

# Anatomy of the oesophagus

Harold Ellis

## Abstract

The oesophagus measures approximately 25 cm in length and is divided into cervical, thoracic and intra-abdominal parts. It extends from the pharynx, at the level of vertebra C6, to the cardia of the stomach after traversing the diaphragm at T10 level. The usual surgical approach to the length of the oesophagus is through the right chest, where it is only crossed by the termination of the azygos vein. The oesophagus is lined throughout by a stratified squamous mucosa. It has a rich blood supply from the inferior thyroid artery, multiple branches directly from the aorta and from the oesophageal branch of the left gastric artery. At the lower end there is an important porto-systemic anastomosis between the oesophageal branch of the left gastric vein and the tributaries of the azygos vein, which accounts for the development of oesophageal varices in portal hypertension. Although there is no anatomical sphincter to be demonstrated at the lower end of the oesophagus in man, a multifactorial 'physiological' sphincter mechanism is present, which relaxes in belching and vomiting.

**Keywords** Cervical; oesophagus; porto-caval venous anastomosis, complex sphincter mechanism; stratified squamous mucosa; thoracic and abdominal parts

The oesophagus extends from the distal termination of the pharynx at the level of the sixth cervical vertebra to the cardiac orifice of the stomach. Its upper extremity can easily be defined as the level of the lower border of the cricoid cartilage of the larynx. It is 25 cm in length and can be divided, for descriptive purposes, into cervical, thoracic and abdominal part (Figure 1a and b).

In the neck, the oesophagus lies immediately behind the trachea, separated only by loose connective tissue. Posteriorly, the dense prevertebral fascia separates it from the sixth and seventh cervical vertebrae, while on either side lie the common carotid arteries and the recurrent laryngeal nerves, the latter lying in the trachea-oesophageal groove. On the left side it relates to the termination of the thoracic duct. The thyroid gland lateral lobe projects over the side of the cervical oesophagus on each side.

The bulk of the oesophagus lies in the thorax, where it traverses the superior and then the posterior mediastinum, here it passes forward and to the left to reach the oesophageal hiatus of the diaphragm at the level of T10 (Figure 1a and b).

Anteriorly the thoracic oesophagus lies successively behind the trachea, the left main bronchus, the pericardium, which separates it from the left atrium of the heart and, finally, the diaphragm.

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**Harold Ellis** CBE MCh FRCS was Professor of Surgery at Westminster Medical School until 1989. Since then he has taught anatomy, first in Cambridge and now at Guy's Hospital, London, UK. Conflicts of interest: none declared.

Posteriorly lie the thoracic vertebrae down to T10, the thoracic duct, the azygos vein and its tributaries and, near the diaphragm, the lower part of the descending aorta, which edges behind it.

On the left side the oesophagus is hidden behind the left subclavian artery, the aortic arch, the left recurrent laryngeal nerve and the thoracic duct and is then overlapped by the postero-laterally placed descending aorta.

On the right side the oesophagus relates to the mediastinal pleura and is crossed by the termination of the azygos vein. Thus the right side, in contrast to the left, allows excellent surgical access in oesophageal mobilization; the terminal part of the azygos vein, if necessary, can be tied and divided.

Distal to the hila of the lungs the vagus nerve on each side joins to form a plexus on the wall of the oesophagus, from which emerge the anterior and posterior vagal trunks, lying directly on the walls of the oesophagus and emerging with it at the oesophageal hiatus of the diaphragm.

The abdominal part of the oesophagus (Figure 2), about 2.5 cm in length, passes through the opening formed by the two crura of the diaphragm and comes to lie in the oesophageal groove on the posterior surface of the left lobe of the liver. It is tethered to the diaphragm by the phreno-oesophageal ligament.

