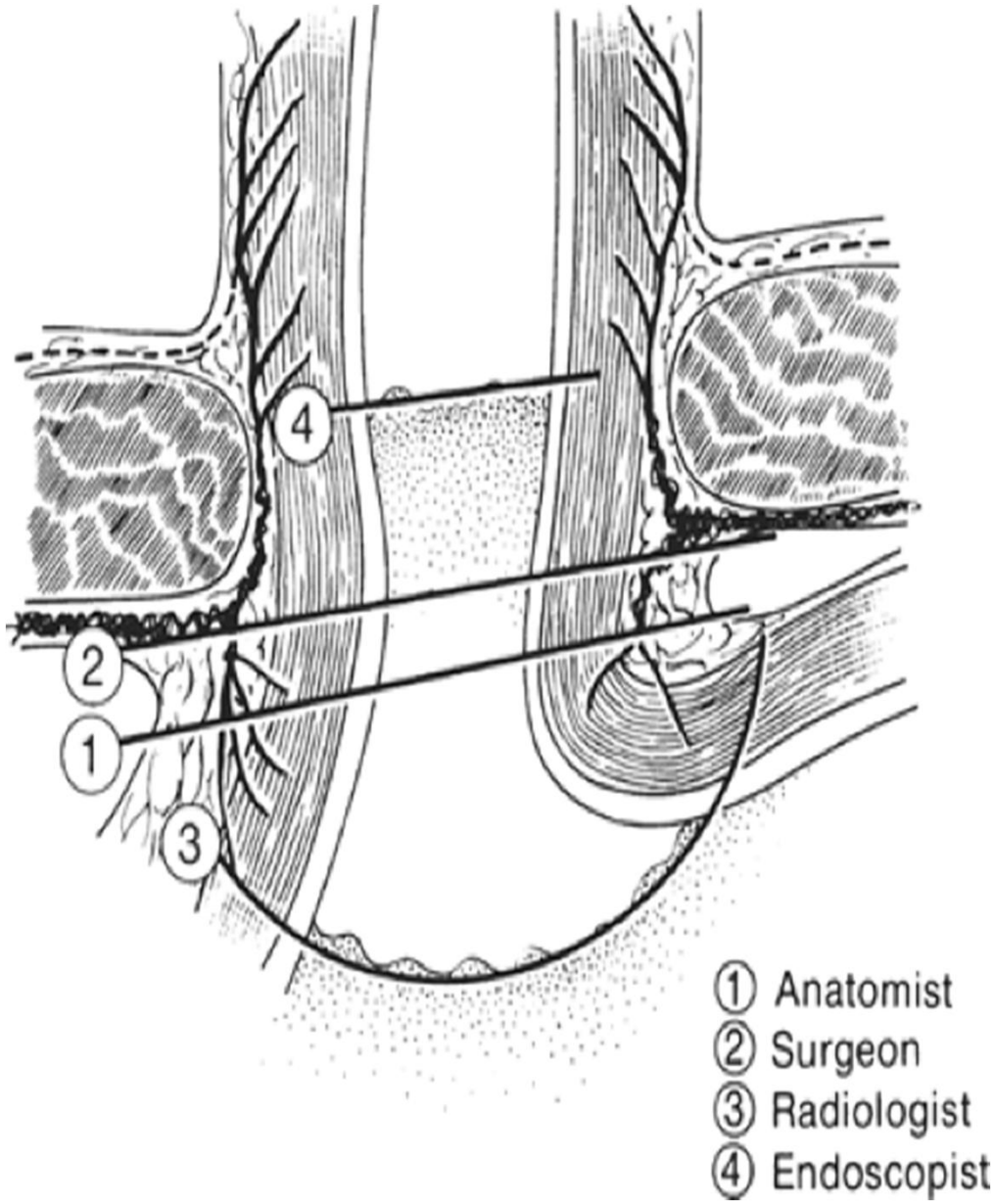
- Anteriorly: with the posterior surface of the the left love of the liver, the anterior vagus nerve and the esophageal nerve plexus
- Posteriorly: with the diaphragm crura, the left inferior phrenic artery and the aorta
- Right side: the caudal love of the liver
- Left side: the stomach



Gastro-esophageal juction

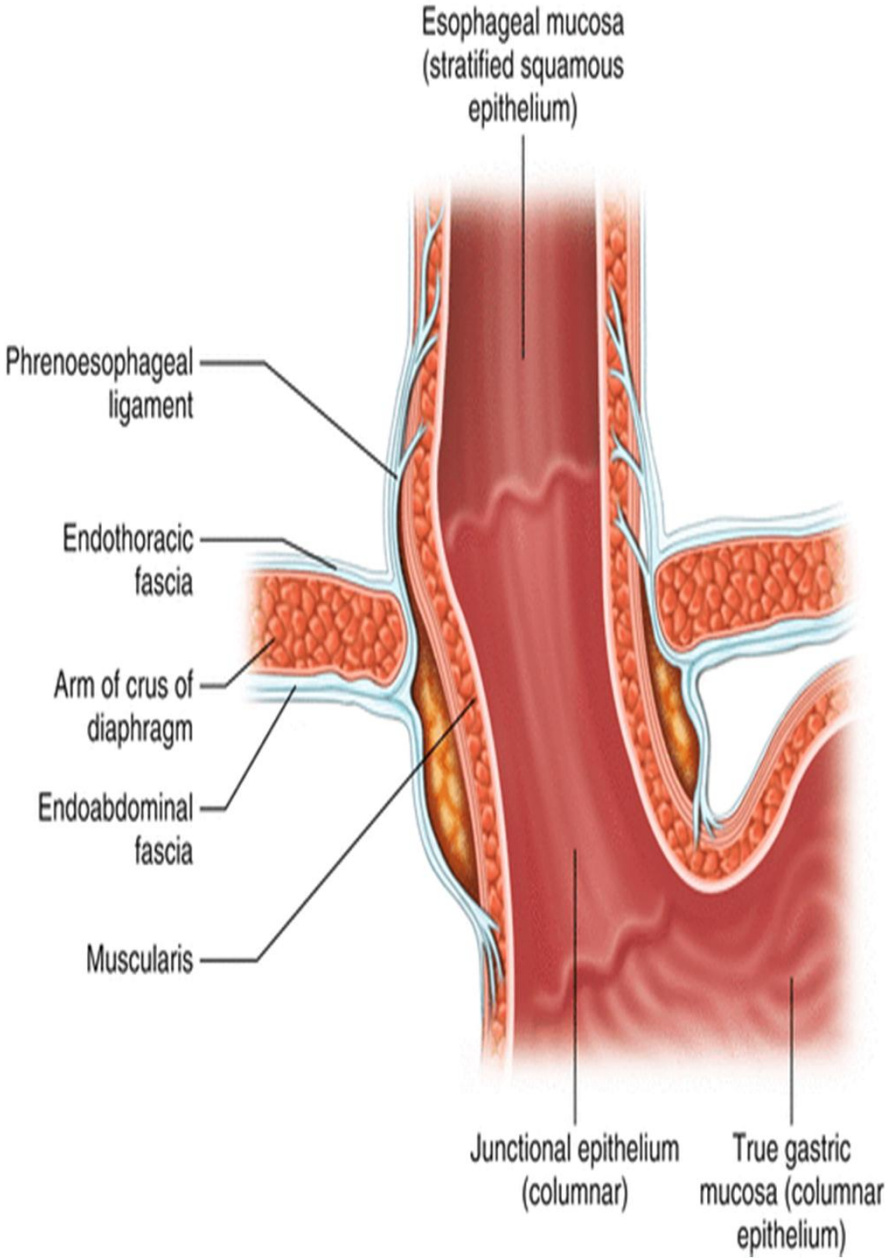
- Difficult to define
- Differences from specialty to specialty
- Internal boundaries

Histology anomalous borderline between multilayer squamous and single layer cylindrical epithelium



«cardiac sphincter»

- Located in cardia
- Prevents reflex
- Mild hypertrophy of the circular muscle layer of the peripheral esophagus
- Anatomical structures that mya contribute to the sphincter formation:
  i. Ankle of His (the ankle of the junction)
  ii. The role of diaphragm (loop)
  iii. The plug that the loose esophageal mucosa forms
  iv. The phrenoesophageal membrane or ligament
  v. The sling pattern of the lateral muscle fibers of stomach



