

Anatomy summary for GI

By

Dawood ALatefi

The Digestive System in the Head and Neck

The Mouth

The Lips:

The lips are two fleshy folds that surround the oral orifice. They are covered on the outside by skin and are lined on the inside by mucous membrane. The substance of the lips is made up by the orbicularis oris muscle and the muscles that radiate from the lips into the face. Also included are the labial blood vessels and nerves, connective tissue, and many small salivary glands. The philtrum is the shallow vertical groove seen in the midline on the outer surface of the upper lip. Median folds of mucous membrane—the **labial frenulae**—connect the inner surface of the lips to the gums.

The Mouth Cavity:

The mouth extends from the lips to the pharynx. The entrance into the pharynx, the **oropharyngeal isthmus**, is formed on each side by the palatoglossal fold. The mouth is divided into the vestibule and the mouth cavity proper.

Vestibule:

The vestibule lies between the lips and the cheeks externally and the gums and the teeth internally. This slitlike space communicates with the exterior through the oral fissure between the lips. When the jaws are closed, it communicates with the mouth proper behind the third molar tooth on each side. The vestibule is limited above and below by the reflection of the mucous membrane from the lips and cheeks to the gums. The lateral wall of the vestibule is formed by the cheek, which is made up by the buccinator muscle and is lined with mucous membrane. The tone of the buccinator muscle and that of the muscles of the lips keeps the walls of the vestibule in contact with one another. The **duct of the parotid salivary gland** opens on a small papilla into the vestibule opposite the upper second molar tooth.

Mouth Proper:

The mouth proper has a roof and a floor.

Roof of Mouth:

The roof of the mouth is formed by the hard palate in front and the soft palate behind.

Floor of Mouth:

The floor is formed largely by the anterior two thirds of the tongue and by the reflection of the mucous membrane from the sides of the tongue to the gum of the mandible. A fold of mucous membrane called the **frenulum of the tongue** connects the undersurface of the tongue in the midline to the floor of the mouth. Lateral to the frenulum, the mucous membrane forms a fringed fold, the **plica fimbriata** connects the undersurface of the tongue in the midline to the floor of the mouth. Lateral to the frenulum, the mucous membrane forms a fringed fold, the plica fimbriata. The submandibular duct of the submandibular gland opens onto the floor of the mouth on the summit of a small papilla on either side of the frenulum of the tongue. The sublingual gland projects up into the mouth, producing a low fold of mucous membrane, the sublingual fold. Numerous ducts of the gland open on the summit of the fold. The submandibular duct of the submandibular gland opens onto the floor of the mouth on the summit of a small papilla on either side of the frenulum of the tongue. The sublingual gland projects up into the mouth, producing a low fold of mucous membrane, the **sublingual fold**. Numerous ducts of the gland open on the summit of the fold.

Mucous Membrane of the Mouth:

In the vestibule, the mucous membrane is tethered to the buccinator muscle by elastic fibers in the submucosa that prevent redundant folds of mucous membrane from being bitten between the teeth when the jaws are closed. The mucous membrane of the gingiva, or gum, is strongly attached to the alveolar periosteum.

Sensory Innervation of the Mouth:

- Roof: The greater palatine and nasopalatine nerves from the maxillary division of the trigeminal nerve
- Floor: The lingual nerve (common sensation), a branch of the mandibular division of the trigeminal nerve. The taste fibers travel in the chorda tympani nerve, a branch of the facial nerve.
- Cheek: The buccal nerve, a branch of the mandibular division of the trigeminal nerve (the buccinator muscle is innervated by the buccal branch of the facial nerve)

The Teeth

Deciduous Teeth:

There are 20 deciduous teeth: four incisors, two canines, and four molars in each jaw. They begin to erupt about 6 months after birth and have all erupted by the end of 2 years. The teeth of the lower jaw usually appear before those of the upper jaw.

Permanent Teeth:

There are 32 permanent teeth: 4 incisors, 2 canines, 4 premolars, and 6 molars in each jaw. They begin to erupt at 6 years of age. The last tooth to erupt is the third molar, which may happen between the ages of 17 and 30. The teeth of the lower jaw appear before those of the upper jaw.

The Tongue

The tongue is a mass of striated muscle covered with mucous membrane. The muscles attach the tongue to the styloid process and the soft palate above and to the mandible and the hyoid bone below. The tongue is divided into right and left halves by a median **fibrous septum**.

Mucous Membrane of the Tongue:

The mucous membrane of the upper surface of the tongue can be divided into anterior and posterior parts by a V-shaped sulcus, the **sulcus terminalis**. The apex of the sulcus projects backward and is marked by a small pit, the foramen cecum. The sulcus serves to divide the tongue into the anterior two thirds, or oral part, and the posterior third, or pharyngeal part. The foramen cecum is an embryologic remnant and marks the site of the upper end of the thyroglossal duct. Three types of papillae are present on the upper surface of the anterior two thirds of the tongue: the **filiform papillae**, the **fungiform papillae**, and the **vallate papillae**. The mucous membrane covering the posterior third of the tongue is devoid of papillae but has an irregular surface, caused by the presence of underlying lymph nodules, the **lingual tonsil**. The mucous membrane on the inferior surface of the tongue is reflected from the tongue to the floor of the mouth. In the midline anteriorly, the undersurface of the tongue is connected to the floor of the mouth by a fold of mucous membrane, the **frenulum of the tongue**. On the lateral side of the frenulum, the deep lingual vein can be seen through the mucous membrane. Lateral to the lingual vein, the mucous membrane forms a fringed fold called the **plica fimbriata**.

Muscles of the Tongue:

The muscles of the tongue are divided into two types: intrinsic and extrinsic.

- **Intrinsic Muscles:**

These muscles are confined to the tongue and are not attached to bone. They consist of longitudinal, transverse, and vertical fibers.

Nerve supply: Hypoglossal nerve

Action: Alter the shape of the tongue

- **Extrinsic Muscles:**

These muscles are attached to bones and the soft palate .They are

Muscle	Origin	Action
genioglossus	Superior genial spine of mandible	Protrudes apex of tongue through mouth
hyoglossus	Body and greater cornu of hyoid bone	Depresses tongue
styloglossus	Styloid process of temporal bone	Draws tongue upward and backward
palatoglossus	Palatine aponeurosis	Pulls roots of tongue upward and backward, narrows oropharyngeal isthmus

Insertion : Blends with each other, the palatoglossus inserts at Side of tongue

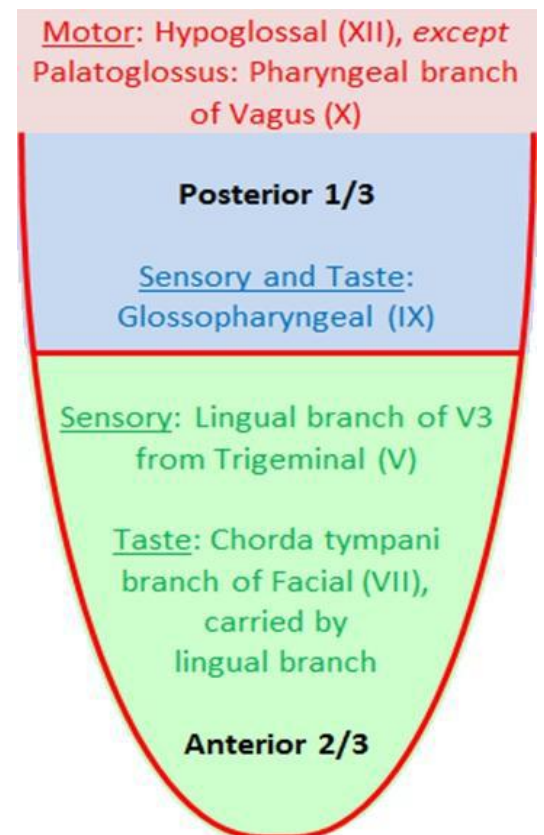
Nerve supply: Hypoglossal nerve except palatoglossus(Pharyngeal branch of vagus)

Movements of the Tongue:

- **Protrusion:** The genioglossus muscles on both sides acting together
- **Retraction:** Styloglossus and hyoglossus muscles on both sides acting together
- **Depression:** Hyoglossus muscles on both sides acting together
- **Retraction and elevation of the posterior third:** Styloglossus and palatoglossus muscles on both sides acting together
- **Shape changes:** Intrinsic muscles

❖ **Sensory Innervation**

- **Anterior two thirds:** Lingual nerve branch of mandibular division of trigeminal nerve (general sensation) and chorda tympani branch of the facial nerve (taste)



- **Posterior third:** Glossopharyngeal nerve (general sensation and taste)

❖ **Blood Supply:**

The lingual artery, the tonsillar branch of the facial artery, and the ascending pharyngeal artery supply the tongue. The veins drain into the internal jugular vein.

❖ **Lymph Drainage:**

Tip: Submental lymph nodes

Sides of the anterior two thirds: Submandibular and deep cervical lymph nodes

Posterior third: Deep cervical lymph nodes.

The Palate

The palate forms the roof of the mouth and the floor of the nasal cavity. It is divided into two parts: the hard palate in front and the soft palate behind.

•Hard Palate

The hard palate is formed by the palatine processes of the maxillae and the horizontal plates of the palatine bones. It is continuous behind with the soft palate.

•Soft Palate

The soft palate is a mobile fold attached to the posterior border of the hard palate. Its free posterior border presents in the midline a conical projection called the uvula. The soft palate is continuous at the sides with the lateral wall of the pharynx. The soft palate is composed of mucous membrane, palatine aponeurosis, and muscles.

The mucous membrane covers the upper and lower surfaces of the soft palate. The palatine aponeurosis is a fibrous sheet attached to the posterior border of the hard palate. It is the expanded tendon of the tensor veli palatini muscle.

Muscles of the Soft Palate:

The muscles of the soft palate are the tensor veli palatini, the levator veli palatini, the palatoglossus, the palatopharyngeus, and the musculus uvulae. The muscle fibers of the tensor veli palatini converge as they descend from their origin to form a narrow tendon,

which turns medially around the pterygoid hamulus. The tendon, together with the tendon of the opposite side, expands to form the palatine aponeurosis. When the muscles of the two sides contract, the soft palate is tightened so that the soft palate may be moved upward or downward as a tense sheet.

Muscle	Origin	Insertion	Nerve supply	Action
Tensor veli palatini	Spine of sphenoid, auditory tube	With muscle of other side, forms palatine aponeurosis	Nerve to medial pterygoid from mandibular nerve	Tenses soft palate
Levator veli palatini	Petrous part of temporal bone, auditory tube	Palatine aponeurosis	Pharyngeal plexus	Raises soft palate
Palatoglossus	Palatine aponeurosis	Side of tongue	Pharyngeal plexus	Pulls root of tongue upward and backward, narrows oropharyngeal isthmus
Palatopharyngeus	Palatine aponeurosis	Posterior border of thyroid cartilage	Pharyngeal plexus	Elevates wall of pharynx, pulls palatopharyngeal folds medially
Musculus uvulae	Posterior border of hard palate	Mucous membrane of uvula	Pharyngeal plexus	Elevates uvula

Movements of the Soft Palate:

The pharyngeal isthmus (the communicating channel between the nasal and oral parts of the pharynx) is closed by raising the soft palate. Closure occurs during the production of explosive consonants in speech. The soft palate is raised by the contraction of the levator veli palatini on each side. At the same time, the upper fibers of the superior constrictor muscle contract and pull the posterior pharyngeal wall forward. The palatopharyngeus muscles on

both sides also contract so that the palatopharyngeal arches are pulled medially, like side curtains. By this means, the nasal part of the pharynx is closed off from the oral part.

Nerve Supply of the Palate:

The **greater** and **lesser palatine nerves** from the **maxillary** division of the **trigeminal** nerve enter the palate through the **greater** and **lesser palatine foramina**. The **nasopalatine** nerve, also a branch of the **maxillary** nerve, enters the front of the **hard palate** through the **incisive foramen**. The glossopharyngeal nerve also supplies the soft palate.

Blood Supply of the Palate:

The greater palatine branch of the maxillary artery, the ascending palatine branch of the facial artery, and the ascending pharyngeal artery

Lymph Drainage of the Palate: **Deep Cervical Lymph Nodes**

Palatoglossal Arch: The palatoglossal arch is a fold of mucous membrane containing the **palatoglossus muscle**, which extends from the soft palate to the side of the tongue. **The palatoglossal arch marks where the mouth becomes the pharynx.**

Palatopharyngeal Arch The palatopharyngeal arch is a fold of mucous membrane behind the palatoglossal arch that runs downward and laterally to join the pharyngeal wall. The muscle contained within the fold is the **palatopharyngeus muscle**. The **palatine tonsils**, which are masses of lymphoid tissue, are located between the palatoglossal and palatopharyngeal arches

The Salivary Glands

Parotid Gland:

The parotid gland is the **largest** salivary gland and is composed mostly of **serous acini**. It lies in a deep hollow below the external auditory meatus, behind the ramus of the mandible, and in front of the sternocleidomastoid muscle. The facial nerve divides the gland into **superficial** and **deep lobes**. The parotid duct emerges from the anterior border of the gland and passes forward over the lateral surface of the masseter. It enters the vestibule of the mouth upon a small papilla opposite the upper second molar tooth.

- **Nerve Supply:** Parasympathetic secretomotor supply arises from the glossopharyngeal nerve. The nerves reach the gland via the tympanic branch, the lesser petrosal nerve, the otic ganglion, and the auriculotemporal nerve.

