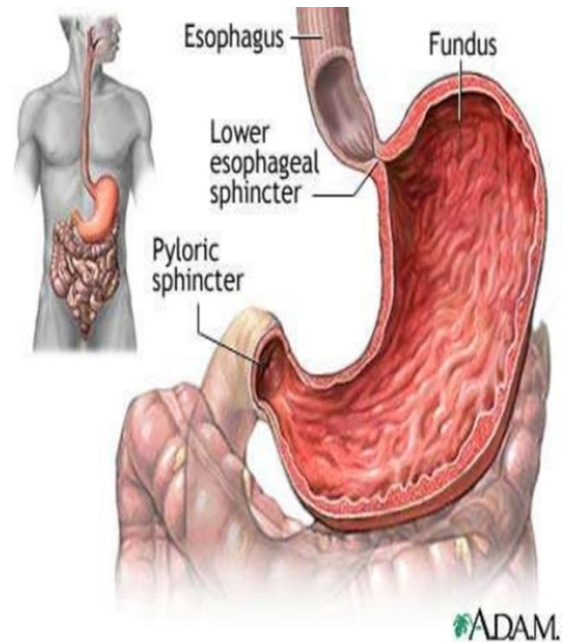


The stomach

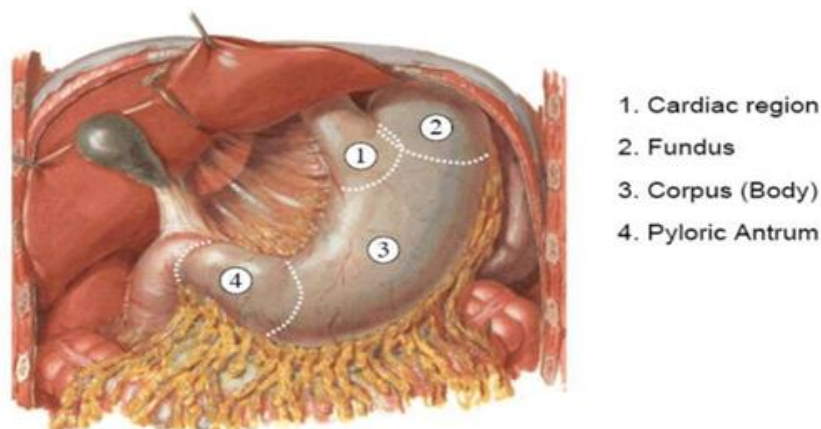
- The stomach is a dilated part of the alimentary canal between the esophagus and the small intestine.
- It is a muscular sac.
- It is a J-shaped.
- It occupies the left upper quadrant, epigastric, and umbilical regions, and much of it lies under cover of the ribs.
- Stomach located at level of T10 and L3 vertebral.
- Position of the stomach varies with bod Habitués



The stomach is divided into four regions:

1. The **cardia**, which surrounds the opening of the esophagus into the stomach.
2. The **fundus of stomach**, which is the area above the level of the cardiac orifice.
3. The **body of stomach**, which is the largest region of the stomach.
4. The **pyloric part**, which is divided into the **pyloric antrum** and **pyloric canal** and is the distal end of the stomach.

Anatomical Divisions of the Stomach

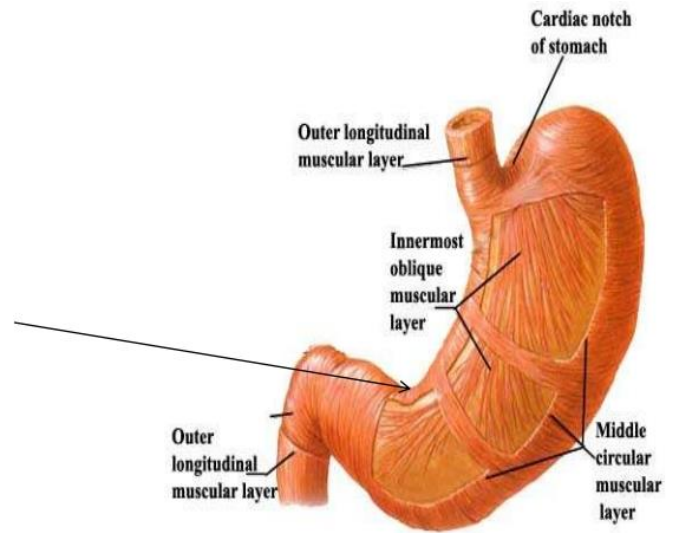


Sphincters

- Ø The **cardiac sphincter (lower esophagus sphincter)** closes off the top end of the stomach.
- Ø The **pyloric sphincter** closes off the bottom.

