MEDICAL EDUCATION RESOURCE

Abdominal Part of Oesophagus and Stomach

? Introduction

The **abdominal part of the oesophagus** is a short segment—only about **1.25 cm long**—forming the bridge between the thoracic oesophagus and the stomach.
It enters the abdomen through the **oesophageal opening of the diaphragm** at the **level of T10**, slightly to the **left of the median plane**, and ends at the **cardiac end of the stomach** (around T11).
The **right border** of this short segment continues with the **lesser curvature**, whereas the **left border** is separated from the **fundus** by the **cardiac notch**.
The oesophagus lies **anterior to the left crus of diaphragm** and the **inferior surface of the left lobe of the liver**.
Peritoneum covers it **anteriorly and on the left side**.

? Dissection Steps

1. Identify the stomach and trace it upward to find the abdominal part of the oesophagus.
2. Clean the oesophagus; note the stomach's parts – **cardiac end, fundus, body, and pyloric part**.
3. Trace the **right and left gastric arteries** along the **lesser curvature** and the **right and left gastroepiploic arteries** along the **greater curvature**.
4. Apply **two ligatures** each at the lower end of the oesophagus and pylorus, cut between them to detach the stomach.
5. Free it from any adherent peritoneum for detailed study.

? Histology of Abdominal Oesophagus

- **Mucosa:** Stratified squamous, non-keratinised epithelium.
  Lamina propria contains connective-tissue papillae.

- **Muscularis mucosae:** Longitudinal fibres, well developed in lower part.

- **Submucosa:** Mucus-secreting **oesophageal glands**.

- **Muscularis externa:**

  - Upper ? – striated muscle

  - Middle ? – mixed

  - Lower ? – smooth muscle
    (Inner circular and outer longitudinal layers)

- **Adventitia:** Connective tissue with capillaries.

?? Clinical Anatomy

- **Portosystemic anastomosis:**
  The lower oesophageal veins connect the **left gastric (? portal vein)** and **azygos system (? SVC)**.
  In **portal hypertension**, these enlarge into **oesophageal varices** ? may rupture ? **severe haematemesis**.

- **Achalasia cardia:**
  Failure of the lower oesophageal sphincter to relax due to neuromuscular incoordination ? **dysphagia** and **progressive dilatation above the cardia**.

- **Reflux oesophagitis:**
  Inflammation or ulceration from regurgitated acid; common cause of heartburn.

- **Vagal nerves:**
  - **Anterior gastric nerve (L vagus)** supplies anterior stomach.
  - **Posterior gastric nerve (R vagus)** supplies posterior surface.
    Both carry some sympathetic fibres from the greater splanchnic nerve.

? Location

The **stomach** lies chiefly in the **epigastric** and **left hypochondriac regions**, extending into the **umbilical region** when distended.
It connects the **abdominal part of the oesophagus** (at the cardiac orifice, T11) to the **duodenum** (via pyloric orifice, L1).
Its position varies with posture and degree of filling: more **vertical when empty**, more **horizontal when full**.

?? External Features

The stomach is **J-shaped** and has:

- **Two openings:**
  - *Cardiac orifice* (joins oesophagus)
  - *Pyloric orifice* (leads into duodenum)
- **Two curvatures:**
  - *Lesser curvature* (right, concave, shorter)
  - *Greater curvature* (left, convex, longer)

- **Two surfaces:**
  - *Anterior surface* – faces anterior abdominal wall and diaphragm
  - *Posterior surface* – forms part of the *stomach bed*
- **Two notches:**
  - *Cardiac notch* (between oesophagus and fundus)
  - *Angular notch* (incisura angularis on lesser curvature)

? Relations of the Stomach

Anteriorly:

- Left lobe of liver
- Diaphragm
- Anterior abdominal wall

Posteriorly (Stomach bed):

- Left crus of diaphragm
- Spleen
- Left suprarenal gland
- Upper pole of left kidney
- Splenic artery

- Pancreas
- Transverse mesocolon

? Blood Supply

Arterial Supply:

- **Lesser curvature:**
  - *Left gastric artery* (from coeliac trunk)
  - *Right gastric artery* (from hepatic artery)
- **Greater curvature:**
  - *Left gastroepiploic artery* (from splenic artery)
  - *Right gastroepiploic artery* (from gastroduodenal artery)
- **Fundus:**
  - *Short gastric arteries* (from splenic artery)

Venous Drainage:

- Corresponds to arteries and drains into **portal vein**:
  - Left and right gastric veins ? portal vein
  - Left gastroepiploic and short gastric veins ? splenic vein
  - Right gastroepiploic vein ? superior mesenteric vein

? Lymphatic Drainage

- **Along lesser curvature:**
  ? Left and right gastric nodes ? coeliac nodes

- **Along greater curvature:**
  ? Right and left gastroepiploic nodes ? pancreaticosplenic nodes

- **Pyloric region:**
  ? Pyloric nodes ? hepatic and coeliac nodes
  Final drainage: into the **coeliac lymph nodes**.

? Nerve Supply

- **Parasympathetic (vagus):**
  - *Left vagus ? anterior gastric nerve* (anterior surface)
  - *Right vagus ? posterior gastric nerve* (posterior surface)
    Function: *Secretion and motility stimulation.*

- **Sympathetic:**
  - From *T6–T9* via *greater splanchnic nerves* and *coeliac plexus*.
    Function: *Vasoconstriction and pain conduction.*

? Interior of Stomach

- **Mucosa:**
  - Forms *gastric folds (rugae)* when empty.

    - Has *gastric pits* opening into *gastric glands*.