Submandibular Gland:

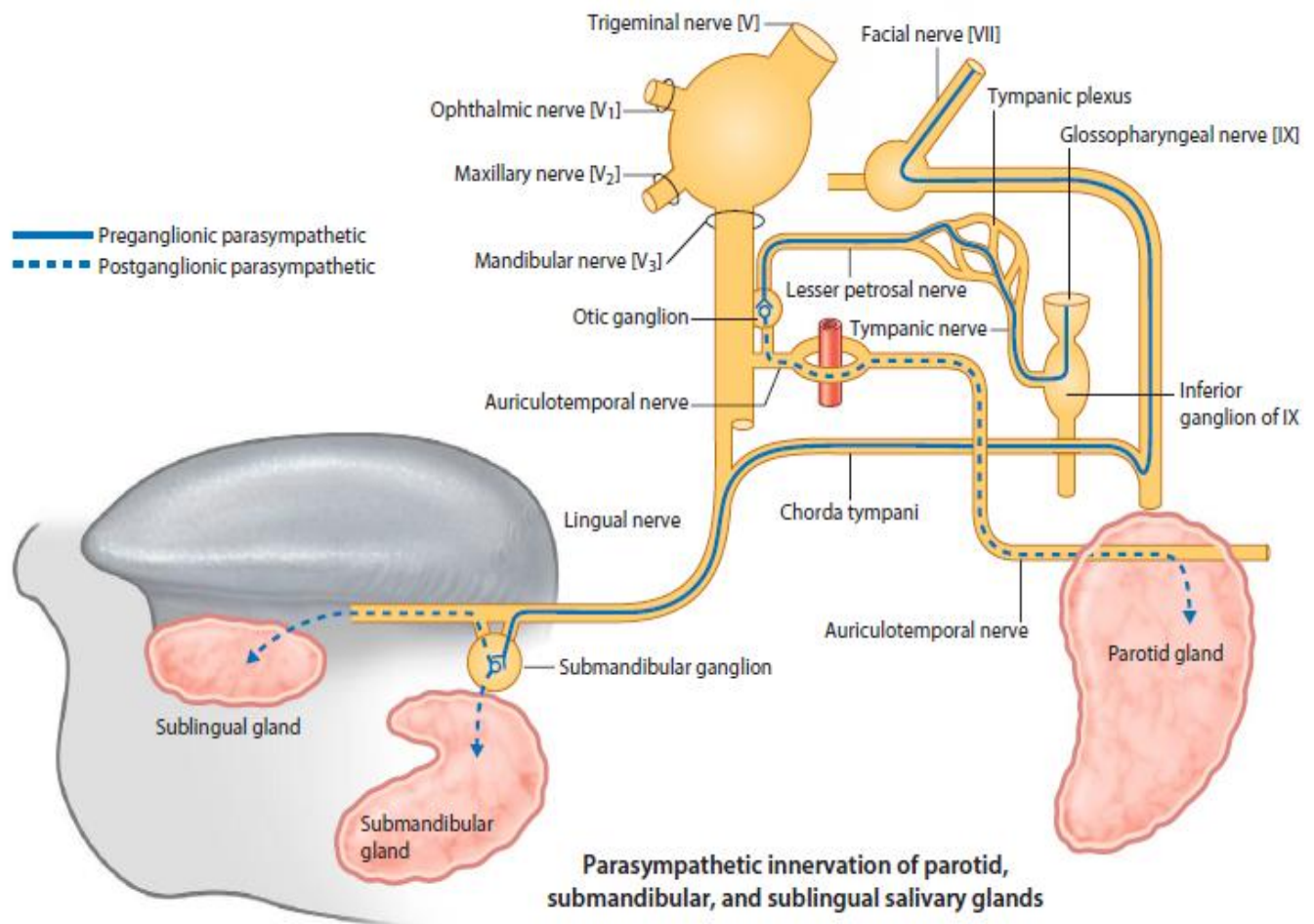
The submandibular gland consists of a mixture of **serous** and **mucous acini**. It lies beneath the lower border of the body of the mandible and is divided into superficial and deep parts by the **mylohyoid** muscle. The deep part of the gland lies beneath the mucous membrane of the mouth on the side of the tongue. The submandibular duct emerges from the anterior end of the deep part of the gland and runs forward beneath the mucous membrane of the mouth. It opens into the mouth on a small papilla, which is situated at the side of the frenulum of the tongue. The larger arm of the hook is directed forward in the horizontal plane below the mylohyoid muscle and is therefore outside the boundaries of the oral cavity—this larger superficial part of the gland is directly against a shallow impression on the medial side of the mandible (submandibular fossa) inferior to the mylohyoid line. The smaller arm of the hook (or deep part) of the gland loops around the posterior margin of the mylohyoid muscle to enter and lie within the floor of the oral cavity where it is lateral to the root of the tongue on the lateral surface of the hyoglossus muscle. The lingual nerve loops under the submandibular duct, crossing first the lateral side and then the medial side of the duct, as the nerve descends anteromedially through the floor of the oral cavity and then ascends into the tongue.

- **Nerve Supply:** Parasympathetic secretomotor supply is from the **facial nerve** via the **chorda tympani**, and the **submandibular ganglion**. The postganglionic fibers pass directly to the gland.

Sublingual Gland:

The sublingual gland lies beneath the mucous membrane (sublingual fold) of the floor of the mouth, close to the frenulum of the tongue. It has both serous and **mucous acini**, with the latter predominating. The sublingual ducts (8 to 20 in number) open into the mouth on the summit of the sublingual fold.

- **Nerve Supply:** Parasympathetic secretomotor supply is from the facial nerve via the chorda tympani, and the submandibular ganglion. Postganglionic fibers pass directly to the gland.



Anatomical relations:

- ❖ Parotid gland lies in the **parotid bed** (a shallow triangular-shaped trench) that is formed by:
 - the **sternocleidomastoid** muscle **behind**;
 - the **ramus** of mandible **in front**;
 - **superiorly**, the base of the trench is formed by the **external acoustic meatus** and the **posterior aspect of the zygomatic arch**.
- ❖ The parotid duct passes anteriorly across the external surface of the masseter muscle and then turns medially to penetrate the buccinator muscle of the cheek and open into the oral cavity adjacent to the crown of the second upper molar tooth
- ❖ The parotid gland encloses the **external carotid artery**, the **retromandibular vein**, and the origin of the **extracranial part of the facial nerve [VII]**.

The Pharynx

The pharynx is situated behind the nasal cavities, the mouth, and the larynx and may be divided into **nasal**, **oral**, and **laryngeal** parts. The pharynx is funnel shaped, its upper, wider end lying under the skull and its lower, narrow end becoming continuous with the esophagus opposite the 6th cervical vertebra. The pharynx has a musculomembranous wall, which is deficient anteriorly. Here, it is replaced by the posterior openings into the nose (choanae), the opening into the mouth, and the inlet of the larynx. By means of the auditory tube, the mucous membrane is also continuous with that of the tympanic cavity.

Muscles of the Pharynx:

The muscles in the wall of the pharynx consist of the **superior, middle, and inferior constrictor muscles**, whose fibers run in a somewhat circular direction, and the **stylopharyngeus** and **salpingopharyngeus muscles**, whose fibers run in a somewhat longitudinal direction. The three constrictor muscles extend around the pharyngeal wall to be inserted into a fibrous band or raphe that extends from the pharyngeal tubercle on the basilar part of the occipital bone of the skull down to the esophagus. The three constrictor muscles overlap each other so that the middle constrictor lies on the outside of the lower part of the superior constrictor and the inferior constrictor lies outside the lower part of the middle constrictor. The lower part of the inferior constrictor, which arises from the cricoid cartilage, is called the **cricopharyngeus muscle**. The fibers of the cricopharyngeus pass horizontally around the lowest and narrowest part of the pharynx and act as a sphincter. **Killian's dehiscence** is the area on the posterior pharyngeal wall between the upper propulsive part of the inferior constrictor and the lower sphincteric part, the cricopharyngeus.

Muscle	Origin	Insertion	Nerve Supply	Action
Superior constrictor	Medial pterygoid plate, pterygoid hamulus, pterygomandibular ligament, mylohyoid line of mandible	Pharyngeal tubercle of occipital bone, raphe in midline posteriorly	Pharyngeal plexus	Aids soft palate in closing off nasal pharynx, propels bolus downward
Middle constrictor	Lower part of stylohyoid ligament, lesser and greater cornu of hyoid bone	Pharyngeal raphe	Pharyngeal plexus	Propels bolus downward
Inferior constrictor	Lamina of thyroid cartilage, cricoid cartilage	Pharyngeal raphe	Pharyngeal plexus	Propels bolus downward
Cricopharyngeus	Lowest fibers of inferior constrictor muscle			Sphincter at lower end of pharynx
Stylopharyngeus	Styloid process of temporal bone	Posterior border of thyroid cartilage	Glossopharyngeal nerve	Elevates larynx during swallowing
Salpingopharyngeus	Auditory tube	Blends with palatopharyngeus	Pharyngeal plexus	Elevates pharynx
Palatopharyngeus	Palatine aponeurosis	Posterior border of thyroid cartilage	Pharyngeal plexus	Elevates wall of pharynx, pulls palatopharyngeal arch medially

Interior of the Pharynx:

The pharynx is divided into three parts: the **nasal pharynx**, the **oral pharynx**, and the **laryngeal pharynx**.

- **Nasal Pharynx:**

This lies above the soft palate and behind the nasal cavities. In the submucosa of the roof is a collection of lymphoid tissue called the pharyngeal tonsil. The pharyngeal isthmus is the opening in the floor between the soft palate and the posterior pharyngeal wall. On the lateral wall is the opening of the auditory tube, the elevated ridge of which is called the tubal elevation. The **pharyngeal recess** is a depression in the pharyngeal wall behind the tubal elevation. The **salpingopharyngeal fold** is a vertical fold of mucous membrane covering the salpingopharyngeus muscle.

- **Oral Pharynx:**

This lies behind the oral cavity. The floor is formed by the posterior one third of the tongue and the interval between the tongue and epiglottis. In the midline is the median glossoepiglottic fold, and on each side the lateral glossoepiglottic fold. The depression on each side of the median glossoepiglottic fold is called the vallecula. On the lateral wall on each side are the palatoglossal and the palatopharyngeal arches or folds and the palatine tonsils between them. The palatoglossal arch is a fold of mucous membrane covering the palatoglossus muscle. The interval between the two palatoglossal arches is called the oropharyngeal isthmus and marks the boundary between the mouth and pharynx. (The palatopharyngeal arch is a fold of mucous membrane covering the palatopharyngeus muscle. The recess between the palatoglossal and palatopharyngeal arches is occupied by the palatine tonsils).

- **Laryngeal Pharynx:**

This lies behind the opening into the larynx. The lateral wall is formed by the thyroid cartilage and the thyrohyoid membrane. The piriform fossa is a depression in the mucous membrane on each side of the laryngeal inlet.

Sensory Nerve Supply of the Pharyngeal Mucous Membrane:

- **Nasal pharynx:** The maxillary nerve (V2)
- **Oral pharynx:** The glossopharyngeal nerve
- **Laryngeal pharynx (around the entrance into the larynx):** The internal laryngeal branch of the vagus nerve.

Blood Supply of the Pharynx:

Ascending pharyngeal, tonsillar branches of facial arteries, and branches of maxillary and lingual arteries.

Lymph Drainage of the Pharynx:

Directly into the deep cervical lymph nodes or indirectly via the retropharyngeal or paratracheal nodes into the deep cervical nodes

The Process of Swallowing (Deglutition):

palatopharyngeus muscles. This prevents the passage of food and drink into the nasal cavities. The larynx and the laryngeal part of the pharynx are pulled upward by the contraction of the stylopharyngeus, salpingopharyngeus, thyrohyoid, and palatopharyngeus muscles. The main part of the larynx is thus elevated to the posterior surface of the epiglottis, and the entrance into the larynx is closed. The laryngeal entrance is made smaller by the approximation of the aryepiglottic folds, and the arytenoids cartilages are pulled forward by the contraction of the aryepiglottic, oblique arytenoid, and thyroarytenoid muscles. The bolus moves downward over the epiglottis, the closed entrance into the larynx, and reaches the lower part of the pharynx as the result of the successive contraction of the superior, middle, and inferior constrictor muscles. Some of the food slides down the groove on either side of the entrance into the larynx, that is, down through the **piriform fossae**. Finally, the lower part of the pharyngeal wall (the cricopharyngeus muscle) relaxes and the bolus enters the esophagus.

Palatine Tonsils

The palatine tonsils are two masses of lymphoid tissue, each located in the depression on the lateral wall of the oral part of the pharynx between the palatoglossal and palatopharyngeal arches. Each tonsil is covered by mucous membrane, and its free medial surface projects into the pharynx. The surface is pitted by numerous small openings that lead into the tonsillar crypts. The tonsil is covered on its lateral surface by a fibrous capsule. The capsule is separated from the superior constrictor muscle by loose areolar tissue, and the external palatine vein descends from the soft palate in this tissue to join the pharyngeal venous plexus. Lateral to the superior constrictor muscle lie the styloglossus muscle, the loop of the facial artery, and the internal carotid artery. The tonsil reaches its maximum size during early childhood, but after puberty it diminishes considerably in size.

