

# Digestive System

University of Jordan  
Faculty of Medicine  
Batch of 2013-2019

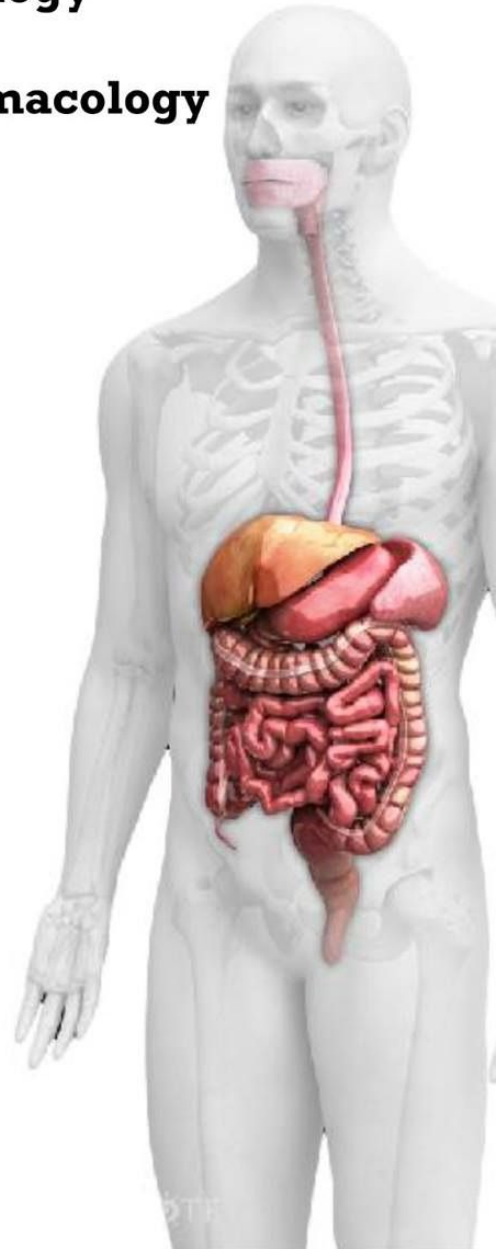


Slide  Sheet  Handout  Other

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**Sheet #: 6**  
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## Peritoneum, Esophagus, & Stomach

### Folds and recesses of posterior abdominal wall

- In the posterior abdominal wall, there're organs that are covered by peritoneum from their anterior aspects only, and we call them: Retroperitoneal organs. [e.g: the duodenum]
- Some organs are covered completely by peritoneum and those are called: Intraperitoneal organs. [e.g: the jejunum]  
→ These turns between retroperitoneal and intraperitoneal organs form the fold of peritoneum and the laxation/extension of its two layers.
  
- Advantages and disadvantages?
  - ❖ **Intraperitoneal** organs are more able to be **moved**.  
[Like jejunum; it has a mesentery with 15 cm length]
  - ❖ **Retroperitoneal** organs are more **fixed** to the posterior wall.  
[Duodenum; it's retroperitoneal, but the last inch of it is considered intraperitoneal because it's where we convert the retro to intra again]
  - ❖ The major **disadvantage** is that this extension of peritoneum is that it forms **Pouches** (spaces) and the **jejunum** may go inside them and then it can be **compressed** there and its **blood supply** will be compressed and affected too → **Gangrene of small intestine** -internal hernia-, it's a complicated case that needs to be treated.

- Again, what internal hernia is? The displacement of small intestine to the pouches, and its blood supply is compressed there, resulting in a: Strangulated hernia.
- **Folds and recesses** of peritoneum are found around the **duodenum**, the **cecum** , the **sigmoid colon**[the sigmoid colon has its mesentery too, it's intraperitoneal after the retroperitoneal descending colon]
    - ❖ Here for example, in the cecum because we have laxation of peritoneal folds between cecum which is intraperitoneal and the ascending colon which is retroperitoneal we find the **Retro-cecal** recess; Fold/Pouch/Space behind the cecum, and it's the most common area that receives the **Appendix**. Also, there may be an **Internal Hernia** if a part of the ilium that's connected to the cecum goes in this pouch and gets compressed.
    - ❖ Another pouch is the **Morison's** pouch (sub-hepatic pouch), it's located between the liver and the right kidney.
    - ❖ In **Males** , there is an **Anterior Urinary** Pouch between the anterior abdominal wall and bladder. There is also **Recto-vesical** pouch between the rectum and urinary bladder, where the sigmoid colon is located.
    - ❖ In a **Female**, There is the **Recto-uterine** pouch (Douglasi pouch) between the uterus and the rectum posteriorly. And the **Vesico-uterine** pouch between the uterus and the urinary bladder anteriorly.