- **Parts (internally):**
    - *Cardiac part* — mucus glands.
    - *Fundus and body* — oxyntic glands (chief and parietal cells).
    - *Pyloric part* — mucus and G-cells (gastrin secretion).

?? Functions of Stomach

- Temporary **storage** of food.
- **Mechanical mixing** and **chemical digestion** (by gastric juice).
- Secretion of **HCl** (by parietal cells), **pepsinogen**, **intrinsic factor**, and **gastrin**.
- Converts food into **chyme** for duodenal passage.
- Acts as **bactericidal** due to acidity.

? Clinical Anatomy

- **Gastric ulcer:** common on *lesser curvature*; may erode *left gastric artery*.
- **Pyloric stenosis:** hypertrophy of *pyloric sphincter* causing projectile vomiting (infants).
- **Hiatus hernia:** part of stomach herniates through *oesophageal hiatus*.
- **Gastric carcinoma:** spreads via *lymphatics*, *blood*, or *direct invasion*.

- **Vagotomy:** division of vagus to reduce acid secretion in peptic ulcer disease.
- **Peptic ulcer:** commonly at junction of body and pylorus; aggravated by acid and H. pylori infection.
- **Gastric dilation:** acute enlargement after pyloric obstruction or overeating.

? Histology of the Stomach

Mucosa

- **Epithelium:** simple columnar cells that secrete mucus and form numerous **gastric pits**; each pit opens into 3–5 **gastric glands**.
- **Lamina propria:** loose connective tissue rich in capillaries and lymphocytes between glands.
- **Muscularis mucosae:** thin inner circular and outer longitudinal smooth-muscle layers aiding glandular secretion.

Types of Gastric Glands

REGION	GLAND TYPE	PRINCIPAL CELLS AND SECRETIONS
Cardiac	Cardiac glands	mucus cells ? protective mucus

REGION	GLAND TYPE	PRINCIPAL CELLS AND SECRETIONS
Fundus and body	Oxyntic (or fundic) glands	• **Chief cells** ? pepsinogen • **Parietal cells** ? HCl + intrinsic factor • **Mucous neck cells** ? mucus • **Entero-endocrine cells** ? gastrin, somatostatin
Pyloric	Pyloric glands	mucus cells + G cells ? gastrin

Submucosa

- Dense irregular connective tissue with blood and lymph vessels, and **Meissner's (submucosal) plexus**.

Muscularis externa

- **Three layers:** inner oblique, middle circular, outer longitudinal.
- **Auerbach's (myenteric) plexus** lies between circular and longitudinal layers ? controls motility.

Serosa

- Thin connective tissue covered by **mesothelium** (visceral peritoneum).

Microscopic identifiers

- Prominent rugae in mucosa.
- Deep gastric pits in pyloric region.
- Large acidophilic parietal cells giving fundic mucosa a granular look.

? Development of the Stomach

1. **Origin:** from the **foregut** (endodermal gut tube) in the 4th week of embryonic life.
2. **Initial form:** a fusiform dilatation of the foregut suspended by dorsal and ventral mesenteries.
3. **Rotations:**
    - **1st rotation (90° clockwise):** brings the **left side anterior** ? forms the anterior (left vagal) and posterior (right vagal) surfaces.
    - **2nd rotation (longitudinal axis):** pulls pyloric end upward and rightward, cardiac end downward and leftward ? establishes the adult orientation.
4. **Growth asymmetry:** posterior wall grows faster ? forms the **greater curvature**; anterior forms the **lesser curvature**.
5. **Mesenteries transform:**
    - **Dorsal mesogastrium ?** greater omentum, gastrosplenic and splenorenal ligaments.
    - **Ventral mesogastrium ?** lesser omentum and falciform ligament.
6. **Final position:** oblique, with long axis from above-left to below-right.
7. **Endoderm** forms epithelium and glands; **splanchnic mesoderm** forms muscle and connective tissue.

?? Molecular Regulation of Gut-tube Development

Gut-tube patterning follows a series of **molecular gradients** that specify regional identity:

- **Retinoic acid (RA):** establishes the **anterior-posterior axis** of the gut.
    - High RA ? posterior (gut hind-end) identity; low RA ? foregut.
- **Hox genes:** activated by RA; determine segmental pattern (oesophagus ? rectum).
- **Sonic hedgehog (Shh):** expressed in gut endoderm; signals to surrounding mesoderm to form distinct layers and organ buds.
- **Bone morphogenetic proteins (BMPs):** work with Shh to differentiate mesenchymal cells into smooth-muscle and connective tissue.
- **Fibroblast growth factors (FGFs):** especially FGF4 and FGF10 guide regional outgrowths (e.g. stomach, liver buds).
- **Wnt signalling:** crucial for gut tube elongation and rotation.
- **Notch and Hes-1:** regulate specific cell lineages (chief vs entero-endocrine cells).
- **Barx1** (from mesenchyme): suppresses Wnt in foregut ? permits stomach formation rather than intestine.

Defects in these pathways ? **atresias, duplications, abnormal rotations**, and congenital stenoses.

? Mnemonics (for easy recall)

1. Parts of the stomach:

? *“Can Funny Boys Play?”*

- **C** – Cardiac part
- **F** – Fundus
- **B** – Body
- **P** – Pyloric part

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2. Layers of the stomach wall:

? *“M S M S”* ? (from inside outward)

- **M** – Mucosa
- **S** – Submucosa
- **M** – Muscularis externa (oblique / circular / longitudinal)
- **S** – Serosa

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3. Arterial supply of stomach:

? *“2 Gastric + 2 Gastroepiploic + Shorts”*

- Left & Right **Gastric arteries** ? Lesser curvature
- Left & Right **Gastroepiploic arteries** ? Greater curvature
- **Short gastric arteries** ? Fundus

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4. Nerve supply mnemonic:

? “Vagus loves motion, Splanchnic loves constriction.”

