Anatomy of the stomach

Harold Ellis

Abstract

The stomach is roughly J-shaped and can be divided into the cardiac orifice, fundus, body, pyloric antrum and pylorus. There is a well-marked anatomical pyloric sphincter and a functionally competent, but not anatomically defined sphincter mechanism at the cardiac orifice. There is a rich arterial supply from all three branches of the coeliac axis and the accompanying venous drainage is to the portal system. There is a clinically important porto-systemic anastomosis at the oesophago-gastric junction. The vagus provides the motor and secretomotor nerve supply while sensory fibres are transmitted by sympathetic fibres passing via the coeliac ganglion to spinal segments T5 to 12.

Keywords Antrum; body; cardiac orifice; fundus; gastric vessels; porto-systemic anastomosis; pylorus; stomach

The stomach is roughly J-shaped, although it size and position vary considerably, depending on the position of the body, the phase of respiration and whether it is full or empty. It also varies markedly with the build of the subject. In the asthenic individual it is elongated and, when full, may descend to the suprapubic region, while in the obese, plethoric subject it may be tucked away, in the lying position, almost entirely above the costal margin, at first out of sight when the abdomen is opened at laparotomy.

The stomach (Figure 1) has an anterior and posterior surface, a greater and lesser curvature and two orifices, the *cardia*, or, more accurately termed, the *cardiac orifice*, and the *pylorus*. The thick circular muscle of the pyloric sphincter is easily felt, (and is hypertrophied in the condition of infantile pyloric stenosis). However, in man there is no anatomical sphincter to be demonstrated at the cardia. The number of mechanisms responsible for the integrity of the cardia is discussed in the article on the oesophagus.

Along the lesser curvature of the stomach is a distinct notch, the *incisura angularis*, which is produced by the arrangement of the involuntary muscle fibres of the stomach wall.

The various parts of the stomach (Figure 1) are well defined, have physiological differences and are used by the endoscopist, radiologist and surgeon in localization of gastric pathologies:

The *fundus* is the dome-like projection of the stomach above and to the left of the cardiac orifice. The *body* of the stomach passes from the cardiac orifice to the incisura — it is this part of the organ that contains the parietal cells which secrete HCl. From the incisura to the pylorus is the *pyloric antrum*, (the 'ante-room'), which produces the hormone *gastrin*, responsible for the

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. Conflicts of interest: none declared.*

hormonal phase of gastric acid secretion. The pylorus is easily identified by palpation of the very distinct ring of sphincter muscle and is also marked by a constant vein (of Mayo) that crosses at this level.

Attached along the lesser curve is the *lesser omentum*, while the *greater omentum* hangs down like an apron from the greater curvature. These peritoneal folds contain the blood vessels, lymphatics and nerve supply of the stomach.

Relations (Figure 2)

In the lying position, much of the anterior aspect of the stomach lies tucked up behind the left diaphragm, overlapped by the left lobe of the liver. In the erect position, it descends further down behind the anterior abdominal wall. Posteriorly, the lesser sac separates the stomach from the pancreas, (with the splenic artery running its tortuous course along the upper margin of the pancreas), the transverse mesocolon, left kidney, left suprarenal gland and the spleen.

Blood supply (Figure 3)

The stomach has a particularly rich blood supply — it is, indeed, the only organ to be supplied from both its sides, along the greater and lesser curvatures. Gastric arteries arise from all three branches of the coeliac axis:

The *left gastric artery*, the largest vessel, is one of the three direct branches of the coeliac axis.

The *right gastric artery* is the first branch of the hepatic artery. (These two vessels lie along the lesser curve).