## Structure

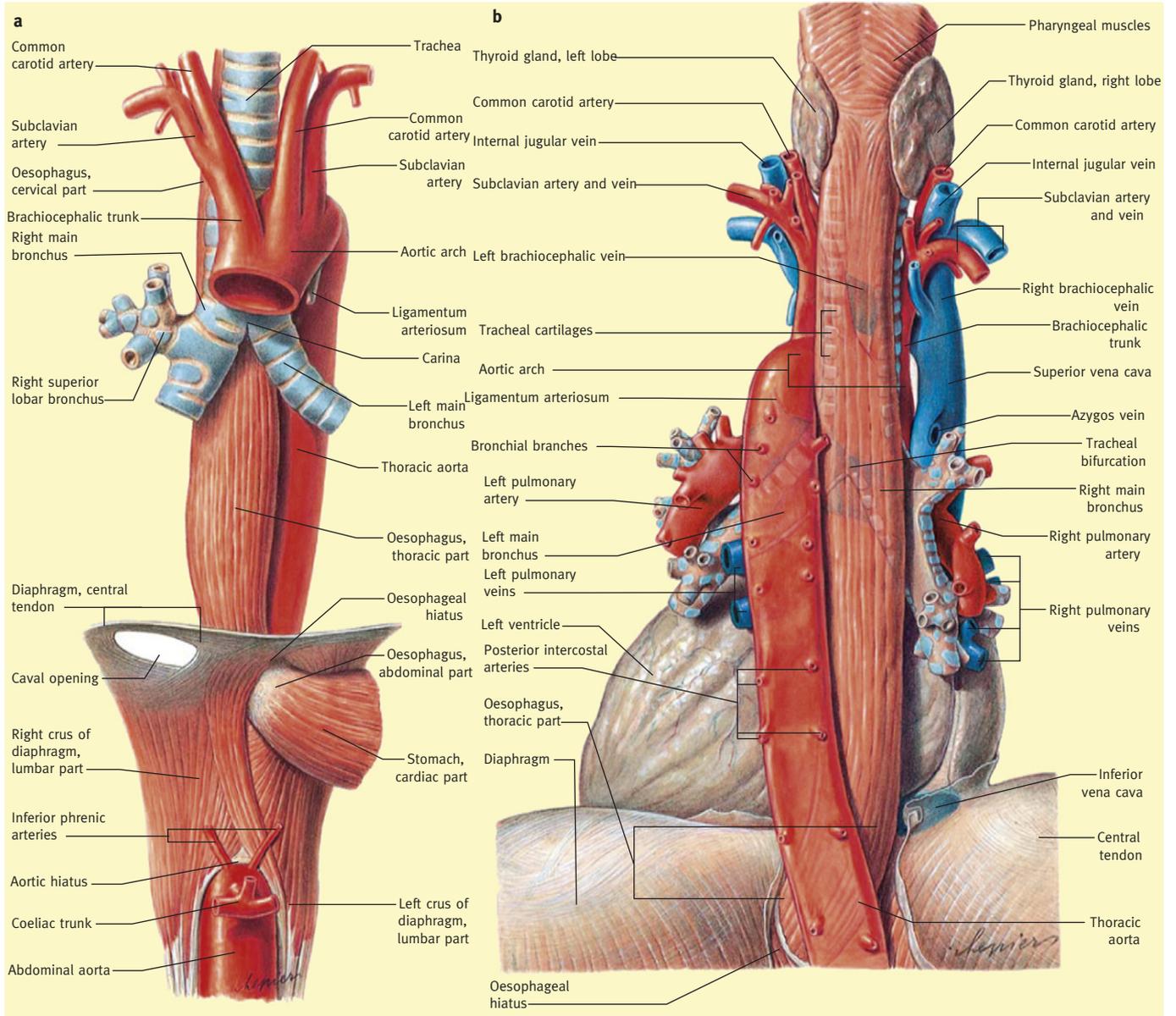
The mucosal lining of the oesophagus comprises a stratified squamous epithelium. This passes abruptly into the columnar epithelium of the cardia at the oesophago-gastric junction. The underlying submucosa is made up of connective tissue containing mucous glands. Deep to this, the muscle layer comprises inner circular and outer longitudinal fibres, striated in the upper third, mixed striated and unstriated in the middle-oesophagus, then entirely unstriated in the lower third. There is an outer connective tissue sheath. Note that there is no anatomical sphincter at the lower end of the oesophagus in man, (although this can be demonstrated in a number of animal species). However, a sphincter mechanism exists, as we do not normally reflux gastric contents on lying down or bending over. This 'sphincter' relaxes to allow belching and vomiting. The mechanism is a complex affair comprising:

- positive intra-abdominal pressure acting on the short abdominal part of the oesophagus
- a physiological high-pressure zone at the lower end of the oesophagus, which can be demonstrated by oesophageal manometry
- valve-like effect of the obliquity of the oesophago-gastric angle
- pinch-cock effect of the crural sling of the diaphragm
- plug-like action of the mucosal folds at the cardiac orifice.