Other features of the stomach include:

- The **greater curvature**, which is a point of attachment for the gastrosplenic ligament and the greater omentum
- The **lesser curvature**, which is a point of attachment for the lesser omentum.
- the **cardial notch**, which is the superior angle created when the esophagus enters the stomach.
- the **angular notch**, which is a bend on the lesser curvature.



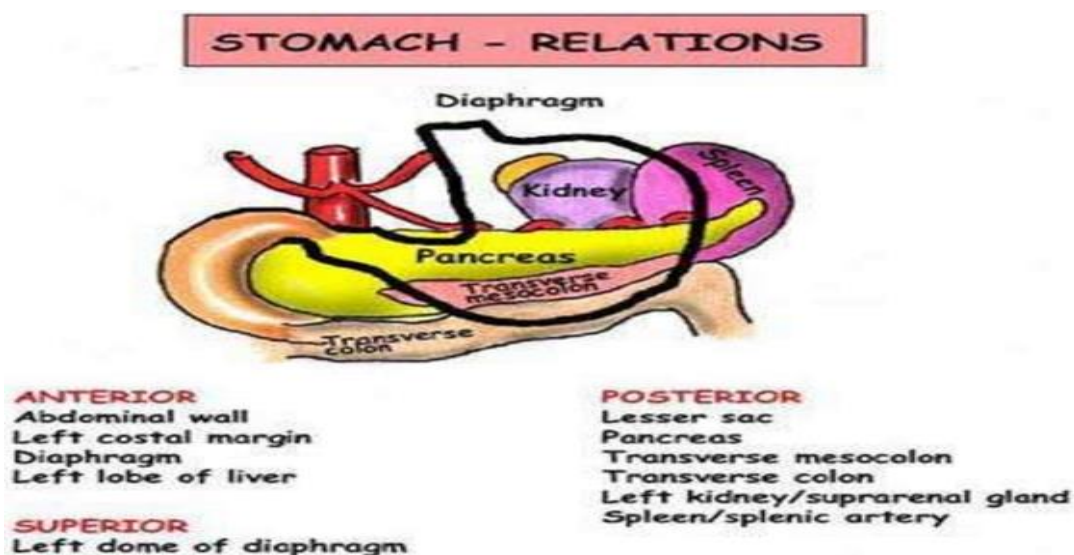
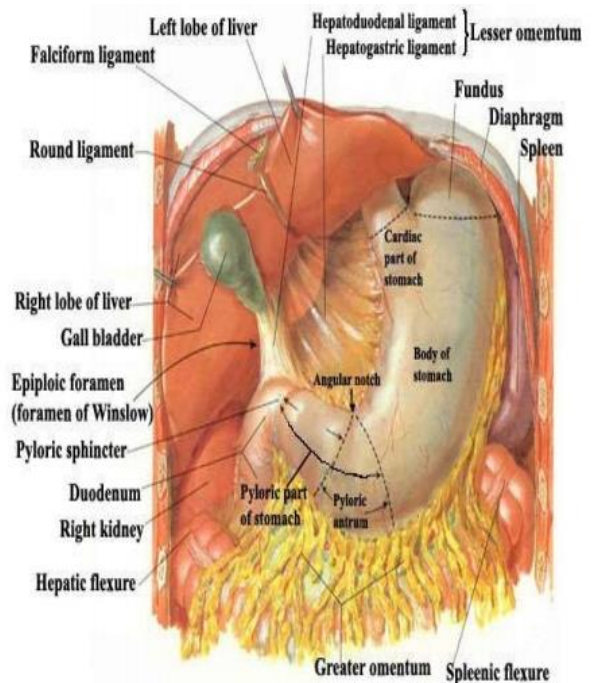
Stomach Anatomical Relation

Antero-superior Surface

- The left half of this surface is in contact with the diaphragm, which separates it from the base of the left lung, the pericardium, and the seventh, eighth, and ninth ribs, and intercostal spaces of the left side.
- The right half is in relation with the left and quadrate lobes of the liver and with the anterior abdominal wall.

