

Physiology



Sheet :

Lecture title :

Date : 9/5/2022

Done by : Mariam Badrasawi & Marya Barham

Edited by: Abdullah Manaseer

If you come by any mistake while browsing this sheet kindly report it to Academic Team Facebook Account

Innervation of large intestine :

1) Myenteric plexus : concentrated beneath teniae.

2) parasympathetic input:

Vagus nerve ... innervates proximal colon.

Pelvic nerve (S2-S4) ... innervates distal colon and rectum (anus).

3) Sympathetic Input ...

a) **Coeliac ganglia and superior mesenteric ganglia** in proximal colon .

b) **inferior mesenteric ganglia** in distal colon .

c) **hypogastric plexus** in rectum and anal canal

4) Pudendal nerve : external anal sphincter and perineum .

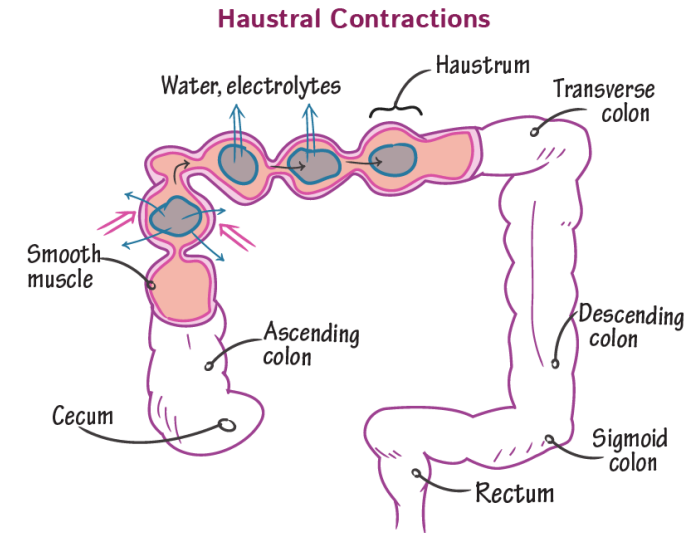
Haustral Contractions

- Purpose?

Mixing movements, facilitate fluid and electrolyte absorption (minimal propulsion)

- Structural and functional basis :

- They appear and disappear every 30-60s
- Require contraction of longitudinal and circular SM - Contraction can be strong to reach almost occlusion.
- Circular SM is concentrated in some areas.
- The non-contracted part bulges.



✓ Also occurs in descending & sigmoid colon to further concentrate fecal waste.

Mass Movements:

Propulsive movements (modified peristalsis)

حركة مندفع للامام... (زي الدودة)

- Purpose - move feces to rectum / stimulate defecation reflex

- Distance - transverse colon to sigmoid

- Occurrence :

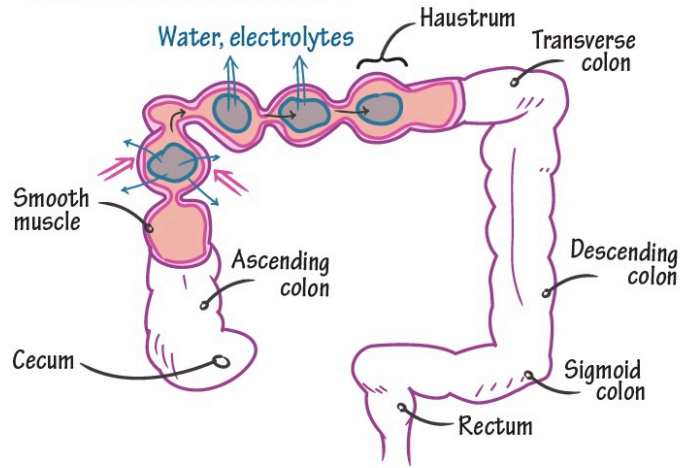
- After meals, series lasting 10-30 min. (1-2 min each)

- Reflexes (Long reflexes)

- Gastrocolic reflex (distention of stomach) .

- Duodenocolic reflex (distention of duodenum).