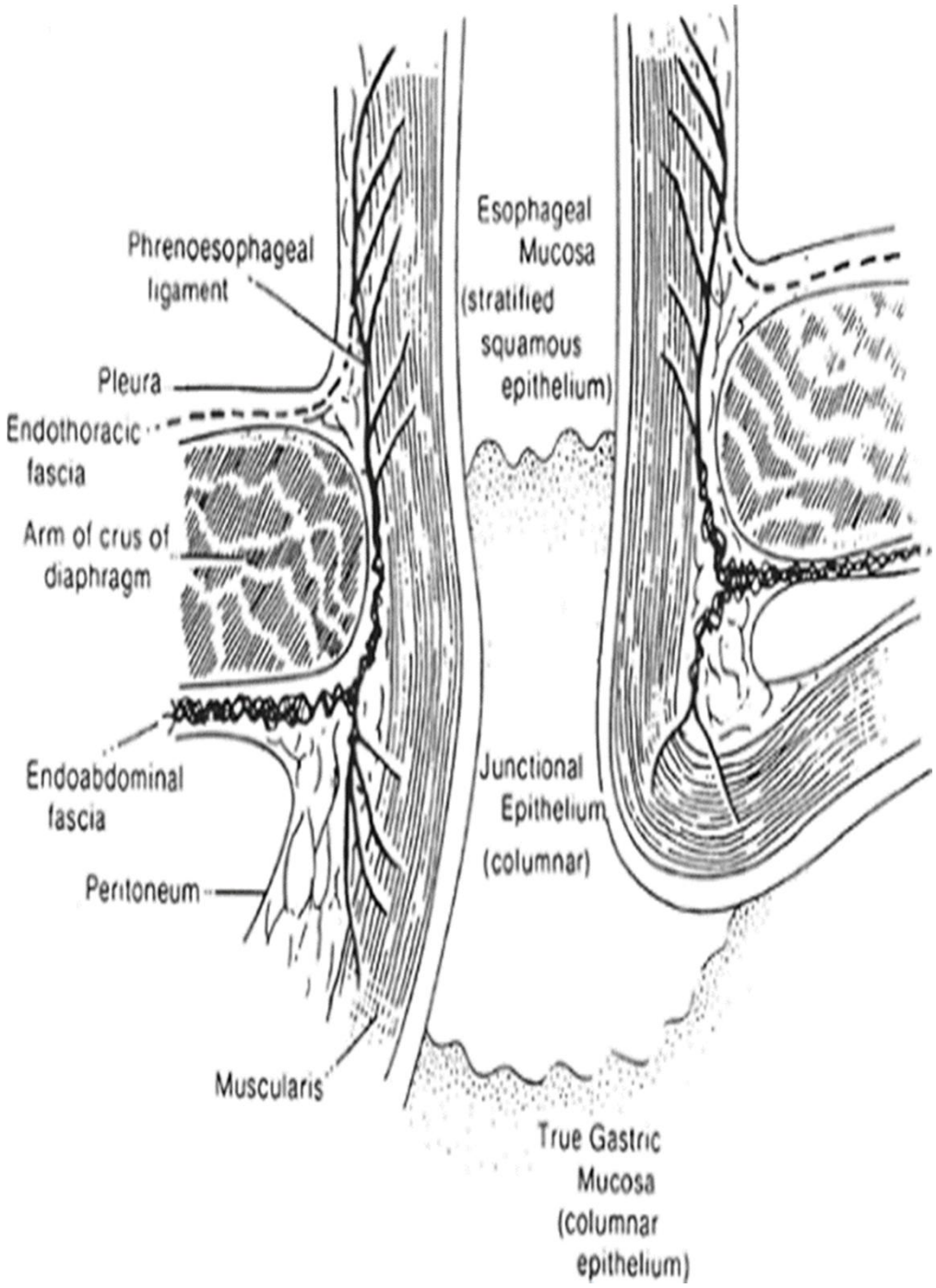
Phrenoesophageal membrane or ligament

It is formed by

a. Pleura
b. Endothoracic fascia
c. Phrenoesophageal fascia(Laimer)
d. Transverse fascia
e.Peritoneum

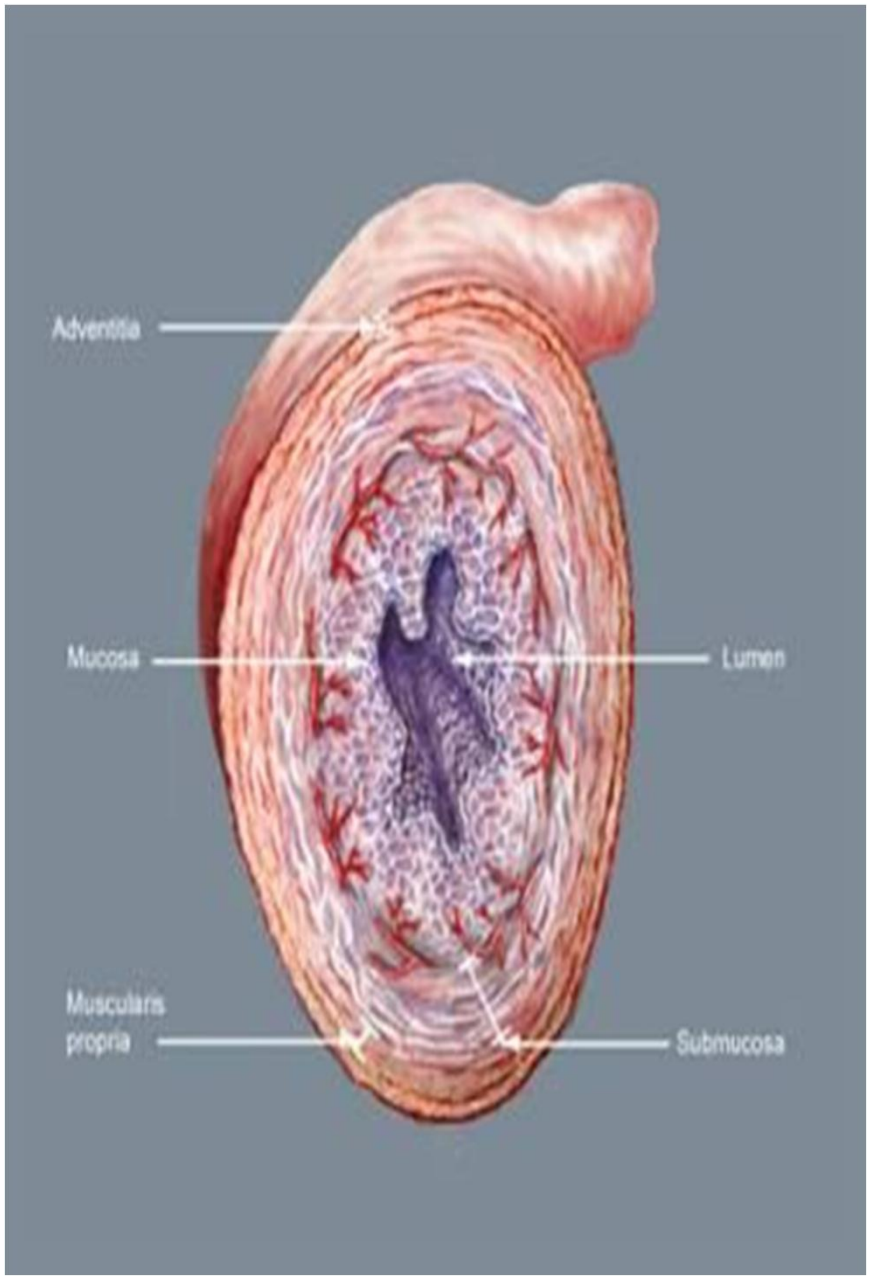
- A and e ensure tightness
- The rest strength and flexibility

- Stronger in children
- Loose in adults
- Absent in patients with diaphragmatic hernia



