Textbook of

Volume 3

Textbook of

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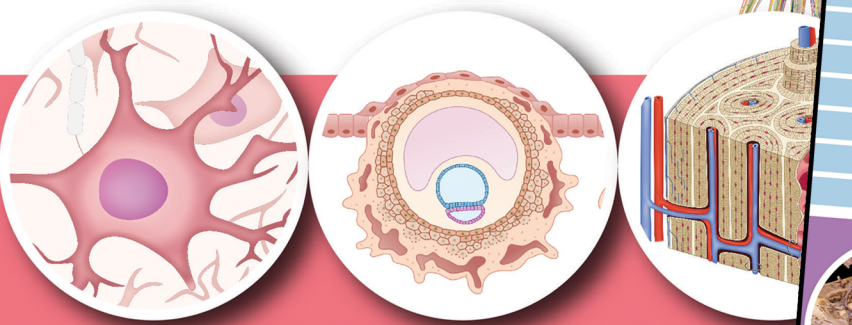
Textbook of

Volume 1

Human Anatomy

As per Competency-Based Dynamic Curriculum (CBDC)

- GENERAL ANATOMY
- HISTOLOGY
- EMBRYOLOGY
- UPPER LIMB



Vaishali Khobragade
Prajakta Udmale

Foreword
Dharmendra B Sharma

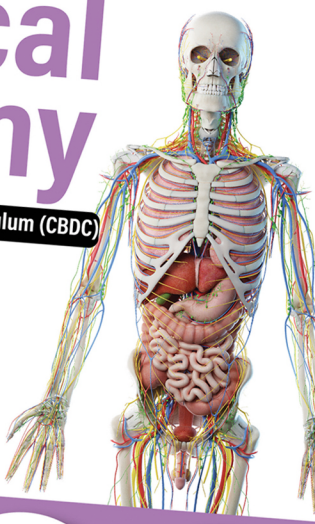
Textbook of

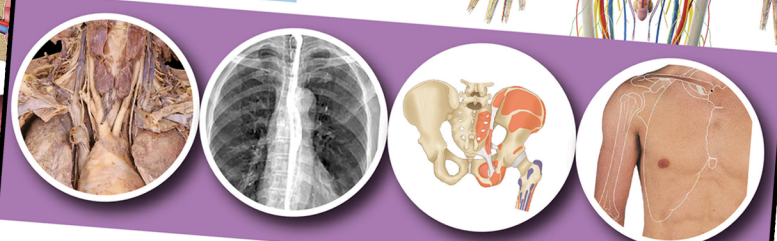
Complimentary Book

Practical Anatomy

As per Competency-Based Dynamic Curriculum (CBDC)

- GENERAL HISTOLOGY
- UPPER LIMB
- HEAD, NECK AND FACE
- CENTRAL NERVOUS SYSTEM
- THORAX
- LOWER LIMB
- ABDOMEN AND PELVIS





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Contents

VOLUME 1

SECTION 1: GENERAL ANATOMY

140

CHAPTER

Stomach

Specific Learning Objectives

Hom UGAN7.4 and 7.37 **At the end of the session, student should be able to:**

1. Describe the morphology of stomach
2. Describe the interior of stomach
3. Describe the relations of stomach
4. Describe the blood and nerve supply of stomach
5. Explain the applied anatomy of stomach
6. Enumerate the homeopathic drugs related to structures of abdomen and pelvis
7. Enumerate the rubrics related to structures of abdomen and pelvis

INTRODUCTION

The stomach, also known as the *gaster* (from the Greek "belly") or *venter*, is a vital organ within the alimentary system. It serves as a muscular pouch responsible for the initial digestion of food.

Location

The stomach resides obliquely in the upper left quadrant of the abdomen, spanning the epigastric, umbilical, and left hypochondriac regions. Primarily, it is situated beneath the protection of the left costal margin and the ribs.

Shape and Position

The shape of the stomach is influenced by the tension of its muscles and the overall body tone. It exhibits distinct forms:

- **J-shaped:** When empty
- **Pyriform (pear-shaped):** When partially distended
- **Steer horn:** In individuals with obesity

Observation of the stomach's shape can be achieved through radiographic imaging following the administration of a barium meal.

Size and Capacity

The stomach's size and capacity vary throughout life stages:

- **At birth:** Approximately 30 mL
- **During puberty:** Around 1 liter
- **In adulthood:** Approximately 1.5 liters

EXTERNAL FEATURES

The stomach exhibits several external features including two orifices, two curvatures, two surfaces, and two distinct parts **(Fig. 140.1)**.

