

Gastric motility & vomiting

By

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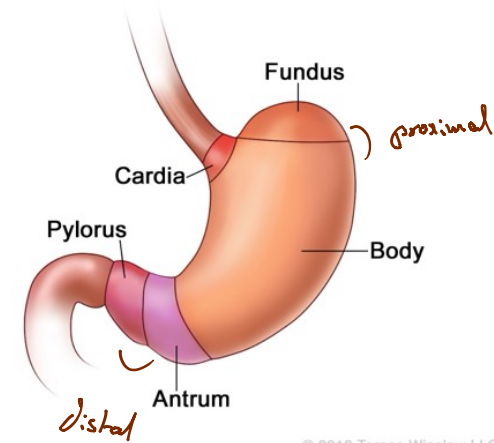
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2024-2025



Types of movements of the stomach



- Anatomy.

Functionally stomach is divided into:

Proximal motor unit

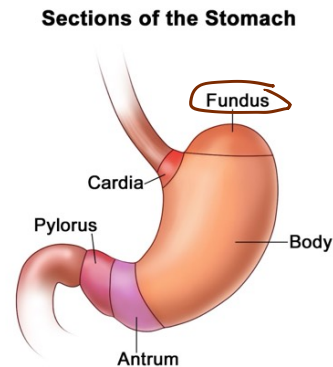
- formed of fundus & body.
- thin wall not for contraction.
- reservoir for food

Distal motor unit

- Antrum & pylorus.
- thick wall. → does not force contraction.
- mixes & empties food. → proper mixing with acid

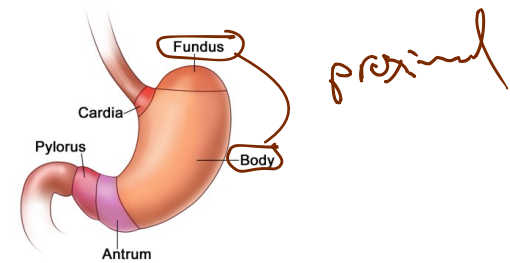
Tonic gastric waves

- Regular weak contractions (3 waves/min) which take place mainly in the fundus to maintain the intra-gastric pressure & mix gastric secretion with food.



Receptive relaxation

Sections of the Stomach



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- It is a reflex relaxation of the fundus and body to receive the bolus of food.

afferent

- Initiated by vagal reflexes (conditioned and unconditioned).

Peristaltic movement

* give main function.

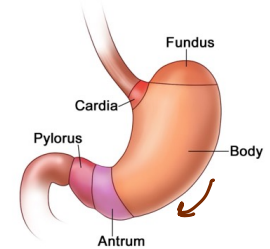
* stimulus

- Distension of stomach by food → stimulate stretch receptors → vago – vagal reflex peristalsis **at the middle of stomach** and proceeds **toward the pyloric antrum** with gradual increase in strength leading to:

not small particles.

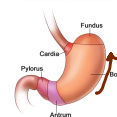
- *- Grinding of food to fine particles.
- *- Emptying of fine particles into the duodenum (propulsive movements).
- *- Peristalsis in opposite direction from pyloric antrum to fundus (Anti-peristalsis) → pyloric mill for mixing of food with gastric secretion.