Blood Supply:

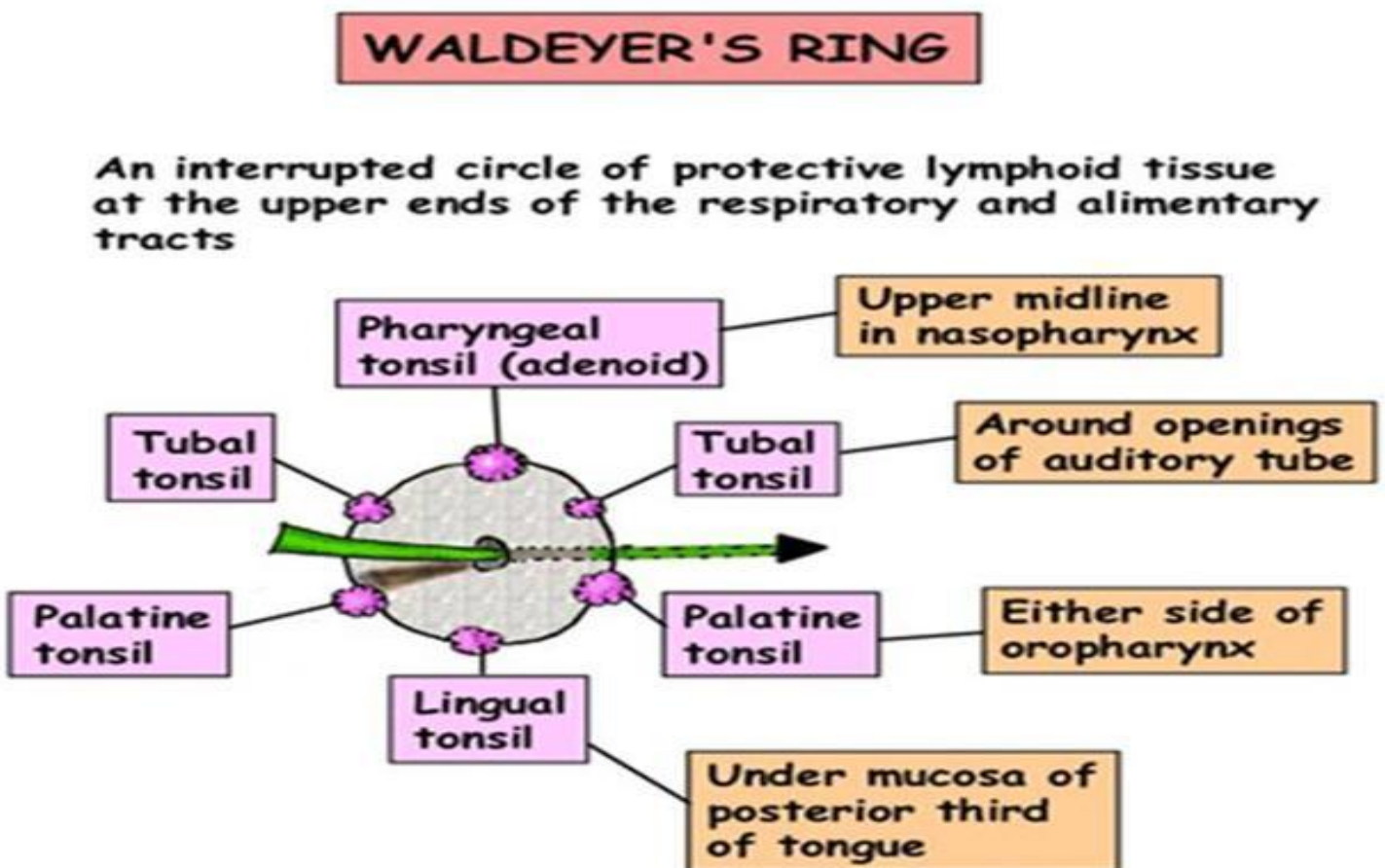
The tonsillar branch of the facial artery. The veins pierce the superior constrictor muscle and join the external palatine, the pharyngeal, or the facial veins.

Lymph Drainage of the Tonsil:

The upper deep cervical lymph nodes, just below and behind the angle of the mandible.

Waldeyer's Ring of Lymphoid Tissue:

The lymphoid tissue that surrounds the opening into the respiratory and digestive systems forms a ring. The lateral part of the ring is formed by the palatine tonsils and tubal tonsils (lymphoid tissue around the opening of the auditory tube in the lateral wall of the nasopharynx). The pharyngeal tonsil in the roof of the nasopharynx forms the upper part, and the lingual tonsil on the posterior third of the tongue forms the lower part.



Abdominal wall

Abdomen is the region of the trunk that lies between the diaphragm above and the inlet of the pelvis below

Borders of the Abdomen:

Superior: - Costal cartilages 7-12.
- Xiphoid process

Inferior: - Pubic bone and iliac crest:
- Level of L4.

Umbilicus:

Level of IV disc L3-L4

Abdominal Quadrants: (Four-quadrant pattern)

- Formed by two intersecting lines: Vertical & Horizontal Intersect at umbilicus.
- Quadrants:-
 - Upper left.
 - Upper right.
 - Lower left.
 - Lower right.

Abdominal Regions:

Divided into 9 regions by two pairs of planes:(two horizontal and two vertical)

1-Vertical Planes:

▪ **Midclavicular planes**

- Left and right lateral planes
- Each vertical line (right and left) passes through the midpoint between the anterior superior iliac spine and the symphysis pubis.

2- Horizontal Planes:

▪ **Subcostal plane**

- at level of L3 vertebra
- Joins the lower end of costal cartilage on each side

▪ **Intertubercular plane:**

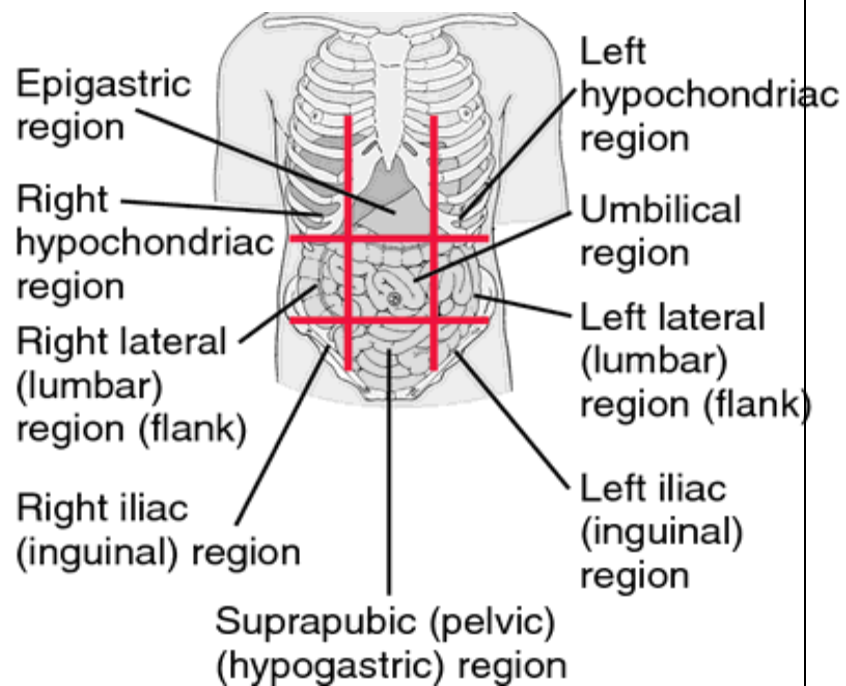
- At the level of L5 vertebra
- Through tubercles of iliac crests.

➤ *The nine regions are:*

- Right hypochondrium
- Epigastric region
- Left hypochondrium

- Right flank
- Umbilical region
- Left flank

- Right groin
- Pubic region
- Left groin



Abdominal wall divided into:-

- Anterior abdominal wall
- Posterior abdominal wall

▪ *What are the Layers of Anterior Abdominal Wall?*

➤ Skin

➤ Superficial Fascia (two layers)

-Above the umbilicus one layer

-Below the umbilicus two layers

- Camper's fascia - fatty superficial layer.
- Scarp's fascia - deep membranous layer.

➤ Deep fascia :

- Thin layer of C.T covering the muscle (it may be absent, especially in women)

➤ Muscular layer

- External oblique muscle
- Internal oblique muscle
- Transverse abdominal muscle
- Rectus abdominis

➤ Transversalis fascia

- Extraperitoneal fascia
- Parietal Peritoneum

Superficial Fascia

- Camper's fascia – fatty layer= dartos muscle in male
- Scarpa's fascia – membranous layer.
 - Attachment of scarpa's fascia= membranous fascia

INF: Fascia lata

Sides: Pubic arch

Post: Perineal body

- Membranous layer in scrotum referred to as colle's fascia
- Rupture of penile urethra lead to extravasations of urine into(scrotum, perineum, penis & abdomen)

Muscular layer

Muscles:

- Rectus abdominis
- External oblique muscle
- Internal oblique muscle
- Transverse abdominal muscle

■ External oblique muscle. -Broad & Thin

- **Direction:**
Downward forward medially
- **Origin :**
outer surface of lower 8 ribs.

- **Insertion**

Xiphoid process, Linea alba, pubic crest, pubic tubercle, the anterior half of the iliac crest.

- **Nerve Supply :**

lower six thoracic nerves ,the iliohypogastric and ilioinguinal nerves (L1)

- ❖ **Aponeurosis of external oblique muscle:**

Superficial inguinal ring.

Inguinal ligament

Lacunar ligament

Pectineal ligament

Boundaries of inguinal canal

Formation of rectus sheath

- ❖ **Inguinal ligament:**

Between the anterior superior iliac spine and the pubic tubercle, the lower border of the aponeurosis is folded backward on itself, forming the **inguinal ligament**

- ❖ **Superficial inguinal ring:**

- 1- triangular shape
- 2- Defect in external oblique aponeurosis
- 3- lies immediately above and medial to the pubic tubercle
- 4- Opening for passing the spermatic cord or ligament of uterus

- ❖ **Lacunar ligament**

- 1- extension of aponeurosis of external muscle backward and upward to the pectineal line
- 2- on the superior ramus of the pubis
- 3- its sharp, free crescentic edge forms the medial margin of the femoral ring

❖ Pectineal ligament

- 1- Continuation of the lacunar ligament at pectineal line
- 2- Continuation with a thickening of the periosteum

■ Internal Oblique: / -Broad & Thin

- **Direction:**

upward forward medially

- **Origin**

Lumbar Fascia, the anterior two thirds of the iliac crest,
lateral two thirds of inguinal ligament.

- **Insertion**

Lower three ribs & costal cartilage, Xiphoid process, Linea alba, symphysis pubis.

- **Nerve Supply**

lower six thoracic nerves, the iliohypogastric and ilioinguinal nerves (L1)

→ *Internal oblique muscle.....cont*

Conjoint tendon

- The lowest tendinous fibers of internal oblique which joint with transverses abdominis
- Attach medially to linea alba
- Has lateral free border
- Support the inguinal canal

Cremastric fascia

As the spermatic cord (or round ligament of the uterus) passes under the lower border of the internal oblique, it carries with it some of the muscle fibers that are called the **cremaster muscle**. The cremasteric fascia is the term used to describe the cremaster muscle and its fascia.

- Internal abdominal muscle assist in the formation of the **Roof of the inguinal canal**

❖ Transversus Abdominis:

Direction

-Its fibers run horizontally forward under the internal oblique

✓ Origin

- Inner surface of lower six costal cartilage,
lumbar fascia, anterior two thirds of iliac crest, lateral third of inguinal ligament.

✓ Insertion

Xiphoid process, Linea alba, symphysis pubis.

The lower part fuses with internal oblique to form conjoint tendon which attach to pubic crest and pectineal line

✓ nerve supply

lower six thoracic nerves ,the iliohypogastric and ilioinguinal nerves (L1)

★ Note that the posterior border of the external oblique muscle is free, whereas the posterior borders of the internal oblique and the transversus muscles are attached to the lumbar vertebrae by the lumbar fascia

→ *Transversus Abdominis.....cont*

Assist in the formation of

- Conjoint tendon
- Rectus sheath

❖ Rectus Abdominis

- Long strap muscle
- Extends along the whole length of the anterior abdominal wall
- In the rectus sheath

✓ Origin

Symphysis pubis, pubic crest

✓ Insertion

5th, 6th and 7th costal cartilage & xiphoid process.

✓ **Nerve Supply**

lower six thoracic nerves

→ *Rectus abdominis muscle.....cont*

- When rectus abdominis contracts, its lateral margin forms a curved ridge that can be palpated and often seen and is termed the **linea semilunaris**.
- The rectus abdominis muscle is divided into distinct segments by three **transverse tendinous** intersections: one at the level of the xiphoid process, one at the level of the umbilicus, and one halfway between these two

Lines & Land marks of the Anterior Abdominal Wall

Linea alba:

- Located along the midline.
- Between the xiphoid process & symphysis pubis
- formed by the fusion of the aponeuroses of the three muscles of the anterior abdominal wall (Ex.In, Tran. Abd.muscle)

Linea semilunaris

- Lateral margins of rectus abdominis muscle
- Can be palpated
- Extend from ninth costal cartilage to pubic tubercle

Tendinous intersection: = Linea transverses

- 3 transverse fibrous bands
- divide the rectus abdominis muscle into distinct segments
 - 1- one at level of xiphoid process
 - 2- one at level of umbilicus and
 - 3- one half way between these two
- They can be palpated as a transverse depressions

❖ Pyramidalis muscle

Origin

Anterior Surface of the pubis

Insertion:

Linea alba

-It lies in front of the lower part of the rectus abdominis muscle

Nerve supply

12th subcostal nerve(12th thoracic nerve)

Rectus sheath (هام جداً)

- The rectus sheath is a long fibrous sheath that encloses the **rectus abdominis muscle** and **pyramidalis muscle (if present)** and contains **the anterior rami of the lower six thoracic nerves** and the **superior and inferior epigastric vessels** and **lymph vessels**. It is formed mainly by the aponeuroses of the three lateral abdominal muscles.

• Contents

- Rectus abdominis muscle
- Pyramidalis muscle (if present)
- The anterior rami of the lower six thoracic nerves
- The superior and inferior epigastric vessels
- Lymphatic vessels.

→Rectus sheath.....cont

- Description the rectus sheath is considered at three levels.
 - **Above the costal margin**, the anterior wall is formed by the aponeurosis of the external oblique. The posterior wall is formed by the thoracic wall—that is, the 5th, 6th and 7th costal cartilages and the intercostal spaces.
 - **Between the costal margin and the level of the anterior superior iliac spine**, the aponeurosis of the internal oblique splits to enclose the rectus muscle; the external oblique aponeurosis is directed in front of the muscle, and the transversus aponeurosis is directed behind the muscle.
 - **Between the level of the anterosuperior iliac spine and the pubis**, the aponeuroses of all three muscles form the anterior wall. The posterior wall is absent, and the rectus muscle lies in contact with the fascia transversalis.

→Rectus sheath.....cont مهم

- The posterior wall of the rectus sheath is not attached to the rectus abdominis muscle. The anterior wall is firmly attached to it by the muscle's tendinous intersections

- **Linea semicircularis (arcuate line):**

Is a crescent-shaped line marking the inferior limit of the posterior layer of the rectus sheath just below the level of the iliac crest.