Two Orifices

Cardiac Orifice

Located at the lower end of the esophagus, behind the left 7th costal cartilage approximately 2.5 cm from its junction with the sternum, at the level of vertebra T11. Although sphincteric action is physiologically evident at this site, a distinct sphincter cannot be anatomically demonstrated.

Pyloric Orifice

Opens into the duodenum. In an empty stomach and supine position, it lies approximately 1.2 cm to the right

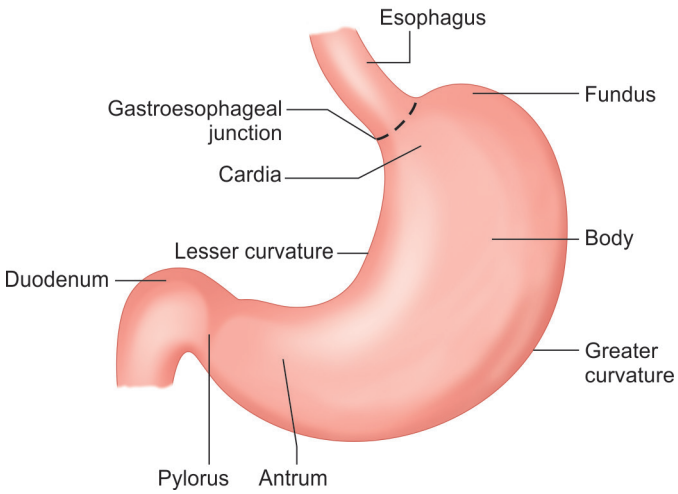

Fig. 140.1: Structure of stomach.

of the median plane, at the level of the lower border of vertebra L1 or the transpyloric plane. Its position is marked on the stomach's surface by:

- A circular groove (pyloric constriction) produced by the underlying pyloric sphincter.
- The prepyloric vein of Mayo, a constriction lying in front of the pyloric constriction.

Two Curvatures

- **Lesser curvature:** Concave and forms the right border of the stomach, providing attachment to the lesser omentum.
- **Greater curvature:** Convex and forms the left border of the stomach, providing attachment to the greater omentum, gastrosplenic ligament, and gastrophrenic ligament.

Two Surfaces

- Anterior or Anterosuperior Surface**:** Faces forwards and upwards.
- Posterior or Posteroinferior Surface**:** Faces backwards and downwards.

Two Parts

Cardiac Part

Subdivided into the fundus and body.

Fundus

Area above the horizontal line extending from the cardiac orifice to the greater curvature, known as the 'bare area' of the stomach.

Body

Lies between the fundus and the pyloric antrum, capable of significant distention along the greater curvature. It houses gastric glands containing mucous cells, chief (peptic or zymogenic) cells secreting digestive enzymes, and parietal (oxyntic) cells secreting hydrochloric acid (HCl).

Pyloric Part

Divided into the pyloric antrum and pyloric canal.

Pyloric Antrum

Separated from the pyloric canal by an inconstant sulcus, the sulcus intermedius, present on the greater curvature. Approximately 7.5 cm long, it contains pyloric glands rich in mucous cells.

Pyloric Canal

Narrow tubular segment, about 2.5 cm long, terminating at the pylorus on its right end.

INTERIOR OF STOMACH

Features

- **Gastric rugae and gastric pits:** When the stomach is empty, its mucosa forms folds known as gastric rugae, which run longitudinally along the lesser curvature and may appear irregular elsewhere. These rugae flatten out when the stomach is distended. Upon closer inspection of the mucosal surface, numerous small depressions known as gastric pits can be observed with the aid of a hand lens. These pits serve as openings for the gastric glands.
- **Gastric canal (Magenstrasse):** The section of the stomach's lumen that aligns with the lesser curvature, characterized by longitudinal rugae, is referred to as the gastric canal or Magenstrasse. This canal facilitates the swift passage of swallowed liquids directly along the lesser curvature to the lower part of the stomach before dispersing to other areas. Consequently, the lesser curvature endures the most exposure to swallowed liquids, rendering it susceptible to peptic ulcers. Thus, it is prudent to be mindful of your beverage consumption.
- ***Layers of the stomach wall:*** Submucous Coat**:** Comprising connective tissue, arterioles, and nerve plexus.

Muscle Coat

- Longitudinal fibers predominantly line the curvatures.
- Inner circular fibers encircle the body and thicken at the pylorus, forming the pyloric sphincter.
- The deepest layer consists of oblique fibers that loop over the cardiac notch, aiding in food mixing with gastric juices **(Fig. 140.2)**.