HISTOLOGY

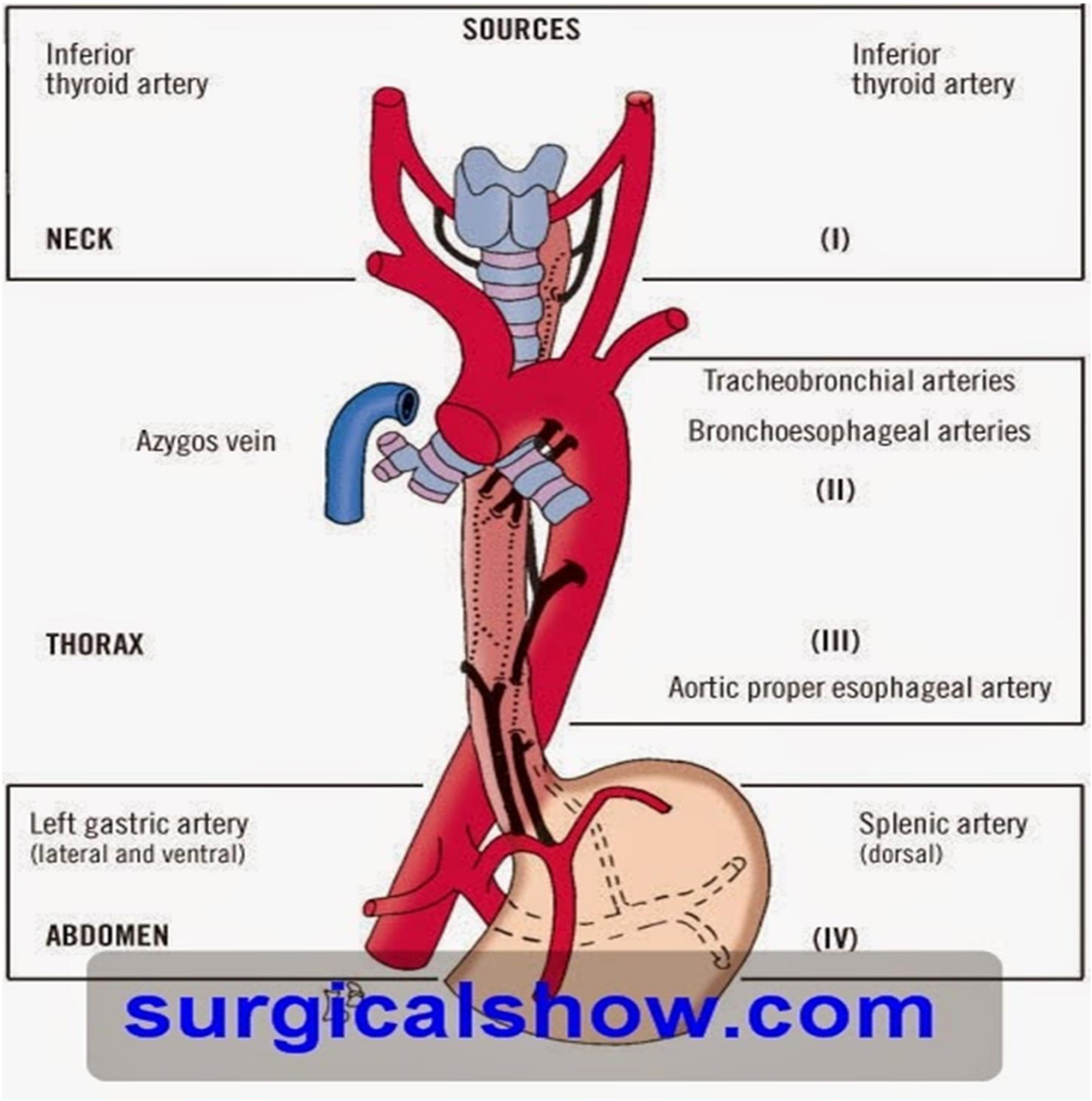
- MUCOSA: multiple layers squamous epithelium
- SUBMUCOSA: wide loose connective tissue
- MUSCLE LAYER: inner circular and outer longitudinal muscle layer
  - Superior ¼ skeletal muscle fibers
  - Second ¼ skeletal and smooth muscle fibers
  - Rest 2/4 only smooth muscle fibers.
- FIBRUS TISSUE: **NO SEROSA**
  - Difficulties in anastomoses



ARTERIAL SUPPLY

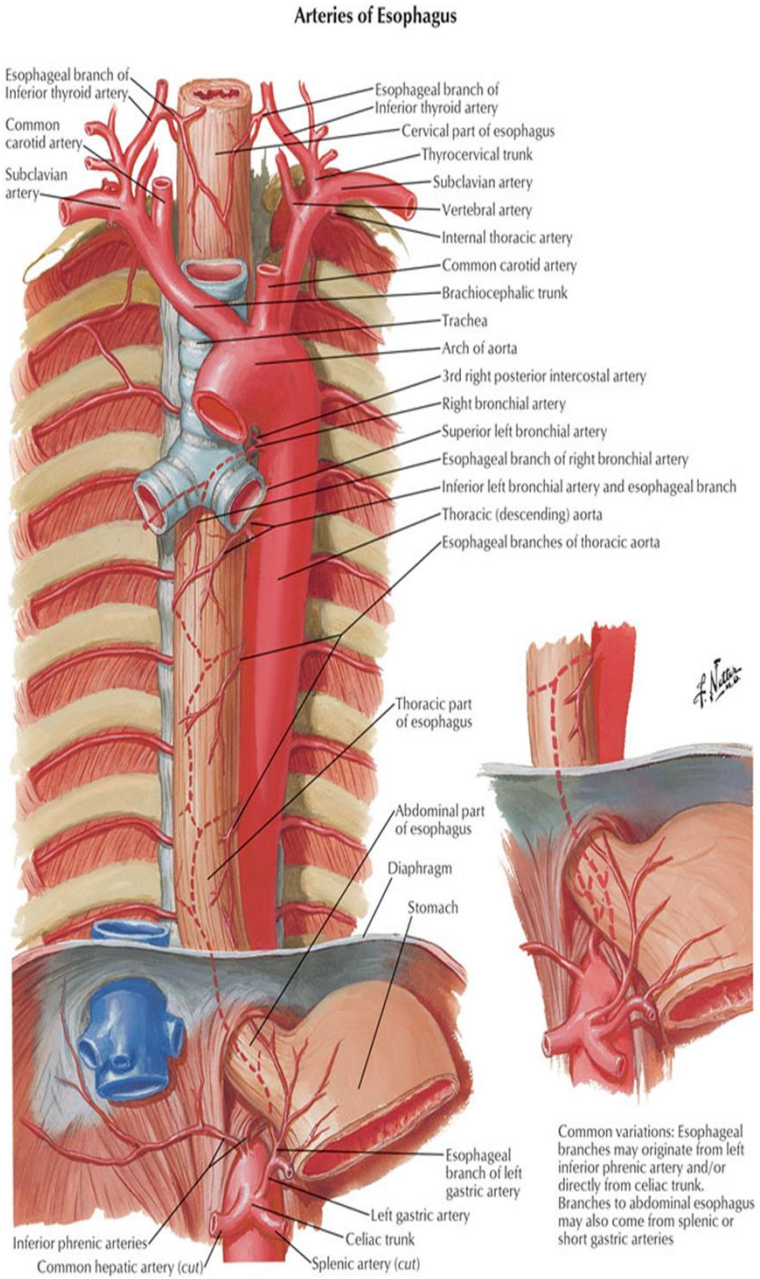
Arterial supply derived from vessels feeding mainly other organs – thyroid, trachea & stomach

- **Cervical part including the segement upto the arch of aorta is supplied by Inferior Thyroid Artery.**
- **Thoracic part is supplied by Oesophageal branches of aorta.**
- **Abdominal Oesophagus :** Oesophageal branches of Left gastric artery and Branches of splenic artery posteriorly



Αρτηρίες

Μοίρες του οισοφάγου	Κύρια αγγειακά στελέχη	Δευτερεύοντα αγγειακά στελέχη ή παραλλαγές
Αυχενική	Κλάδος κάτω θυρεοειδικών αρτ	Κλάδος φαρυγγικών α
	Επιμήκεις & εγκάρσιες αναστομώσεις με την τραχεία	Κλάδος υποκλειδίου α Κλάδος βρογχικής α
Ανώτερη θωρακική	Κλάδος υποκλειδίου α. κατώτεροι κλάδοι της κάτω θυρεοειδικής α.	Πρόσθια τραχειοοισοφαγική α. από το αορτικό τόξο
Μέση θωρακική	75% πλυθησμού 2 αρ. Βρογχικές α. & 1 δε. Βρογχική α.	ΔΕ έσω μαστική δεξιό πλευροαυχενικό στ. ΔΕ υποκλείδιος α
	Κλάδοι από το αορτικό τόξο	
Κατώτερη θωρακική	Άνω & κάτω οισοφαγικές α. από την αορτή	Κλάδοι από ΔΕ μεσοπλεύριες α
Κοιλιακή	Κλάδοι από την αρ γαστρική α. & Αρ κάτω φρενική α.	Δε κάτω φρενική α. Κλάδοι από τη σπληνική, κοιλιακή α, κλάδοι από τη άνω επινεφριδικής α.