إضافي

It should be noted that where the aponeuroses forming the posterior wall pass in front of the rectus at the level of the anterior superior iliac spine, the posterior wall has a free, curved lower border called the **arcuate line**. At this site, the inferior epigastric vessels enter the rectus sheath and pass upward to anastomose with the superior epigastric vessels.

→ Others fascia in the ant. abd. ominal wall

❖ Transversalis fascia

- a thin layer of fascia that lines the Transversus Abdominis muscle
- continue to diaphragm , iliacus muscle & pelvis fascia
- contribute to femoral sheath

❖ Extraperitoneal Fascia

The extraperitoneal fat is a thin layer of connective tissue that contains a variable amount of fat and lies between the fascia transversalis and the parietal peritoneum.

❖ Parietal peritoneum

The walls of the abdomen are lined with parietal peritoneum. This is a thin serous membrane and is continuous below with the parietal peritoneum lining the pelvis.

lumbar triangle (مثن مهم)

- 1- the inferior lumbar (Petit) triangle, which lies superficially
 - 2- the superior lumbar (Grynfeltt) triangle, which is deep and superior to the inferior triangle.
- Of the two, the superior triangle is the more consistently found in cadavers, and is more commonly the site of herniation

- however, the inferior lumbar triangle is often simply called the lumbar triangle, perhaps owing to its more superficial location and ease in demonstration.

❖ **Lumbar triangle(petitis)** (مش مهم)

- The inferior lumbar (Petit) triangle is formed
 - Medially by the latissimus dorsi muscle
 - laterally by the external abdominal oblique muscle
 - Inferiorly by the iliac crest
 - The floor internal abdominal oblique muscle.
 - The fact that herniation occasionally occur here is of clinical importance.

❖ **Superior lumbar (Grynfeltt-Lesshaft) triangle** (مش مهم)

Medially: by the quadratus lumborum muscle

laterally :by the internal abdominal oblique muscle

Superiorly: by the 12th rib.

The floor : transversalis fascia

Roof: is the external abdominal oblique muscle

Action of the Ant. Abdominal muscle

•Deep expiration

•Increase the intra abdominal pressure in

- Vomiting
- Cough
- Defecation
- Labour

•Protect viscera

•keep viscera in position

•Rectus abdominis → bends trunk forward

Blood supply of the ant. Abdominal wall

❖ **Arteries**

- Sup. Epigastric artery

- Inf. Epigastric artery
- Intercostal arteries
- Lumbar arteries
- Deep circumflex artery

❖ Veins

1- Above the umbilicus

- Lateral Thoracic. vein. → Axillary vein

2- Below the umbilicus

- Inferior Epigastric → Femoral vein

3- Paraumbilical veins

- Ligamentum teres → portal vein(Porto- systemic anastomosis)

Nerve supply of the ant. Abdominal wall

The nerves of the anterior abdominal wall are the anterior rami of the lower six thoracic and the 1st lumbar nerves. They pass forward in the interval between the internal oblique and the transverses muscles. The thoracic nerves are the lower five intercostal nerves and the subcostal nerves, and the 1st lumbar nerve is represented by the iliohypogastric and ilioinguinal nerves, branches of the lumbar plexus. They supply the skin of the anterior abdominal wall, the muscles, and the parietal peritoneum.

•**Thoracoabdominal nerve:** Lower 6th thoracic nerves & 12th subcostal nerve

•LI nerve

- Iliohypogastric nerve
- Ilioinguinal nerve

•**Dermatomes** (Anterior, lateral cutaneous nerve terminal branches of Thoracoabdominal nerve

- T7 to skin superior to umbilicus below xiphoid process
- T10 to skin surrounding umbilicus
- L1 to skin inferior to umbilicus above sym.pubis

It is useful to remember the following:

Dermatomes over:

- The xiphoid process: T7
- The umbilicus: T10
- The pubis: L1

Lymphatic drainage of ant. Abdominal wall

- Above the umbilicus→ Anterior axillary lymph nodes
- Below the umbilicus → Superficial Inguinal lymph nodes
- Above the iliac crest→ Posterior axillary lymph nodes
- Below the iliac crest→ Superficial Inguinal lymph nodes

Clinical notes

Abdominal stab wounds

Surgical incision

Abdominal stab wounds مش مهم

- Lateral to rectus sheath
- Ant. To rectus sheath
- In the midline= Linea alba
- Structures in the various layers through which an abdominal stab wound depend on the anatomical location

Surgical incision

- The length and direction of surgical incision through the ant. Abdominal wall to expose the underlying viscera are largely controlled by
 - 1- position & direction of nerves
 - 2- direction of muscle fibers
 - 3- arrangement of the apponeurosis forming the rectus sheath
- The incision should be made In the direction of the lines of cleavage in the skin so that the hairline scare is produced.

Incision through the rectus sheath

- Widely used
- The rectus abdominis muscle and its nerve supply are kept intact
- On closure the ant & post wall of the sheath are sutured separately and the rectus muscle back into position between the suture lines

Common types of incisions

- Paramedian incision →
- Pararectus incision → linea semilunaris
- Midline incision → linea alba
- Transrectus incision →

- Transverse incision →
- Muscle splitting or **McBurney's incision**. → for cecostomy and appendectomy
- Abdominothoracic incision

Stomach and esophagus

Esophagus:

- The esophagus is a tubular structure (muscular, collapsible tube) about 10 in. (25 cm) long that is continuous above with the laryngeal part of the pharynx opposite the sixth cervical vertebra
- The esophagus conducts food from the pharynx into the stomach. Wavelike contractions of the muscular coat, called peristalsis, propel the food onward.
- It passes through the diaphragm at the level of the 10th thoracic vertebra to join the stomach
- **In the neck**, the esophagus lies in front of the vertebral column; laterally, it is related to the lobes of the thyroid gland; and anteriorly, it is in contact with the trachea and the recurrent laryngeal nerves
- **In the thorax**, it passes downward and to the left through the superior and then the posterior mediastinum
- At the level of the sternal angle, the aortic arch pushes the esophagus over to the midline

The relations of the thoracic part of the esophagus :

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- **Anteriorly:** The trachea and the left recurrent laryngeal nerve; the left principal bronchus, which constricts it; and the pericardium, which separates the esophagus from the *left atrium*
- **Posteriorly:** The bodies of the thoracic vertebrae; the thoracic duct; the azygos veins; the right posterior intercostal arteries; and, *at its lower end*, the descending thoracic aorta
- **Right side:** The mediastinal pleura and the terminal part of the azygos vein
- **Left side:** The left subclavian artery, the aortic arch, the thoracic duct, and the mediastinal pleura

- Inferiorly to the level of the roots of the lungs, the vagus nerves leave the pulmonary plexus and join with sympathetic nerves to form the esophageal plexus
- The left vagus lies anterior to the esophagus and the right vagus lies posterior
- **At the opening in the diaphragm, the esophagus is accompanied by the two vagi, branches of the left gastric blood vessels, and lymphatic vessels**
- Fibers from the **right crus** of the diaphragm pass around the esophagus in the form of a sling.
- In the abdomen, the esophagus descends for about 0.5 in. (1.3 cm) and then enters the stomach
- It is related to the **left lobe of the liver** anteriorly and to the **left crus** of the diaphragm posteriorly.

Blood supply of the esophagus

- *The upper third of the esophagus* is supplied by the inferior thyroid artery
- *The middle third* by branches from the descending thoracic aorta
- *The lower third* by branches from the left gastric artery
- The veins from the **upper third** drain into the inferior thyroid veins, from the **middle third** into the azygos veins, and from the **lower third** into the left gastric vein, a tributary of the portal vein.

Lymphatic drainage of the esophagus

- Lymph vessels from the **upper third** of the esophagus drain into the deep cervical nodes
- from the **middle third** into the superior and posterior mediastinal nodes,
- and from the **lower third** into nodes along the left gastric blood vessels and the celiac nodes

Nerve Supply of the Esophagus

In the lower part of its thoracic course, the esophagus is surrounded by the esophageal nerve plexus.

- The esophagus is supplied by parasympathetic and sympathetic efferent and afferent fibers via the vagi and sympathetic trunks
- In the lower part of its thoracic course, the esophagus is surrounded by the esophageal nerve plexus.

Gastroesophageal sphincter

- **No anatomic sphincter exists** at the lower end of the esophagus. However, the circular layer of smooth muscle in this region serves as a physiologic sphincter.
- As the food descends through the esophagus, relaxation of the muscle at the lower end occurs ahead of the peristaltic wave so that the food enters the stomach
- The tonic contraction of this sphincter prevents the stomach contents from regurgitating into the esophagus.
- The closure of the sphincter is under vagal control, and this can be augmented by the hormone gastrin and reduced in response to secretin, cholecystokinin, and glucagon.

Stomach

- The stomach is a dilated part of the alimentary canal
- Between the esophagus and the small intestine

Stomach site:

☐ It occupies the left upper quadrant mainly in the **epigastric region**.....→(epigastric, umbilical, left hypochondrium of the abdomen)

Shape of stomach:

- It is roughly J-shaped and has two openings, the **cardiac** and **pyloric orifices**; two curvatures, the **greater** and **lesser curvatures**; and two surfaces, an **anterior** and a **posterior surface**. The stomach is relatively fixed at both ends but is very mobile in between. It tends to be high and **transversely** arranged in the **short, obese** person (**steer-horn stomach**) and **elongated vertically** in the **tall, thin** person (**J-shaped stomach**).
- Its shape undergoes considerable variation in the same person and depends on:
 - The volume of its contents

- The position of the body
- The phase of respiration.

Function of stomach :

The stomach is the dilated portion of the alimentary canal and has three main functions:

- It **stores food** (in the adult it has a capacity of about 1500 mL)
- It **mixes the food with gastric secretions** to form a semifluid chyme
- It **controls the rate of delivery of the chyme to the small intestine** so that efficient digestion and absorption can take place.

Parts of stomach:

The stomach is divided into the following parts :

1- Fundus:

- Dome-shaped
- Projects upward and to the left of the cardiac orifice
- It is usually full of gas.

2- Body:

- Extends from the level of the cardiac orifice to the level of the incisura angularis (a constant notch in the lower part of the lesser curvature)

3- Pyloric region ; divided into:

a- Pyloric antrum:

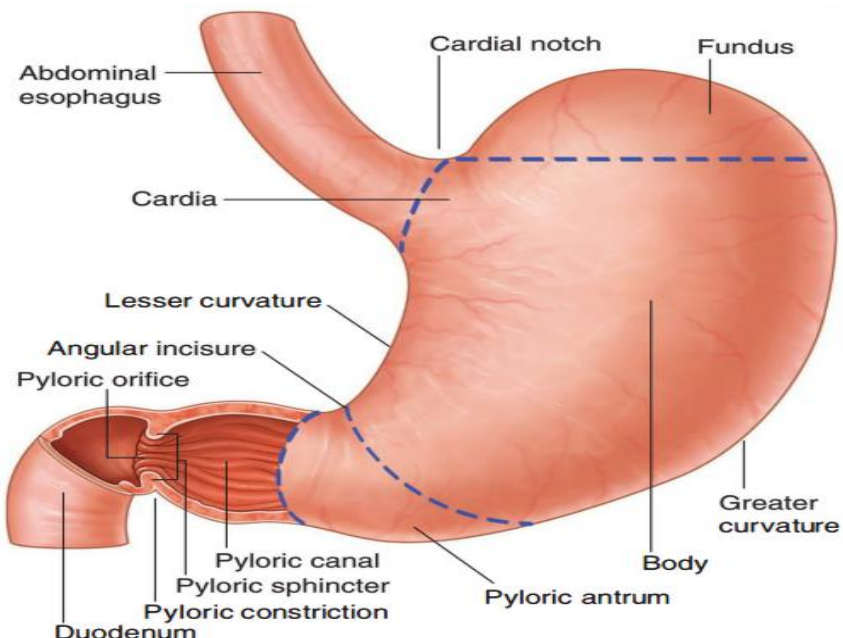
- This extends from the incisura angularis to the pylorus

B- Pylorus:

- The most tubular part of the stomach
- The thick muscular wall is called the pyloric sphincter

■ Orifices of the stomach

- **Cardiac orifice**
- **pyloric orifice**



❖ Cardiac orifice :

- The cardiac orifice is where the esophagus enters the stomach
- No anatomic sphincter can be demonstrated here
- A physiological sphincter → physiological mechanism exists that prevents regurgitation of stomach contents into the esophagus

The site of Cardiac orifice

- 7th Left costal cartilage
- 1 inch to the Left of midline
- 45 cm from incisors in the oral cavity.
- 10 cm from anterior abdominal wall

■ Pyloric orifice:

- Present at end of the pyloric canal
- On the level of **L1**
- 1 inch to the Right of the midline.
- The circular muscle coat of the stomach is much thicker here and forms the anatomic and physiologic pyloric sphincter
- The pylorus lies on the transpyloric plane, and its position can be recognized by a slight constriction on the surface of the stomach.
- The pyloric sphincter controls the outflow of gastric contents into the duodenum.
- The sphincter receives motor fibers from the sympathetic system and inhibitory fibers from the vagus nerve.

→ Pyloric opening...cont

Function of pyloric opening control by:

1- Hormonal influences from **stomach & duodenum**

2- Nerve fibers

Filling stomach → Myenteric fibers → relaxation of sphincter

Curvatures of stomach:

1- The lesser curvature:

- Forms the right border of the stomach
- Extends from the cardiac orifice to the pylorus

2- The greater curvature:

- Much longer than the lesser curvature
- Extends from the left of the cardiac orifice, over the dome of the fundus, and along the left border of the stomach to the pylorus

Histology of the stomach

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Omenta:

Omenta are two-layered folds of peritoneum that connect the stomach to another viscus. The **greater omentum** connects the greater curvature of the stomach to the transverse colon . It hangs down like an apron in front of the coils of the small intestine and is folded back on itself to be attached to the transverse colon . The **lesser omentum** suspends the lesser curvature of the stomach from the fissure of the ligamentum venosum and the porta hepatis on the undersurface of the liver . The **gastrosplenic omentum** (ligament) connects the stomach to the hilum of the spleen .

