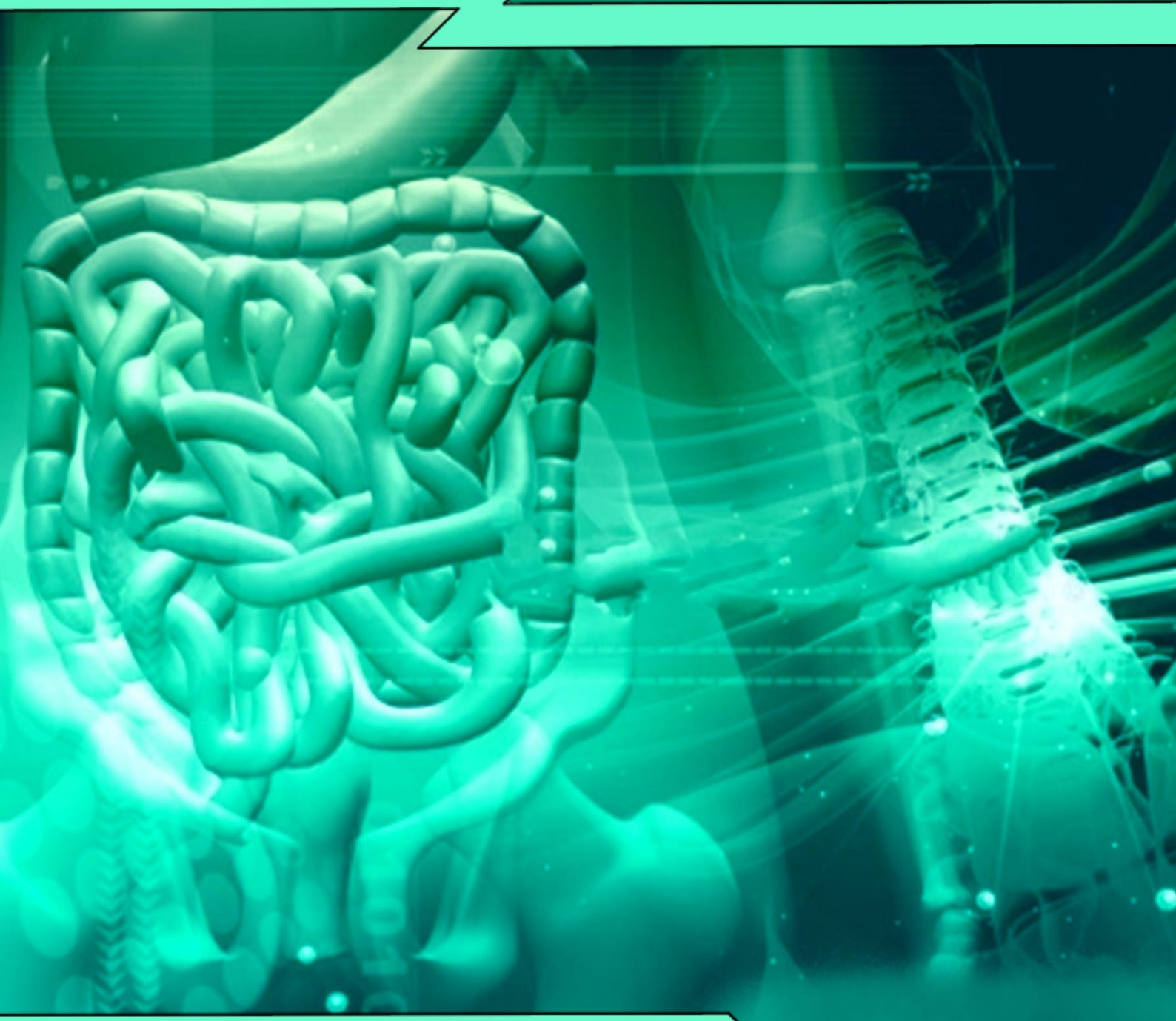
HATAHET ANATOMY



Digestive system (2)

Lecture: 15

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Lecture 15: Digestive system (2)

In the previous lecture, we discussed the organs of the GIT, and now we will discuss the accessory digestive organs