- **Vagus (parasympathetic):** increases motility + secretion
- **Splanchnic (sympathetic):** vasoconstriction + pain pathway

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5. Layers of gastric mucosa glands (Fundic type):

? “M C P E”

- **M** – Mucous neck cells
- **C** – Chief (zymogenic) cells
- **P** – Parietal (oxyntic) cells
- **E** – Entero-endocrine cells

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6. Lymphatic drainage mnemonic:

? “4 Routes ? Celiac end”

- Left gastric nodes
- Right gastric nodes
- Gastroepiploic nodes
- Pyloric nodes ? all drain to **Celiac nodes**

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7. Rotation of stomach (development):

? “Left comes Front; Pylorus goes Right & Up.”

– Describes the 90° rotation bringing left surface anteriorly and shifting pylorus to the right.

? Facts to Remember

- The **abdominal part of oesophagus** is about **1.25 cm long** and ends at the **cardiac orifice** (T11).
- The **stomach** lies mainly in **epigastric and left hypochondriac regions**, partly in umbilical region when full.
- It has **two orifices**, **two curvatures**, **two surfaces**, and **two notches** (cardiac & angular).
- The **fundus** is the dome above the cardiac orifice, usually gas-filled.
- The **pyloric canal and antrum** regulate gastric emptying into the duodenum.
- **Peritoneal covering:** complete, except at attachment sites of omenta.
- **Arterial supply:** rich anastomoses along both curvatures — mainly from **coeliac trunk branches**.
- **Venous drainage:** all veins ? portal vein (directly or via splenic/SMA).
- **Lymphatics:** follow arteries ? end in **celiac group of lymph nodes**.
- **Nerve supply:**
    - *Parasympathetic (vagus)* ? motility + secretion
    - *Sympathetic (T6–T9 via greater splanchnic)* ? vasoconstriction + pain
- **Histology:** mucosa forms gastric pits and glands; parietal cells secrete HCl + intrinsic factor; chief cells secrete pepsinogen.

- **Development:** from foregut; rotates 90° ? left surface anterior; posterior wall grows faster ? greater curvature.
- **Molecular control:** RA, Hox, Shh, FGF, Barx1 genes coordinate stomach identity and curvature formation.
- **Clinical correlations:**
  - *Hiatus hernia* ? protrusion through diaphragm.
  - *Achalasia cardia* ? failure of LES relaxation.
  - *Gastric ulcer* ? often on lesser curvature; may erode left gastric artery.
  - *Pyloric stenosis* ? hypertrophy of circular muscle in infants.
  - *Vagotomy* ? reduces acid secretion in peptic ulcer disease.

?? Clinicoanatomical Problems

1.
A 50-year-old man complains of **pain radiating behind the sternum after meals and lying down**.
? Likely cause: **Gastro-oesophageal reflux (GERD)** due to failure of the **lower oesophageal sphincter** or **hiatus hernia**.
? Mechanism: acid reflux from the stomach into the oesophagus causes **reflux oesophagitis**.

2.
A chronic alcoholic presents with **severe vomiting of blood (haematemesis)**.
? Most probable lesion: **ruptured oesophageal varices**.
? Cause: **portal hypertension**; communication between **left gastric vein (portal)** and

oesophageal veins (systemic) enlarges ? rupture.

3.

A 45-year-old patient has **difficulty in swallowing liquids and solids** with dilatation of the oesophagus on X-ray.

? Diagnosis: **Achalasia cardia**.

? Cause: defective **myenteric (Auerbach's) plexus** ? failure of relaxation of **lower oesophageal sphincter**.

4.

A 60-year-old woman complains of **epigastric pain relieved by food** and a **black, tarry stool**.

? Diagnosis: **Gastric ulcer on lesser curvature** (posterior wall).

? Complication: erosion of **left gastric artery** ? haemorrhage.

5.

A 3-week-old infant presents with **projectile non-bilious vomiting after feeding**.

? Diagnosis: **Congenital hypertrophic pyloric stenosis**.

? Pathology: hypertrophy of **circular muscle layer** of pylorus obstructs gastric outlet.

6.

A 38-year-old obese man has **upper abdominal pain after heavy meals** and an X-ray shows part of the stomach above the diaphragm.

? Diagnosis: **Hiatus hernia (sliding type)**.

? Anatomy: herniation of **cardiac end of stomach** through **oesophageal hiatus (T10)** into thoracic cavity.

7.

A patient develops **burning epigastric pain worsened by spicy food**.

? Diagnosis: **Peptic ulcer (pyloric or duodenal region)**.

? Mechanism: excess acid secretion + *Helicobacter pylori* infection; posterior ulcer may erode **gastroduodenal artery**.

8.

A 58-year-old smoker presents with **loss of appetite, early satiety, and vomiting**.

? Diagnosis: **Carcinoma of the pyloric region** causing **gastric outlet obstruction**.
? Spread: lymphatics ? **pyloric ? hepatic ? coeliac nodes**.

9.
After partial gastrectomy, the patient develops **vitamin B?? deficiency and anaemia**.
? Reason: loss of **parietal cells** ? lack of **intrinsic factor** ? **pernicious anaemia**.

10.
A posterior gastric ulcer perforates; patient develops **severe pain radiating to the back**.
? Explanation: ulcer erodes through posterior wall ? involves **pancreas** lying in **stomach bed**.