The *right gastroepiploic artery* arises at the bifurcation of the gastro-duodenal branch of the hepatic artery, (its other branch forming the superior pancreatico-duodenal artery).
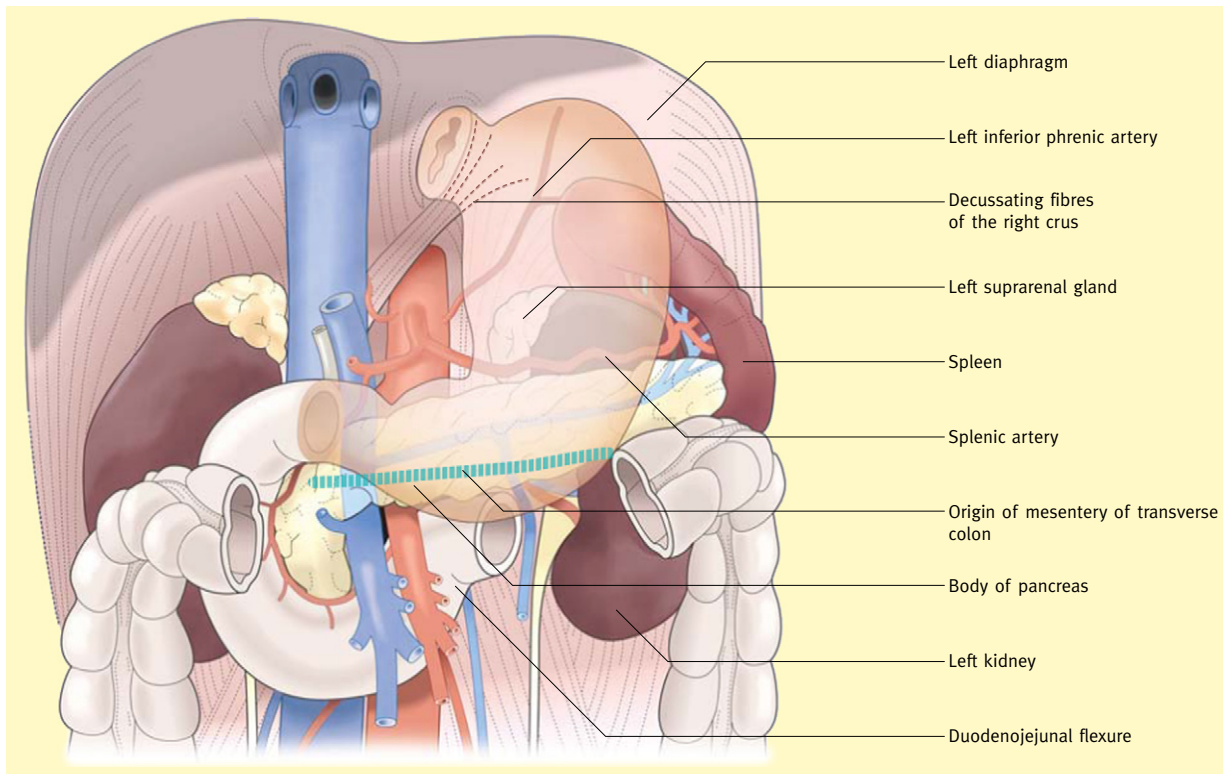
The *left grastroepiploic artery* and the *short gastric arteries* originate from the splenic artery.

The corresponding veins, running with these vessels, drain into the portal system, mostly either into the splenic or superior mesenteric vein, although some pass directly into the portal vein.
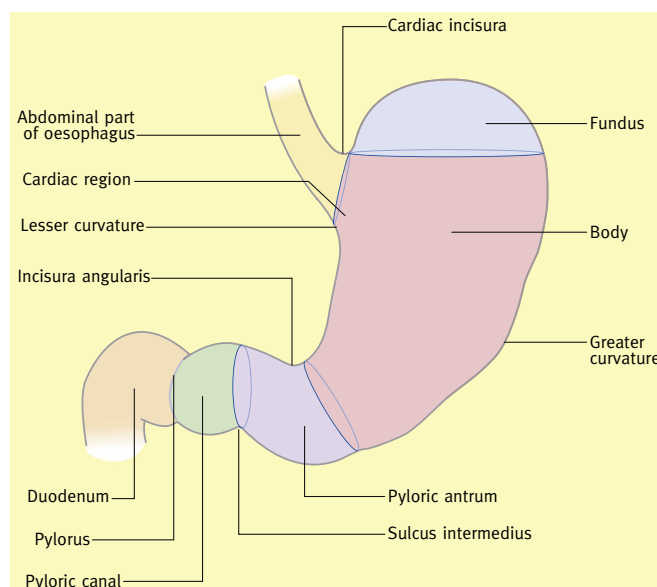
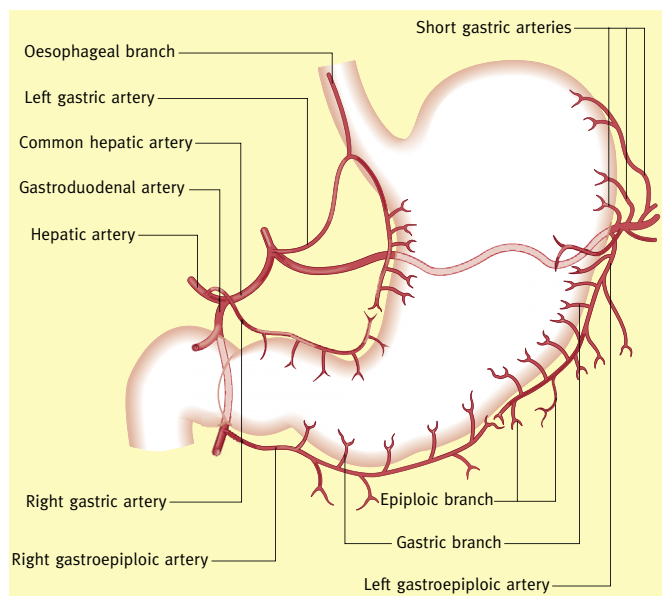**Figure 1** The parts of the stomach. (From Gray's Anatomy 40th edition).