Mesenteries:

Mesenteries are two-layered folds of peritoneum connecting parts of the intestines to the posterior abdominal wall, for example, the **mesentery of the small intestine**, the **transverse mesocolon**, and the **sigmoid mesocolon**. The peritoneal ligaments, omenta, and mesenteries permit blood, lymph vessels, and nerves to reach the viscera. The extent of the peritoneum and the peritoneal cavity should be studied in the transverse and sagittal sections of the abdomen .

Mucous membrane

- ▣ The mucous membrane of the stomach is thick and vascular and is thrown into numerous folds, or **rugae** , mainly longitudinal in direction
- ▣ The folds flatten out when the stomach is distended.

Muscular wall of the stomach

The muscular wall of the stomach contains **longitudinal fibers** (outer surface), **circular fibers**(inner surface), and **oblique fibers**

Peritoneum of stomach

- The peritoneum (visceral peritoneum) completely surrounds the stomach.
 - It leaves the **lesser curvature** as the **lesser omentum**
 - It leaves the **greater curvature** as the **gastrosplenic ligament(gastrosplenic omentum)** and the **greater omentum**
- The gastrosplenic ligament extends from the upper part of the greater curvature to the spleen, and the greater omentum extends from the lower part of the greater curvature to the transverse colon
- **The lesser curvature** is suspended from the liver by **the lesser omentum**
- **Gastrophrenic ligament** between the fundus and the diaphragm.

❖ Relation of stomach

Anterior (Anterior- superior)

- The anterior abdominal wall
- the left costal margin
- the left pleura and lung
- the diaphragm
- the left lobe of the liver

Posteriorly = stomach bed (stomach bed contents)

- The lesser sac
- the left crus of diaphragm
- the spleen+ the splenic artery
- the upper part of the left kidney + the left suprarenal gland(adrenal gland)

هالام جداً

- the body of pancreas
- the transverse colon+ the transverse mesocolon

Blood supply and venous drainage of the stomach

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1) Arterial supply

- The arteries are derived from the branches of the celiac artery
- The celiac trunk arise from the front of the abdominal aorta and its located at the level of T12 to L1 above the pancreas
- Its 1 cm long

→ Blood supply....cont

Relations of celiac artery

- ▣ On each side : celiac ganglia+ lymphatic nodes
- ▣ Crus of diaphragm and lumbar nerves
- ▣ Its Branches for foregut

Main distribution

- ▣ Left gastric artery
- ▣ Splenic artery
- ▣ Hepatic artery

→ Blood supply for stomach.....cont

1- The left gastric artery

- Arises from the celiac artery
- It passes upward and to the left to reach the esophagus
- Then descends along the lesser curvature of the stomach
- It supplies the lower third of the esophagus and the upper right part of the stomach

→ Blood supply....cont

2- The right gastric artery

- arises from the hepatic artery at the upper border of the pylorus
- runs to the left along the lesser curvature.
- It supplies the lower right part of the stomach.

3- The short gastric arteries

- Arise from the splenic artery (5-7 arteries)
- Arises from splenic artery in the gastrosplenic ligament
- pass upward in the gastrosplenic to supply the fundus

4- The left gastroepiploic artery

- Arises from the splenic artery before the hilum of the spleen
- Passes forward in the gastrosplenic (ligament)
- Supply the stomach along the upper part of the greater curvature in the greater omentum

5- The right gastroepiploic artery

- arises from the gastroduodenal branch of the hepatic artery
- It passes to the left and supplies the stomach along the lower part of the greater curvature in the greater omentum.

2) Venous drainage

- The veins drain into the portal circulation
- The left and right gastric veins drain **directly** into the portal vein
- The short gastric veins and the left gastroepiploic veins join the splenic vein
- The right gastroepiploic vein joins the superior mesenteric vein (which meet the splenic vein behind the neck of pancreas to form the portal vein

Lymphatic drainage

- Follow the arteries of stomach into:
 - The left and right gastric nodes
 - The left and right gastroepiploic nodes
 - The short gastric nodes
- All lymph from the stomach eventually passes to the celiac nodes located around the root of the celiac artery on the posterior abdominal wall.

Nerve supply for stomach

- The nerve supply includes **sympathetic fibers** derived from the **celiac plexus**

- **parasympathetic fibers** from the **right and left vagus nerves** .
- The **sympathetic innervation** of the stomach carries a proportion of **pain sensation**
- The **parasympathetic vagal fibers** are **secreto-motor** to the **gastric glands** and **motor** to the **muscular wall of the stomach**(peristaltic movement)
- The **pyloric sphincter** receives **motor fibers** from the **sympathetic** system and **inhibitory fibers** from the **vagus nerve**.

→Nerve supply for stomach....cont

❖ The anterior vagal trunk

- mainly from the left vagus nerve

Distribution

- 1- The anterior surface of the stomach.
- 2- A large hepatic branch passes up to the liver
- 3-Ant. Nerve Laterjet→pylorus

→Nerve supply for stomach....cont

❖ The posterior vagal trunk

-mainly from the right vagus nerve

-Distribution

- 1- mainly the posterior wall of the stomach.
- 2- Ant. Wall of body of stomach
- 3- Celiac branch→ small intestine+ as far as to splenic flexure+ pancreas
- 4- post. Nerve laterjet→ pylorus

Clinical notes

- Gastric Ulcer
- Trunkal vagotomy [Sectioning the vagus nerves below the diaphragm around the esophagus.
- Highly selective vagotomy(cut all branches of the vagi except laterjet.n)
- Peptic ulcer(D.U)
- Gastroscopy
- Pyloroplasty(drainage)= gastro- jejunostomy

Causes of Ulcers in stomach

Inguinal canal

- It is an oblique passage through the lower part of the anterior abdominal wall.
- Present in both sexes.
- In the males, it allows structures to pass to and from the testis to the abdomen.
- In females, it allows the round ligament of the uterus to pass from the uterus to the labium majus.
- Transmits ilioinguinal nerve in both sexes.
- It is about 1.5 in. (4 cm) long in the adult.
- extends from the deep inguinal ring, a hole in the fascia transversalis, downward and medially to the superficial inguinal ring, a hole in the aponeurosis of the external oblique muscle.
- It lies **parallel** to and immediately **above** the inguinal ligament.
- In the newborn child, the deep ring lies almost directly posterior to the superficial ring so that the canal is considerably shorter at this age.
- It has 4 walls and 2 rings

Deep(internal) Inguinal Ring:

- Is an oval opening in the **fascia transversalis** (Transversalis fascia)
- lies about 0.5 in. (1.3 cm) above the inguinal ligament midway between the anterior superior iliac spine and the symphysis pubis
- The margins of the ring give attachment to the **internal spermatic fascia**

Superficial(external) Inguinal Ring

- triangular-shaped defect in the aponeurosis of the external oblique muscle
- Lies immediately **above** and **medial** to the pubic tubercle
- The margins of the ring, sometimes called the crura(medial & lateral crus), give attachment to the **external spermatic fascia**

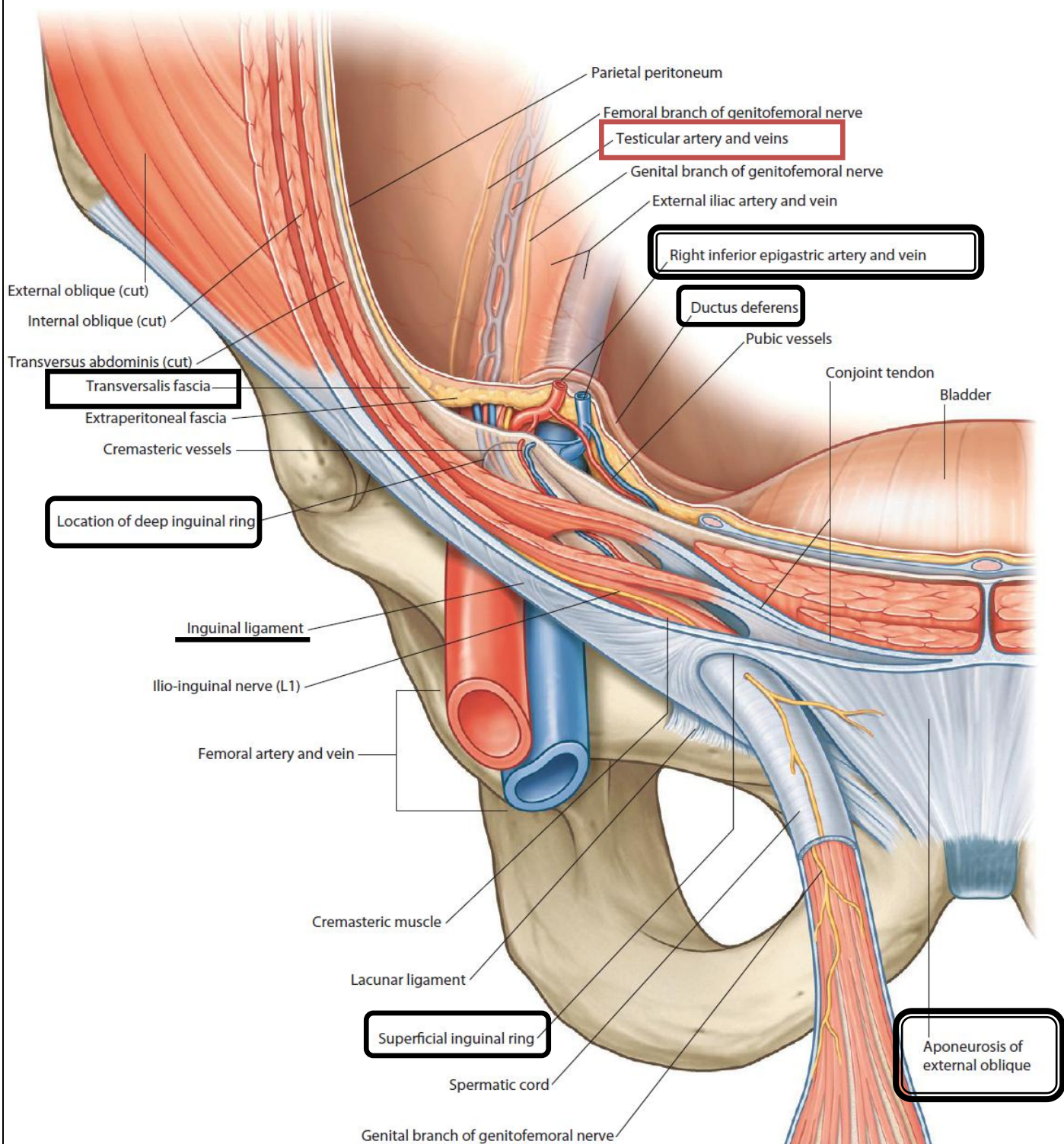
Walls of the Inguinal Canal

■ Anterior Wall of Inguinal Canal:

- It is formed along its entire length by **aponeurosis of the external oblique muscle**

- It is reinforced in its lateral third by the **origin of the internal oblique** from the inguinal ligament
- This wall is therefore strongest where it lies opposite the weakest part of posterior wall, namely, the deep inguinal ring.

The inguinal ligament is composed of reflexions from the external oblique aponeurosis



*A common frustration for medical students is the inability to observe these rings as openings. One must remember that the internal spermatic fascia is attached to the margins of the deep inguinal ring and the external spermatic fascia is attached to the margins of the superficial inguinal ring so that the edges of the rings cannot be observed externally. Compare this arrangement with the openings for the fingers seen inside a glove with the absence of openings for the fingers when the glove is viewed from the outside.

■ Posterior Wall of Inguinal Canal:

- It is formed along its entire length by the **fascia transversalis**.
- It is reinforced in its medial third by **conjoint tendon**, the common tendon of insertion of internal oblique and transversus, attached to the pubic crest and pectineal line
- This wall is therefore strongest where it lies opposite the weakest part of the anterior wall, namely, the superficial inguinal ring.

■ Inferior Wall of Inguinal Canal = floor:

- It is formed by the rolled-under inferior edge of the aponeurosis of the external oblique muscle called **inguinal ligament** and at its medial end, the **lacunar ligament** .(other way to say: Upturned lower edge of the inguinal ligament and, at its medial end, the lacunar ligament)

■ Superior Wall of Inguinal Canal = Roof

- It is formed by the arching lowest fibers of the internal oblique and transversus abdominis muscles

Functions of Inguinal Canal:

- ✚ It allows structures of spermatic cord to pass to and from the testis to the abdomen in male.
- ✚ In the female, permits the passage of the round ligament of the uterus from the uterus to the labium majus.

