

L'enseignement de l'anatomie des appareils digestif, urinaire et génital par l'utilisation de vidéos d'anatomie 3D en anglais, intérêts pédagogiques par rapport aux méthodes classiques d'enseignement

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# ***OESOPHAGUS***

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## I. INTRODUCTION

The oesophagus is a musculomembranous tube passing between the pharynx in the neck and the stomach in the abdomen. Thus, the oesophagus has three distinct portions, cervical, thoracic and abdominal. It transports food bowl after deglutition.

## II. DESCRIPTIVE ANATOMY

### A- SITUATION

The oesophagus extends from the cricoid cartilage at the level of C6 vertebra to the cardiac orifice of the stomach at the level of T10 vertebra and towards the left seventh costal cartilage.

The cervical portion of the oesophagus commences in continuity with the cricopharyngeus muscle at the level of the lower border of the cricoid cartilage and C6 vertebra and lies in front of C6 and 7 vertebrae and the prevertebral fascia and behind the trachea.

The thoracic portion enters the thoracic inlet in the midline in front of the body of T1 vertebra and passes downwards through the superior and posterior mediastinum slightly to the left of the midline behind the left bronchus.

The diaphragmatic portion commences at the oesophageal opening opposite to T10 vertebra usually two centimetres and half centimetres to the left of the midline behind the seventh left costal cartilage and between the fibres of the left crus and a sling of fibres from the right crus.

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The abdominal portion is retroperitoneal and is firmly bound to the margins of the diaphragmatic opening by the phreno-oesophageal ligament, it turns forwards and to the left immediately below the opening to join the cardiac orifice of the stomach.

### B- DIMENSIONS

The oesophagus is twenty-five centimetres long. Its cervical portion measures five centimetres, its thoracic portion sixteen centimetres, its diaphragmatic portion one centimetre and its abdominal portion is three centimetres long.

The lumen of the oesophagus is virtual when empty with an internal diameter of two centimetres and half.

### C- SHAPE

On a left lateral view, the oesophagus is moulded onto the shape of the spine. (Figure 1)

On a frontal view, the oesophagus is slightly undulating, flattened anteroposteriorly with a scalloped lumen.

Its cervical portion inclines slightly to the left of the midline.

Its thoracic portion inclines slightly to the right of the midline at the level of T3 vertebra and then slightly to the left of the midline behind the left bronchus, which may indent it slightly at the level of T4 vertebra. At this point, the oesophagus inclines forward with a concavity more marked than that of the vertebral column in front of the descending thoracic aorta and in contact with the pericardium.

Its abdominal portion is oblique to the left and varies in length according to the tone of its muscle and the degree of distension of the stomach.

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The oesophageal lumen is constricted by several of its anatomical relations along its course.

The commencement of the oesophagus is constricted by the cricopharyngeal sphincter fifteen centimetres from the incisor teeth. It constitutes the narrowest part of the oesophagus.

The second narrowing of the oesophageal lumen is where it is crossed by the aortic arch twenty-two centimetres from the teeth.

The bronchial constriction is where it is crossed by the left principal bronchus twenty-seven centimetres from the teeth.

The diaphragmatic narrowing is where it passes through the opening in the diaphragm thirty-eight centimetres from the teeth.