Sections of the Stomach



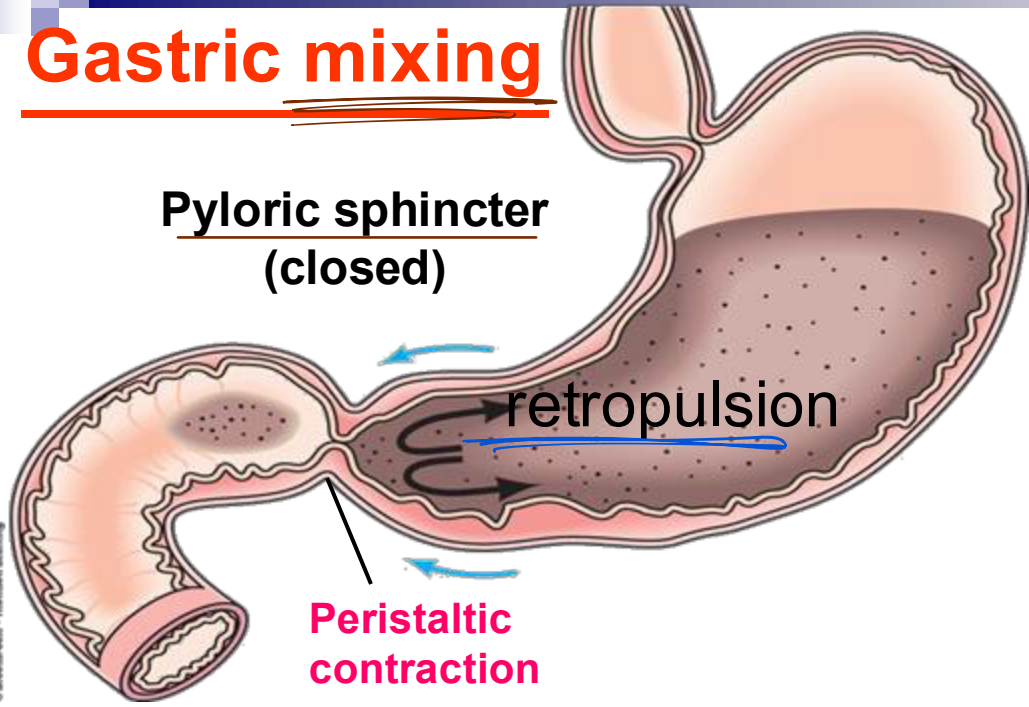
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Sections of the Stomach