Accessory Digestive Organs

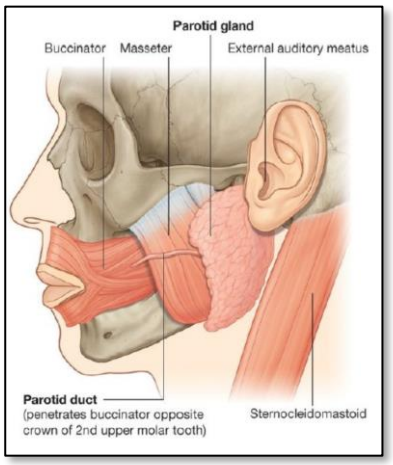
Salivary glands

- Salivary glands are the exocrine glands that secrete saliva into the oral cavity
- they classified into 2 groups:

[1] Minor salivary glands, small and in hundreds: (Labial, Buccal, Lingual, Palatal)

[2] Major salivary glands, 3 large glands that produce the most of saliva, and they are:

➢ Parotid gland



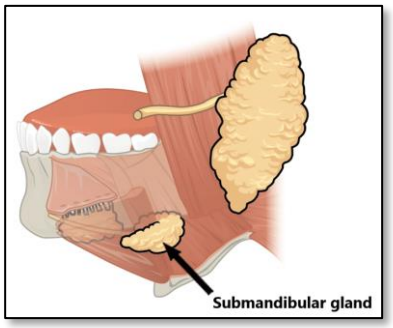
- the largest salivary gland
- located in the parotid region, between Mandibular ramus & Mastoid process
- has a wedge shape with apex & base:

  - **Apex (inferior)** → Mandibular angle
  - **Base (superior)** → Zygomatic arch

- its duct is called (**Stensen's duct**) and it has the following course:

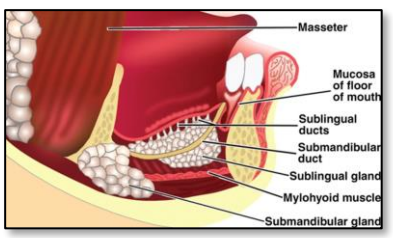
  ① passes horizontally and superficial to **Masseter muscle**
  ② turns medially and pierces the **Buccinator muscle**
  ③ opens into the mouth opposite to the 2nd upper molar tooth