## Para-colic gutters (grooves)

1- **Supra-colic gutters in the supra-colic compartment** that contains the sub-phrenic and sub-hepatic compartments.

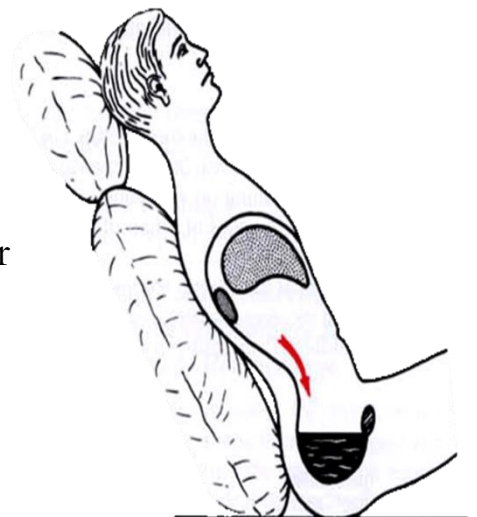
→**Sub-phrenic?** (below-the-diaphragm)

These are 2 spaces (right & left) separated by falciform ligament this space is located between the diaphragm and the liver .

- In these spaces, Sub-phrenic **abscesses** may develop after untreated **appendicitis** become chronic and reach there, and sadly the patient will be having **fever, pain** in the right iliac fossa, and the inflammation/abscess will spread specially to the **right side** of the falciform ligament because the patient may sleep on his right side. [This case is hardly diagnosed unless you started asking about very detailed history]- - Note: On the left side, no infections reach the sub-phrenic space from downwards, why? There's phrenico-colic ligament that binds the left colic flexure to the diaphragm and thus prevent any dissemination of fluids from the lower gutter to the diaphragm.

→**Sub-hepatic recess:** Below the liver.

Sometimes the puss cells don't go to the sub-phrenic recess ,instead they go between the liver and the right kidney [in Morison's space] and abscesses are formed there.



- ❖ These Abscesses spread depending on the sleeping/setting position of the patient.
- In the sitting position of the figure before , the abscess will remain localized in the pelvis.

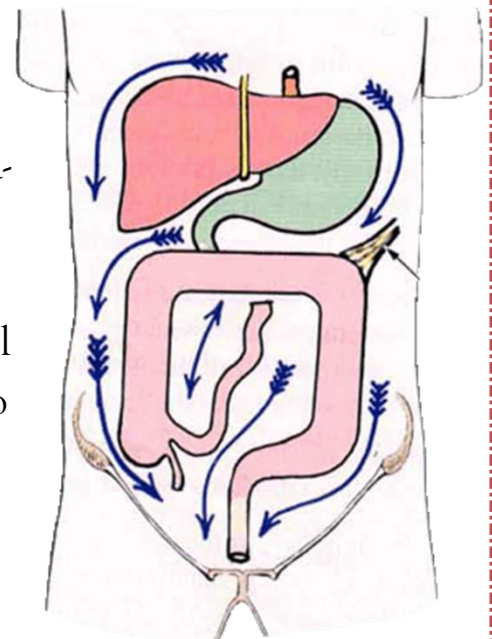
2- **Infra-colic gutters:** surround the ascending a descending colons, which are separated by the transverse colon.

- The transverse colon has a mesentery that's attached to the posterior abdominal wall, that's why any infection below the level of transverse colon will stay in the pelvis but never goes upwards on the left side because of that transverse meso-colon mesentery and phrenico-colic ligament.

- But on the right side, it can go to pelvis or to sub-phrenic and sub-hepatic spaces.

→ Let's talk about the **right** infra-colic (para-colic) gutter; it has a closed medial side, and opened lateral one.

→ The **left** gutter has also medial and lateral sides, and here both of them is connected to the pelvis, without going upwards.