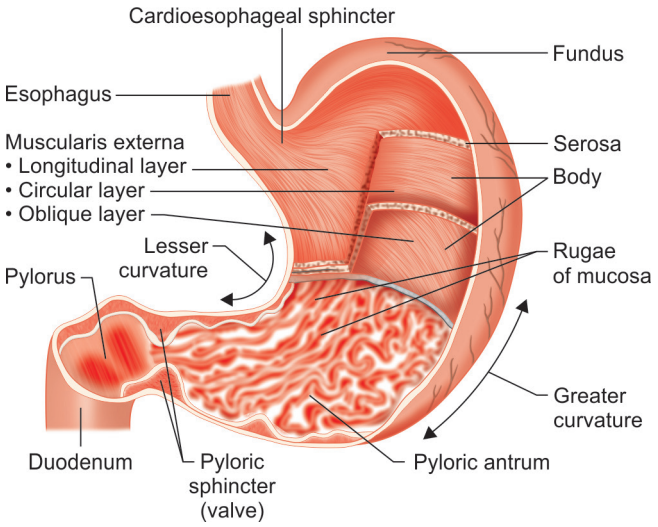

Fig. 140.2: Internal features of stomach.

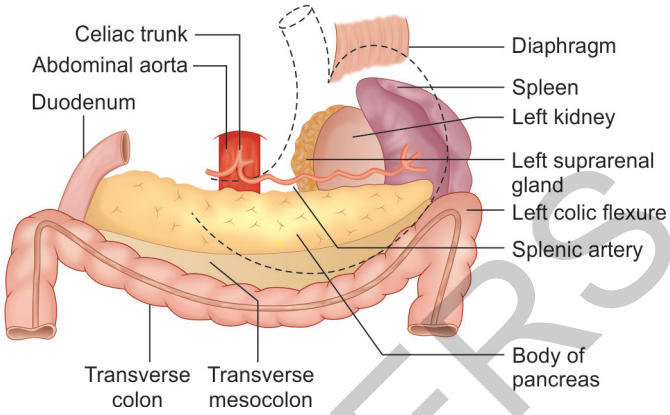

Fig. 140.3: Stomach bed.

RELATIONS OF STOMACH

Peritoneal Relations

- **Lesser omentum:** Peritoneum lines both surfaces of the stomach. At the lesser curvature, the layers of peritoneum converge, becoming continuous with the lesser omentum.
- **Greater omentum:** Along most of the greater curvature, the peritoneal layers merge to form the greater omentum.
- **Gastrosplenic ligament:** Near the fundus, the peritoneal layers coalesce to form the gastrosplenic ligament.
- **Gastrophrenic ligament:** Near the cardiac end, the peritoneum on the posterior surface extends onto the diaphragm as the gastrophrenic ligament.
- **Bare area of the stomach:** Cranial to the gastrophrenic ligament, a small portion of the posterior stomach surface directly contacts the diaphragm (left crus). The greater and lesser curvatures, along the peritoneal reflections, are also bare.

Visceral Relations

- **Anterior:** The diaphragm, liver, and anterior abdominal wall.
- **Posterior:** Structures comprising the stomach bed, all separated from the stomach by the lesser sac cavity, including **(Fig. 140.3)**: (a) Diaphragm (b) Left kidney (c) Left suprarenal gland (d) Pancreas (e) Transverse mesocolon (f) Splenic flexure of the colon (g) Splenic artery (h) Spleen.

BLOOD SUPPLY AND LYMPHATIC DRAINAGE

Arterial Supply

The stomach receives its blood supply from various arteries:

Lesser Curvature

- **Left gastric artery:** A branch of the celiac trunk.
- **Right gastric artery:** A branch of the proper hepatic artery.

Greater Curvature

- *Right gastroepiploic artery:* A branch of the gastroduodenal artery.
- *Left gastroepiploic artery*: A branch of the splenic artery.

Fundus

The fundus is primarily supplied by 5 to 7 short gastric arteries, which are also branches of the splenic artery **(Fig. 140.4)**.

Venous Drainage

The venous drainage of the stomach is directed towards the portal system, superior mesenteric vein, and splenic vein:

- Right and left gastric veins drain into the portal vein.
- The right gastroepiploic vein terminates in the superior mesenteric vein.
- The left gastroepiploic and short gastric veins conclude in the splenic vein.