➢ Submandibular gland

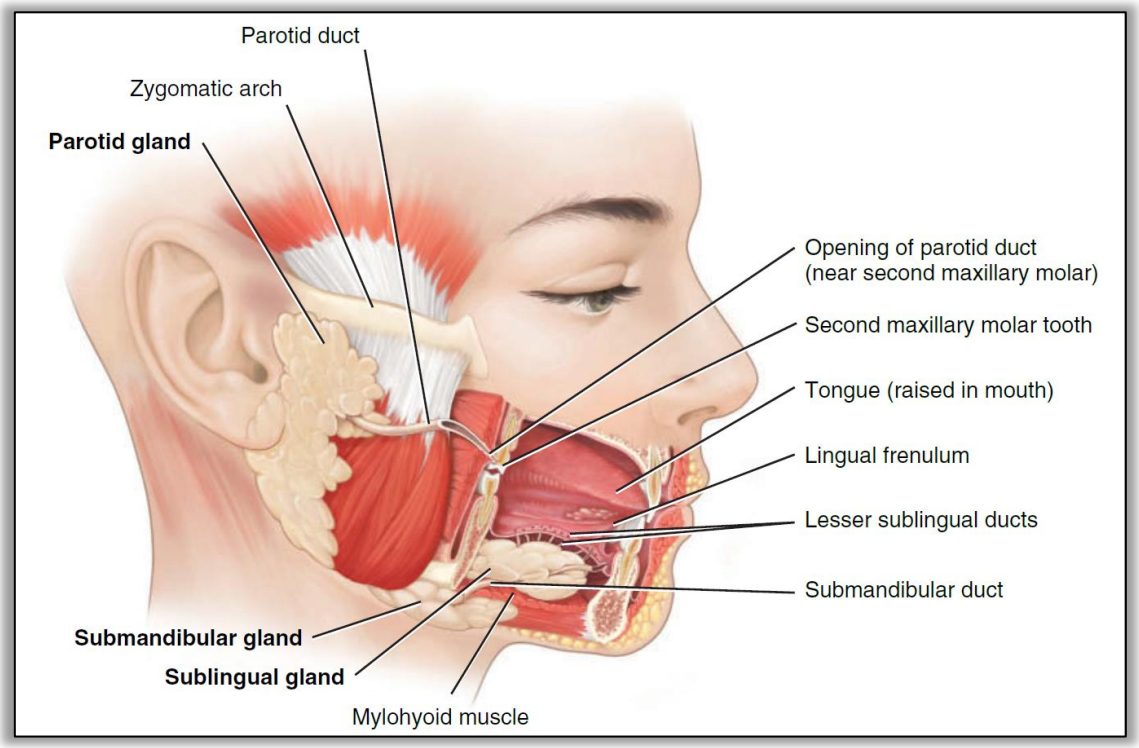


- located beneath and deep to the mandible
- composed of 2 parts (superficial & deep) wrapped around the **Mylohyoid muscle**
- its duct is called (**Wharton's duct**) and it opens in the floor of the mouth at each side of the lingual frenulum

➢ Sublingual gland



- located beneath the mucous membrane of the floor of the mouth
- its duct is called (**Rivinus' duct**) and it opens through (8-20) smaller ducts into the floor of the mouth



Liver

- Liver is the largest internal organ; the 2nd largest organ in the body after the skin
- located in the RUQ and extends to the LUQ
- liver has over 500 functions, some of them are: **Bile production and secretion**, **Blood filtration**, **Metabolism**, **Storage**
- liver is a mobile organ; it can descend for up to 10 cm during inspiration
- Anatomy of liver:

✪ **Surfaces**, liver has 2 surfaces:

❶ Diaphragmatic surface

- the convex supero-anterior surface
- faces the anterior abdominal wall muscles

❷ Visceral surface

- the flat infero-posterior surface
- faces other abdominal organs
- contains impressions from other organs:

  - **Gastric impression**, for the stomach
  - **Renal impression**, for the right kidney
  - **Colic impression**, for the right colic flexure

***Note**: The liver is covered with peritoneum (intraperitoneal), except in 3 areas:

A. Bare area, located between both limbs of the coronary ligament
B. over the bed of gallbladder
C. Porta hepatis (Hilum of liver), where the Portal triad is located, it is composed of:

- **Portal vein** (*in*), collects blood from the guts
- **Hepatic artery** (*in*), a branch of the celiac trunk
- **Bile duct** (*out*), joins the pancreatic duct at the major duodenal papilla

✪ **Lobes**, the liver has 4 anatomical lobes and 2 physiological lobes (R & L), so we will list all of them as follows:

❶ **Right lobe**
❷ **Left lobe**
❸ **Quadrate lobe**, located between gall bladder & ligamentum teres
❹ **Caudate lobe**, located between IVC & ligamentum venosum

***Note**: Both caudate & quadrate lobes are anatomically (location) related to the **RIGHT** lobe, but physiologically (**blood supply & bile production**) to the **LEFT** lobe

✪ **Ligaments**, these are double layers of the peritoneum that attach the liver to other structures, these are:

❶ **Falciform ligament**

- sickle-shaped ligament located anteriorly
- it attaches the liver to the abdominal wall
- separates between R&L lobes of the liver
- extends in the vertical axis of the liver:

  - superiorly → splits into the coronary ligament & Left triangular ligament
  - inferiorly → encircles the round ligament