- By that, we finished out talk about the peritoneum and now we'll start with the esophagus and stomach, (slide5).

## The Esophagus

- The esophagus is the continuation of the pharynx, it starts at the lower border of **C6** vertebrae [ at the level of the lower border of **Cricoid cartilage** (Larynx)]
- It's a muscular tube -25 cm in length.
- If you want to measure its length starting from the incisors ( if you're using a Gastroscope ) , it will take 45 cm to end.  
In other words: the distance between the Cardia of stomach and incisors measures 45 cm.
- Its function: It propels the bolus downwards to the stomach.
- It ends in the **Physiological** sphincter: the Cardiac orifice.

### ❖ Physiological sphincter?

- It has no true thickening in the inner circular smooth muscle to form a true anatomical sphincter, so it's just a physiological one that prevents the regurgitation of contents of stomach back to the esophagus by the help of an acute angle between the stomach and the esophagus.
- While the Pyloric orifice (the other end of stomach) has a true Anatomical sphincter (thickening in the circular muscles) + It's also considered Physiological sphincter.
- Histologically, the esophagus is composed of four layers: [Mucosa, Sub-mucosa, Muscularis externa, Adventitia], except in its lower 1.3 cm that's located in the abdominal cavity ,it is lined by serosa .

- Esophagus goes in the **esophageal orifice** in the diaphragm - 1 inch to the left of the midline (at the left copula of diaphragm) at the level of **T10** - along **with the right and left vagus nerves**.
- ➔ The 2 Vagals nerv after entering the orifice, they become ordered; one to the anterior aspect and the other to the posterior aspect.
- ➔ They are called: the **Gastric nerves**, or the Vagal nerves of stomach

### Relations of esophagus

- At the upper part, it's situated Behind the trachea, and the recurrent laryngeal nerve is situated between them.  
[ Trachea is anterior to esophagus]
- The trachea bifurcates, and at the level of the sternal angle, the left bronchus crosses the esophagus anteriorly.
- The Arch of Aorta starts anteriorly then goes to the left side of esophagus.  
[Remember the three main branches of The Arch of Aorta:  
[Brachiocephalic A., Left Common Carotid A., Left Subclavian A.]
- Intially, the Right vagus is on the right side, and the left on the left.
- The 2 lungs and their pleura are situated on the right and left sides.
- The descending Aorta at first is located on the left side and the esophagus is on the right, but at the lower part, the esophagus crosses in front of the thoracic aorta and goes to the left side to be able to enter its orifice in the left side of diaphragm.
- ➔ The orifice of the Thoracic Aorta in the diaphragm is located in the midline at the level of T12, and then it becomes the descending abdominal Aorta.
- The thoracic duct crosses from right to left posterior to the esophagus.

## Blood Supply of Esophagus

- The **Descending Thoracic Aorta** gives esophageal branches.
- **Phrenic** arteries supply it at the upper part.
- The lower end of esophagus is supplied by the **left gastric** artery (important )

## Venous Drainage

- In the upper/thoracic part, it drains into the Azygos vein.
- The lower third drains into the left gastric vein that ends in the portal vein, and here there're also systemic veins that form the Porto-systemic anastomosis with the portal veins.

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## The Stomach

- The stomach has a lesser curvature connected to the lesser omentum and a great curvature connected to the greater omentum that reaches the transverse column.'
- The stomach is located in the **Epigastric** and **Umbilical** regions
- It has 2 Orifices ( Cardiac & Pyloric )
- It Has 2 Surfaces ( Anterior & Posterior)
- It has 2 Curvatures ( lesser & Greater )
- It is **J-shaped** in normal people, but **Steer-horn** shaped in obese ones
- Its shape and volume depend also on its content and position, and the respiratory state.
- From **inside** there are **Rugae** (folding of submucosa through the mucosa to increase the surface area)
  - ❖ Rugea are transverse in orientation, but around the lesser curvature they are ordered longitudinally to facilitate the direct movement of fluids from the stomach to the duodenum.
  - Here we need to notice that water descends quickly from the stomach to duodenum and it's barely mixed with food in the stomach.
- The stomach is covered completely by peritoneum
- The Peritoneum forms the greater and lesser omenta, which you need to know their attachments and contents.