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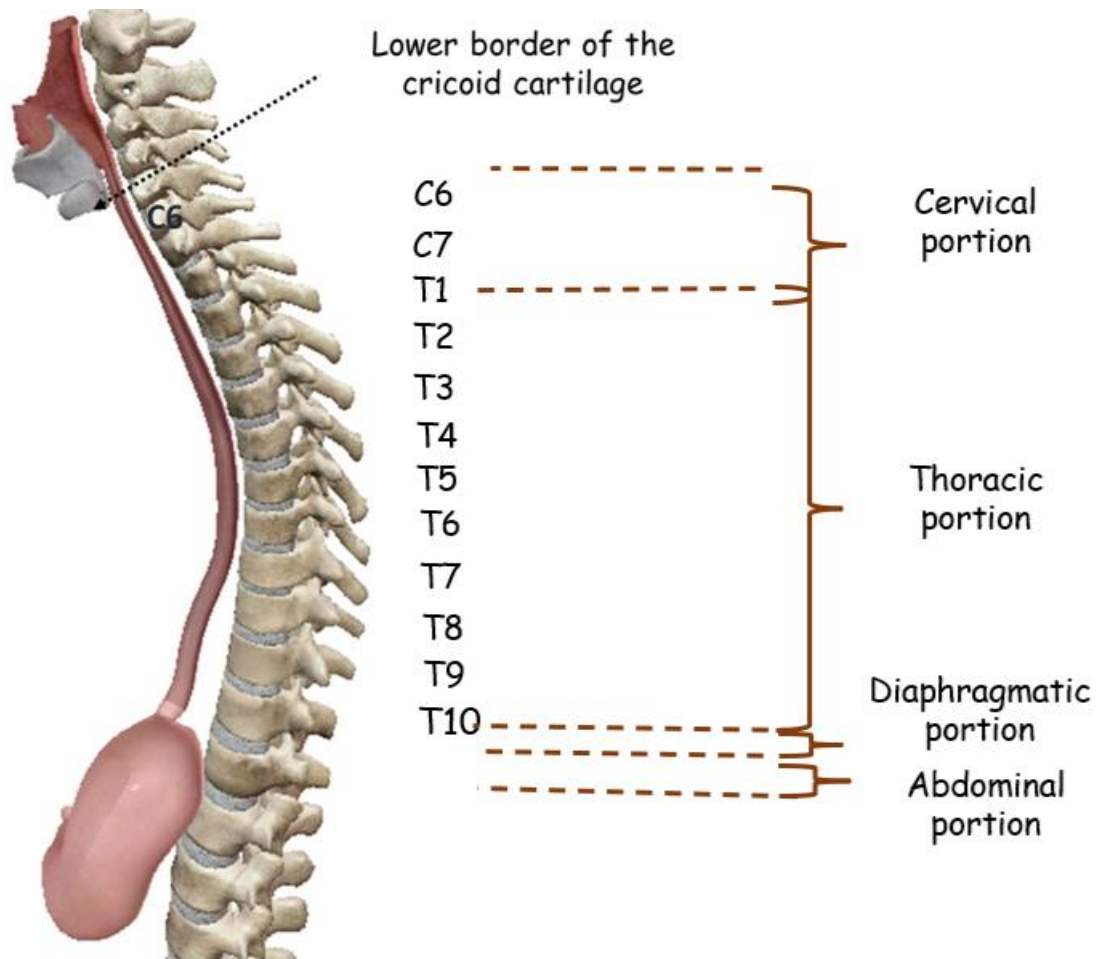


Figure 1: Lateral view of the oesophagus

### III. STRUCTURE

The oesophagus is a hollow organ with a scalloped lumen surrounded by three millimetres thick five layers-wall. (Figure 2)

From the outer to the inner layer, the adventitia or the oesophageal fascia is a thin layer of lax connective tissue continuous with the phreno-oesophageal ligament. The phreno-oesophageal ligament is continuous with the diaphragmatic fascia and is attached to the cardiac part of the

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oesophageal fascia two centimetres above the cardiac orifice. It is rich of elastic fibres and some of them reach the submucosa of the oesophageal wall. It constitutes a solid support of the oesophagus and participates to the anti-reflux barrier.

The oesophageal muscle is skeletal in the upper third, the cricopharyngeus muscle, and visceral in the lower two thirds of the tube. The cricopharyngeus muscle attaches to the cricoid cartilage by the crico-oesophageal tendon. The inner layer of the muscle is circular, and the outer is longitudinal. The latter makes connexions with pleura, trachea and principal bronchi.

The submucosa is highly blood supplied and innervated, it contains small groups of mucus-secreting glands present at the upper and lower ends.

The muscularis mucosa is characteristically thicker in the oesophagus than in any other part of the alimentary tract.

The mucous membrane is lined by a stratified squamous non-keratinizing epithelium. Its underlying connective tissue layer, the lamina propria, is scattered with lymphoid follicles. The macroscopic aspect of the mucosa consists of pink-coloured longitudinal folds, that of the abdominal portion is pale and more folded.