The Postero-inferior surface

- is in relation with the diaphragm, the spleen, the left suprarenal gland, the upper part of the front of the left kidney, the anterior surface of the pancreas, the left colic flexure, and the upper layer of the transverse mesocolon.
- These structures form a shallow bed, the **stomach bed**, on which the viscus rests.



Stomach Blood Supply

Arterial blood supply(Coeliac trunk) : 3 Branches

- **Left Gastric Artery**

- Supplies the cardia of the stomach and distal esophagus

- **Splenic Artery**

- Gives rise to 2 branches which help supply the greater curvature of the stomach

- » Left Gastroepiploic

- » Short Gastric Arteries

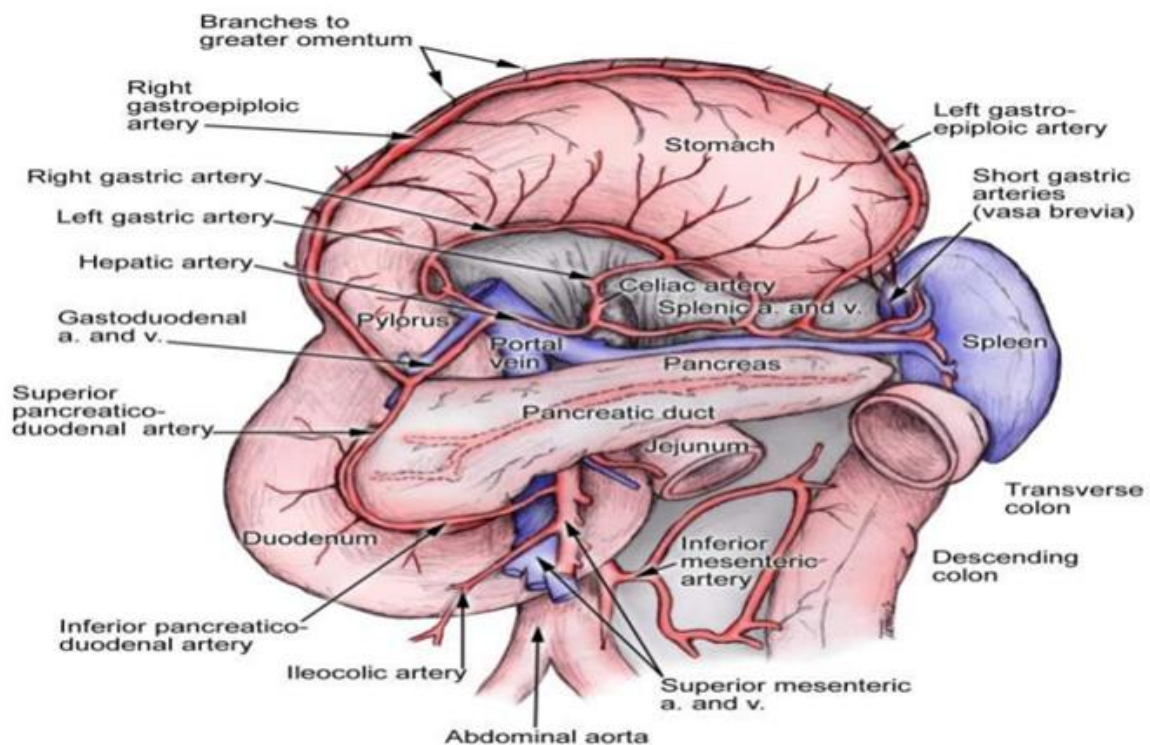
- **Common Hepatic or Proper Hepatic Artery** 2 major branches