❷ **Round ligament (Ligamentum teres)**

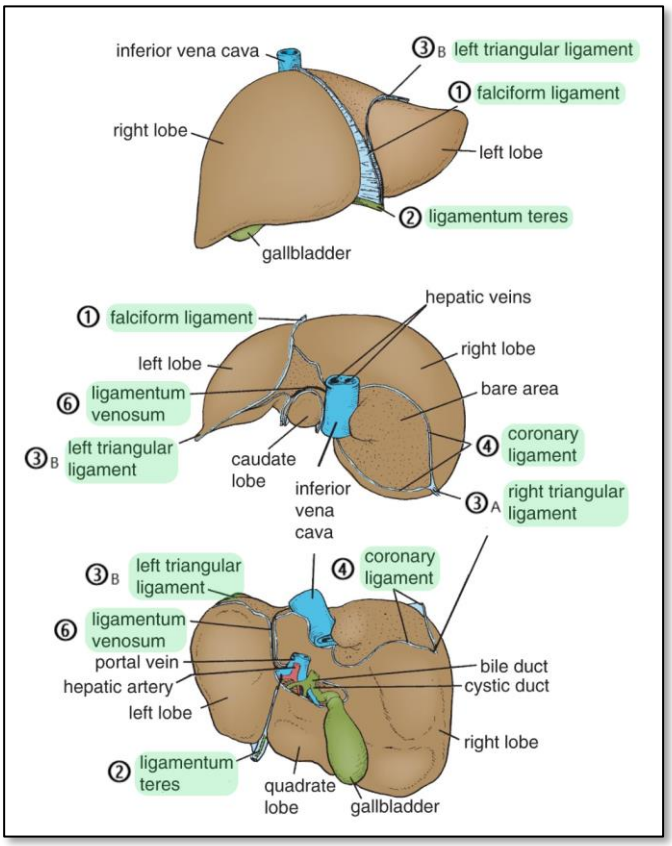
- it is the remnant of the **Umbilical vein**
- enclosed by the falciform ligament

❸ **Coronary ligament**

- composed of 2 layers that are widely separated
- has 2 limbs (anterior & posterior) that extend and demarcate the bare area of the liver
- terminates at the right side as the **R. triangular L.**

❹ **Triangular ligaments**, two ligaments:

A. **Right triangular ligament**, the termination of the coronary ligament when the 2 limbs meet. It connects the liver to diaphragm



B. **Left triangular ligament**, the continuation of the falciform ligament

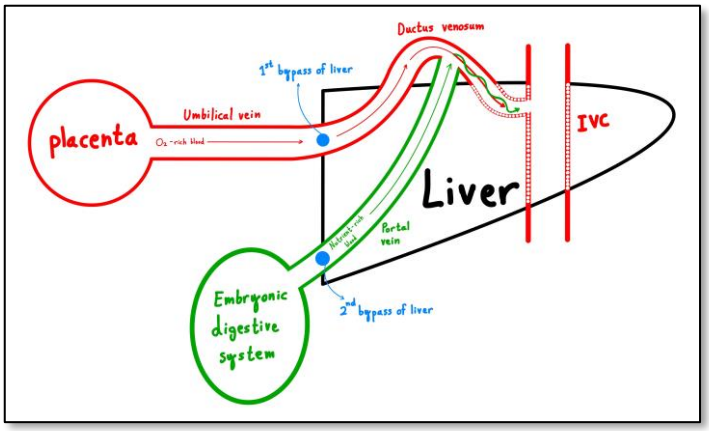
❺ **Hepatocaval ligament**, a transverse ligament that holds the IVC to its impression on the visceral surface of the liver