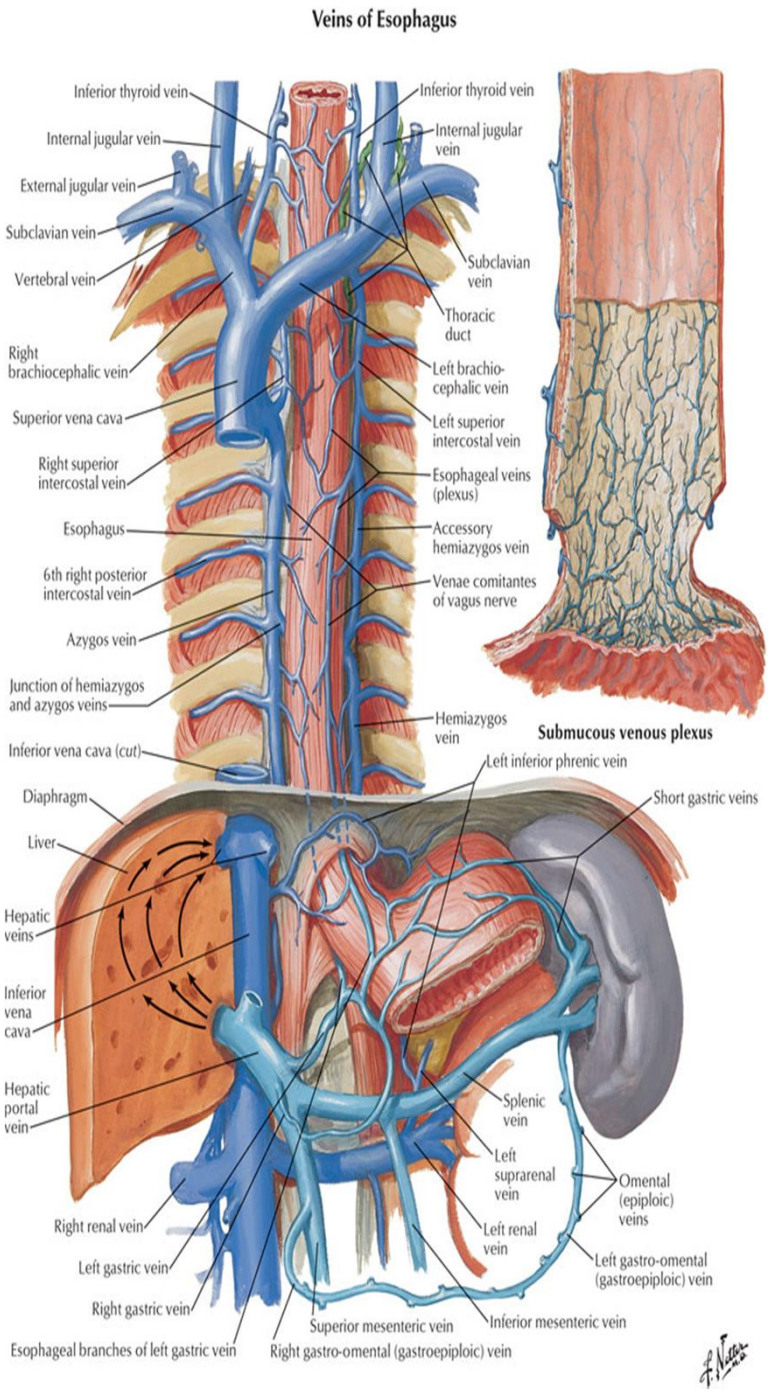


VENOUS DRAINAGE

- Blood from upper part drains into Brachiocephalic veins.
- Middle part drains into Azygos vein.
- Lower part drains into Left gastric vein.

Μοίρες οισοφάγου	Φλεβική αποχέτευση	Κατάληξη
Αυχενική & ανώτερη θωρακική	Κάτω θυρεοειδική φλ. Βρογχική φλ. 1η μεσοπλεύρια φλ.	Ανώνυμος φλ. ΑΚΦ
Θωρακική (μέσο τριτημόριο)	Άζυγος & ημιάζυγος φλ.	ΑΚΦ
Κατώτερη θωρακική & κοιλιακή	Κλάδος αρ. γαστρικής φ Κλάδοι σπληνικής φ Αρ. κάτω φρενική φ	Πυλαία φλ.

* Οι υποβλεννογόνιες αναστομώσεις μεταξύ συστηματικής & πυλαίας κυκλοφορίας στον άπω οισοφάγο είναι υπεύθυνες για τη δημιουργία κιρσών στη πυλαία υπέρταση



LYMPHATIC DRAINAGE

In the proximal third of the esophagus, lymphatics drain into the deep cervical lymph nodes.

In the middle third, drainage is into the superior and posterior mediastinal nodes.

The distal-third lymphatic follow the left gastric artery to the gastric and celiac lymph nodes

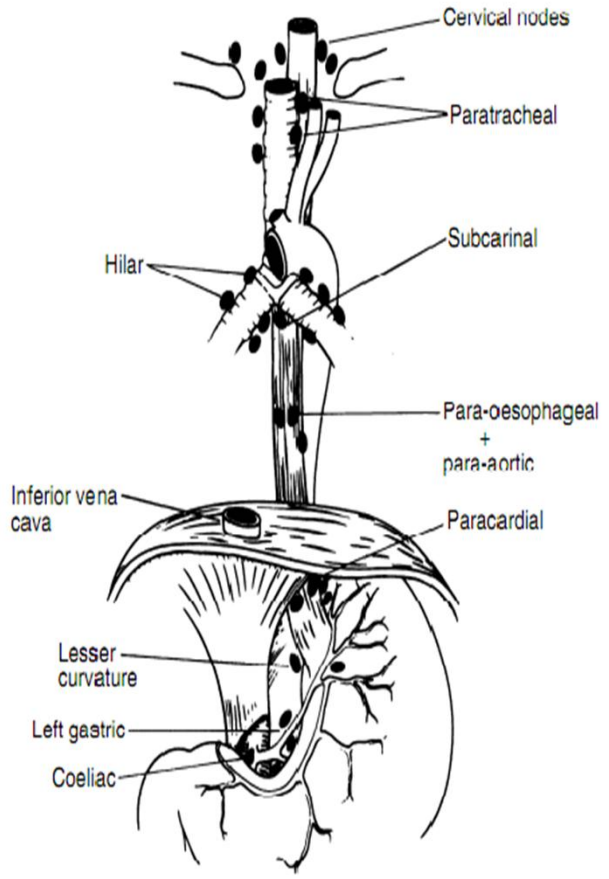
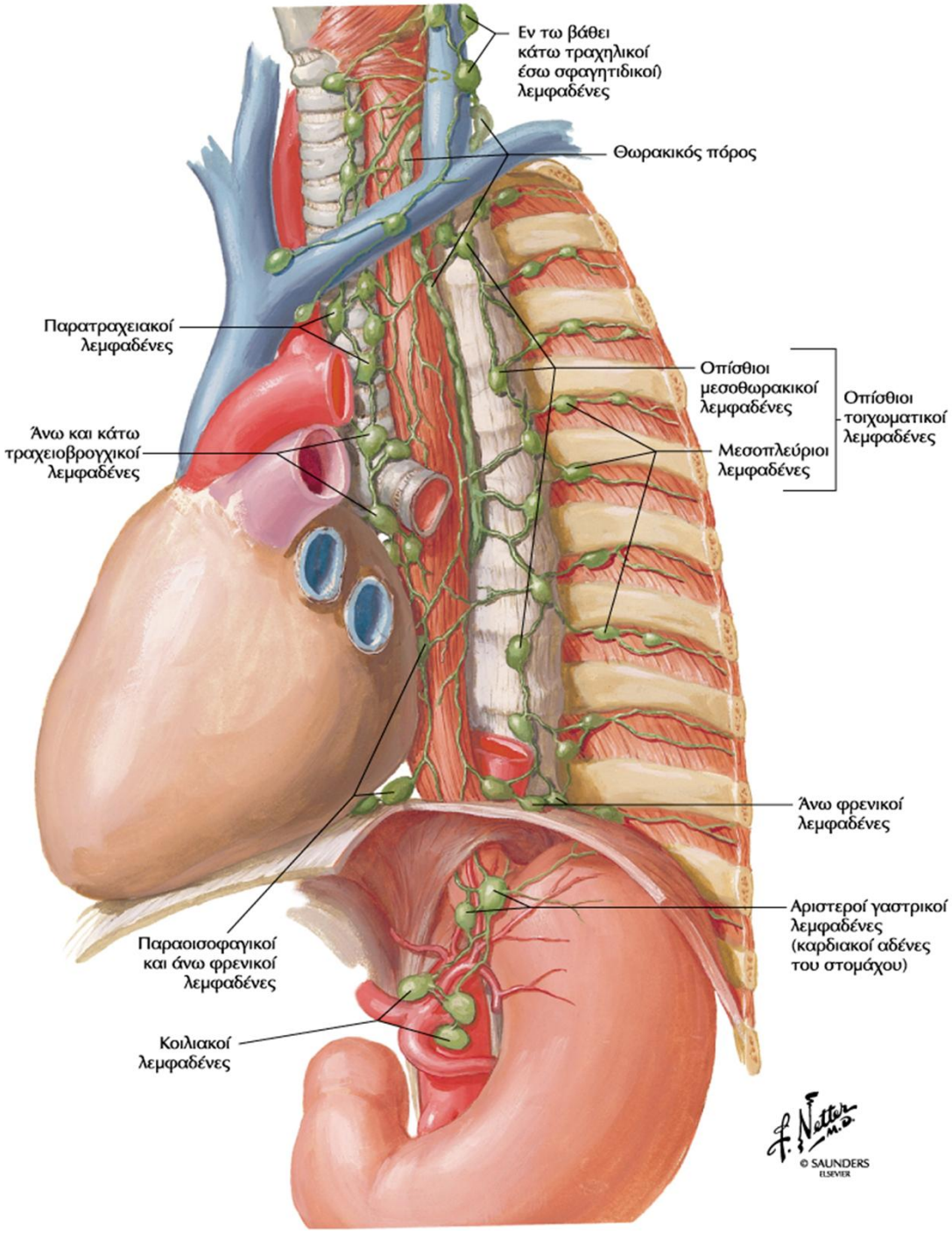


