Anatomy of the stomach

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Abstract

The stomach is the widest part of the alimentary canal. It is a sac-like structure that is continuous proximally with the abdominal oesophagus and distally with the duodenum. The stomach is ensleeved in peritoneum. The proximal and distal ends of the stomach are relatively immobile due to their fixity to nearby structures. Elsewhere the stomach shows appreciable mobility. The principal functions of the stomach are (i) to act as a receptacle and reservoir for ingested food and to release the food into the duodenum in small and physiologically appropriate amounts; (ii) to secrete hydrochloric acid and proteolytic enzymes that initiate protein digestion and neutralize many harmful bacteria in the ingested food; and (iii) to churn the ingested food and soften it by means of gastric juice to produce a liquefied mixture termed *chyme*.

Embryologically the stomach is derived entirely from the foregut and this is reflected in its blood supply coming wholly from the coeliac axis. The past two decades have seen a dramatic decline in the need for surgical intervention in acid-peptic disease. This has been due largely to the advent of proton-pump inhibitors and to the discovery of a medically treatable microbial cause for most cases of peptic ulcer disease. In the present day, operations for gastric neoplastic disease and bariatric surgery collectively account for most of the major gastric surgical procedures in adults.

This article describes in detail the surgically-relevant topographical anatomy of the stomach including its blood supply and lymphatic drainage.

Keywords Antrum; fundus; gastric blood supply; lesser sac; lymphatic drainage; pylorus; stomach bed

External features

The stomach lies largely in the left hypochondrial region under cover of the lower part of the rib cage. The lower and distal part of the stomach, however, lies in the epigastric and upper umbilical regions of the abdomen. The stomach is a distensible organ. In the adult, it has an average capacity of 1.5 litres. The stomach is approximately J-shaped, although in certain individuals it may lie transversely when it is known as a steer-horn stomach. The size, shape and position of the stomach can vary considerably, depending on the posture of the individual and on the state of fullness of the stomach.

The empty stomach appears flattened. It presents anterior and posterior surfaces, which are separated from each other by the greater and lesser curvatures (Figure 1). The lesser curvature forms the upper right border of the stomach while the greater curvature forms the lower left border. The stomach has two openings or orifices. The proximal one is termed the cardiac orifice through which the stomach communicates with the oesophagus. The distal orifice is termed the pyloric orifice and this lies at the gastroduodenal junction. The regions of the stomach adjacent to the cardiac and pyloric openings are known as the cardia and pylorus respectively. The main parts of the stomach are the fundus, body and pyloric part.

The various parts of the stomach (Figure 1) have physiological differences and are taken into account by the endoscopist, radiologist and surgeon in localization of gastric pathologies.

The fundus of the stomach is the part which projects upwards above the level of the cardiac orifice. Lying to the left of the abdominal oesophagus, it makes contact with the left dome of the diaphragm. Two-thirds of the way from the cardiac orifice along the lesser curvature of the stomach is a distinct notch, the angular notch (incisura angularis). The body of the stomach extends from the cardiac orifice to the level of the angular notch. It is the largest part of the stomach and is the part that contains in its inner lining, the parietal cells which secrete HCl. The pyloric part of the stomach extends from the angular notch to the gastroduodenal junction. It comprises the pyloric antrum proximally and the pyloric canal distally. The distal end of the pyloric canal features a very distinct ring of sphincter muscle. It is immediately proximal to the pyloric orifice, and can be easily felt. It is greatly thickened in the condition of infantile hypertrophic pyloric stenosis. The position of the pyloric sphincter is indicated by the presence of a fairly constant vein, the prepyloric vein (of Mayo) that runs vertically on the anterior surface of the pylorus.

The pyloric antrum produces the hormone gastrin, which is responsible for the hormonal phase of gastric acid secretion.

Attached along the lesser curve is the lesser omentum, a double-layered peritoneal sheet that extends from the lesser curvature of the stomach to the visceral surface of the liver. At the lesser curvature the two leaves of the lesser omentum diverge; the anterior leaf covering the anterior wall of the stomach and the posterior leaf adhering to the posterior wall. At the greater curvature the two leaves meet to form the greater omentum. The greater omentum hangs down like an apron from the greater curvature. The lesser and greater omenta contain the blood vessels, lymphatics and nerve supply of the stomach.

Topographical relations

In addition to the lesser and greater omenta which are attached to the lesser and greater curvatures of the stomach, respectively, other important topographical relations of the stomach are as follows.

Posterior relations: situated immediately behind the stomach and lesser omentum is the lesser sac (also known as the omental bursa). The lesser sac is, in effect, a diverticulum or recess of the general peritoneal cavity (also known as the greater sac). The window of communication between the lesser sac and general peritoneal cavity is termed the epiploic foramen or (foramen of Winslow). Behind the peritoneum that forms the posterior wall of the lesser sac are a number of structures which collectively make up the 'stomach bed' (Figure 2). These structures include the diaphragmatic crura, left dome of the diaphragm, the initial part of the abdominal aorta with the coeliac axis originating from it, the upper part of the left kidney, the left suprarenal gland, the pancreas, the medial surface of the spleen and the upper surface of the transverse mesocolon.