11.
A gastric ulcer perforates anteriorly; patient presents with **rigid abdomen and free gas under diaphragm**.
? Cause: air escapes into the **greater sac of peritoneal cavity** ? **pneumoperitoneum**.

12.
After long-standing peptic ulcer, patient undergoes **vagotomy**.
? Purpose: to cut **vagal fibres** to stomach ? decreases **acid secretion**.
? Consequence: must preserve **pyloric branch** (nerve of Latarjet) for gastric emptying.

13.
A large posterior gastric ulcer erodes the **splenic artery** ? **massive intraperitoneal bleeding**.
? Anatomical reason: splenic artery lies in the **stomach bed** behind the upper part of the body.

14.
Patient with portal hypertension develops **varices and ascites**; endoscopy shows dilated veins at lower oesophagus.
? Mechanism: **porto-systemic anastomosis** between **left gastric and azygos veins** becomes enlarged.

15.
Pain from gastric ulcer is referred to the **epigastric region**.
? Explanation: sympathetic supply from **T6–T9** segments ? pain referred to corresponding

dermatomes of epigastrium.

16.

A blow to the upper abdomen ruptures the **left lobe of liver and anterior wall of stomach**.

? Reason: both lie directly under the **anterior abdominal wall** at the epigastrium.

17.

A patient with chronic gastritis presents with **delayed gastric emptying** and **distension**.

? Pathophysiology: fibrosis of **pyloric sphincter** or damage to **vagal branches** impairs peristaltic coordination.

18.

During surgery, surgeon notes enlarged **Virchow's node (left supraclavicular)**.

? Significance: **Troisier's sign** ? secondary deposit from **gastric carcinoma** via **thoracic duct**.

19.

A perforated gastric ulcer allows contents to leak into **lesser sac**; patient develops **abscess behind stomach**.

? Reason: the **posterior wall of stomach** forms **anterior boundary of the lesser sac**.

20.

A case of **pyloric carcinoma** invades posteriorly into pancreas.

? Explanation: **posterior gastric surface** rests on **pancreas** — common site of direct invasion.

? Clinicoanatomical Problems as OPD Cases

Case 1 – Gastro-oesophageal Reflux Disease (GERD)

Presentation:
A 45-year-old male complains of *burning retrosternal pain after meals*, aggravated by lying down or bending forward, and relieved by antacids.

Anatomical basis:

- Due to **incompetence of the lower oesophageal sphincter (LES)** at the **oesophageal opening of diaphragm (T10)**.
- Reflux of acidic gastric contents ? **reflux oesophagitis**.

Investigation:
Upper GI endoscopy showing **mucosal erosion** at lower oesophagus.
Treatment: Lifestyle modification, PPIs, and prokinetics.

Case 2 – Hiatus Hernia

Presentation:
A 55-year-old obese woman complains of *epigastric discomfort* and *regurgitation of sour fluid* on lying down.

Anatomical basis:

- **Sliding hernia:** Cardiac end of stomach and abdominal oesophagus herniate through **oesophageal hiatus (T10)** into thorax.
- **Para-oesophageal hernia:** Fundus herniates beside oesophagus.

Complication: Strangulation or reflux oesophagitis.
Confirmed by: Barium swallow showing stomach above diaphragm.

Case 3 – Oesophageal Varices in Portal Hypertension

Presentation:
A 50-year-old man with chronic liver disease presents with **massive haematemesis** and **melaena**.

Anatomical basis:

- Dilatation of veins at the **lower oesophagus**, where **left gastric vein (portal)** anastomoses with **oesophageal veins (systemic)**.
- These varices rupture under pressure.

Significance: Part of **porto-systemic anastomosis**.
Treatment: Endoscopic band ligation, portocaval shunt, or TIPS.

Case 4 – Achalasia Cardia

Presentation:
A 35-year-old male has **progressive dysphagia** for solids and liquids, **nocturnal regurgitation**, and a **bird-beak** sign on barium swallow.

Anatomical basis:

- **Degeneration of Auerbach's plexus** in the distal oesophagus ? **failure of LES relaxation**.
- Proximal oesophagus dilates, distal narrows.

Treatment: Balloon dilatation, myotomy, or botulinum injection.

Case 5 – Peptic Ulcer Disease

Presentation:
A 40-year-old man has **epigastric burning pain relieved by food**, recurring at night.

Anatomical basis:

- Ulcer at **pyloric canal or duodenal bulb** (acid-secreting zone).
- Blood supply via **gastroduodenal and right gastric arteries**.

Complication: Posterior duodenal ulcer may **erode gastroduodenal artery** ? haemorrhage.
Investigation: Endoscopy, H. pylori test.

Case 6 – Gastric Ulcer

Presentation:
A 50-year-old man complains of **epigastric pain aggravated by food**, weight loss, and vomiting.

Anatomical basis:

- Most often on the **lesser curvature near the angular notch**.
- Ulcer may perforate **posteriorly into pancreas** or **erode left gastric artery** ? bleeding.

Complication: Perforation ? peritonitis, **bleeding ? haematemesis**.
Confirmed by: Endoscopy and biopsy to rule out malignancy.

Case 7 – Congenital Hypertrophic Pyloric Stenosis

Presentation:
A 3-week-old male infant presents with **projectile non-bilious vomiting** after feeding and **palpable “olive-shaped” mass** in epigastrium.

Anatomical basis:

- **Hypertrophy of circular muscle layer** of the pylorus ? obstruction of gastric outlet.
- Pylorus located at **L1 vertebral level** (transpyloric plane).