Figure . Diagram of the groups of lymph nodes draining the esophagus. There is no standard terminology.


Εν τω βάθει κάτω τραχηλικοί έσω σφαγητιδικοί) λεμφαδένες
Θωρακικός πόρος
Παρατραχειακοί λεμφαδένες
Οπίσθιοι μεσοθωρακικοί λεμφαδένες
Οπίσθιοι τοιχωματικοί λεμφαδένες
Άνω και κάτω τραχειοβρογχικοί λεμφαδένες
Μεσοπλεύριοι λεμφαδένες
Άνω φρενικοί λεμφαδένες
Αριστεροί γαστρικοί λεμφαδένες (καρδιακοί αδένες του στομάχου)
Παραοισοφαγικοί και άνω φρενικοί λεμφαδένες
Κοιλιακοί λεμφαδένες
F. Netter M.D.
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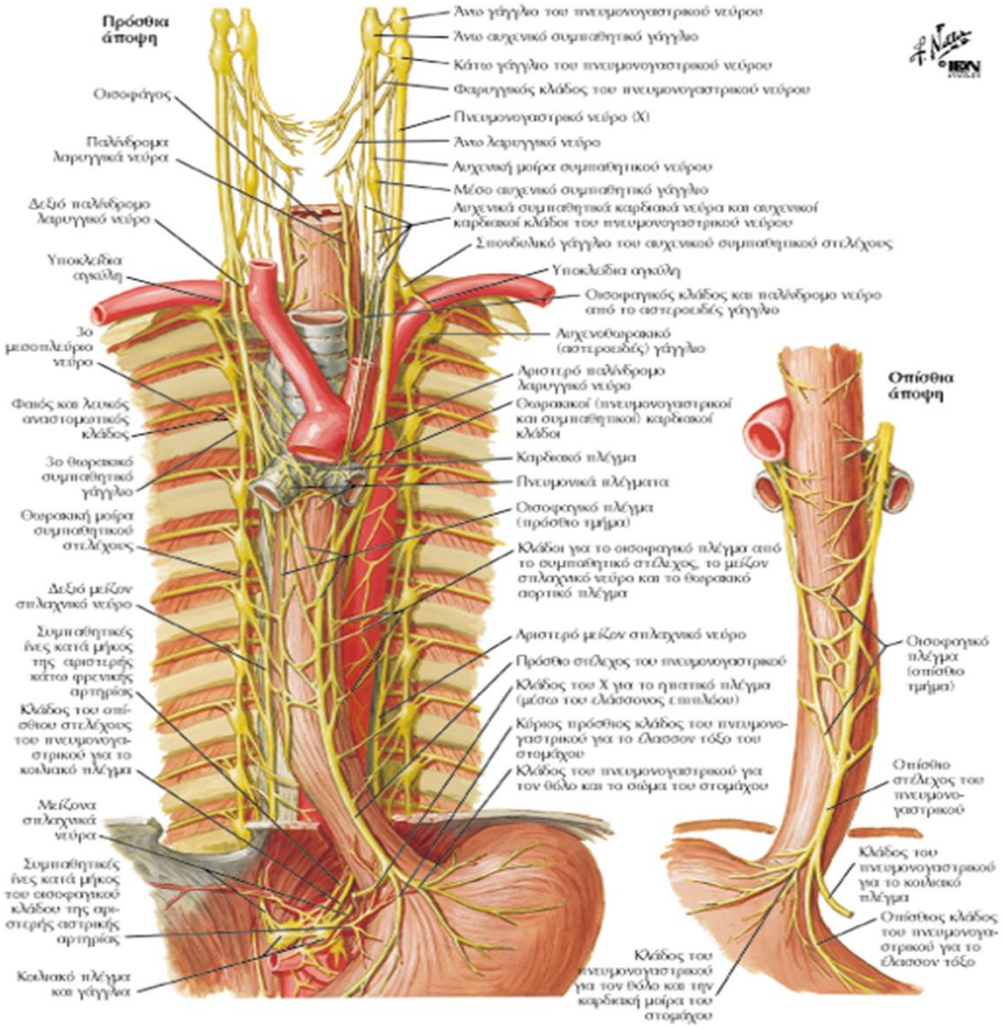
NERVE SUPPLY

- **Parasympathetic**
  - Upper half is supplied by Recurrent Laryngeal Nerve.
  - Lower half is supplied by Oesophageal plexus formed mainly by 2 vagi.

- **Sympathetic**
  - From cervical & thoracic sympathetic chain
  - Contraction of sphincters, wall relaxation, peristalsis



Esophageal Injuries

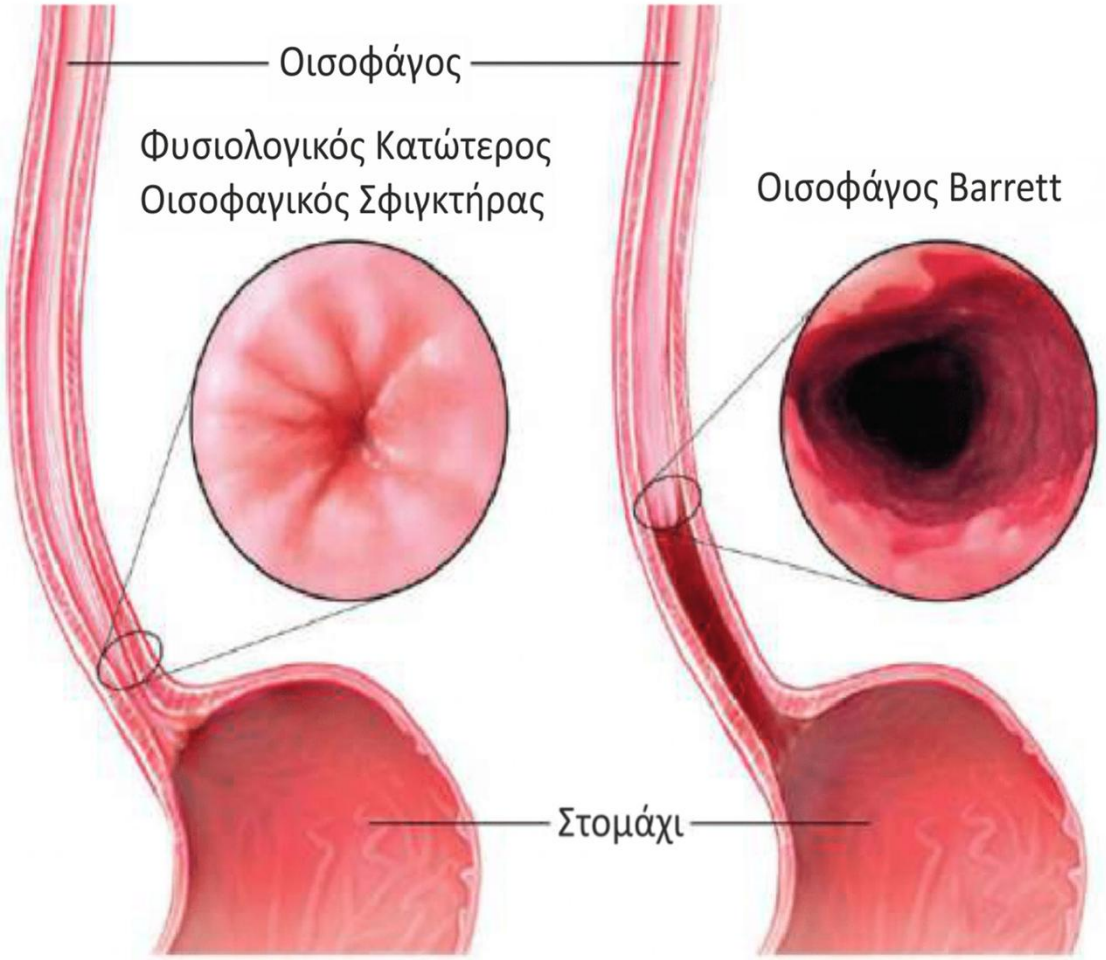
- **Oesophageal injuries** are the rarest kinds of penetrating neck trauma, but they cause most complications after a surgical procedure or other treatment. Most oesophageal injuries occur in conjunction with an airway injury because the airway lies anterior to the oesophagus and provides some protection to it.