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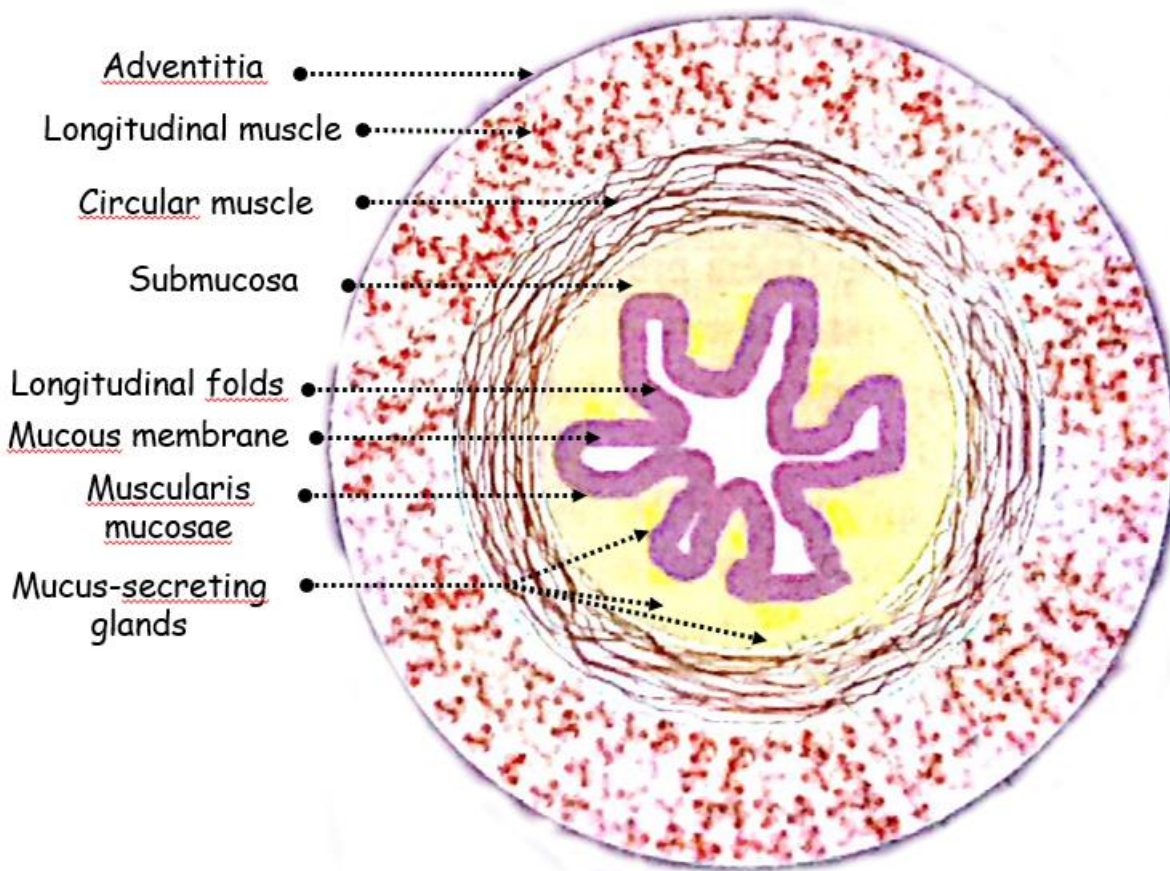


Figure 2: Horizontal section of the oesophagus showing its structure

#### IV. ANATOMICAL RELATIONS

The anatomical relations of the oesophagus are different according to each one of its portions.

The cervical portion is in contact, forwards, with the trachea, the lower poles of the thyroid gland, the thoracic duct more at the left and the recurrent laryngeal nerves.

Backwards, it lies in front of the C6 and C7 vertebrae covered by the prevertebral fascia.

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Laterally, the oesophagus is surrounded by lateral lobes of the thyroid gland, recurrent laryngeal nerves, the carotid sheath containing the common carotid artery, the internal jugular vein, the vagus nerve and ansa cervicalis and the inferior thyroid artery.

The thoracic portion is in contact, at the front and from the top to the bottom, with the trachea, its bifurcation, the left principal bronchus, the right pulmonary artery, the tracheobronchial lymph nodes and the oblique pericardic sinus of Haller.