Treatment: Ramstedt’s pyloromyotomy.

Case 8 – Carcinoma of the Stomach

Presentation:
A 60-year-old smoker presents with **loss of appetite, early satiety, and weight loss**.

Examination: Hard epigastric lump; **Troisier's sign** (left supraclavicular node).

Anatomical basis:

- Common in **pyloric or lesser curvature region**.
- **Lymphatic spread:** gastric ? hepatic ? coeliac ? **Virchow's node via thoracic duct**.

Investigation: Upper GI endoscopy, biopsy, CT for staging.

Case 9 – Perforated Gastric Ulcer

Presentation:
A 45-year-old man develops **sudden severe epigastric pain**, **board-like rigidity**, and **air under diaphragm** on X-ray.

Anatomical basis:

- **Anterior wall perforation** ? gas escapes into the **greater sac** ? **pneumoperitoneum**.
- **Posterior wall perforation** ? leakage into **lesser sac** ? retro-gastric abscess.

Emergency: Immediate surgical closure (Graham patch).

Case 10 – Pernicious Anaemia after Gastrectomy

Presentation:
A patient post-gastrectomy develops **fatigue, pallor, and macrocytic anaemia**.

Anatomical basis:

- Loss of **parietal cells** ? no **intrinsic factor** ? failure of **vitamin B?? absorption** in ileum.

Treatment: Lifelong **parenteral vitamin B?? injections**.

Case 11 – Gastric Outlet Obstruction

Presentation:
A patient with **chronic peptic ulcer** complains of **vomiting of stale food**, **visible peristalsis**, and **succussion splash**.

Anatomical basis:

- **Fibrotic narrowing** of the **pyloric canal** ? obstruction to gastric emptying.

Result: Metabolic alkalosis due to loss of HCl.

Case 12 – Posterior Gastric Ulcer Eroding Splenic Artery

Presentation:
A 55-year-old male presents with **sudden massive haematemesis** and **collapse**.

Anatomical basis:

- Posterior ulcer erodes **splenic artery**, which runs behind the stomach along **upper border of pancreas** in the **stomach bed**.

Emergency: Surgical ligation of artery and ulcer repair.

Case 13 – Vagotomy for Peptic Ulcer

Presentation:
A patient undergoing surgery for **recurrent peptic ulcer** has **truncal vagotomy** performed.

Anatomical basis:

- Division of **anterior and posterior vagal trunks** near oesophagus ? reduces **acid secretion**.

- **Pyloroplasty** done simultaneously to aid gastric emptying.

Complication: Gastric stasis if pyloric branch (nerve of Latarjet) is cut.

Case 14 – Referred Pain from Gastric Ulcer

Presentation:
A patient with **posterior gastric ulcer** experiences **back pain near T8–T9** region.

Anatomical basis:

- Stomach innervation from **T6–T9** via **greater splanchnic nerves**;
  visceral pain referred to corresponding dermatomes of **epigastrium and back**.

Case 15 – Pancreatic Involvement by Posterior Gastric Ulcer

Presentation:
Epigastric pain radiating to the back; serum amylase mildly raised.

Anatomical basis:

- **Posterior surface of stomach** lies directly on **pancreas** (part of stomach bed); ulcer may erode into it.

? Summary of Anatomical Insights

CONDITION	KEY STRUCTURE INVOLVED	CLINICAL FEATURE
GERD	LES and diaphragmatic crura	Heartburn
Hiatus hernia	Oesophageal hiatus (T10)	Reflux/regurgitation
Varices	Left gastric + azygos veins	Haematemesis
Achalasia	Myenteric plexus	Dysphagia

CONDITION	KEY STRUCTURE INVOLVED	CLINICAL FEATURE
Peptic ulcer	Pyloric canal	Burning pain
Gastric ulcer	Lesser curvature	Pain after food
Pyloric stenosis	Circular muscle hypertrophy	Projectile vomiting
Carcinoma	Lesser curvature	Weight loss
Posterior perforation	Lesser sac	Retrogastric abscess

? Frequently Asked Questions – Abdominal Part of Oesophagus and Stomach

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1. What is the length of the abdominal part of the oesophagus?

About **1.25 cm**; it extends from the **oesophageal hiatus of the diaphragm (T10)** to the **cardiac orifice** of the stomach at **T11**.

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2. What prevents reflux of gastric contents into the oesophagus?

- **Oblique muscle fibres** of the stomach acting as a **physiological sphincter**,
- **Acute angle of His**,
- **Diaphragmatic crura** around the hiatus,
- Mucosal folds acting like valves.

Together these form the **lower oesophageal sphincter mechanism**.

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3. What is the vertebral level of the cardiac and pyloric ends of the stomach?

- **Cardiac end:** T11
- **Pyloric end:** L1 (transpyloric plane)

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4. What is the capacity of the stomach?

- In adults: about **1.5 litres** when moderately distended.

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5. Name the parts of the stomach.

- **Cardiac part**
- **Fundus**
- **Body**
- **Pyloric part** (antrum + canal)

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6. What are the curvatures and surfaces of the stomach?

- **Lesser curvature** (right border) and **greater curvature** (left border).
- **Anterior surface** faces diaphragm and liver.
- **Posterior surface** forms the **stomach bed** (rests on pancreas, spleen, left kidney, adrenal, transverse mesocolon).

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7. What are the peritoneal attachments of the stomach?

- **Lesser curvature ? Lesser omentum**
- **Greater curvature ? Greater omentum, gastrosplenic ligament, gastrophrenic ligament**

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8. Which arteries supply the stomach?