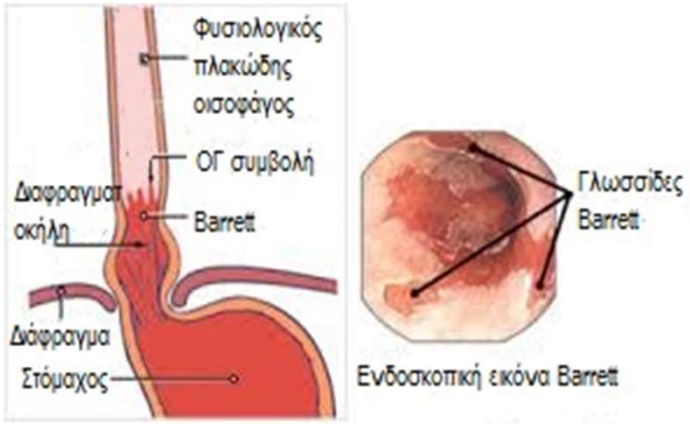
- **Oesophageal injuries** are often occult (hidden), which makes the injury difficult to detect, especially when it is isolated. Unrecognized oesophageal perforation causes death in nearly all patients who do not have surgery and in approximately 50% of those who do.

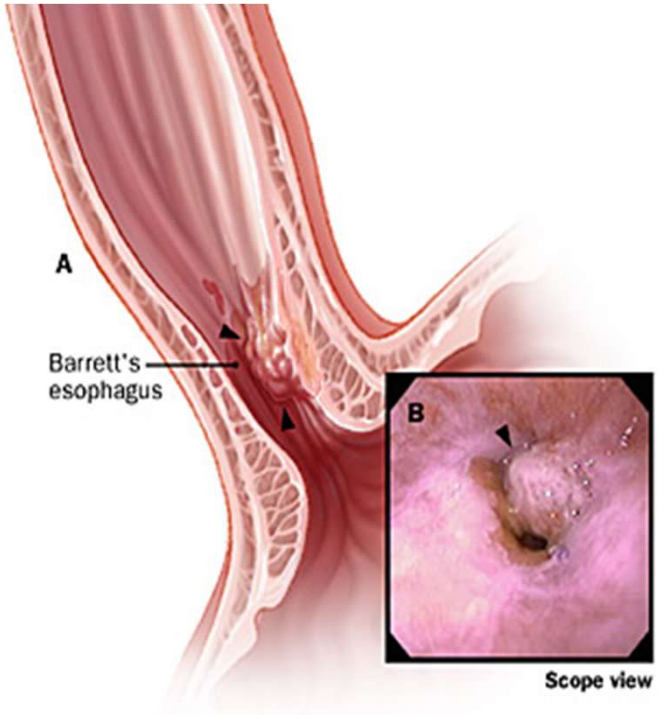
TRACHEO-ESOPHAGEAL FISTULA

- The most common congenital anomaly of the oesophagus is tracheo-oesophageal fistula (TEF). Usually, it is combined with some form of oesophageal atresia. In the most common type of TEF (approximately 90% of cases), the superior part of the oesophagus ends in a blind pouch and the inferior part communicates with the trachea.
- In these cases, the pouch fills with mucus, which the infant aspirates. In some cases, the superior oesophagus communicates with the trachea and the inferior oesophagus joins the stomach, but sometimes it does not, producing TEF with oesophageal atresia. TEFs result from abnormalities in partitioning of the oesophagus and trachea by the tracheo-oesophageal septum.