Backwards, it lies in front of the T1 to T4 vertebrae, from T4 vertebra down, it lies in front of the thoracic duct and the descending aorta.

To the right, it lies next to the arch of the vena azygos, the right vagus nerve and the mediastinal pleura.

To the left, from T1 to T4 vertebrae which constitute the limits of superior mediastinum, it is in contact, from the top to the bottom, with the mediastinal pleura, the subclavian artery, the arch of the aorta which indents it, the left vagus nerve and the thoracic duct. From T4 vertebra down, it only stays in contact with the left mediastinal pleura.

The diaphragmatic portion is surrounded the oesophageal opening in the diaphragm towards T10 vertebra. Forwards, it is in contact with the left vagus nerve and, backwards, with the right vagus nerve.

The abdominal portion is suspended by the phreno-oesophageal ligament and is in contact, forwards, with the anterior vagal trunk made of the left vagus nerve and through the

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posterior peritoneum with the lesser omentum and the left lobe of liver to the right and the greater omentum to the left.

Backwards, it is in contact with the posterior vagal trunk made of the right vagus nerve and the abdominal aorta.

To the left, it is separated from the fundus of the stomach by the cardiac notch, a major element of the anti-reflux barrier.

## V. BLOOD SUPPLY; LYMPH DRAINAGE AND NERVE SUPPLY

### A- ARTERIES

The portion of the oesophagus from the cricoid cartilage down to the level of the arch of the aorta is supplied by the inferior thyroid artery.

The portion of the oesophagus from the arch of the aorta to the oesophageal opening in the diaphragm is supplied by the oesophageal arteries. They arise directly from the aorta.

The abdominal portion is supplied by the oesophageal branches of the left gastric and left phrenic arteries.

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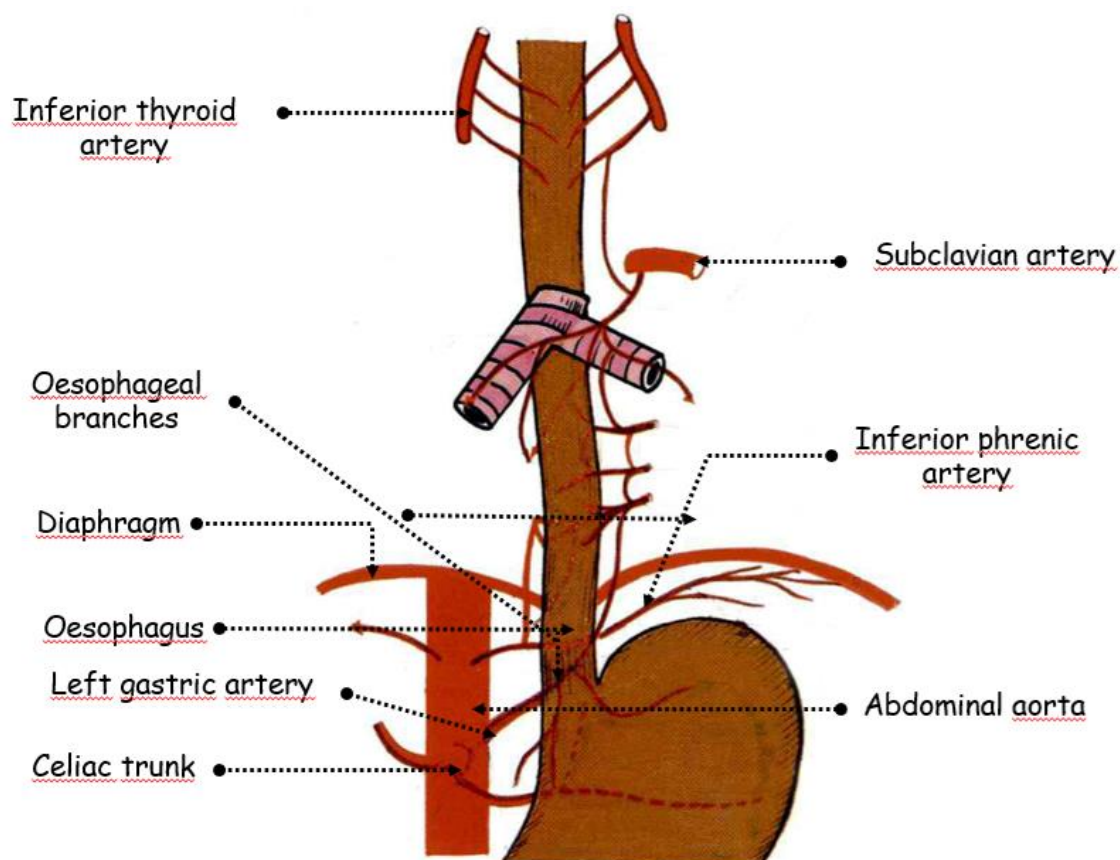