- 3 main parts of stomach: Fundus, Body, Pylorus.
- The main **function** of stomach is the **DIGESTION**, producing gastric/acidic chyme. Then **MIXING** of digested material by contraction. Then **EVACUATING** the chime to the duodenum + **CONTROLLING** that evacuation at the level of the pyloric sphincter along with contractions in the muscles of the wall.
- The **Pyloric** sphincter is controlled by **Sympathetic** fibers.
- The **Muscles in the wall of stomach** is controlled by **Parasympathetic** fibers.
- ➔ When there's a stimulation for the parasympathetic system, the sphincter is relaxed ➔ Evacuation of chime.
- ➔ It takes 2-4 Hours for each meal to be evacuated from the stomach.
  
- More detailed parts of stomach:
  - ❖ **Cardiac orifice**
    - It lies at the level of the 7<sup>th</sup> costal cartilage, 1 inch to the left
    - 45 cm far from incisors
    - 10 cm behind the anterior abdominal wall
  
  - ❖ **Fundus**
    - Note the angulation that prevent the reflux near the fundus.
    - It's usually filed with air & gases, that's why it appears as a space filled with black dots on x-rays.
    - Although the Cricopharyngeal muscle works to prevent the passage of air, air still can pass with food and fill the fundus.
    - It's located at the same level of the cardia.

### ❖ Body

- At the end of the lesser curvature, there's an angle that separates the body from the pyloric part of stomach and is considered a good land mark: Incisura Angularis.

### ❖ Pyloric part

- Pyloric Antrum
- Pyloric Canal -1 inch-
- Pyloric Sphincter& Orifice:

[thickening of the circular layer of muscle.]

[ At the level of L1 - 1 inch to the right of midline]

[ Vein of Mayo is located in front of the sphincter as an important land mark for the position of pyloric sphincter in surgeries]

- The pyloric part then ends and the duodenum begins with an area known - on x-rays- as duodenal cap.  
→The Duodenal Cap is a triangular area in which constriction then dilatation are noticed.  
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Let's talk again about the Control of serving the chyme from the stomach to the duodenum;

### ❖ Autonomically:

- Motor Control by sympathetic fibers that contract the sphincter
- Relaxation by myenteric fibers for draining the chime

### ❖ Hormonally. [some hormonal effects from duodenum]

## Histology of Stomach

- Mucosa of Gastric glands & Gastric pits  
[ All discussed in the histology lecture ]

## Relations of Stomach

- The **anterior** surface of the stomach has an anterior relation with the anterior abdominal wall, left costal margin, left pleura and lung, diaphragm, and liver.
  - The Posterior relations are concluded in the “stomach bed”.  
The stomach bed contains:
    - ❖ The lesser sac (a space behind the stomach to allow it to extend)
    - ❖ The left crus of diaphragm (it has vertebral origin)
    - ❖ The left kidney and left supra-renal gland
    - ❖ The Pancreas
    - ❖ The Splenic Artery (Tortuous artery passes over the upper border of pancreas behind the stomach)  
[ Pay attention here for the passage of the artery only. The vein passes behind the pancreas not the stomach so the pancreas separates the stomach from the splenic vein .]
    - ❖ The spleen that's behind the tail of pancreas
- Generally, It's lateral to the lesser sac and to the stomach; it covers the greater curvature, then it curves so a small part of it will go anteriorly and covers the anterior surface of the stomach, and another part will cover the posterior surface and is impressed by that posterior surface resulting in what's known as Gastric Impression.

- ❖ The transverse colon and meso-colon.
  - [ some cases, if the meso-colon is long, the transverse colon may go below the stomach.

## Blood Supply Of Stomach

- ➔ The GI tract is divided into:
  - Foregut
    - ❖ [From the lower end of esophagus, stomach, upper half of the duodenum ]
    - ❖ supplied by the Celiac Trunk.
  - Midgut
    - ❖ [Lower half of duodenum, small intestine, large intestines till the lateral third of transverse colon]
    - ❖ supplied by the Superior Mesenteric artery .
  - Hindgut
    - ❖ [from the lateral third of transverse colon to the rectum]
    - ❖ supplied by the Inferior Mesenteric artery.