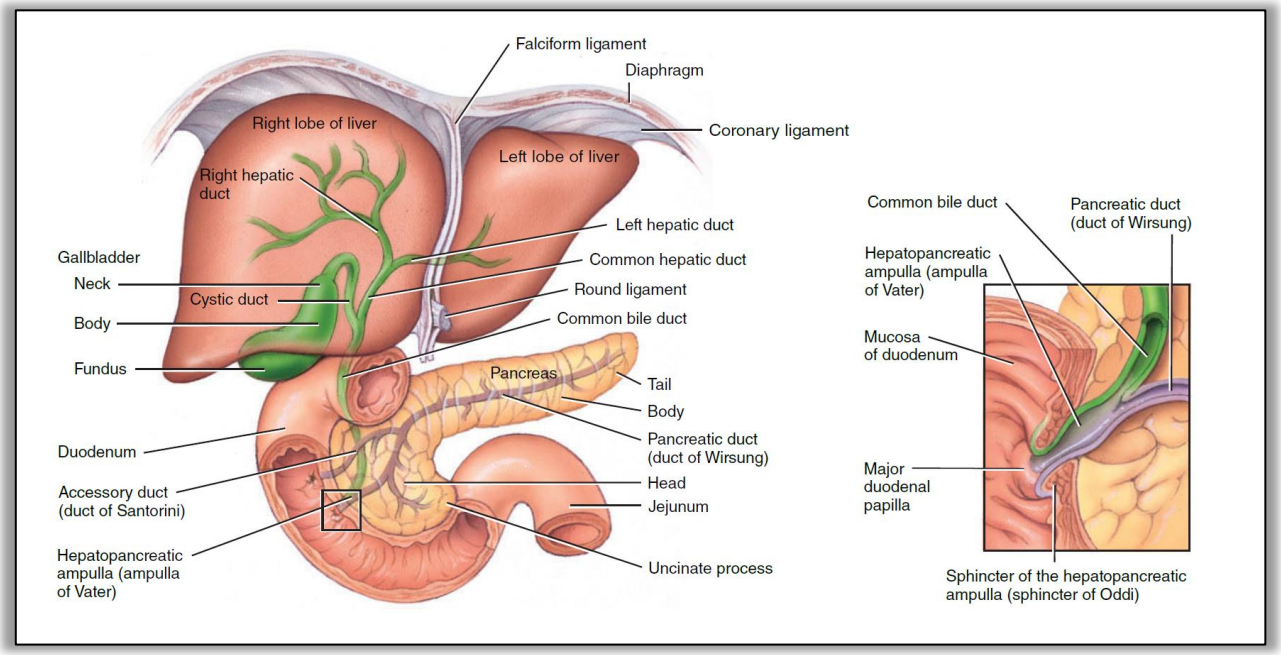
❻ **Ligamentum venosum**, a remnant of **Ductus venosum**; a fetal structure that aids in the 1st and 2nd bypass/shunt of the liver in the fetal circulation

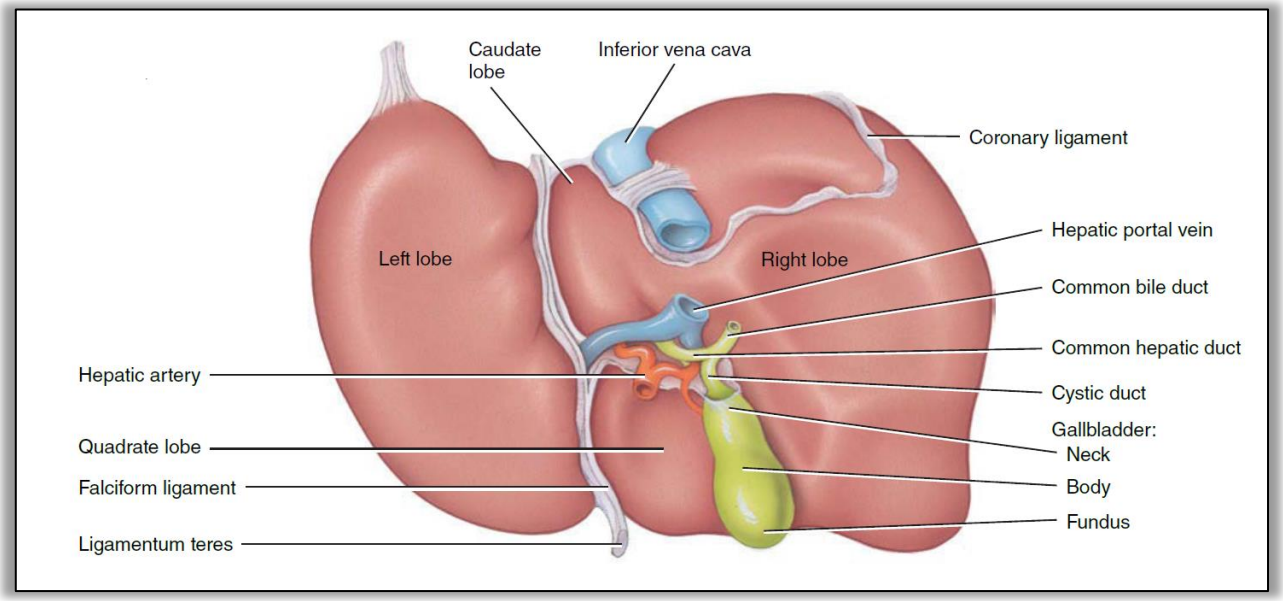
✪ **Hepatic bypass of Fetal circulation**