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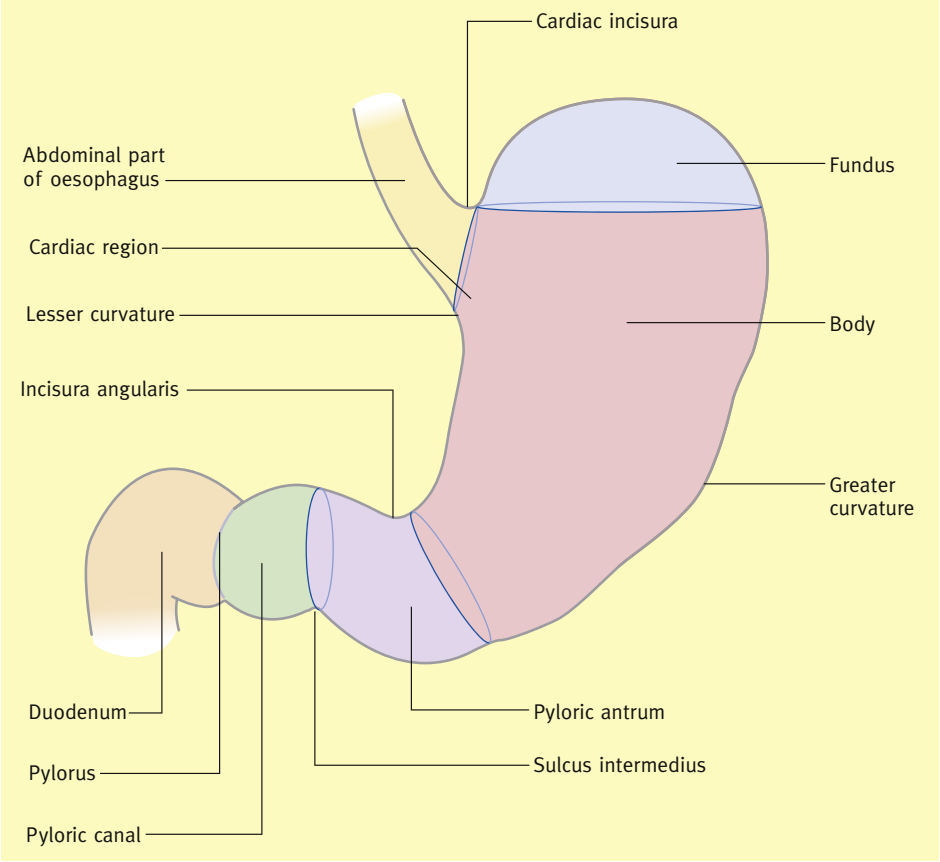

Figure 1 The borders and regions of the stomach (viewed from the front).

Anterior relations: the stomach is related anteriorly to a number of structures but is separated from these structures by the greater sac. The portion of the stomach lying under cover of the left rib cage is related anteriorly to the left hemi-diaphragm. Further to the left the anterior wall of the stomach is related to the medial surface of the spleen. In the epigastric region the stomach and lesser omentum are overlapped by the left lobe of the liver. Lower still the anterior wall of the stomach is related to the posterior surface of the anterior abdominal wall.

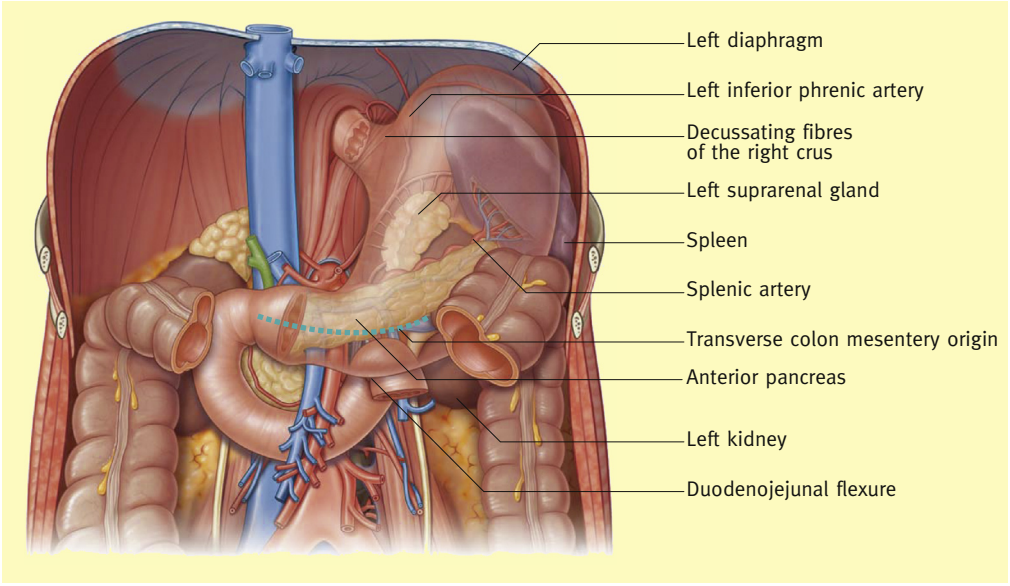

Figure 2 Posterior topographical relations of the stomach.