- » Right Gastric- supplies a portion of the lesser curvature

- » Gastroduodenal artery

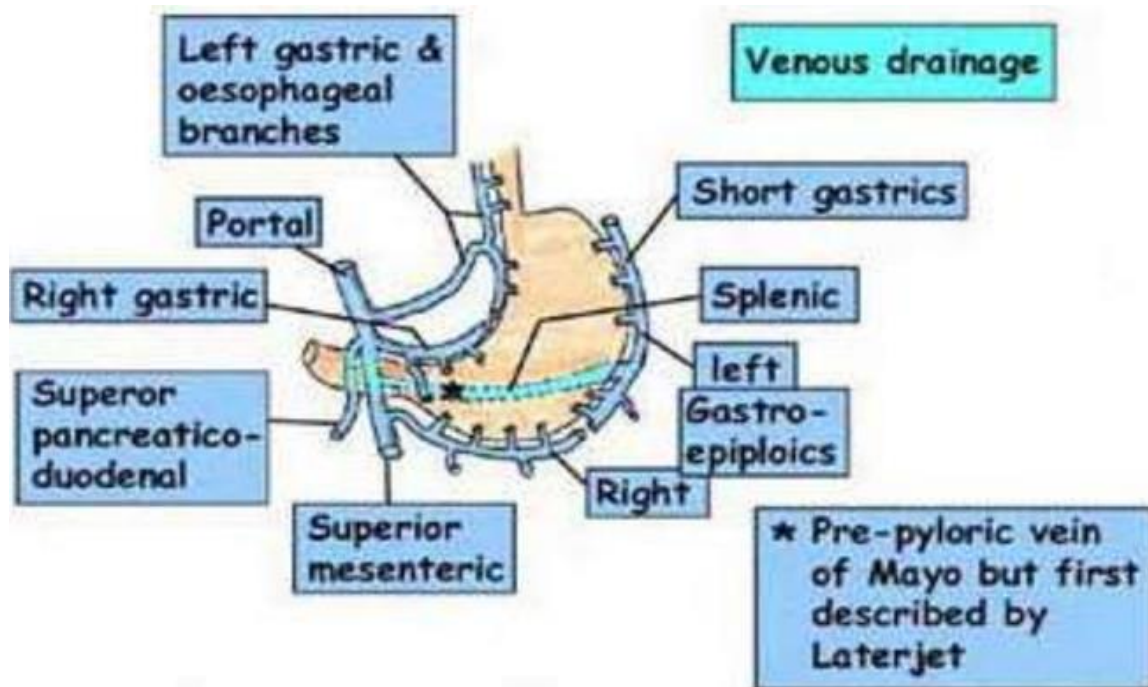
- Gives rise to Right Gastroepiploic artery