➢ **1st bypass** → as the oxygenated blood comes from the placenta of the mother, it will shunt from the umbilical vein to ductus venosus; bypassing the liver

➢ **2nd bypass** → as the nutrient-rich blood comes from digestive system of the fetus, it will shunt from the portal vein to ductus venosus; bypassing the liver







Gallbladder

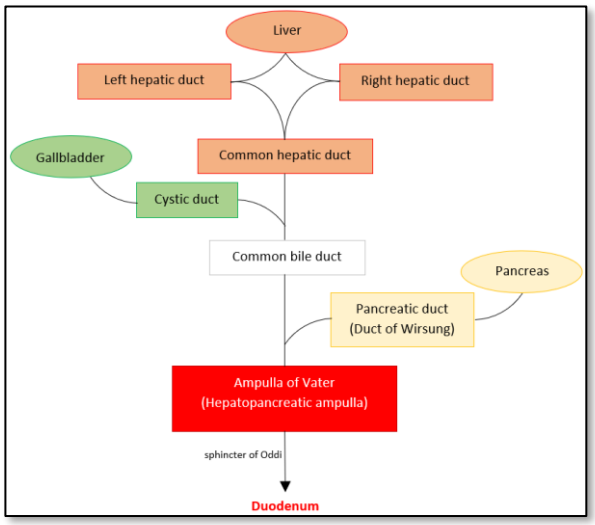
- Bile duct is a pear-shaped sac located in a depression of the inferior surface of the right lobe of the liver
- it stores & concentrates bile (remember the liver secretes it, not the gallbladder)
- bile facilitates the digestion of lipids in the small intestine
- has 3 main parts: Fundus, Body, Neck
- can be located where the R. midclavicular line crosses the 9th costal cartilage
- gallbladder is supplied by the **Cystic artery**, a branch of the Right hepatic artery
- **Bile Tree**:

R&L hepatic ducts will join together forming **Common hepatic duct** → common hepatic duct joins the **Cystic duct** to form the **Common bile duct** → common bile duct joins the **Pancreatic duct** forming the **Hepatopancreatic ampulla** (**Ampulla of Vater**) → hepatopancreatic ampulla will open into the 2nd part of duodenum through the major papilla

Pancreas

- glandular organ <u>posterior to the greater curvature of the stomach</u>
- has both exocrine and endocrine function:

❶ **Exocrine** → secretes hydrolytic enzymes into the duodenum
❷ **Endocrine** → (**Islets of Langerhans**) which secrete insulin and glucagon into the venous circulation



- has 4 main parts:

➢ Head
- the disc-shaped portion of pancreas
- located within the concavity of the 2nd part of duodenum

➢ Neck
- a constricted portion between head & body
- the SMA runs posterior to the neck of pancreas

➢ Body
- the largest part
- extends all the way to the left side, reaching the spleen
- contains 2 pancreatic ducts:
  - **Primary pancreatic duct** (**Wirsung's duct**), opens into the major duodenal papilla
  - **Accessory pancreatic duct** (**Santorini's duct**), opens into the minor duodenal papilla

➢ Tail
- the only intraperitoneal part of the pancreas
- it contacts with the spleen

Miscellaneous Structures

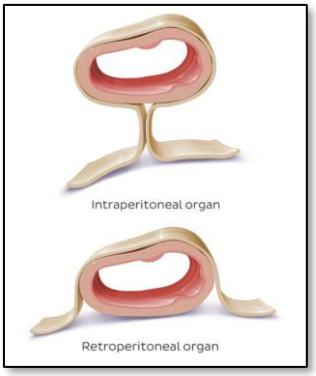
Peritoneum

- Peritoneum is the serous membrane that covers the abdominopelvic organs, composed of 3 parts:

A. **Parietal layer**, the outer layer that lines the internal abdominal muscles
B. **Visceral layer**, the inner layer that surrounds the organs
C. **Peritoneal cavity**, the cavity between the 2 layers, it is filled with serous fluid; <u>to reduce friction</u>

- Organs in relation to the peritoneum has 3 types:

A. **Intraperitoneal organ** → completely covered by the visceral layer
B. **Retroperitoneal organ** → touched <u>anteriorly</u> by the parietal layer
C. **Sub-peritoneal organ** → have no relation with the peritoneum & located inferior to it, ex: **Urinary bladder**



The peritoneum has many folds for the blood vessels and nerves to pass through and reach the organs; <u>because nerves and vessels do **NOT** pierce the peritoneum</u>. These folds are:

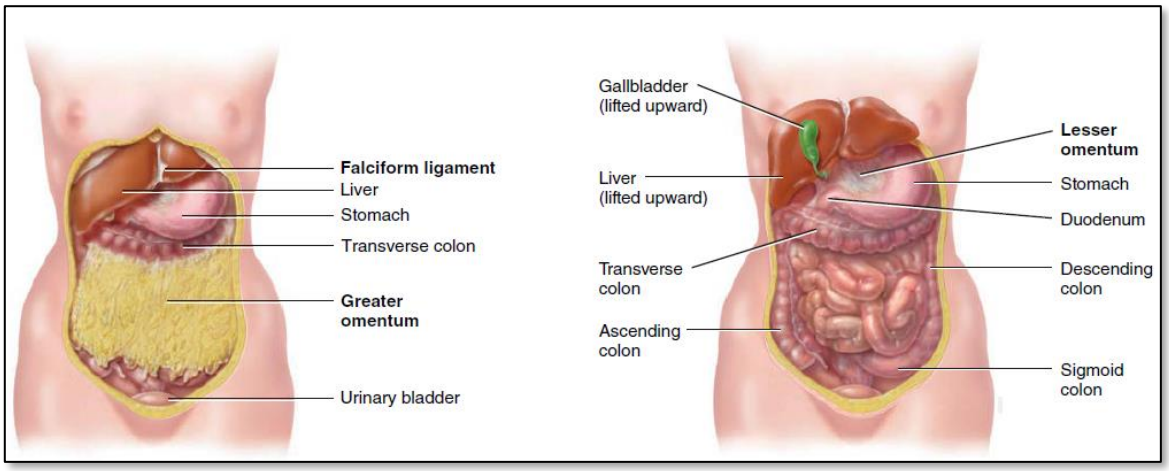
❶ Omentum, the peritoneal folds related to the stomach, has 2 parts:

A. Greater omentum

- a double double-sheet (4 layers in total) peritoneal fold that hangs in front of abdominal organs like an apron (مريول)
- extends between: (**Greater curvature of stomach → Transverse colon**)

B. lesser omentum

- extends from: (**Lesser curvature of stomach & 1st 2 cm of duodenum → Liver**)



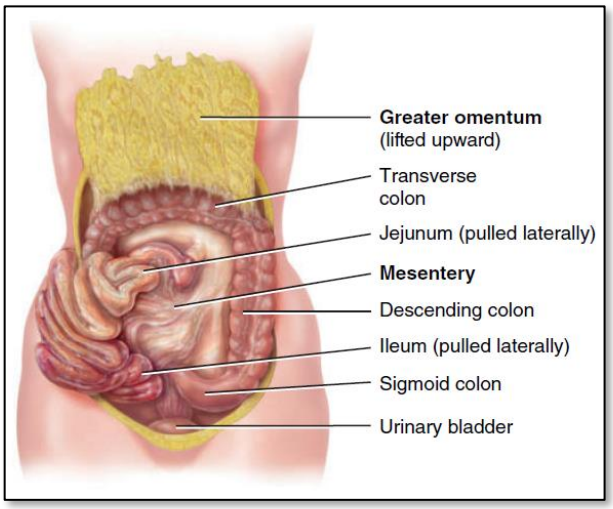
❷ Mesentery,

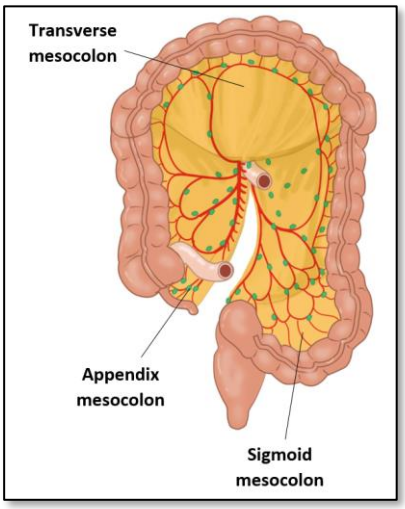
- the largest peritoneal fold, fan-shaped (شبه المروحة)
- related to the **small intestine**