Haustral Contractions



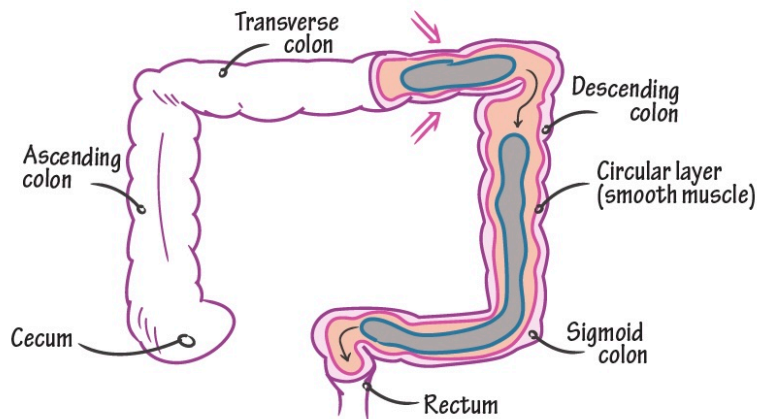
- ✓ Also occurs in descending & sigmoid colon to further concentrate fecal waste.

Peristalsis

- ✓ Circular layer contracts, decreases large intestine diameter to propel chyme forward.
- ✓ Longitudinal layer contracts, shortens the large intestine.
- ✓ Circular layer contracts further distally, propels chyme forward.

Mass Movements

- ✓ Triggered by gastrocolic reflex.



Mass movement refers to peristaltic waves that forcefully propels faeces towards the rectum during defecation

Haustral contraction: slow , uncoordinated segmenting movement that further mix chyme (acid+digested food) and bring it in further contact with intestine to increase water and electrolytes absorption.

Mass movement: slow but powerful contraction of the large intestine that move undigested waste to the rectum for defecation via the anus.

Sheet##

#mixing movement happens second to second or minutes to minutes , while mass movement happened two to three times on day? to send its content to long distance to larg intestine .

there is property of large intestine : it can storage the material , and mass movement to send the content to long distance ...after that the material should be go out of the larg intestine .

#we have in start voluntary then involuntary ,and the end(unase) involuntary and voluntary movement (the opposite of beging).

The structure of large intestine is a large diameter with large length, while the rectum is a small diameter with small length ...so we will send the material a long distance (from ascending ,transverse ,descending) colon to the rectum to end of anus ,so we have distention ,that distention stimulates the contraction ,the movement here like “peristalsis” ,in addition the contacts becomes from liquid to semisolid ,contribute in distention

- Controls of defecation: three levels:

- intrinsic reflex .
- spinal cord reflex .
- higher centers involvement .

Intrinsic Defecation Reflex:

-mediated by enteric nervous system

-Initiated when feces enters rectum via **mass movement**

-rectal distention (توسع) ...afferent signals through myenteric plexus to descending, sigmoid colon and rectum...contraction that force feces toward anus .

Internal anal sphincter relaxes and if external anal sphincter is voluntarily relaxed, defecation occurs.

Spinal Cord Reflex :

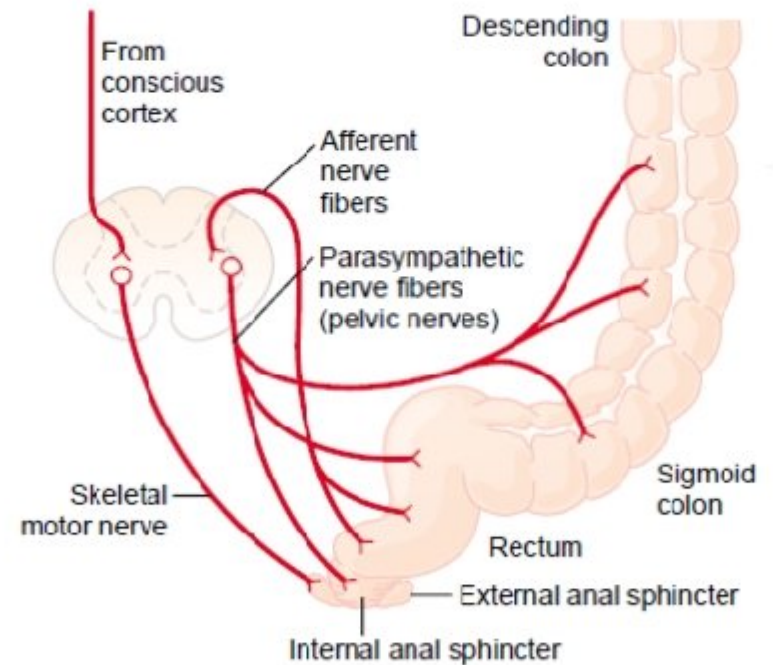
- Parasympathetic cord reflex greatly intensifies intrinsic reflex (but is not different qualitatively)