- helps supply greater curvature in conjunction with Left Gastroepiploic Artery



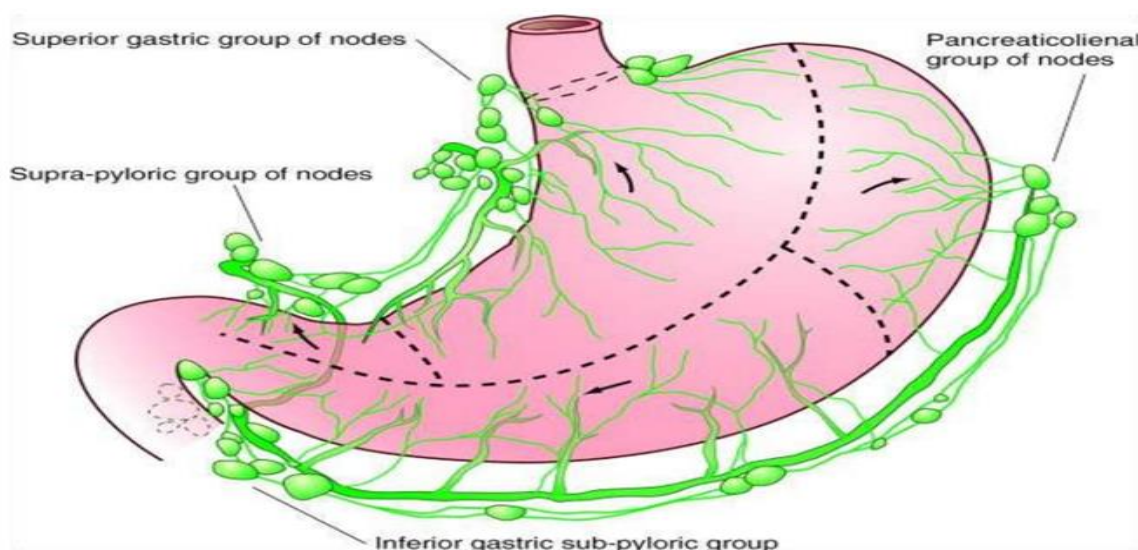
Stomach Venous Drainage

- Parallels arterial supply
- Rt & Lt gastric veins drain to the **portal**
- Rt gastroepiploic drains to the **SMV**
- Lt gastroepiploic drains to the **splenic**



Stomach Lymphatic Drainage

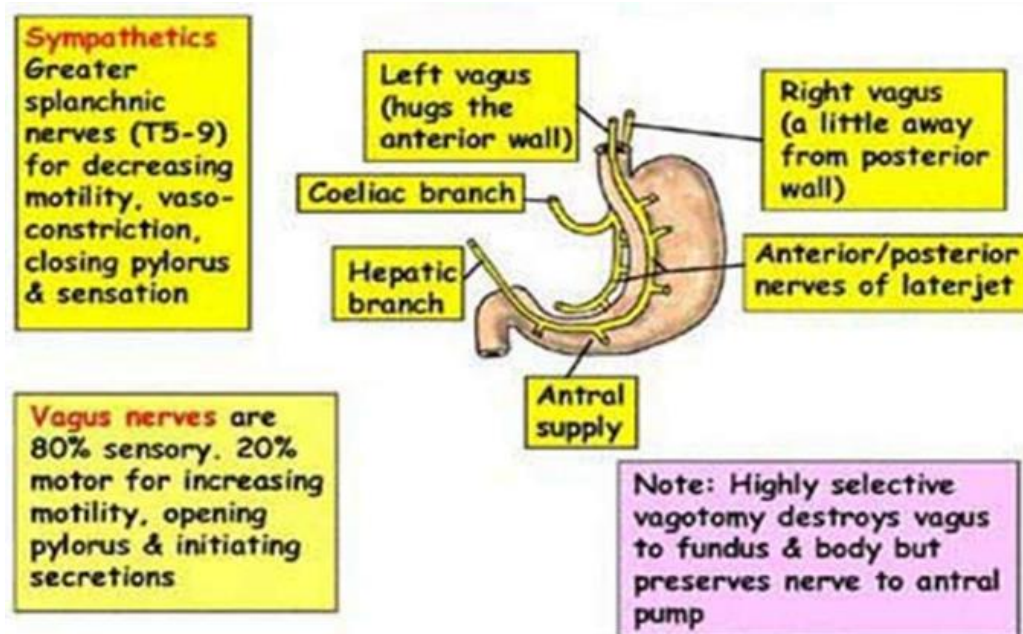
- Lymph from the proximal portion of the stomach drains along the lesser curvature first drains into superior gastric lymph nodes surrounding the Left Gastric Artery.
- Distal portion of lesser curvature drains through the suprapyloric nodes.
- Proximal portion of the greater curvature is supplied by the lymphatic vessels that traverse the pancreaticosplenic nodes.
- Antral portion of the greater curvature drains into the subpyloric and omental nodal groups.