❸ Mesocolon

- related to the **large intestine**
- has 3 main parts:

A. Transverse mesocolon
B. Sigmoid mesocolon
C. Appendix mesocolon





❹ Falciform ligament

Peritoneal organs

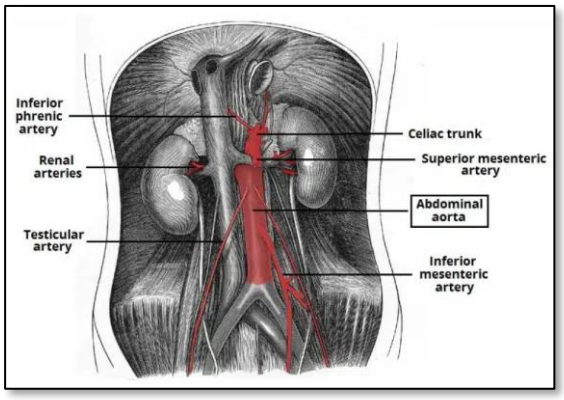
Intraperitoneal organs	Retroperitoneal organs
Stomach 1st two cm of duodenum Jejunum Ileum Appendix Transverse colon Sigmoid colon Liver, except over 3 areas Tail of pancreas Spleen	Duodenum, except 1st two cm Cecum Ascending colon Descending colon Pancreas, except its tail Kidneys

Arterial blood supply

➢ Celiac trunk

- very short artery at the level of T12, just beneath median (aortic) hiatus
- supplies the **Foregut**
- divides into 3 arteries:

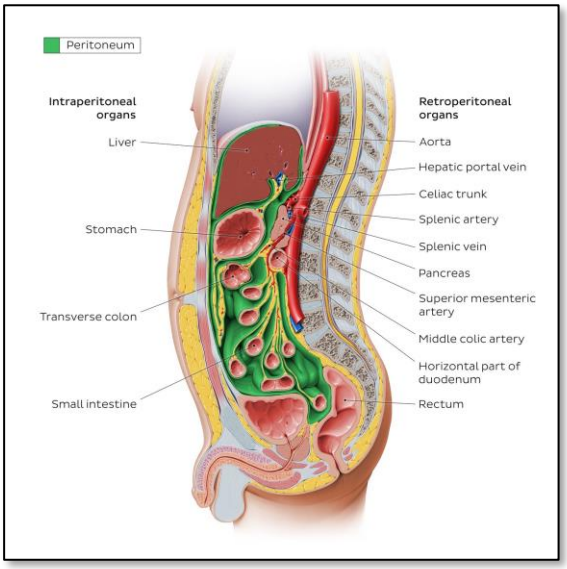
❶ **Splenic artery** (the largest), supplies the spleen
❷ **Common hepatic artery**, supplies the liver
❸ **Left gastric artery**, supplies the left curvature of stomach



➢ Superior mesenteric artery

- suspended above the L. renal vein
- descends anterior to $^{1}/_{3}$ of duodenum & posterior to the neck of pancreas
- supplies the **Midgut**
- associated with the **(Left renal vein entrapment syndrome) "Nutcracker Phenomenon - NCP"**

▪ **Nutcracker syndrome**: a syndrome by which the L. renal vein is pinched/compressed by the 2 arteries surrounding it (**AA** & **SMA**) when the angle between them is injured and swollen, this results in **Varicocele** (دوالي الخصيتين)



➢ Inferior mesenteric artery

- runs downward to the left
- supplies the **Hindgut**

Embryology

Based on the Embryological origin & Blood supply, the GIT abdominal organs are divided into 3 main regions:

- **Foregut**, extends between (Oral cavity → Major duodenal papilla)
- **Midgut**, extends between (Major duodenal papilla → Distal $^{1}/_{3}$ of transverse colon)
- **Hindgut**, extends between (Distal $^{1}/_{3}$ of transverse colon → Anus)