Figure 3: Anterior view of the oesophagus showing its arteries

## B- VEINS

The portion of the oesophagus from the cricoid cartilage down to the level of the arch of the aorta is drained by the brachiocephalic veins through the inferior thyroid veins.

The portion from the arch of the aorta to the oesophageal opening in the diaphragm is drained by the azygos and hemiazygos veins which flow into the superior vena cava.

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The abdominal portion is drained by the oesophageal tributaries of the left gastric vein that empties in the portal vein and by the oesophageal tributaries of the hemiazygos vein that empties in the superior vena cava.

The latter portion of the oesophagus is a zone of anastomosis between portal and systemic venous systems above the oesophageal hiatus.

### C- LYMPH DRAINAGE

The lymphatics of the oesophagus follow the arteries.

Although the different portions of the oesophagus drain into different lymph nodes, within the oesophageal walls, there are lymphatic channels which enable lymph to pass for long distances within the viscus.

The cervical portion of the oesophagus drains into the deep cervical nodes near the origin of the inferior thyroid artery.

The thoracic portion drains into the tracheobronchial group.

The diaphragmatic and abdominal portions drain into the preaortic nodes of the celiac group.

### D- NERVES

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The upper part of the oesophagus is supplied by the recurrent laryngeal nerve and by sympathetic fibres from cell bodies in the middle cervical ganglion running in on the inferior thyroid arteries. The lower part receives fibres from the sympathetic trunks and greater splanchnic nerves, while the parasympathetic supply is from the vagus nerves which form anterior and posterior oesophageal plexuses on the respective surfaces. These plexuses, which form a wide-meshed network that encircles the tube below the level of the lung roots, are essentially parasympathetic and their fibres become collected together over the last few centimetres of the thoracic oesophagus as the anterior and posterior vagal trunks. The anterior trunk contains predominantly left vagal fibres and the posterior mainly right fibres, but both trunks have fibres from both vagi. The motor supply is from the vagus, from cell bodies in the nucleus ambiguus for the upper striated-muscle part, and from the dorsal motor nucleus with relay in plexuses in the wall for the lower visceral muscle part. The glands also receive secretomotor fibres from the vagus but these are derived from cell bodies in the inferior salivary nucleus. There are also afferent fibres in the vagi with cell bodies in the inferior vagal ganglia, but pain fibres appear to run with both the vagal and the vasomotor sympathetic supply, since like cardiac pain oesophageal pain can be referred to the neck, arm and thoracic wall.

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## **VI. SURGICAL APPROACH**

The cervical part of the oesophagus is approached in the neck by opening up the interval between the trachea and the carotid sheath.

In the thorax, a long length of oesophagus is readily accessible on the right side in front of the vertebral column, especially after transecting the azygos arch. The posterior intercostal vessels and thoracic duct are at risk when mobilizing the oesophagus posteriorly.

The lower part is more easily approached from the left side, above the diaphragm in the interval between the heart in front and the aorta behind.

## **VII. CONCLUSION**

The oesophagus is a hollow muscular organ that occupies the superior mediastinum, the posterior mediastinum and the retroperitoneum. It has a major role in digestion and, due to its long course, has several cervical, thoracic and retroperitoneal relations. Its blood supply, lymph drainage and nerve supply are quite diverse. Its abdominal portion constitutes a zone of portosystemic anastomosis. Its main role is transporting the food bowl to the stomach, thus, it has an important motor function.

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