Contents of inguinal canal:

- **Spermatic cord** and its contents in male
- **Round ligament** in female
- **Genital branch** of genitofemoral nerve
- **Ilioinguinal nerve**: Enter the canal through the posterior wall

Inguinal triangle

- Region of abdominal wall

Borders

- Medial border: Lateral margin of the rectus sheath, also called linea semilunaris
- Superolateral border: Inferior epigastric vessels
- Inferior border: Inguinal ligament

Spermatic Cord

- It is a collection of structures that pass through the inguinal canal to and from the testis.
- It is covered with three concentric layers of fascia derived from the layers of anterior abdominal wall
- It begins at the **deep inguinal ring** lateral to the inferior epigastric artery and ends at the **testis**

Structures of Spermatic Cord

- Vas deferens
- Testicular artery and vein
- Testicular lymph vessels
- Autonomic nerves
- Processus vaginalis
- Cremasteric artery
- Artery of the vas deference
- Genital branch of genitofemoral nerve

Covering of the Spermatic Cord(the Spermatic Fasciae)

- The covering of the spermatic cord are three concentric layers of fascia derived from the layers of the anterior abdominal wall
- Each covering is acquired as the processus vaginalis descends into the scrotum through the layers of the abdominal wall
- **External spermatic fascia** :derived from the external oblique aponeurosis and attached to the margins of the superficial inguinal ring
- **Cremasteric Fascia**: derived from the internal oblique muscle
- **Internal Spermatic Fascia**: derived from the fascia transversalis and attached to the margins of deep inguinal ring

Vas Deferens (Ductus Deferens):

- It is a cord like structure
- Can be palpated between finger and thumb in the upper part of the scrotum
- It is a thick walled muscular duct that transport spermatozoa from the epididymis to the prostatic urethra

Testicular Artery

- It is a branch of abdominal aorta at level of L2
- It is long and slender
- Descends on the posterior abdominal wall
- It traverses the inguinal canal and supplies the testis and the epididymis

Testicular Veins

- These are the extensive venous plexus, the pampiniform plexus
- Leaves the posterior border of the testis
- As the plexus ascends, it becomes reduced in size so that at about the level of deep inguinal ring, a single testicular vein is formed
- runs up on the posterior abdominal wall
- Drains into left renal vein on left side and inferior vena cava on right side

Autonomic nerve & Genitofemoral nerve

Autonomic nerves

- Sympathetic fibers run with testicular artery from renal or aortic sympathetic plexuses
- Afferent sensory nerve

Genital branch of the genitofemoral nerve

- Its root L1& L2
- Supply the cremastic muscle

Testicular lymphatic vessels

- Ascend through the inguinal canal
- Passes up over the post. Abdominal wall
- Reach the lumbar (Para-aortic) lymph nodes on each side of the aorta at level L1

Processus vaginalis

- An out pouching of peritoneum that in the fetus is responsible for the formation of the inguinal canal
- The remains of the processus vaginalis causes the indirect hernia

Developing of process vaginalis

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Abdominal Herniae

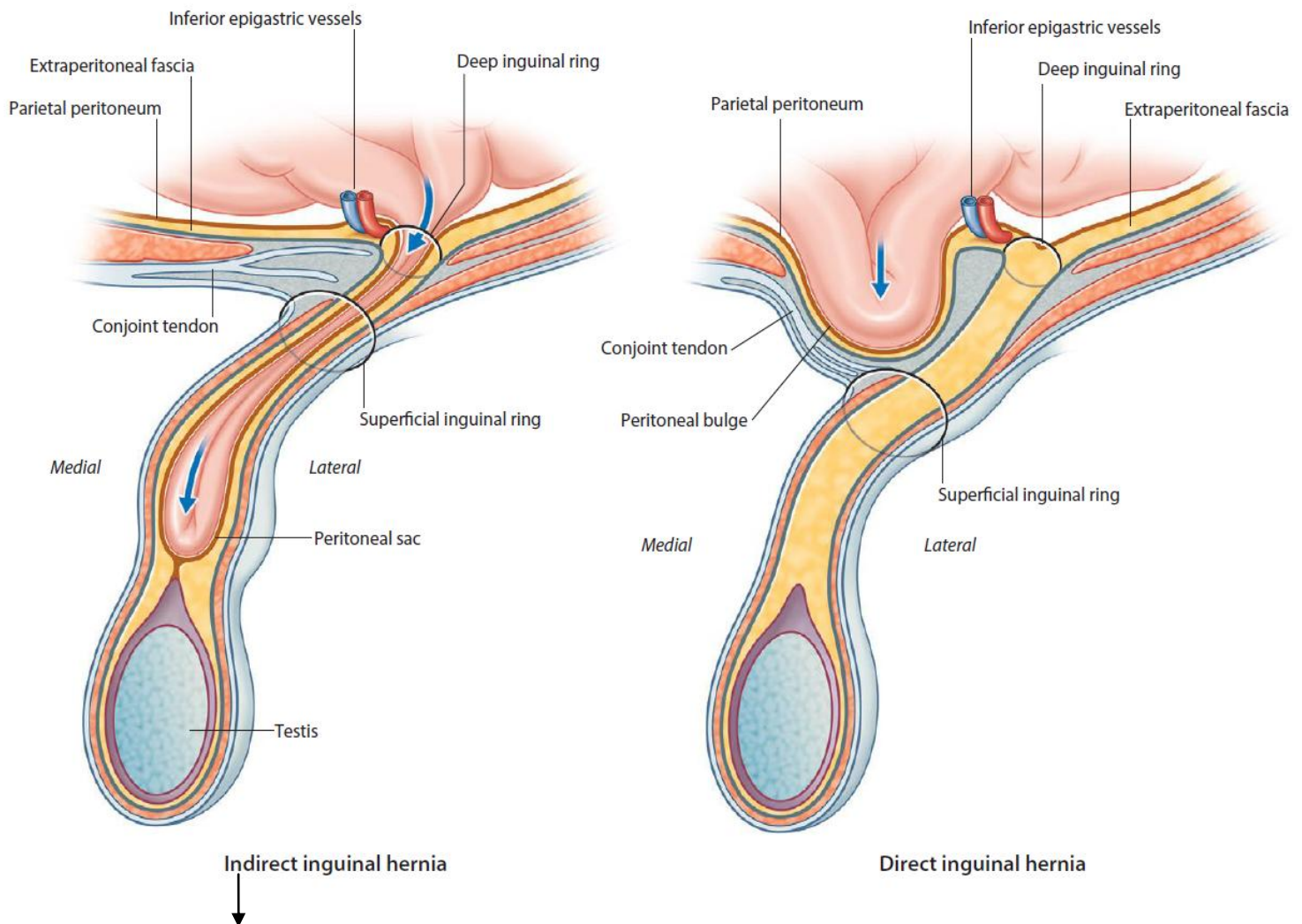
- A hernia is the protrusion of part of the abdominal contents beyond the normal confines of the abdominal wall
- It consists of three parts: **the sac, the contents of the sac, and the coverings of the sac.**
- The hernial sac is a pouch (diverticulum) of peritoneum and has a neck and a body
- The hernial contents may consist of any structure found within the abdominal cavity and may vary from a small piece of omentum to a large viscus such as the kidney.
- The hernial coverings are formed from the layers of the abdominal wall through which the hernial sac passes.
- Abdominal herniae are of the many types , one of them is the Inguinal (indirect or direct).

Inguinal Hernia

■ Indirect Inguinal Hernia:

- It is the most common form of hernia
- It is believed to be congenital in origin → It is most common in children and young adults.
- The hernial sac is remains of processus vaginalis
- the sac enters the inguinal canal through the deep inguinal ring lateral to the inferior epigastric vessels
- It may extend part of the way along the canal or the full length, as far as the superficial inguinal ring.
- If the processus vaginalis has undergone no obliteration, then the hernia is complete and extends through the superficial inguinal ring down into the scrotum or labium majus.
- Under these circumstances, the neck of the hernial sac lies at the deep inguinal ring lateral to the inferior epigastric vessels
- An indirect inguinal hernia is about 20 times more common in males than in females,
- It is more common on the right (normally, the right processus vaginalis

becomes obliterated after the left; the right testis descends later than the left).



- It is the remains of the processus vaginalis and therefore is congenital in origin.
- It is more common than a direct inguinal hernia.
- It is much more common in males than females.
- It is more common on the right side.
- It is most common in children and young adults.
- The hernial sac enters the inguinal canal through the deep inguinal ring and lateral to the inferior epigastric vessels. The neck of the sac is narrow.
- The hernial sac may extend through the superficial inguinal ring above and **medial** to the pubic tubercle. (Femoral hernia is located below and lateral to the pubic tubercle.)
- The hernial sac may extend down into the scrotum or labium majus.

■ Direct Inguinal Hernia

- It composes about 15% of all inguinal hernias
- It is common in old men with weak abdominal muscles and is rare in women.

- The hernial sac bulges forward through the posterior wall of the inguinal canal medial to the inferior epigastric vessels.
- The neck of the hernial sac is wide.

	Direct	Indirect
Age	Common on old	young
Bilaterally	Usually bilateral	unilateral
Shape	Hemispherical	Oval
Reaches scrotum	never	Can reach the scrotum
Direction of descent	Forwards	Downwards , forwards medially
Reduction	backward	Upward, backward laterally
Relation to inf. epigastric art.	Medially	Laterally
Superficial inguinal ring test	Feel impulse on the side finger	Feel an impulse on the tip of the finger
Deep ring test Reduction of hernia, put thumb over deep ring, ask patient to cough	Hernia appears	Hernia does not appear
Coverings	1- Lat. To lat. Umbilical lig Same as indirection 2- Med. To lat	Skin, superficial fascia, Ex.sp.fascia, cremastric muscle & fascia. Int.spermatic fascia

Direct Hernia Route

Note:

The hernia sac passes directly through inguinal triangle and may disrupt the floor of the inguinal canal.

Indirect Hernia Route

Note:

The hernia sac passes outside the boundaries of Hesselbach's triangle(inguinal triangle) and follows the course of the spermatic cord.

Scrotum

- It is an outpouching of the lower part of the anterior abdominal wall
- It contains testes, epididymis, and the lower ends of the spermatic cord
- Its wall has following layers: skin, superficial fascia, external spermatic fascia derived from external oblique, cremasteric fascia derived from internal oblique internal spermatic fascia derived from transversalis, and tunica vaginalis(parietal & visceral layer)

Skin of the Scrotum

- Skin of the scrotum is thin, wrinkled, and pigmented and forms a single pouch
- A ridge in the midline indicates the line of fusion of the two lateral labioscrotal swellings
- Superficial fascia is continuous with the fatty and membranous layers of the anterior abdominal wall

Superficial Fascia

- Superficial fascia is continuous with the fatty and membranous layers of the anterior abdominal wall
- The fat is replaced by smooth muscle called dartos muscle
- It is responsible for wrinkles of the skin
- Membranous layer referred to as Colle's fascia
- Innervated by sympathetic nerve fibers
- Both layers of sup. Fascia contribute to a median partition that crosses the scrotum and separates the testes from each other

Spermatic Fasciae :

- Lies beneath the superficial fascia
- Derived from three layers of anterior abdominal wall on each side
- The external spermatic fascia is derived from external oblique
- The cremasteric fascia is derived from internal oblique
- The internal spermatic fascia is derived from the fascia transversalis

Tunica Vaginalis :

- Lies within the spermatic fasciae
- Covers the anterior, medial and lateral surfaces of each testis
- It is the lower expanded part of the processus vaginalis
- Normally shut off just before birth from the upper part of the processus and the peritoneal cavity

Testis

- They are a firm, mobile organ, within the scrotum
- Left testis usually lies at a lower level than the right
- Upper end of the gland is tilted forward
- Surrounded by a tough fibrous capsule, the tunica albuginea
- A series of fibrous septa divide the interior of the organ into lobules
- Lying in each lobule are one to three coiled seminiferous tubules
- The tubules open into the network of channels called the rete testis
- Small efferent ductules connect the rete testis to the upper end of the epididymis

Structures inside the testis

• **Seminiferous tubules**

– Thin, highly coiled structures where sperm production occurs.

• **Interstitial cells**

– Major source of androgens

– Located between seminiferous tubules

• **Epididymis**

– Site of sperm maturation

– Runs along back of testis

• **Vas deferens**

– Sperm-carrying tube

– Begins at the testis and ends at the urethra.

Blood supply of testes

Artery

- Testicular arteries → Abdominal aorta at level L2

Vein

- Pampiniform plexus → reduced to a single vein → ascend through inguinal canal → Rt. testicular vein drains into I.V.C & Lt. testicular vein drains into Lt. renal vein

Lymphatic drainage of testes

- Ascend in the spermatic cord
- End in the lymph nodes on the side of aorta(Lumber or Para- aortic) nodes at level L1
- Scrotum+ skin→ inguinal canal lymphatic nodes

Nerve supply to testes

Autonomic nerves

- Sympathetic fibers run with testicular artery from renal or aortic sympathetic plexuses
- Afferent sensory nerve

Genital branch of the genitofemoral nerve

- Supply the cremastic muscle

Scrotum→ By the above nerves + ilioinguinal nerve

Clinical Notes

Clinical conditions involving the scrotum and testes

Varicocele:

- The veins of the pampiniform plexus elongated & dilated
- Lt side more common ☐ venous pressure is higher
- Common in young & adult
- Vasectomy**→Infertility
- Processus vaginalis**

Upper part → obliterated just before birth

Lower part →Tunica vaginalis

Congenital anomalies of processus vaginalis

- 1- persist→ indirect inguinal hernia
- 2- Narrowed →congenital hydrocele
- 3- Obliterated upper & lower part ☐ encysted hydrocele of the cord

Abnormality in testis & scrotum.....cont

Hydrocele

-Accumulation of fluid within the tunica vaginalis of the testis

-Causes

1- Inflammatory

2- idiopathic

-Tapping a hydrocele → structures (all layers covering the testis, skin → tunica vaginalis) traversed by the cannula

Congenital anomalies of the testes

Cryptorchidism

-Incomplete descent of testis although traveling down normal pathway

-It may be found in

1- Abdominal cavity

2- In inguinal canal

3- At superficial inguinal ring

4- In upper part of scrotum

Mal descent

- Testes travel down an abnormal pathway

1- Superficial fascia

2- Root of penis

3- Perineum

4- In the thigh

The small intestine

The small intestine is divided into three regions: duodenum, jejunum, and ileum.

Duodenum

- The duodenum is the first part of the small intestine, and most of it is deeply placed on the posterior abdominal wall.
- It is situated in the epigastric and umbilical regions.
- It is a C-shaped tube that extends from the stomach around the head of the pancreas to join the jejunum
- Concave tube
- About 10 inch length.
- It joins the stomach to the jejunum.
- It curves around the head of the pancreas to the left and backwards.
- It is important because it receives the opening of the bile and pancreatic ducts.

→ Duodenum....cont

- Most of the duodenum is **retroperitoneal** except the **1st inch & last inch**
- This short segment(1st inch) has the lesser omentum on its upper border, the greater omentum on its lower border, and the lesser sac posterior to it
- The duodenum extends from the pylorus to the jejunum
- It is divided into 4 parts.