Figure 2 Posterior relations of the stomach. (From Gray's Anatomy 40th edition).

Note that the left gastric artery also gives off an oesophageal branch, which passes through the oesophageal hiatus of the diaphragm to supply the lower oesophagus. It is accompanied by the corresponding oesophageal vein, a tributary of the left gastric vein, and which anastomoses with oesophageal veins draining into the azygos system. In portal hypertension, these venous anastomoses dilate into varices in the lower oesophagus and at the cardia — an important and dangerous cause of haematemesis.

Lymphatic drainage follows the usual rule of accompanying the blood supply of the organ. It passes primarily to lymph nodes along the gastric curvatures. Spread into the thoracic duct may result in palpable secondary deposits from a gastric cancer being felt in the left supraclavicular region.

Figure 3 Arterial supply of the stomach. (From Gray's Anatomy 40th edition).
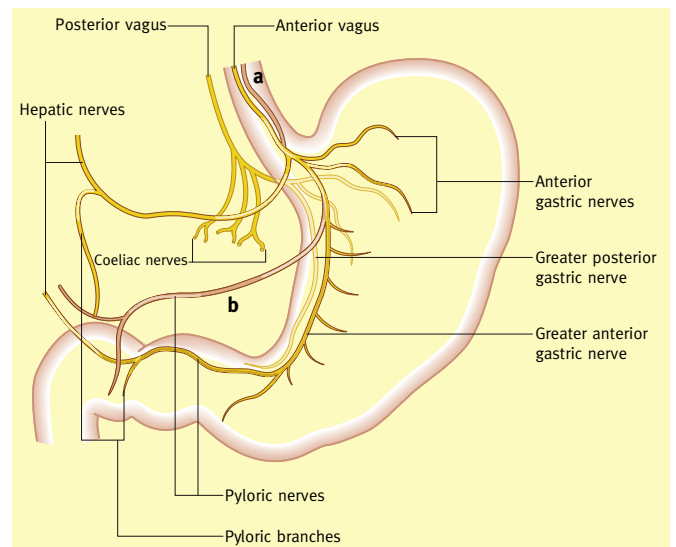
Figure 4 Distribution of the vagal nerves to the stomach. The two commonest variations in the anterior vagus are shown in pink. (**a**) Multiple main trunks. (**b**) Low origin of the hepatic/pyloric branch lying close to the lesser curvature. (From Gray's Anatomy 40th edition).

542

Nerve supply

Efferent sympathetic fibres pass from the stomach accompanying the blood vessels to the coeliac ganglia and are transmitted thence to spinal segments T5 to 12. They account for the ill-defined referral of gastric pain to the epigastrium and lower chest.

The parasympathetic gastric motor and secretomotor fibres are transmitted in the anterior and posterior vagi, which enter the abdomen through the oesophageal hiatus (Figure 4). The anterior vagus also gives off the hepatic branch, which is motor to the gall bladder. ◆

FURTHER READING

Ellis H. Anatomy of the oesophagus. *Surgery* 2011; **29**: 000–000.