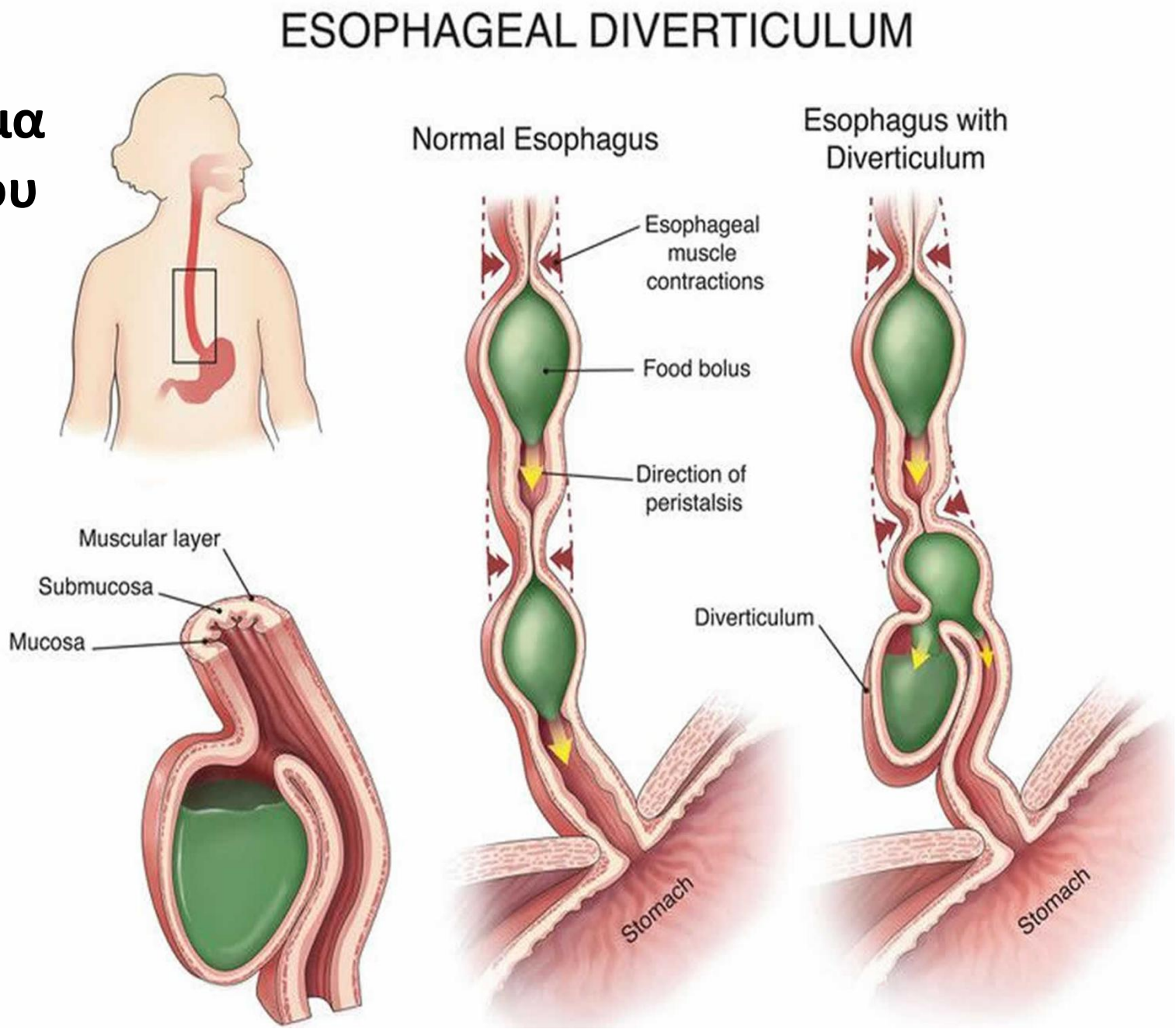
Οισοφάγος
Barrett

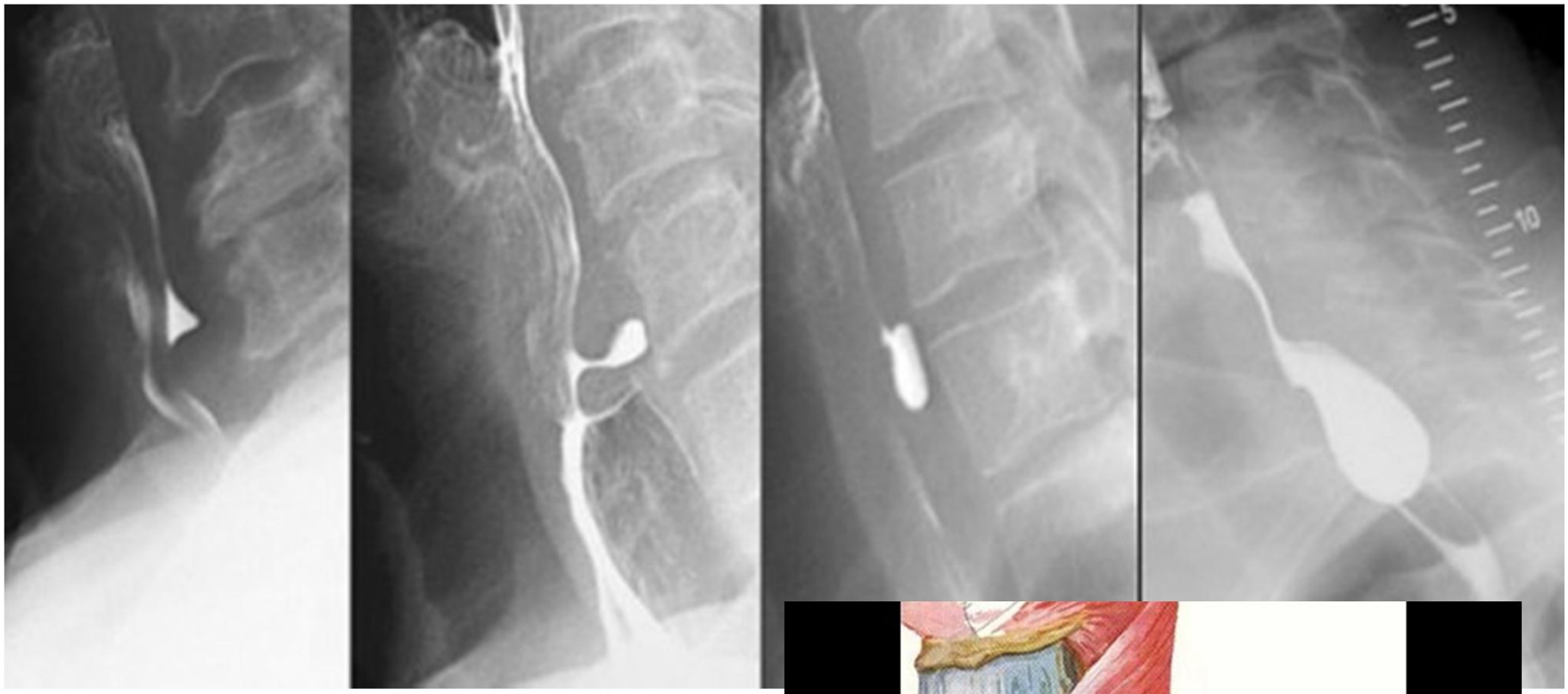


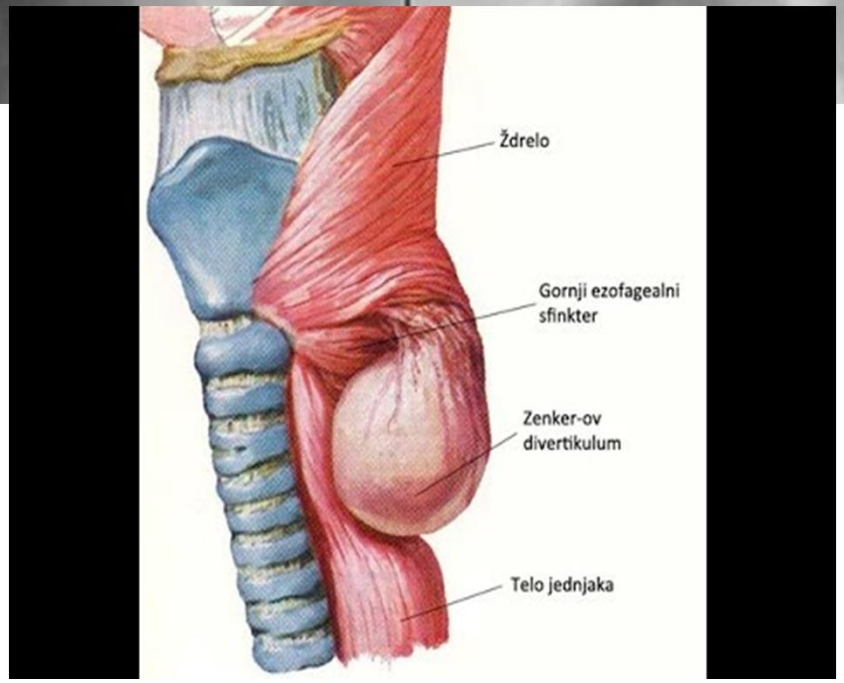




Εκκόλπωμα οισοφάγου



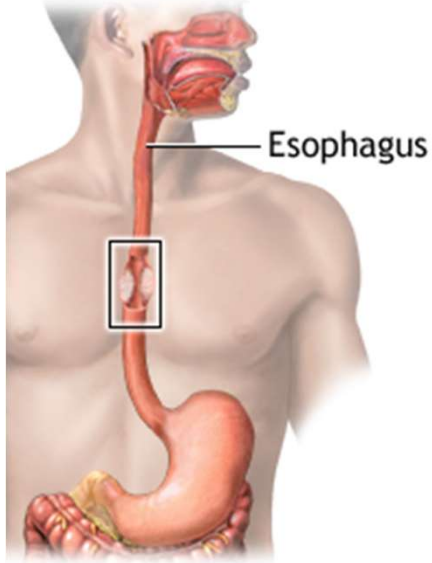


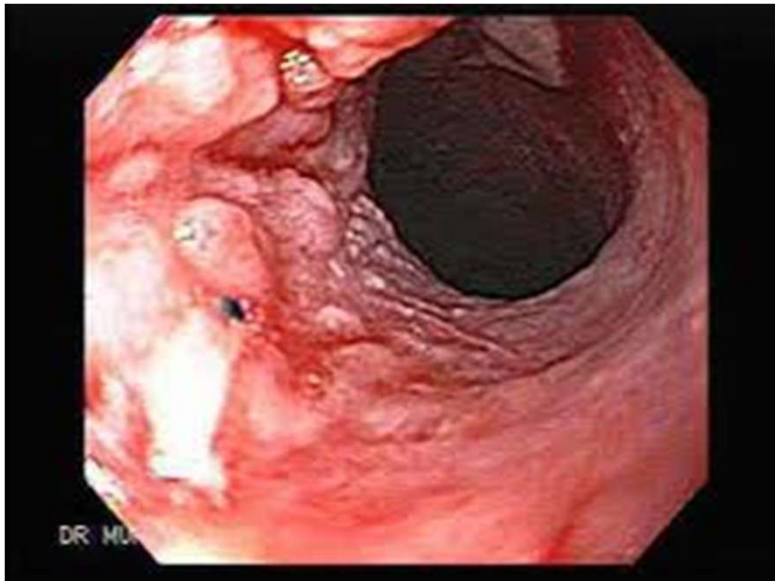


Εκκόλπωμα Zenker

OESOPHAGEAL CANCER

- The most common presenting complaint of cancer of the oesophagus is dysphagia (difficulty in swallowing), which is not usually recognized until the lumen is reduced by 30-50%.
- Oesophagoscopy is a common diagnostic tool for observing these cancers.
- Enlargement of the inferior deep cervical lymph nodes also suggests oesophageal cancer.
- Compression of the recurrent laryngeal nerves by an oesophageal tumour produces hoarseness.