SO ➔the blood supply of stomach comes from the CELIAC TRUNK of the Abdominal Aorta

- at the lower border of T12 or upper border of L1-
- above the upper border of pancreas behind the stomach-
- near the crus of diaphragm-

- The Celiac trunk gives of some branches:
  - ❖ **Left Gastric Artery** to supply the lower end of esophagus and the anterior wall of the body of stomach.
  - ❖ **Hepatic Artery** [to the liver] but also gives of branches to the stomach which are:
    - Right Gastric Artery
    - Right Gastro-Epiploic Artery
    - Superior Pancreato-duodenal branch of Gastro-duodenal Artery
  - ❖ **Splenic Artery** to the stomach and spleen, and gives:
    - Left Gastro-epiploic Artery
    - 5-7 Short Gastric Arteries mainly to the fundus
- ➔ The Celiac trunk is accompanied on the sides of its origin with the Celiac Ganglia, & **Celiac Lymph Nodes** that collect the lymphatic drainage of the stomach.
- ➔ The Lymphatic drainage of stomach is collected firstly in the right and left gastric, gastro-epiploic, and short gastric lymph nodes; and those all drains finally into the main Celiac Lymph Nodes.

### Venous Drainage [It's just the Opposite]

- The Left Gastric vein is coming from the lower end of esophagus and stomach, then ends in the portal vein.
- The Right Gastric vein goes with the Right Gastro-epiploic to the Superior Mesenteric.

- The Short Gastric & the Left Gastro-epiploic veins drain into the Splenic vein
  - ❖ Then the Splenic vein & the Superior Mesenteric unite behind the neck of Pancreas and form the Portal vein.
  - ❖ The Portal vein receives the left -and sometimes the right- Gastric veins -as mentioned above-
  - ❖ The Portal vein goes to the Liver; it simply collects the absorptive material from the entire GI tract and send it to the liver.

## Nerve Suppy

- Sympathetic
    - The Aortic plexus from L1+L2
    - Mainly to control the sphincter (motor)
  - Parasympathetic
    - The Vagus nerve
    - Secreto-motor to glands + Peristaltic movement
- ➔ Have a look on the Vagi and remember what's mentioned in previous pages;
- They're Left & Right, and when they pass with esophagus they become Anterior & Posterior, respectively.
  - They Give different branches and terminal fibers.

- The **Left Vagus** (the **Anterior**) supplies:

- \* The **Anterior surface of Fundus and Body**.
- \* The **Pylorus** by the Nerve of Latarjet.
- \* The Liver by a Hepatic branch.

- The **Right Vagus** (the **Posterior**) supplies

- \* The **Posterior wall of Stomach**, and also some parts of the Anterior wall.
- \* The **Pylorus** by the Nerve to Latarjet.
- \* The **Intestines** by the **Celiac branch** that continues along with the small intestine to the lateral third of transverse colon.

Note: the colon -after the lateral third- is supplied by the parasympathetic fibers of the sacral plexus S2,S3,S4.

## Clinical Point

Many years ago, gastric ulcer (peptic ulcer) was used to be considered a result of hyperacidity of stomach, and the treatment was the cutting of the Vagus nerve that's controlling the secretion and thus hyperacidity.

- Later on, it was discovered that actually the peptic ulcer is a complication of a bacterial infection by the H.pylori bacteria which normally present in the stomach, but under certain conditions, it starts to multiply abnormally and causes pathogenic effects and ulceration especially in the first inch of duodenum.

And the treatment turns to be just by specific antibiotic and H<sup>+</sup> blockers.



## THE END

بحب أهدي الشيت للعائلة الكريمة والأقارب، ولكل اللي ساعدني أوصل لهون،  
ولنادي قرائمييا العظيم بأعضاؤه، ومجموعة البيوستات الأفخم 11A، والأصدقاء  
في المنفى: شذى تيلخ، علا عاطف، أريج جابر، رنيم بدر، ريهام الهندي، نادين  
فريحات، رعدة ياسين، بشرى المعاقبة، مي زياد، ويارب ما أكون نسيت حدا.

كنت بدور ع اقتباس أونصيحة ووجدت انه أعظم نصيحة:  
لما تحتاج أي اقتباس أو دليل أو إرشاد في حياتك في أي وقت، افتح القرآن الكريم  
واقراء، القرآن كنز (:)