- **Left & right gastric arteries** along lesser curvature
- **Left & right gastroepiploic arteries** along greater curvature
- **Short gastric arteries** to fundus
  (All are branches of the **coeliac trunk** or its divisions.)

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9. How is the venous blood drained from the stomach?

- Veins parallel arteries ? all drain into **portal venous system** either directly or via **splenic vein**.

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10. What is the lymphatic drainage of the stomach?

- Follows arteries ?
  - **Left/right gastric nodes**,
  - **Gastroepiploic nodes**,
  - **Pyloric nodes**,
  - ? finally drain into **coeliac lymph nodes**.

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11. What is the nerve supply of the stomach?

- **Parasympathetic:** Vagus nerves (motility + secretion)
- **Sympathetic:** T6–T9 via **greater splanchnic nerves** (vasoconstrictor, pain fibres)

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12. What is the physiological function of the stomach?

- Acts as a **reservoir**,
- **Mixes food with gastric juice**,
- Begins **protein digestion** (pepsin, HCl),
- Regulates controlled **emptying into duodenum**.

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13. What is the microscopic structure of the gastric mucosa?

- **Simple columnar epithelium** ? mucus secretion.
- **Gastric pits** leading to **glands** containing:
  - Parietal (HCl),
  - Chief (pepsinogen),
  - Mucous neck, and
  - Entero-endocrine (gastrin) cells.

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14. What is the embryological origin of the stomach?

- From the **foregut**.
- Rotates **90° clockwise**, left side becomes **anterior**, forming **greater** and **lesser curvatures**.

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15. Why is posterior gastric ulcer pain referred to the back?

- Stomach receives **sympathetic fibres from T6–T9**, and the **posterior surface** lies on the **pancreas**; pain therefore radiates to **epigastric and back regions**.

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16. Which artery is eroded by a posterior gastric ulcer?

- The **splenic artery**, running behind the stomach in the **stomach bed**.

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17. What are the common sites of gastric ulcer?

- On the **lesser curvature near the angular notch**, occasionally on the **posterior wall** of the body.

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18. Why does a duodenal ulcer cause pain relieved by food, but a gastric ulcer worsens with food?

- **Duodenal ulcer:** food neutralises acid temporarily ? pain relief.
- **Gastric ulcer:** food increases acid secretion ? aggravates pain.

---

19. What is the nerve of Latarjet?

- Terminal branch of the **anterior vagal trunk** supplying the **pylorus**; must be preserved during **vagotomy** to maintain gastric emptying.

---

20. What is the difference between sliding and para-oesophageal hiatus hernia?

- **Sliding:** gastro-oesophageal junction and cardia move above diaphragm.
- **Para-oesophageal:** fundus herniates beside oesophagus while junction remains below diaphragm.

---

21. What is the importance of the angle of His?

- Acute angle between oesophagus and stomach at the cardiac end; prevents reflux when stomach distends.

---

22. What is the main nerve supply for peristalsis?

- **Myenteric (Auerbach's) plexus** between circular and longitudinal muscle layers controls peristaltic movement.

---

23. What happens if the parietal cells are destroyed?

- Loss of **HCl and intrinsic factor** ? **achlorhydria** and **pernicious anaemia**.

---

24. Which lymph node enlargement indicates gastric carcinoma?

- **Left supraclavicular (Virchow's) node**, called **Troisier's sign**.

---

25. Why is the stomach called a J-shaped organ?
Because of its **oblique position**—the cardiac end higher and left, pyloric end lower and right—forming the letter "J".

---

26. What are the main functions of the greater omentum?

- Prevents **spread of infection** (“policeman of abdomen”),
- Provides **fat storage**,
- Protects underlying viscera.

---

27. What is the bed of the stomach?
From above downward:

- Left dome of diaphragm,
- Spleen,
- Left kidney and suprarenal,
- Pancreas,
- Splenic artery,
- Transverse mesocolon.

---

28. Why does the pyloric part act as a physiological sphincter?
Because its **circular muscle layer** is thickened and controlled by **vagal and sympathetic inputs**, regulating food emptying.

---

29. What is a Meckel’s diverticulum, and how is it related to the foregut?
Not part of stomach but a common question in continuation — it’s a **persistent vitelline duct** (ileal outpouching), embryologically from **midgut**, sometimes confused in clinical pain localisation.

---

30. What is the most dangerous complication of a perforated gastric ulcer?

- **Peritonitis** due to leakage of acidic contents,
- **Massive haemorrhage** if a major artery is eroded.

? Multiple Choice Questions – Abdominal Part of Oesophagus and Stomach

---

1. The abdominal part of the oesophagus is approximately:

A. 0.5 cm

B. 1.25 cm

C. 2.5 cm

D. 3 cm

? **Answer:** B – *1.25 cm*

Explanation: It extends from the oesophageal hiatus (T10) to the cardiac orifice (T11).

---

2. The lower oesophageal sphincter is mainly formed by:

A. Circular muscle thickening

B. Oblique muscle fibres of stomach

C. Diaphragmatic crura

D. Mucosal folds only

? **Answer:** B – *Oblique fibres of stomach*

Explanation: The sling-like oblique fibres at the cardiac end act as a physiological sphincter.

---

3. The cardiac orifice of the stomach lies opposite the vertebral level:

A. T9

B. T10

C. T11

D. T12

? **Answer:** C – *T11*

---

4. The pylorus of the stomach lies at the level of:

A. T12

B. L1

C. L2

D. L3

? **Answer:** B – *L1 (transpyloric plane)*

---

5. The stomach is mainly supplied by branches of which artery?

A. Superior mesenteric artery

B. Inferior mesenteric artery

C. Coeliac trunk

D. Internal thoracic artery

? **Answer:** C – *Coeliac trunk*

Explanation: All major arteries to the stomach (gastric, gastroepiploic, short gastric) originate from coeliac branches.