- Rectal distention also initiates cord reflex

Afferent signals go to sacral cord and then back to descending and sigmoid colon, and rectum by way of parasympathetic fibers in pelvic nerves

The lower neurons (S2-S4) provide sensory and motor fibers for defecation reflex. They are intact when spinal cord is injured at higher levels.

Defecation Reflex



May also be called sphincter anar

Afferent and efferent pathways of the parasympathetic mechanism for enhancing the defecation reflex

we have a smooth muscular sphincter in an anal region called ...**Internal anal sphincter**, open when reaching the material to it, but the human can control in this movement by another sphincter of skeletal muscles called ..**external anal sphincter**, it can be controlled of it by the skeletal motor nerve.

Smooth muscles in GI:

**The contraction of the sheets of smooth muscles for aim:
to move things to send them to the proper place.**

**The proper place for mouth contents (food) and esophagus is the
stomach, during that we should mix the material.**

**Another function of the digestive system is secretion, Transport forms are
maybe inside the cells, or outside the cells,**

the secretion is a type of transport.

The third function of GI after secretion & transport is digestion.

stomach

we have 2 layers of muscles in the alimentary canal :

the outer longitudinal layer and the inner circular one,

**There is integration in contractility pattern between them, which make a direction to low
gut ...that happened by proximal contracting, preceded by distal relaxation, in the stomach
there is the same background, by using the smooth muscles to move the material,**

The function of esophagus is to move it's content to stomach :)

Stomach function is storage

Septal relaxation: property of stomach allows the stomach to reserve the material for along time, without increase the pressure (when you eat, here you will increase mass in your stomach, that will make tension, they will increases the pressure, but because the stomach will make distal relaxation, so it isn't increasing in pressure there.)

Small and large intestine :

The small intestine will mix ;it will receive the bile , pancreatic,and stomch contents,so mixing it together ,to proper down to third part that is ascending colon ,and then we said we have **mass movement** in small intestine.

Internal anal sphincter:

internal ring of smooth muscles which are involuntarily controlled.

Similar to esophagus relaxation during swallowing; we have internal anal sphincter , when relax allowing contents to go down .

External anal sphincter :

Ring of skeletal muscles which are voluntary controlled by brain .

When opened , it formed normal defecation process.

When contracted , it obliterates the opening of the internal one .

#Normal defecation : the external sphincter relaxes smoothly (we have limitations in children).

#Sometimes , it needs more contraction... reflex will bring more material to allow things to go out ... parasympathetic sacral origin to allow contraction of mass movement.

#Other times , it becomes more solid ; not able to go out .

Here , person should stop breathing and which pushes the lung, intestine, and person will dedicate very solid material instead of the normal semisolid.

when there is a resistance to flow of contents maybe there are solid or irritation.

#sphincters are high pressure areas, and we can decrease this pressure by relaxation.

#we have two sphincters in the lower part of the anus , the outer will relax by reflex, but we control upon this relaxation, and we can evacuate the contents when the environment is appropriate.