Lymphatic Drainage

The lymphatic drainage of the stomach is organized into four main territories:

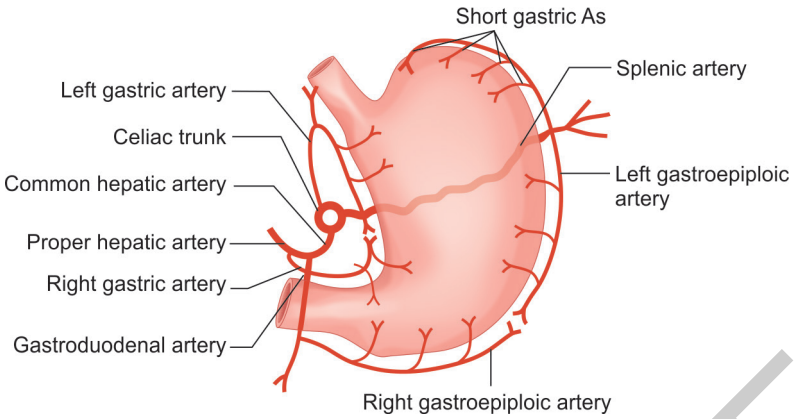

Fig. 140.4: Arterial supply of stomach.

1. *Area A:* Left Gastric Nodes, located at the lesser curvature of the stomach, drain the right two-thirds of the stomach and the abdominal part of the esophagus.
2. *Area B:* Pancreaticosplenic nodes, positioned at the upper part of the greater curvature of the stomach, drain the upper left part of the stomach.
3. *Area C:* Right Gastroepiploic Lymph Nodes, situated at the lower part of the greater curvature of the stomach, drain the lower two-thirds of the stomach.
4. *Area D:* Pyloric Nodes, located at the lower part of the pyloric stomach, drain the pyloric area.

Lymph vessels from all stomach areas converge to the celiac nodes, and then proceed through the intestinal lymph trunk to reach the cisterna chyli.

NERVE SUPPLY

The stomach receives innervation from both sympathetic and parasympathetic nerves.

- The ***sympathetic nerves*** supplying the stomach originate from T6 to T10 of the spinal cord and travel via the greater splanchnic nerves, celiac, and hepatic plexuses. These nerves serve several functions:
  - They regulate vasomotor activity.
  - They provide motor innervation to the pyloric sphincter, while exerting inhibitory effects on the rest of the gastric musculature.
  - They serve as the primary pathway for transmitting pain sensations from the stomach.
- The ***parasympathetic nerves*** supplying the stomach arise from the vagus nerve, passing through the esophageal plexus and gastric nerves. The anterior gastric nerve, composed of one or two trunks, predominantly contains left vagal fibers, while the posterior gastric nerve, also comprising one to two trunks, primarily contains right vagal fibers. These nerves perform the following functions:
  - They provide motor and secretomotor innervation to the stomach.
  - Stimulation of these nerves leads to increased motility of the stomach and secretion of gastric juice rich in pepsin and hydrochloric acid (HCl).
  - They exert inhibitory effects on the pyloric sphincter.

FUNCTIONS OF STOMACH

- **Reservoir and mixing:** The stomach primarily serves as a reservoir for food storage and facilitates the mixing of food through its muscular contractions.
- **Peristaltic movements:** Through peristaltic movements, the stomach softens and thoroughly mixes the ingested food with gastric juice, aiding in digestion.
- **Gastric juice production:** Gastric glands within the stomach lining produce gastric juice, which contains enzymes crucial for the digestion of food.
- **Hydrochloric acid secretion:** Gastric glands also secrete hydrochloric acid, which plays a dual role by aiding in digestion and serving as a defense mechanism against harmful microorganisms present in ingested food and beverages.
- **Mucus production:** Specialized cells in the stomach lining produce mucus, forming a protective barrier that shields the gastric mucosa from the corrosive effects of hydrochloric acid.
- **Absorption:** While the primary site of nutrient absorption is the small intestine, the stomach does absorb certain substances such as alcohol, water, salt, and select drugs.
- **Production of intrinsic factor:** The stomach produces intrinsic factor, a glycoprotein essential for the absorption of vitamin B12 in the small intestine, thereby playing a critical role in maintaining overall health and preventing deficiencies.