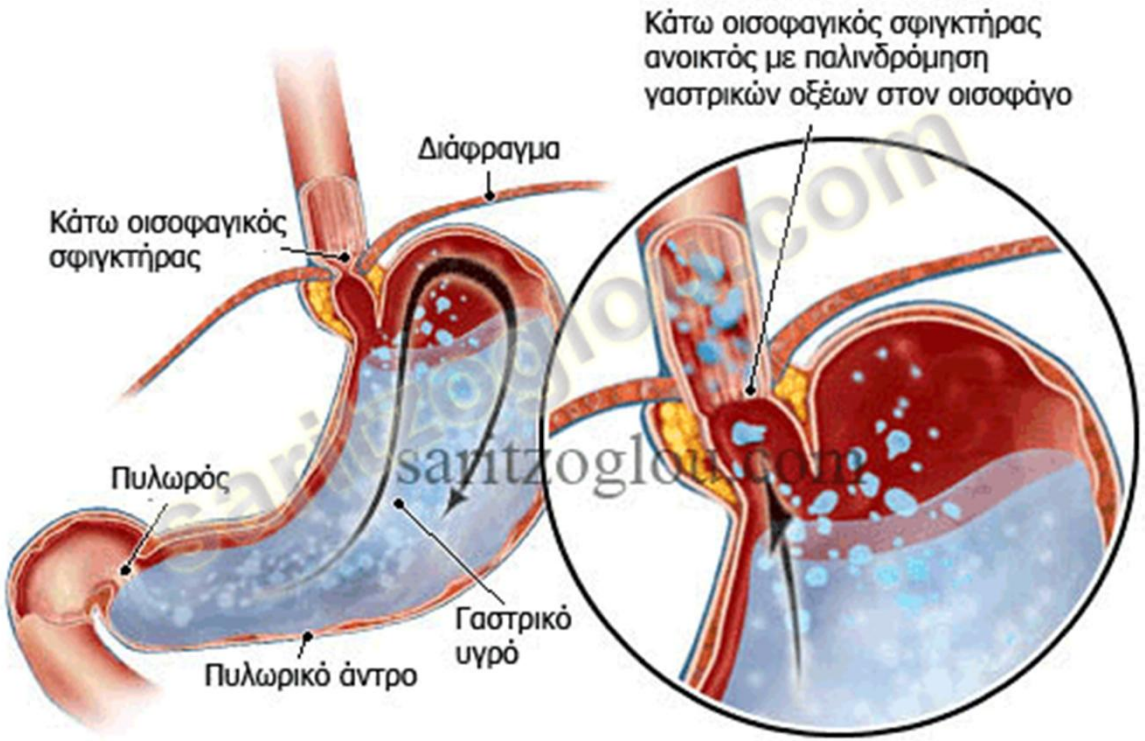




PYROSIS

Pyrosis or **heartburn** is a burning sensation in the chest or in the epigastrium. The pain often rises in the chest and may radiate to the neck, throat, or jaw.

Heartburn is usually associated with regurgitation of gastric acid (gastric reflux) which is the main symptom of gastroesophageal reflux disease (GERD).



OESOPHAGEAL VARICES

Oesophageal varices are extremely dilated sub-mucosal veins in the lower third of the oesophagus. They are most often a consequence of portal hypertension, commonly due to cirrhosis; patients with oesophageal varices have a strong tendency to develop bleeding.

Oesophageal varices are diagnosed with endoscopy.

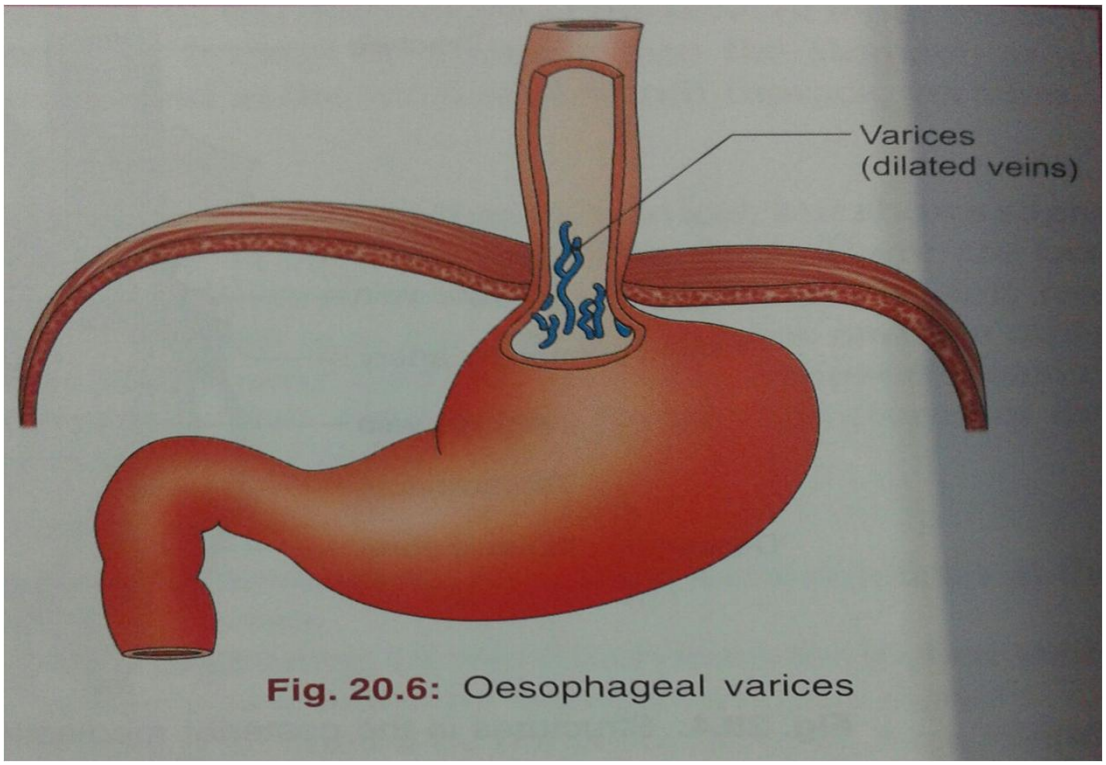
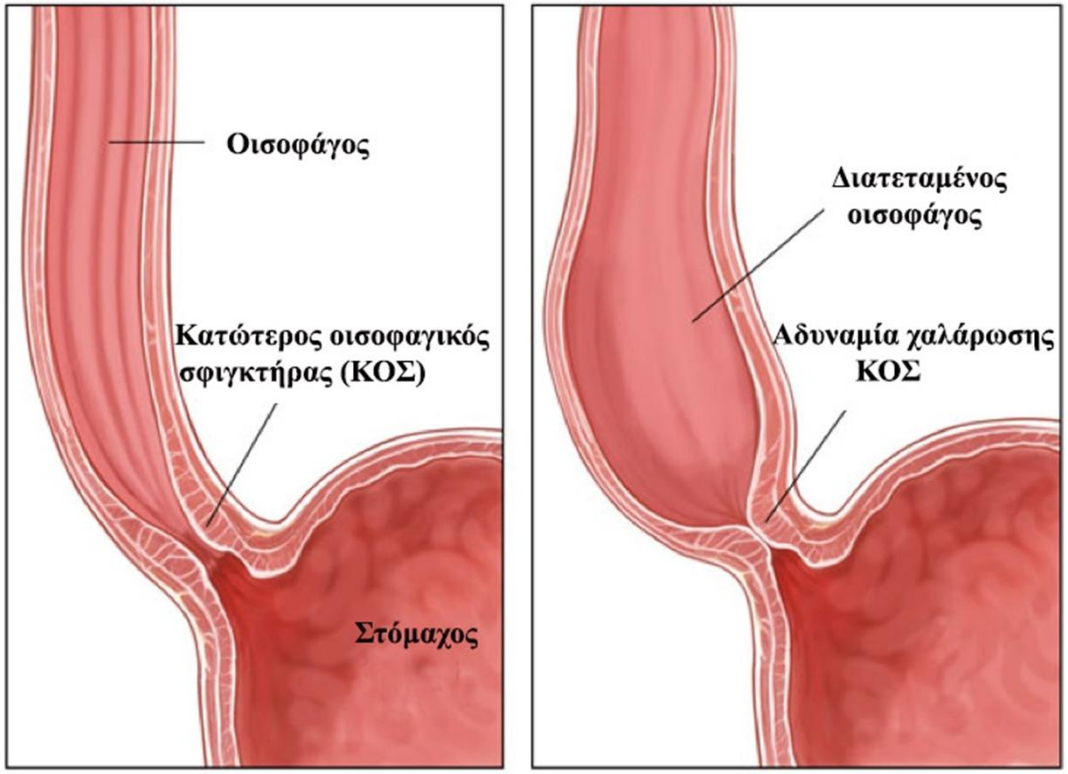


Fig. 20.6: Oesophageal varices

ACHALASIA CARDIA

- Lower end of oesophagus normally kept closed. It is opened by the stimulus of a food bolus. In case of neuromuscular coordination, the lower end of oesophagus fails to dilate with the arrival of food, therefore accumulates in the oesophagus.
- This condition of neuromuscular in coordination characterised by inability of oesophagus to dilate is known as Achalasia Cardia.



Thank you!!!