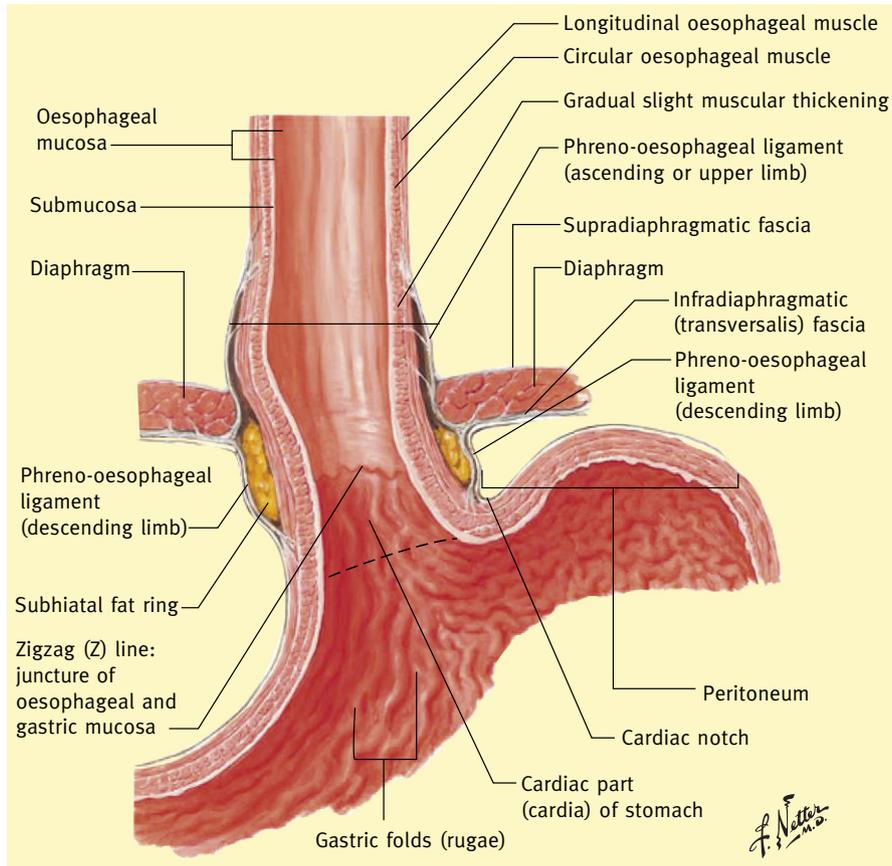
## Blood supply (Figure 3a and b)

The oesophagus has a rich arterial supply; above, from the inferior thyroid artery, then, segmentally, from a series of branches passing directly from the adjacent thoracic aorta and then from the oesophageal branch of the left gastric artery which ascends through the oesophageal hiatus of the diaphragm.