Organs are **retroperitoneal** if they have peritoneum on their anterior side only.

Site of duodenum

- The duodenum is situated in the **epigastric** and **umbilical regions**
- for purposes of description, is divided into four parts

■ 1st part of Duodenum

- The first part of the duodenum begins at the **pylorus** and runs **upward** and **backward** on the **transpyloric plane(L1)** at the level of the 1st lumbar vertebra
- The first part is 2 inches long: 1st inch intraperitoneal and 2nd inch retroperitoneal
- It begins from the pyloduodenal junction
- At the level of the transpyloric line
- Runs upward and backward at the level of the **1st lumbar vertebra** 1 inch to the right.

Relations of 1st part of duodenum

Anterior

- The quadrate lobe of the liver
- the gallbladder

Superior

- The entrance into the lesser sac (the **epiploic foramen=omental foramen=wislow foramen**)

posterior

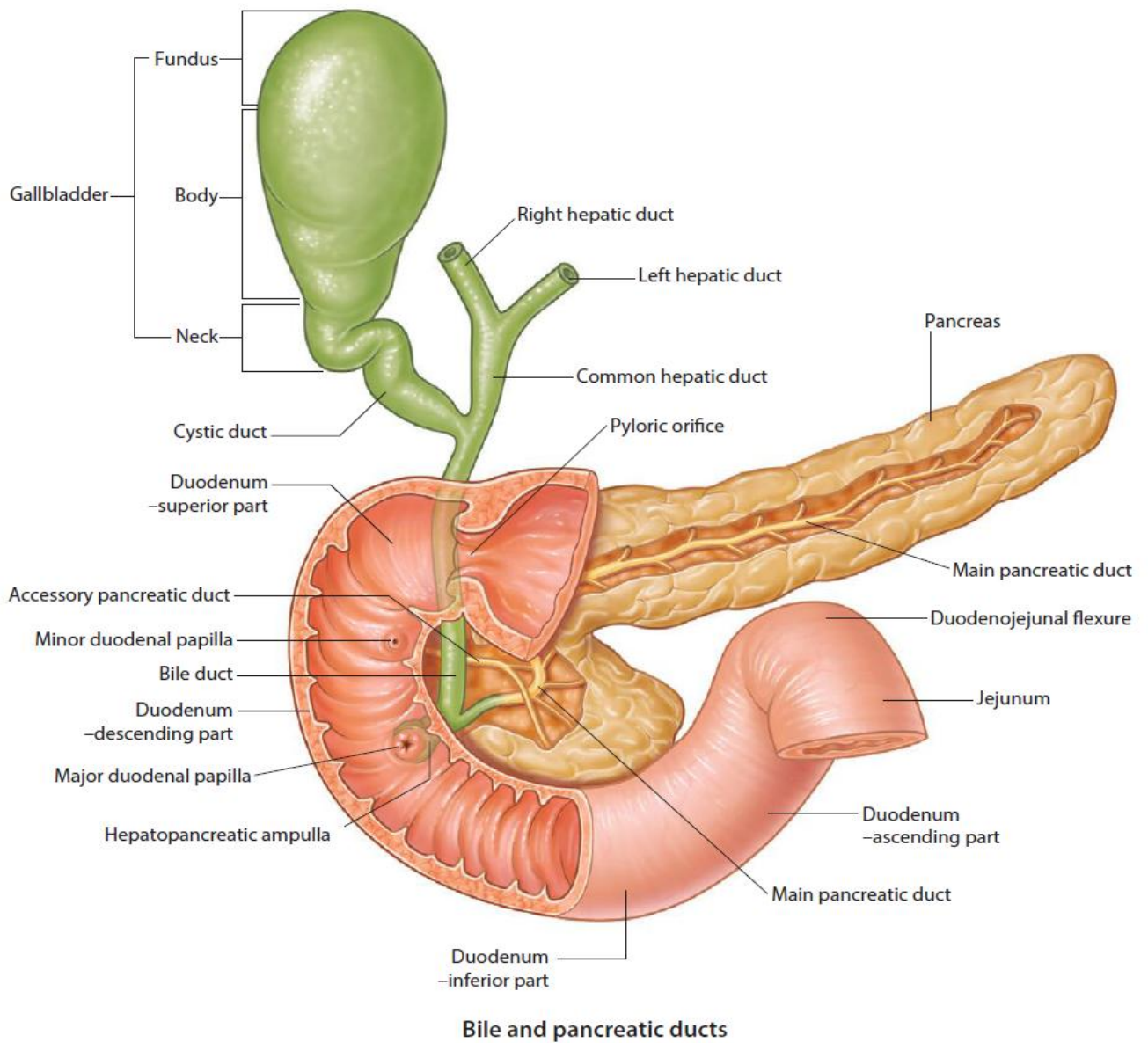
- The lesser sac
- gastroduodenal Artery
- the Bile duct
- portal vein
- inferior vena cava (I.V.C)

Inferior

- The head of the pancreas.

■ 2nd part of duodenum

- It is 3 inch long
- retroperitoneal
- runs downward vertically on the right side
- in front of the hilum of the right kidney
- next to the 3rd and 4th lumbar vertebrae.
- About halfway down its medial border, the bile duct and the main pancreatic duct pierce the duodenal wall. They unite to form the **ampulla** that opens on the summit of the **major duodenal papilla**
- The accessory pancreatic duct (if present) opens in the **minor duodenal papilla** more superiorly.



Relations of 2nd part of duodenum

Anterior

- The fundus of the gallbladder
- Right lobe of the liver
- Transverse colon
- coiled of small intestine.

Posterior

- Hilum of Right Kidney
- Right Ureter.

Lateral

- Right colic flexure
- Ascending colon
- Right lobe of the liver.

Medial

- Head of pancreas
- Bile and pancreatic ducts

■ 3rd part of duodenum

- 4 inch long
- retroperitoneal
- Runs horizontally to the left
- On the subcostal plane.
- Runs in front of the vertebral column
- Under the lower margin of the head of pancreas
- Above the coils of the jejunum.

Relations of 3rd part of duodenum

Anteriorly:

- The root of the mesentery of the small intestine - the superior mesenteric vessels contained within the mesentery
- coils of jejunum

Posteriorly:

- The right ureter
- the right psoas muscle
- the inferior vena cava
- the aorta

Superiorly:

- The head of the pancreas

Inferiorly:

- Coils of jejunum

■ 4th part of duodenum

- **1 inch** long (= intraperitoneal)
- Runs upward to the left
- End in the duodejejunal junction at the level of the **2nd lumbar** vertebrae 1inch to the left.
- The junction (flexure) is held in position by a peritoneal fold, the **ligament of Treitz**, which is attached to the right crus of the diaphragm (duodenal recess).

Relation of 4th part of duodenum

Anterior

- The beginning of the root of the mesentery
- coils of the jejunum.

Posterior

- Left psoas major
- the sympathetic chain
- left margin of the aorta.

Superior

- Uncinate process of the pancreas.

Blood supply of duodenum

Arteries

- 1- **upper half** (upper 1.5): (**1st part + upper 1/2 of 2nd part**) is supplied by the **superior pancreaticoduodenal artery**, a branch of the **gastroduodenal artery** .
- 2- **lower half** (lower 2.5): (**lower 1/2 of 2nd part + 3rd + 4th part**) is supplied by the **inferior pancreaticoduodenal artery**, a branch of the **superior mesenteric artery**

Veins

- The **superior pancreaticoduodenal vein** drains into the **portal vein**
- The **inferior vein** joins the **superior mesenteric vein** .

Lymphatic drainage

- The lymph vessels follow the arteries
- **drain upward** → via pancreaticoduodenal nodes → the gastroduodenal nodes → the celiac nodes
- **drain downward** → via pancreaticoduodenal nodes → the superior mesenteric nodes around the origin of the superior mesenteric artery.

Nerve supply

- Sympathetic nerve
- parasympathetic (vagus) nerves from:
 - 1- **The celiac plexus**
 - 2- **Superior mesenteric plexus**

Attachment of the root of the mesentery of the small intestine to the posterior abdominal wall. Note that it extends from the duodenojejunal flexure on left of the aorta, downward, and to the right to the ileocecal junction. The superior mesenteric artery lies in the root of the mesentery.

Jejunum and Ileum

Location and Description

- The jejunum and ileum measure about **20 ft (6 m)** long
- the **upper two fifths** is the **jejunum** & the **lower 3/5** is the **ileum**
- Each has distinctive features
- there is a gradual change from one to the other
- The jejunum begins at the duodenojejunal flexure
- the ileum ends at the ileocecal junction.
- The coils of jejunum and ileum are freely mobile and are attached to the posterior abdominal wall by a fan-shaped fold of peritoneum known as the mesentery of the small intestine

mesentery of the small intestine

- fan-shaped fold of peritoneum
- The long free edge of the fold encloses the mobile intestine.
- The short root of the fold is continuous with the parietal peritoneum on the posterior abdominal wall along a line that extends downward and to the right from the left side of the 2nd lumbar vertebra to the region of the sacroiliac joint.

Contents of the mesentery

- The branches of the superior mesenteric artery and vein
- Lymphatic vessels & lymphatic nodes
- nerves

Difference between Jejunum & Ileum

the jejunum can be distinguished from the ileum by the following features:

- The jejunum lies coiled in the upper part of the peritoneal cavity below the left side of the transverse mesocolon; the ileum is in the lower part of the cavity and in the pelvis
- The jejunum is wider bore, thicker walled, and redder than the ileum. The jejunal wall feels thicker because the permanent infoldings of the mucous membrane, the plicae circulares, are larger, more numerous, and closely set in the jejunum, whereas in the upper part of the ileum they are smaller and more widely separated and in the lower part they are absent.
- The jejunal mesentery is attached to the posterior abdominal wall above and to the left of the aorta, whereas the ileal mesentery is attached below and to the right of the aorta.
- The jejunal mesenteric vessels form only one or two arcades, with long and infrequent branches passing to the intestinal wall. The ileum receives numerous short terminal vessels that arise from a series of three or four or even more arcades.
- At the jejunal end of the mesentery, the fat is deposited near the root and is scanty near the intestinal wall. At the ileal end of the mesentery, the fat is deposited throughout so that it extends from the root to the intestinal wall.
- Aggregations of lymphoid tissue (Peyer's patches) are present in the mucous membrane of the lower ileum along the antimesenteric border. In the living, these may be visible through the wall of the ileum from the outside.

Difference between Jejunum & Ileum

	jejunum	Ileum
length	Proximal 2/5	Distal 3/5
site	in the upper part of the peritoneal cavity below the left side of the transverse mesocolon	in the lower part of the cavity and in the pelvis
wall	thicker wall & redder	Thinner & less redder
Arcades in mesentery	-simple, only one or two arcades -with long infrequent branches -Long vasa recta	numerous short terminal vessels arise from a series of three or four or even more Arcade - Short vasa recta
Fat in mesentery	- the fat is deposited near the root - it is scanty near the intestinal wall - Less in amount → appear window	- the fat is deposited throughout mesentery - Big amount - No window appear

Difference between Jejunum & Ileum

	jejunum	Ileum
Diameter	wider	smaller
villi	numerous	Less numerous
Plicae circularis(the permanent enfolding of the mucous membrane& submucosa	They are: 1- larger 2- more numerous 3- closely set	they are: 1- smaller 2- more widely separated 3- in the lower part they are absent .
Lymphatic follicles	No or few	Aggregations of lymphoid tissue (Peyer's patches) are present in the mucous membrane

Blood supply of Jejunum & Ileum

Arteries:

- The arterial supply is from branches of the **superior mesenteric artery** .
- The intestinal branches arise from **the left side** of the artery and run in the mesentery to reach the gut.
- They anastomosis with one another to form a series of **arcades**.
- The lowest part of the ileum is also supplied by **the ileocolic artery**.

Veins:

- The veins correspond to the branches of the superior mesenteric artery
- Drain into the superior mesenteric vein.

Lymphatic Drainage of jejunum & ileum

- The lymph vessels pass through many intermediate mesenteric nodes
- Finally reach the superior mesenteric nodes → around the origin of the superior mesenteric artery.

Nerve Supply of jejunum & Ileum

The nerves are derived from the sympathetic and parasympathetic (vagus) nerves from the [superior mesenteric plexus](#).