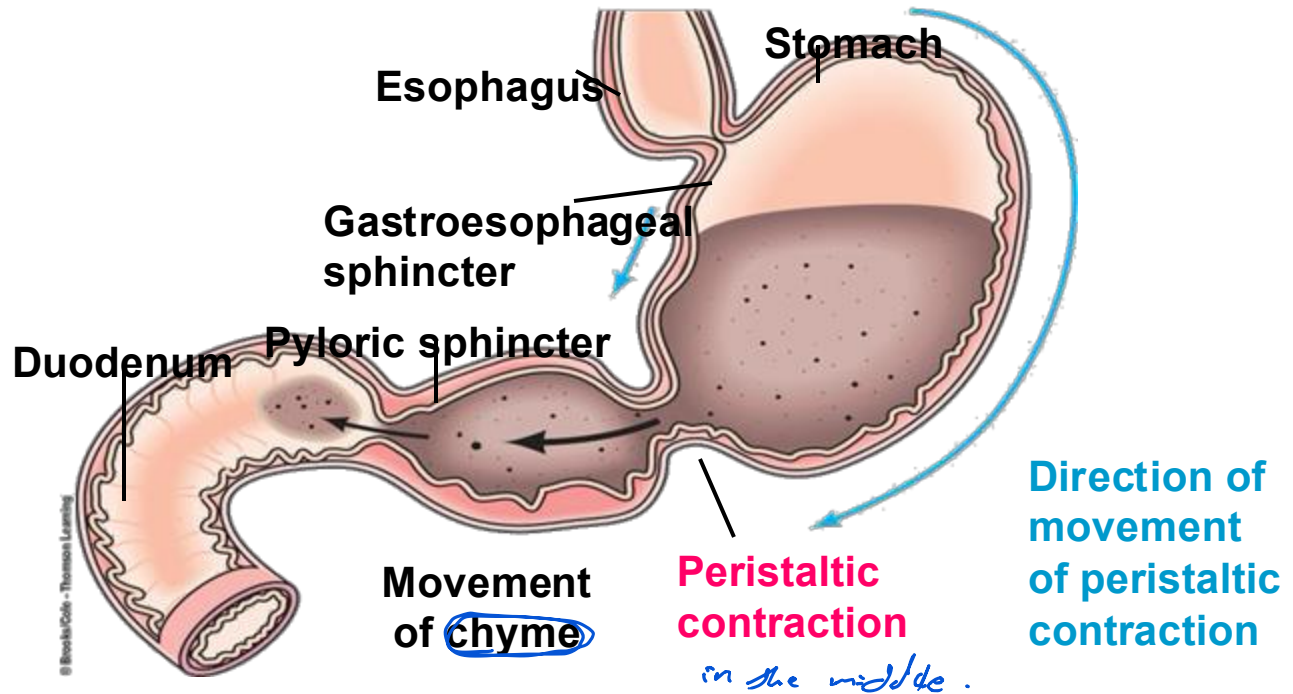


to insure.

Gastric mixing



Gastric emptying



Hunger

contractions:

- Fasting $\xrightarrow{12h}$ hypoglycemia \rightarrow activation of the feeding center in hypothalamus \rightarrow
- Sends impulse to cortex \rightarrow hunger sensation.
Cortical sensation.
- Sends impulse to vagal nucleus \rightarrow hunger strong painful contraction near the fundus
↪ in medulla oblongata.
- They start slowly, then increase \rightarrow tetanic contraction for 2-3 minutes then disappear and reappear in the next feeding time to reach maximal intensity in 3-4 days then gradually disappear.
↪ sustained cont.
(May due to ↓ sensitivity of feeding center to hypoglycemia).

survive 2-3 month

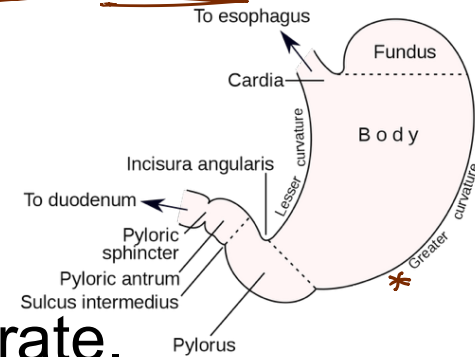
depend on his muscle tone.

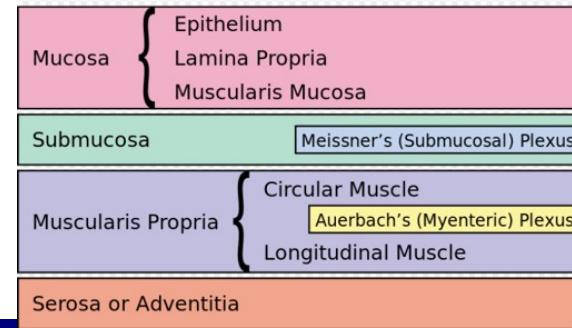
** زي حالات الإمساك عن الطعام.*

Basic electrical rhythm (gastric slow waves) :

- 3-5 cycles/min. due to partial depolarization of circular smooth muscle cells in the stomach wall.
- Some lead to spike potential → peristalsis.
- Start at midpoint of greater curvature (pacemaker of the stomach).
- Vagal and gastrin → ↑ spike potential rate.
- Sympathetic & secretin → ↓ spike potential rate.

* ↑ has a lower amplitude
epinephrine





Nervous regulation of gastric motility

Vagal (*parasympthetic*) :

- Inhibitory purinergic to proximal unit.

via: Vagal st

→ fibers in myenteric plexus

- Excitatory cholinergic to distal unit.

either direct from vagus

contraction of wall relaxation of sphincter
↑↑ emptying of GIT.

↓ chemical transmission

purinergic (ADP, ATP) fibers.

Sympathetic: or myenteric plexus.

relaxation of wall, contraction of sphincter, delayed evacuation.

- Inhibitory (noradrenergic) to GIT wall.

Myenteric plexus:

- Through local enteric reflexes.

* excitatory in distal unit.

Factors affecting gastric emptying :

Carb - protein, fat.

- With a mixed meal the stomach usually empty in about 3 hours through the pyloric pump (50-70 cm.water) which regulate the rate of gastric emptying .

The rate of emptying is controlled by:

Factors in the stomach:

■ Type of food:

carb > protein > Fat.