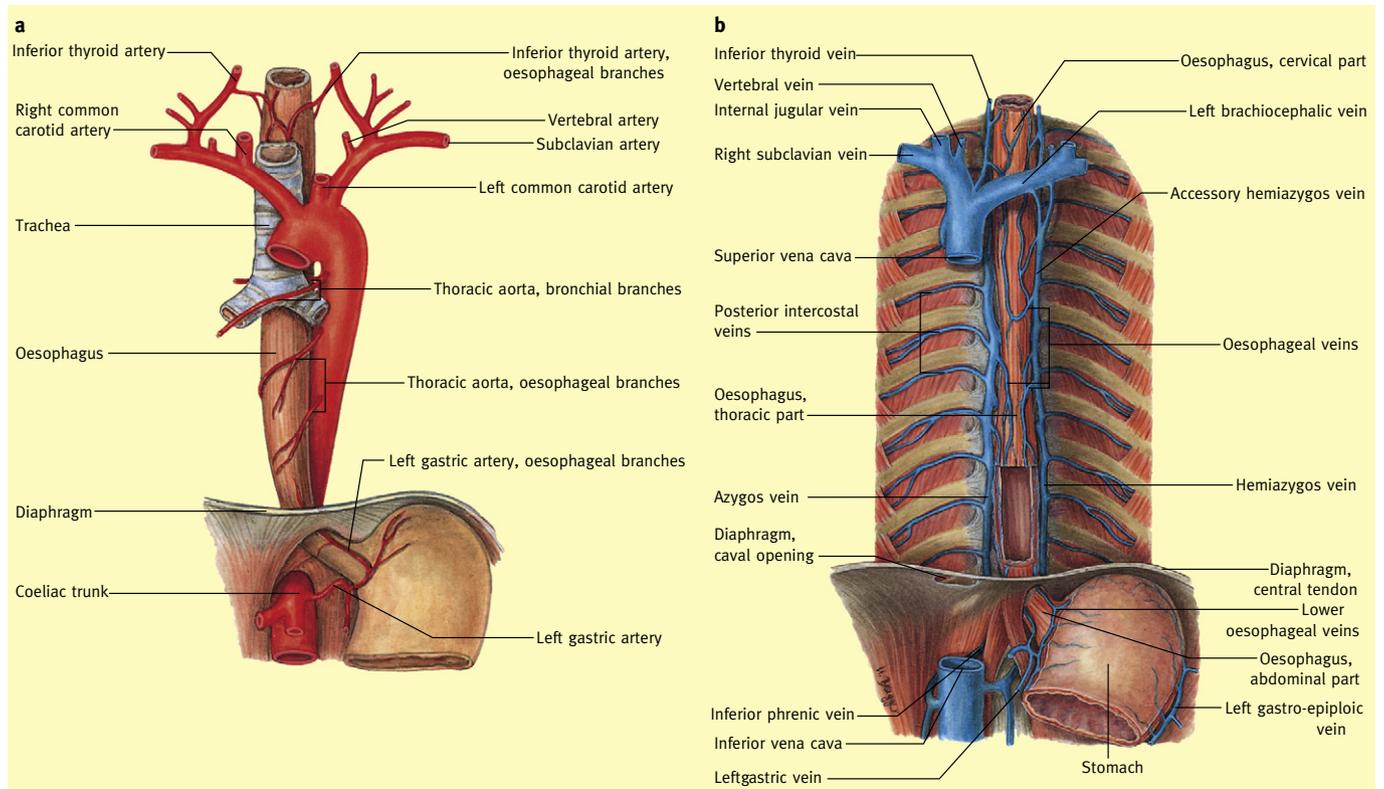
The veins from the cervical oesophagus drain into the inferior thyroid veins. The thoracic oesophagus drains into the azygos system, while the lower part of the organ empties into the



**Figure 1** The oesophagus: anterior view (a), posterior view (b). (From Gray's Anatomy 40th edition).



**Figure 2** The lower end of the oesophagus and oesophago-gastric junction. (From Gray's Anatomy 40th edition).



**Figure 3** Oesophagus: arterial supply (a), venous drainage (b). (From Gray's Anatomy 40th edition).

oesophageal tributaries of the left gastric vein, which itself drains directly into the portal vein.

Note that the anastomosis between the azygos (systemic) and left gastric (portal) venous tributaries in the submucosa of the lower end of the oesophagus is of great clinical importance. In portal hypertension these veins distend into large collateral channels, (*oesophageal varices*), which may rupture, resulting in massive haematemesis.

### Lymphatic drainage

This obeys the universal rule, that 'lymphatics of an organ follow its blood supply'. A peri-oesophageal lymphatic plexus drains into posterior mediastinal nodes which drain both upwards into the supraclavicular nodes and downwards, along nodes around the left gastric vessels. Involved hard supraclavicular nodes may be palpated quite frequently in patients with advanced oesophageal carcinoma. ◆