Defecation Reflex - Higher Centers

- **Afferent signals entering spinal cord initiate other effects that require intact spinal cord.**
 - **deep breath, closure of glottis, and increased abdominal pressure**
 - **all work to move fecal contents downward**
- **Spinal transection or injury can make defecation a difficult process**
 - **cord defecation reflex can be excited (either digitally or with enema)**

List of Sphincters:

- Upper esophageal sphincter (pharyngoesophageal)
- Lower esophageal sphincter (gastroesophageal)
- Pyloric sphincter (gastroduodenal)
- Ileocecal valve / sphincter
- Internal anal sphincter
- External anal sphincter

Sphincters:

1) **Upper esophageal sphincter**: high pressure area that prevents air enters the esophagus.

Without the UES , if u take a breath it will go to the larynx and trachea as well as pharynx and then to esophagus .

2) **Lower esophageal sphincter**: prevents acidic gastric material from going back to the esophagus, but it will allow the bolts to going down during swallowing.

3) **Pyloric sphincter**: high pressure area between pylorus and beginning of duodenum

the gastric media is acidic and the intestinal media is alkaline

...

It prevents the entrance of large amounts of matter From stomach to duodenum simultaneously and gives sufficient time to neutralize the acidity of the amount which passes from stomach each time

4) Ileocecal valve/sphincter:

Ileum enters the cecum in a certain angle so when the pressure increase in it will compressed this structure , so it works as a valve.

#When this valve/sphincter is damaged leading to a harmful effect which is entry of bacteria from the large intestine (contaminated regions) to the small intestine (clean area).

Each part of intestine has it's own sequence;

1)Esophagus sequence is swallowing: primary and secondary peristalsis.

2)stomach has many forms : precipitative relaxation,constriction movements for mixing , mass movement for pumping that will pump small amount of Material, the rest will turn back for further resting.

Once we send material from area to another, we also send information with it so we have **reflex**

Reflex : involuntary response to stimulus that cause inhibition or stimulation depending on the function of it .

Peristaltic reflex : relaxation proceeded by contraction allowing movement of material.

Chemical material like neurons could be stimulatory or inhibitory depending on the areas and the receptor that occupied .

How reflex occurs;

The stimulatory information will go to the proximal cluster if muscle(contraction) and inhibitory information will go to the distal cluster of muscle (relaxation)

Table 20.2 ► Summary of Gastrointestinal Reflexes

Reflex*	Mechanism	Function
Receptive relaxation	This is a vagovagal reflex that causes the muscles of the proximal stomach to relax, which facilitates entry of the bolus into the stomach	It allows the stomach to expand without increasing intragastric pressure (accommodation)
Enterogastric reflex	Entry of chyme into the duodenum inhibits further gastric emptying	Controls amount of chyme entering the duodenum, allowing for optimal digestion and absorption of nutrients
Intestino-intestinal reflex	Overdistention of one portion of the small intestine inhibits motility in the rest of the small intestine	Decompensatory
Gastroileal reflex	Food in the stomach causes increased peristalsis in the ileum and relaxation of the ileocecal sphincter	Promotes the emptying of chyme from the ileum into the colon
Gastrocolic reflex	Increased motility and secretion in the stomach results in increased colonic activity	This reflex begins the process of defecation.
Rectosphincter reflex	Distention of the rectum by colonic contents (following mass movement) causes relaxation of the internal anal sphincter and elicits the urge to defecate	Defecation

* Reflexes mediated by the enteric nervous system.

List of Reflexes

- **Peristaltic Reflex:**
 - stretch bowel, proximal contraction, distal relaxation
- **Enterogastric Reflex:**
 - from duodenum to regulate gastric emptying
- **Gastroileal Reflex (gastroenteric)**
 - gastric distention relaxes ileocecal sphincter
- **Intestino-intestinal Reflex:**
 - over-distention or injury of bowel segment causes entire bowel to relax
- **Gastro- and Duodenocolic Reflexes:** - distention of stomach / duodenum initiates mass movements
- **Defecation Reflex (rectosphincteric)** - rectal distention initiates defecation

List of Reflexes (cont'd)

- **Inhibitory Reflexes**
- **Peritoneointestinal reflex**
- **Renointestinal reflex**
- **Vesicointestinal reflex**