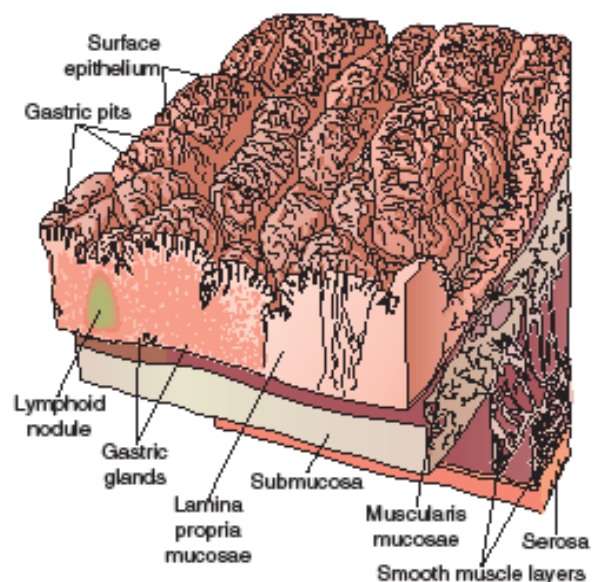
Stomach Innervations

The main innervations are Left and Right Vagus Nerves.

- Parasympathetic innervation of Stomach- Vagus Nerve
 - 90% of fiber in vagal trunk is afferent (info transmitting from stomach to CNS)
- Sympathetic innervation of Stomach- Splanchnic Nerve
 - Derived from spinal segment T5-T10



- The stomach is almost entirely covered with peritoneum.
- The peritoneum forms the outer gastric serosa.
- Beneath the serosa is the muscularis propria.
- The MP is made up of 3 layers of smooth muscle.
- The middle layer is the circular muscle and is the only “complete” layer of muscle
- As you progress distally the middle layer of muscle begins to thicken and form the pylorus, which functions as a true sphincter.
- This and the GE junction form the gastric “borders” and are the two “fixed” points of the stomach.
- The outer muscle layer (longitudinal) is contiguous with the outer layer of the esophagus.
- The submucosa lies between the MP and the mucosa. It is a collagen rich layer of connective tissue and is the *strongest* layer of the gastric wall.



•The submucosa also contains the rich blood vessel network and the lymphatics as well as Meissner's plexus.

The mucosa consists of 3 layers:

- Surface epithelium (columnar).
- Lamina propria : Connective tissue layer that supports the surface epithelium.
- Muscularis mucosae (probably the reason for rugal folds). The MM is the boundary for invasive/noninvasive gastric cancer.

Cell Types

•Parietal:

- Location: Body
- Function: secrete acid and intrinsic factor

•Chief:

- Location: Body
- Function: produce Pepsin

•ECL:

- Location: Body
- Function: Histamine production

•G cells:

- Location: Antrum
- Function: Gastrin production

•D cells:

- Location: Body, Antrum
- Function: produce Somatostatin

•Mucus:

- Location: Body, Antrum
- Function: mucus production

•Surface epithelium:

- Location: Diffuse
- Function: produce mucus, bicarb, prostaglandins

Gastric Physiology

•Principle Function:

- Storage:
 - Receptive relaxation
- Start digestion:
 - Separates meal into fat/protein/carbohydrates

Regulation of Function

- The stomach is under both **neural and hormonal** control.

Gastric Hormones:

- Synthesized as inactive precursors
- Converted to active form by post-translational modification
- stimulus for release is: FOOD
- Composition of food dictates timing and specific hormone release.

Inhibition:

- Removal of stimulus
- Negative feed-back loops
- Inhibitory peptides, ie. Somatostatin

Gastric Hormones:

- Gastrin
- Somatostatin
- Gastrin-releasing peptide (GRP)
- Histamine

Gastrin

- Synthesis:** G-cells in the antrum
- Release:** AA, protein, vagal tone, antral distention, GRP, pH > 3.0, ETOH, Histamine.
- Inhibition:**
 - pH < 3.0, somatostatin, secretin, CCK, VIP, GIP, glucagon.
- Target cells:** Parietal and Chief cells
- Action(s):**
 - Stimulates acid secretion
 - Direct action on parietal cells
 - Potentiating interaction with histamine
 - Possible: releasing of histamine
 - Stimulates motility in stomach, intestine, and gall bladder
 - Inhibits contraction of pylorus and sphincter of Oddi.
 - Stimulates GI mucosal growth.