Carbohydrate is the most rapid. Then proteins followed by fats.

■ Consistency of food:

liquids more rapid which depends on type of food, degree of mastication and the strength of gastric peristalsis.

■ Volume of food:

Moderate volume of chyme → ↑ emptying via vago-vagal reflex and release of gastrin hormone.

Large volume → over distension → ↓ emptying.

passive extension of stomach


*(normal)
stimulate of peristaltic waves via
stretch receptor // reflex inhibition → so stomach*

Emotional factors:

- Pain: visceral and somatic pain → reflex inhibition of gastric emptying.
- Depression & sudden fear → reflex inhibition of gastric emptying through sympathetic activation.
- Anxiety & anger → reflex stimulation of gastric emptying through parasympathetic activation.

Vomiting

■ Definition

- It is the expulsion of gastric contents through the esophagus, pharynx and mouth.

- It is a complex act controlled by vomiting center in the medulla oblongata and mediated by cranial nerves V, VII, IX, X & XII and spinal nerves to diaphragm and abdominal muscles.

ant. horn cell C3,4,5.
- It is preceded by nausea, salivation and increase respiration.

Centers:

- Vomiting center : in the medulla oblongata.
- Chemo receptor trigger Zone (CTZ) :

In close to vomiting center in medulla oblongata.

Its stimulation by emetic drugs, motion sickness or metabolic causes → stimulation of (CTZ)

like renal failure.

:

Causes of vomiting:

1) Central vomiting:

Direct stimulation of CTZ by drugs as morphine, alcohol drinking, diabetic ketoacidosis, renal failure or early pregnancy.

2) Reflex vomiting:

Stimuli:

Unconditioned:

Irritation of back of tongue.

Irritation of gastric mucosal. *bacteria, defect in barrier protecting the stomach from acidity. → gastritis.*

Severe visceral pain (Renal colic, coronary thrombosis...).

anginal pain

Stimulation of semicircular canal

small apparatus → vestibular apparatus: which keeps equilibrium.
استقبال التوازن

so any disturbance → dizziness and if vomiting.

Conditioned:

- (cortical excitation of vomiting) Visual, olfactory and psychic (as morning sickness of pregnancy.)

- **Afferents :** according to site of stimuli.

Center : Direct on vomiting center.

Some to CTZ as semicircular canal irritation
and psychic.

in early pregnancy.

Efferents :

- Via cranial nerves V, VII, IX, X, XII .
- Phrenic nerve to diaphragm.
- Spinal nerves to abdominal muscles.

Response :

- → vomiting

Mechanism of vomiting :

■ 1-Nausea

with salivation, ↑ H.R., sweating, stomach wall is relaxed, and antiperistalsis may occur in duodenum.

■ 2-Retching:

muscle of stomach relaxed

بچاوں اطلع

بب و لامتی

بطلع

intermittent contraction of diaphragm and abdominal muscles against closed L.E.S., and diaphragmatic opening is also contracted.

3- Gastric evacuation :

lower oesophageal sphincter.

- The cardiac sphincter relaxes, and the stomach wall is completely relaxed (passive stomach).
- Powerful contraction of the diaphragm, abdominal muscle and pelvic floor muscle → ↑ intra abdominal pressure → squeezing the relaxed stomach and expulsion its contents to the mouth.

- During vomiting the soft palate elevated, closure of glottis and inhibition of respiration to prevent the vomitus to pass to respiratory passages (as in swallowing).

- When the stomach is empty, antiperistalsis waves may drive the intestinal contents into the stomach (as bile juice).

↓
Jaundice

↓
yellowish juice.

Effect and complications of vomiting :

- Dehydration (loss of secretion). *should be replaced*

pH in blood ↑↑

- ① Alkalaemia : due to loss acid and the resynthesis of acid is associated with ↑ alkaline tide in plasma.

stomach acid pepsin → HCO₃ → blood

pH ↑↑

- Alkalaemia → ↓ ionized Ca⁺² → tetany.

muscle spasm.




Thanks