Clinical Anatomy

- **Gastric pain localization:** Pain originating from the stomach is typically felt in the epigastrium, the region of the abdomen located just below the sternum.
- **Gastritis:** Gastritis refers to the inflammation of the gastric mucosa, which lines the stomach. This inflammation can manifest as either acute or chronic and may result from various factors such as infections, medications, or autoimmune conditions.
- **Gastroenteritis:** Gastroenteritis is characterized by inflammation of both the stomach and the small intestine. It commonly presents with symptoms such as abdominal pain, nausea, vomiting, diarrhea, and sometimes fever. Viral or bacterial infections are often the underlying cause.
- **Peptic ulcer:** Peptic ulcers can develop in areas exposed to pepsin and hydrochloric acid, primarily within the stomach, the first part of the duodenum, or occasionally at the lower end of the esophagus. These ulcers result from an imbalance between protective and aggressive factors affecting the gastric mucosa.
- **Gastric ulcers and lifestyle:** Gastric ulcers, particularly those in the stomach, are often associated with factors such as chronic stress, irregular eating habits, excessive consumption of NSAIDs (nonsteroidal anti-inflammatory drugs), and smoking. While individuals who lead fast-paced lifestyles may experience increased stress, it is the combination of factors rather than speed alone that contributes to the development of gastric ulcers.
- **Pyloric obstruction:** Pyloric obstruction refers to the narrowing or blockage of the pylorus, the opening between the stomach and the small intestine. This condition can lead to visible peristalsis, or rhythmic contractions of the stomach muscles, observed in the epigastrium. Additionally, vomiting after meals is a common symptom of pyloric obstruction due to the inability of food to pass from the stomach into the small intestine.

Homeopathic Remedies

Disease/Disorder	*Remedies*
Gastritis	Nux vomica, Arsenic, Robinis, Iris, Kali bichrom, Phosphorus, Bismuth
Gastric ulcers	Abies nigra, Nux vomica, Kali bichrom, Lyco, Carbo veg, Graphitis, Phosphorus

Homeopathic Rubrics

- Appetite increased in night: Stomach, Appetite
- Stomach, Constriction cardiac orifice swallowing on
- Stomach, Nausea riding in a carriage
- Stomach, Vomiting riding in.

Horizontal Integration with Physiology

Anatomy and physiology of stomach.

Problem-based Learning

Problem 1: A 38-years-old female came with the complaints of burning pain in the chest. She also has belching, nausea, regurgitation of food with discomfort in upper abdomen and bitter taste in mouth. What is the possible diagnosis?

Answer: Gastroesophageal reflux disease (GERD) **(Fig. 140.5)**.

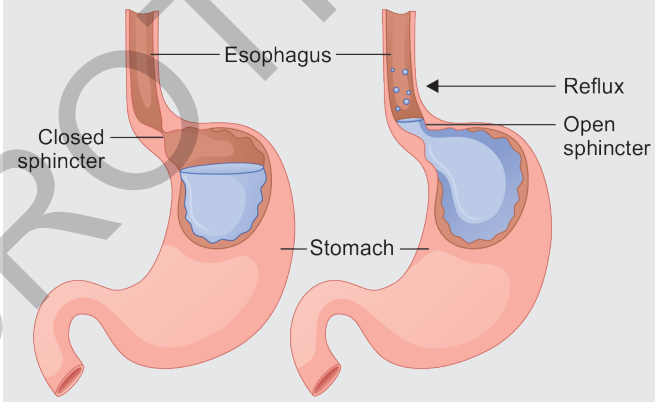

Fig. 140.5: Gastroesophageal reflux disease.

Problem 2: A 30-years-old man, complained of:
- Feeling fullness, bloating
- Pain in abdomen
- Heartburn
- Nausea and vomiting
- Indigestion
- Loss of appetite

What is the possible diagnosis?

Answer: Gastric ulcer.

Textbook of
Human Anatomy

Salient Features

- **Concise and Succinct Chapters:** Each chapter is meticulously created for clarity and brevity.
- **Competency-Based Dynamic Curriculum (CBDC) Compliance:** The entire book aligns with the CBDC framework, ensuring relevance and effectiveness in education.
- **Enhanced Visual Aids:** New, high-quality images, diagrams, and tables are incorporated to facilitate better understanding of complex concepts.
- **Crisp and Accessible Content:** The content is updated for clarity, making it easier for readers to follow and comprehend.
- **Clinical Anatomy:** Each chapter includes current clinical anatomy insights; enhancing practical knowledge.
- **Learning Objectives Aligned with Competency Table:** Topics are structured according to the competency table in the CBDC to meet specific learning outcomes.
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- **Structured Volume Arrangement:** The content is organized into three theory volumes and one practical volume, with each unit preceded by a competency table. Each volume concludes with multiple-choice questions (MCQs), short-answer questions (SAQs), and long-answer questions (LAQs). The practical volume features a competency table at the beginning and viva questions at the end.
- **Inclusion of Core Disciplines:** General Anatomy, Embryology, and Histology are included across the volumes, providing a comprehensive foundation for students.

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