---

6. Which of the following arteries runs along the lesser curvature?

A. Left gastroepiploic artery

B. Right gastroepiploic artery

C. Left gastric artery

D. Short gastric artery

? **Answer:** C – *Left gastric artery*

---

7. The short gastric arteries supply the:

A. Fundus of stomach

B. Pyloric canal

C. Cardiac end

D. Lesser curvature

? **Answer:** A – *Fundus of stomach*

Explanation: Short gastric arteries arise from the splenic artery and reach the fundus via the gastrosplenic ligament.

---

8. The venous blood from the stomach ultimately drains into the:

A. Inferior vena cava

B. Azygos vein

C. Portal vein

D. Renal vein

? **Answer:** C – *Portal vein*

---

9. The lymph from the stomach finally drains into:

A. Hepatic nodes

B. Coeliac nodes

C. Aortic nodes

D. Iliac nodes

? **Answer:** B – *Coeliac lymph nodes*

---

10. The parasympathetic innervation of the stomach is through:

A. Greater splanchnic nerve

B. Lesser splanchnic nerve

C. Vagus nerve

D. Pelvic splanchnic nerve

? **Answer:** C – *Vagus nerve*

---

11. Which of the following is not a part of the stomach bed?

A. Left kidney

B. Pancreas

C. Spleen

D. Duodenum (1st part)

? **Answer:** D – *Duodenum (1st part)*

Explanation: Duodenum lies below the stomach bed; stomach bed is formed by left dome of diaphragm, spleen, left kidney, left adrenal, pancreas, and splenic artery.

---

12. The pyloric canal is mainly related posteriorly to:

A. Inferior vena cava

B. Portal vein

C. Left kidney

D. Spleen

? **Answer:** B – *Portal vein*

---

13. The most common site of gastric ulcer is:

A. Greater curvature

B. Fundus

C. Lesser curvature near angular notch

D. Pyloric antrum

? **Answer:** C – *Lesser curvature near the angular notch*

---

14. Pain of gastric ulcer is referred to:

A. Umbilical region

B. Right hypochondrium

C. Epigastric region

D. Suprapubic region

? **Answer:** C – *Epigastric region*

Explanation: Due to sympathetic afferents from T6–T9 segments.

---

15. Posterior gastric ulcer may erode which artery?

A. Left gastric artery

B. Gastroduodenal artery

C. Splenic artery

D. Right gastroepiploic artery

? **Answer:** C – *Splenic artery*

---

16. Congenital hypertrophic pyloric stenosis occurs due to:

A. Absence of pyloric mucosa

B. Hypertrophy of circular muscle

C. Hypertrophy of longitudinal muscle

D. Failure of pyloric development

? **Answer:** B – *Hypertrophy of circular muscle layer*

---

17. Which nerve controls gastric motility and secretion?

A. Sympathetic nerves (T12–L1)

B. Vagus nerve

C. Phrenic nerve

D. Hypogastric nerve

? **Answer:** B – *Vagus nerve*

---

18. The greater curvature receives its arterial supply mainly from:

A. Right and left gastric arteries

B. Right and left gastroepiploic arteries

C. Short gastric arteries only

D. Inferior phrenic artery

? **Answer:** B – *Right and left gastroepiploic arteries*

---

19. The lower end of the oesophagus is guarded by which structure?

A. True anatomical sphincter

B. Diaphragmatic crura only

C. Physiological sphincter formed by muscle sling

D. Fibrous ring

? **Answer:** C – *Physiological sphincter formed by muscle sling*

---

20. The fundus of the stomach is normally seen in X-ray as:

A. Air bubble under left dome of diaphragm

B. Gas shadow under right dome of diaphragm

C. Fluid shadow in umbilical region

D. None of the above

? **Answer:** A – *Air bubble under left dome of diaphragm*

Bonus Conceptual MCQs

21. The nerve of Latarjet supplies:

A. Fundus

B. Cardiac end

C. Pylorus

D. Lesser curvature

? **Answer:** C – *Pylorus*

---

22. Lymphatic drainage from pyloric part first goes to:

A. Hepatic nodes

B. Pyloric nodes

C. Left gastric nodes

D. Splenic nodes

? **Answer:** B – *Pyloric nodes*

---

23. Hiatus hernia is herniation of stomach through:

A. Aortic hiatus

B. Caval opening

C. Oesophageal hiatus

D. Epiploic foramen

? **Answer:** C – *Oesophageal hiatus (T10)*

---

24. The embryological rotation of stomach occurs:

A. 90° clockwise

B. 90° anticlockwise

C. 180° clockwise

D. 180° anticlockwise

? **Answer:** A – *90° clockwise*

---

25. Pernicious anaemia after gastrectomy is due to loss of:

A. Pepsin

B. Gastrin

C. Intrinsic factor

D. Secretin

? **Answer:** C – *Intrinsic factor*

? Quick Recall Summary

CONCEPT	KEY FACT

Length of abdominal oesophagus	1.25 cm
Cardiac end level	T11
Pylorus level	L1
Main artery	Coeliac trunk
Ulcer common site	Lesser curvature
Ulcer erosion artery	Splenic
Nerve of Latarjet	Pylorus
Embryonic rotation	90° clockwise
Referred pain segment	T6–T9
Portal drainage	Via gastric veins

? Viva Voce – Abdominal Part of Oesophagus and Stomach

---

1. What is the length of the abdominal part of the oesophagus?

? About **1.25 cm**.