Somatostatin

•**Synthesis:** CNS, **antrum**, **fundus**, sm. bowel, colon, and D-cells in pancreas.

•**Release:**

- Antral acidification
- Fats, protein, acid in duodenum
- Pancreatic: glucose, amino acids, CCK

•**Inhibition:**

•Release of acetyl-choline from vagal nerve fibers

•**Action(s):**

- The “master off switch”
- Inhibits the release of most GI hormones
- Inhibits pancreatic and GI secretion(s)
- Inhibits intestinal motility.

•**Clinical:**

- Octreotide- decrease fistula output
- Treatment of esophageal variceal bleed
- Can ameliorate symptoms of endocrine tumors

GRP

•**Synthesis:** Gastric antrum, small bowel mucosa

•**Release:** vagal stimulation

•**Action(s):**

- The “master on switch”
- Stimulates the release of all GI hormones (? Secretin).
- Stimulates GI secretion
- Stimulates GI motility
- * most important: stimulates gastric acid secretion and release of antral gastrin

Histamine

- •Stimulates parietal cells
- •Found in ECL cells and resident Mast cells.
- •Release is stimulated by: Gastrin, acetyl-choline, epinephrine
- •Inhibited by Somatostatin.
- A necessary intermediary of acid production.

Acid Secretion

Two forms:

- Basal Acid Secretion
- Stimulated Acid Secretion

Stimulated Acid Secretion

Three Phases:

- •Cephalic phase
- •Gastric phase
- •Intestinal Phase

These phases occur *concurrently* NOT *consecutively*.

Cephalic Phase

- Originates with the sight, smell, thought or taste of food.
- Stimulates the cortex and hypothalamus.
- Signals cause Vagus to release Ach, Ach causes increase in parietal cell acid production.
- Accounts for 20-30% of acid production.

Gastric Phase

- Begins when food enters the gastric lumen (gastric distention).
- Digestion products stimulate the G cells, they release gastrin, parietal cells release acid.
- Distention alone can increase acid production.
- Accounts for 60-70% of acid production.
- Phase lasts until the stomach is empty.

Intestinal Phase

- Poorly understood.
- initiated by chyme entering the small bowel.
- Accounts for ~10% of acid production.

Other functions

- Gastric acid suppression
- Mucosal protection
- B12 absorption

INVESTIGATION OF THE STOMACH AND DUODENUM

Contrast radiology

Upper gastrointestinal radiology is not used as much as in previous years, as endoscopy is a more sensitive investigation for most gastric problems

Flexible endoscopy is the most commonly used and sensitive technique for investigating the stomach and duodenum

Great care needs to be exercised in performing endoscopy to avoid complications and missing important pathology

Axial imaging, particularly multislice CT, is useful in the staging of gastric cancer, although it may be less sensitive in the detection of liver metastases than other modalities

CT/positron emission tomography

Positron emission tomography (PET) is a functional imaging technique which relies on the uptake of a tracer in most cases by metabolically active tumour tissue. Fluorodeoxyglucose (FDG) is the most commonly used tracer.

Endoscopic ultrasound is the most sensitive technique in the evaluation of the 'T' stage of gastric cancer and in the assessment of duodenal tumours

Laparoscopy is very sensitive in detecting peritoneal metastases, and laparoscopic ultrasound provides an accurate evaluation of lymph node and liver metastases

Gastric emptying studies

These are useful in the study of gastric dysmotility problems, particularly those that follow gastric surgery. The principle of the examination is that radioisotope-labelled liquid and solid meals are ingested by the patient and the emptying of the stomach is followed on a gamma camera.

Angiography

Angiography is used most commonly in the investigation of upper gastrointestinal bleeding that is not identified using endoscopy. Therapeutic embolisation may also be of value in the treatment of bleeding in patients in whom surgery is difficult or inadvisable. In expert centres embolisation now replaces surgery in the majority of cases.

Thanks



Lec.1