---

2. What is the vertebral level of the cardiac orifice of the stomach?

? **T11** vertebra.

---

3. What is the vertebral level of the pylorus?

? **L1** vertebra (transpyloric plane).

---

4. Which structure prevents reflux of gastric contents into the oesophagus?

? The **lower oesophageal sphincter** formed by **oblique fibres** of the stomach and **diaphragmatic crura**.

---

5. What is the shape of the stomach?

? **J-shaped**, with cardiac end higher and pyloric end lower.

---

6. Name the two curvatures of the stomach.

? **Lesser curvature** (right border) and **greater curvature** (left border).

---

7. In which regions of the abdomen does the stomach lie?

? Mainly in **epigastric** and **left hypochondriac** regions.

---

8. What is the capacity of the stomach in adults?

? About **1.5 litres**.

---

9. Name the four parts of the stomach.

? **Cardiac part**, **fundus**, **body**, and **pyloric part** (antrum + canal).

---

10. What is the cardiac notch?

? The **angle between the oesophagus and fundus** of the stomach.

---

11. What is the angular notch?

? A notch on the **lesser curvature** marking the junction of the body and pyloric part.

---

12. What are the peritoneal attachments of the stomach?

? **Lesser omentum** (lesser curvature) and **greater omentum, gastrosplenic, gastrophrenic ligaments** (greater curvature).

---

13. What is the blood supply of the stomach?

? From branches of the **coeliac trunk** — left & right gastric, left & right gastroepiploic, and short gastric arteries.

---

14. Into which vein does venous blood from the stomach drain?

? Into the **portal vein** (directly or via splenic and superior mesenteric veins).

---

15. Where do the lymphatics of the stomach ultimately drain?

? Into the **coeliac lymph nodes**.

---

16. What is the nerve supply of the stomach?

? **Parasympathetic (vagus)** for motility and secretion;
Sympathetic (T6–T9) for vasoconstriction and pain sensation.

---

17. What is the function of the stomach?

? Acts as a **reservoir**, performs **mechanical and chemical digestion**, and regulates **gastric emptying**.

---

18. Which part of the stomach contains three muscle layers?

? The **muscularis externa** — inner oblique, middle circular, outer longitudinal.

---

19. What is the nerve of Latarjet?

? A terminal branch of the **anterior vagal trunk** supplying the **pylorus**.

---

20. What is the stomach bed?

? Structures behind the stomach:

- Left dome of diaphragm
- Spleen
- Left kidney & suprarenal
- Pancreas
- Splenic artery

- Transverse mesocolon

---

21. What is the function of the pyloric sphincter?
? Controls **gastric emptying** into the duodenum.

---

22. Which part of the stomach is most prone to ulceration?
? **Lesser curvature** near the **angular notch**.

---

23. Which artery is likely to be eroded by a posterior gastric ulcer?
? **Splenic artery**.

---

24. Which nerve plexus controls gastric peristalsis?
? **Auerbach's (myenteric) plexus**.

---

25. What causes congenital hypertrophic pyloric stenosis?
? **Hypertrophy of circular muscle** in the pyloric canal.

---

26. Which type of hernia involves the stomach?
? **Hiatus hernia** through the **oesophageal hiatus (T10)**.

---

27. What is the usual radiographic sign of the fundus?
? **Gastric air bubble** under the left dome of the diaphragm.

---

28. What is the angle of His?
? The acute angle between the **oesophagus and the stomach** that prevents reflux.

---

29. What is the embryological origin of the stomach?
? From the **foregut**, which undergoes **90° clockwise rotation**.

---

30. Why does pain from gastric ulcer refer to the epigastrium?
? Because the stomach receives **sympathetic supply from T6–T9**, corresponding to the **epigastric dermatome**.

---

31. Why is the greater omentum called the “policeman of the abdomen”?

? It **walls off infection or inflammation**, limiting its spread to other organs.

---

32. What is Troisier’s sign?

? Enlargement of the **left supraclavicular (Virchow’s) lymph node** in **gastric carcinoma**.

---

33. Which cells secrete hydrochloric acid and intrinsic factor?

? **Parietal (oxyntic) cells** of gastric glands.

---

34. Which cells of the stomach secrete pepsinogen?

? **Chief (zymogenic) cells**.

---

35. What is the histological type of epithelium in the stomach?

? **Simple columnar epithelium**.

---

36. What is the function of the intrinsic factor?

? Facilitates **vitamin B?? absorption** in the ileum.

---

37. What are the main contents of gastric juice?

? **HCl, pepsinogen, mucus, intrinsic factor**, and **lipase**.

---

38. What is the clinical significance of the transpyloric plane?

? It passes through:

- **L1 vertebra**
- **Pylorus**, **fundus of gallbladder**, **origin of SMA**, and **hilum of kidneys**.

---

39. What is the mechanism of vomiting anatomically?

? Reverse peristalsis of stomach and oesophagus coordinated by the **medullary vomiting centre**.

---

40. What is the difference between gastric and duodenal ulcers in terms of pain timing?
? **Gastric ulcer:** Pain **after food**.
Duodenal ulcer: Pain **before food**, relieved by eating.

? Viva Summary Table

TOPIC	KEY ANSWER
Cardiac end level	T11
Pylorus level	L1
Capacity	1.5 L
Common ulcer site	Lesser curvature
Artery eroded	Splenic
Nerve supply	Vagus + T6–T9
Lymph drainage	Coeliac nodes
Histology	Simple columnar
Intrinsic factor	Parietal cells
Rotation in development	90° clockwise