Congenital anomaly of small intestine

Meckel's Diverticulum:

- a congenital anomaly of the ileum
- Present in 2% of people
- 2 feet from ileocecal junction
- 2 inch long
- contains gastric or pancreatic tissue
- Remains of vitelline duct of embryo

The peritoneum

NOTE: to write this sheet we refer to the slides from the last year , and whenever you see “not mentioned” , that means the doctor did not go through

General Arrangement:

- The peritoneum is a thin serous membrane that lines the walls of the abdominal and pelvic cavities and clothes the viscera.
- The peritoneum can be regarded as a balloon against which organs are pressed from outside

Consisting of:

1- **parietal peritoneum:**

- lines the walls of the abdominal and pelvic cavities,

2- **visceral peritoneum**

- covers the organs(covers the viscera)

3- **peritoneal cavity:**

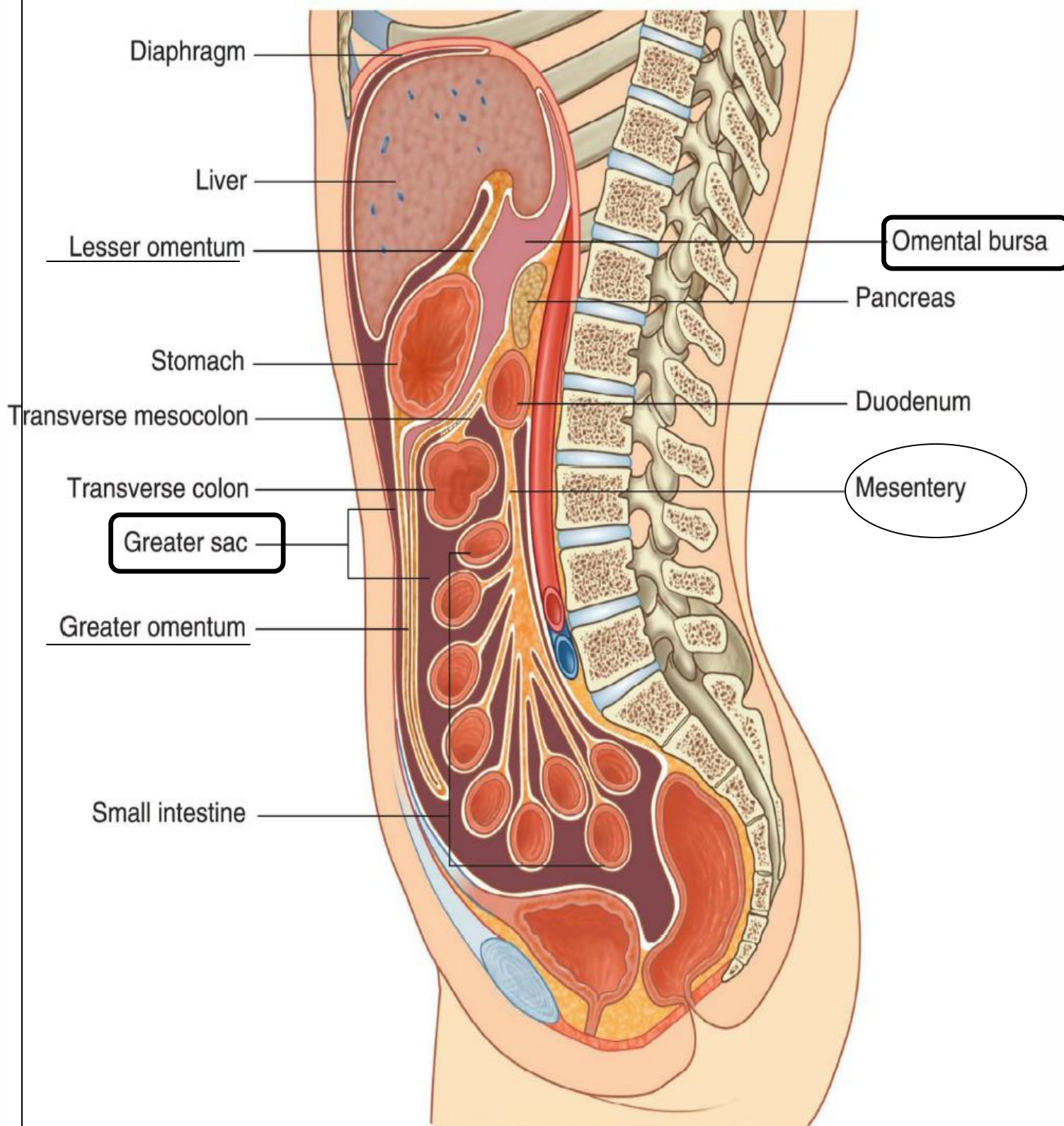
- potential space between the parietal and visceral layers, which is in effect the inside space of the balloon
- In males, this is a closed cavity,
- **But in females, there is communication with the exterior through the uterine tubes, the uterus, and the vagina.**

Peritoneum (visceral + parietal)→is a big surface area.

❖ The peritoneal cavity is the largest cavity in the body and is divided into two parts:

- the **greater sac** and the **lesser sac**.
- The **greater sac** is the main compartment and extends from the diaphragm down into the pelvis.
- The **lesser sac** is smaller and lies behind the stomach.
- The greater and lesser sacs are in free communication with one another through an oval window called the **opening of the lesser sac**, or the **epiploic foramen**

the **greater sac** and the **lesser sac** are important for the exam



Lesser sac = omental bursa

Remember:

The lesser sac is behind the stomach, while the greater sac is in the front.

- The lesser sac lies behind the stomach and the lesser omentum
 - Deep to lesser omentum
 - Behind the stomach
- It extends upward as far as the diaphragm and downward between the two layers of the greater omentum.
- Under the diaphragm and liver
- Deep to lesser opening (Epiploic opening)

Walls:

• Superior

peritoneum which covers the caudate lobe of liver and diaphragm

• Anterior

lesser omentum, peritoneum of posterior wall of stomach, and anterior two layers of greater omentum.

• Inferior

conjunctive area of anterior and posterior two layers of greater omentum

• Posterior

posterior two layers of greater omentum, transverse colon and transverse mesocolon, peritoneum covering posterior abdominal wall.

• Left

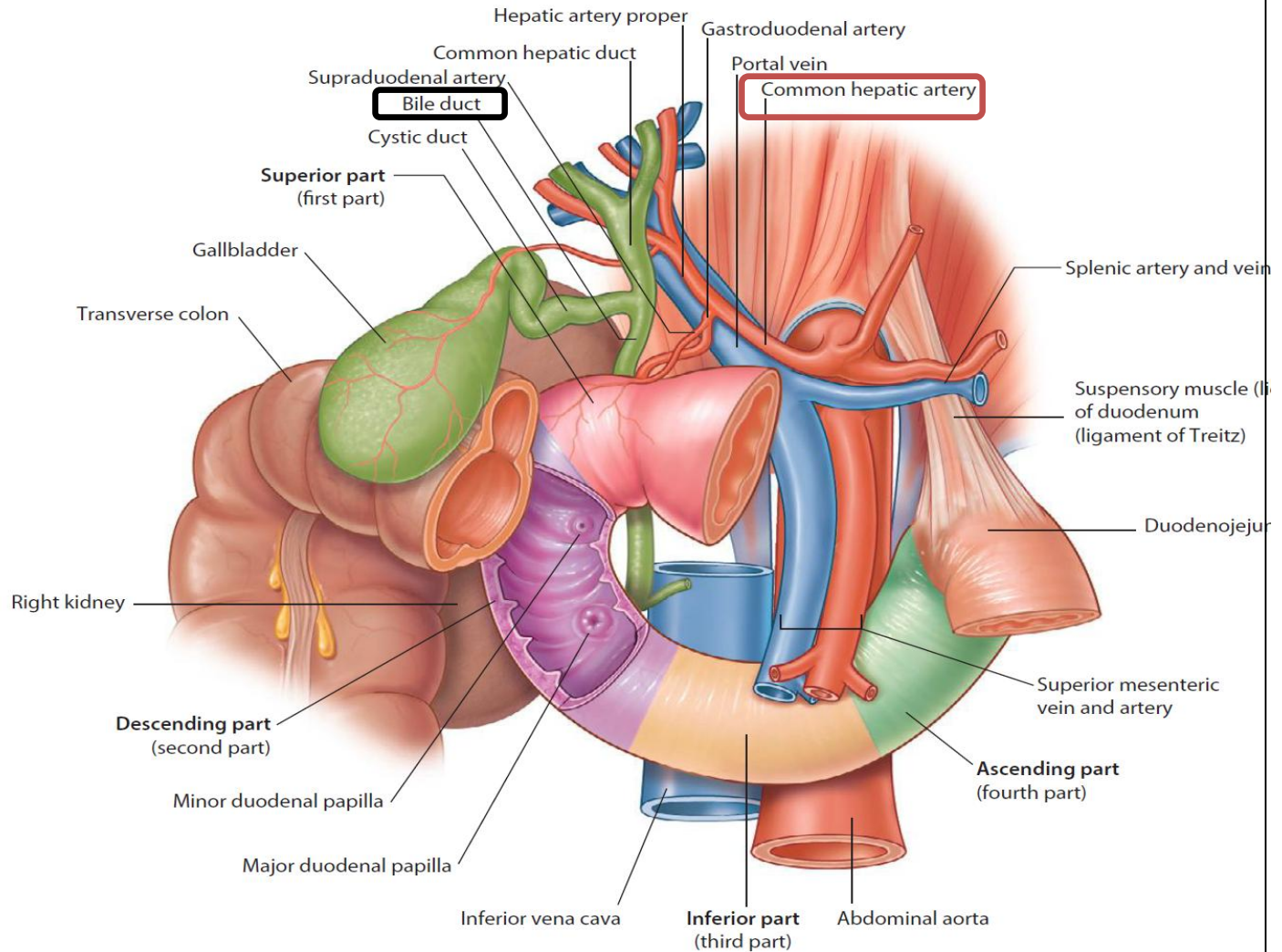
spleen, gastrosplenic ligament , splenorenal ligament

• Right

omental foramen

Note:

Omental foramen = Epiploic foramen = foramen of Winslow.
Cystic duct joins the common hepatic duct form the common bile duct, beside the common bile duct, you find the hepatic artery.



- During a cholecystectomy operation, the Dr found a big vessel behind the gallbladder, he thought it was a big hepatic arteryà suppose he ligated the hepatic artery, what will happen? Necrosis of the liver, so very important to know the structure because anatomy is not normal all the time. Sometimes you can see the artery up the way, down the way, on the right, on the left and so on
- In the back of the lesser sac you find the pancreas, so if there a pancreatitis, the fluid will be collected in the lesser sac

Greater sac

- It is the peritoneal cavity where the intestine is inside
- Deep to anterior Abdominal wall
- Below the diaphragm
- Above pelvic viscera
- Out to:
 - + **Liver** → surround all the liver except **bare area**
 - + **Stomach** → completely surrounded by peritoneum
 - + **Transvers colon**
 - + **Greater omentum** → two layers of peritoneum from greater curvature of stomach
 - + **Duodenum** → just the anterior surface covered by peritoneum
 - + **Small intestine** → surrounds all the intestine and form mesentery

❖ The greater sac is Subdivided by greater omentum into :

- **Antero- superior part**
- **Postero - inferior part**

❖ Antero- superior part divided by **falciform ligament** into:

- Right part
- Left part

❖ Poster – inferior divided by **mesentery** & **small intestine** into:

- Right part
- Left part

→ Is the free border of the lesser sac.
→ is the entry to the lesser sac, behind the common bile duct

Omental(epiploic)foramen

Position:

*the doctor said this part is very important

- lies between the liver and duodenum
- just **above** the first part of the duodenum ,**behind** the lesser omentum
- in front of the inferior vena cava
- short, vertically flattened passage, about 3cm

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تستطيع تمييز الاتي

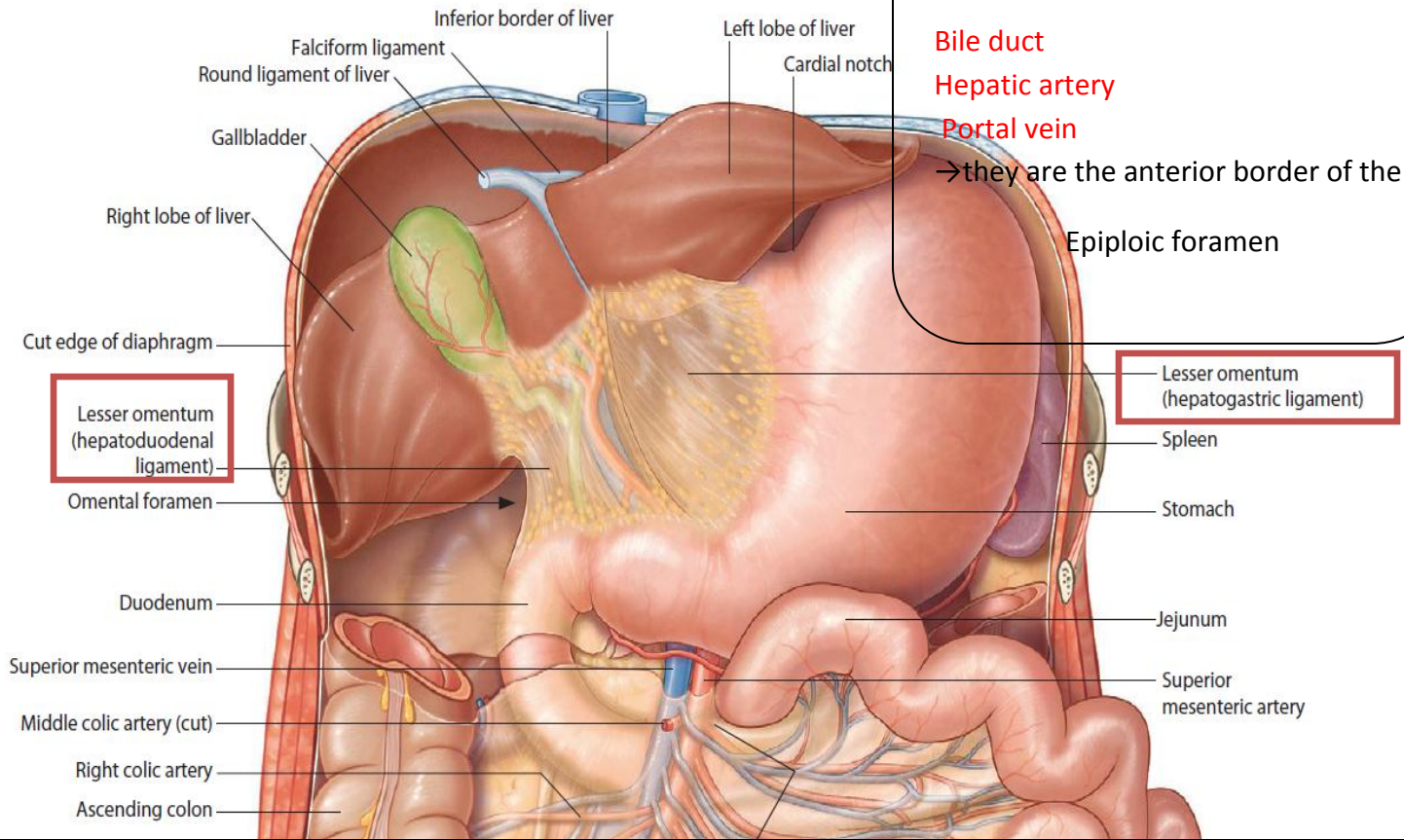
Bile duct

Hepatic artery

Portal vein

→ they are the anterior border of the

Epiploic foramen

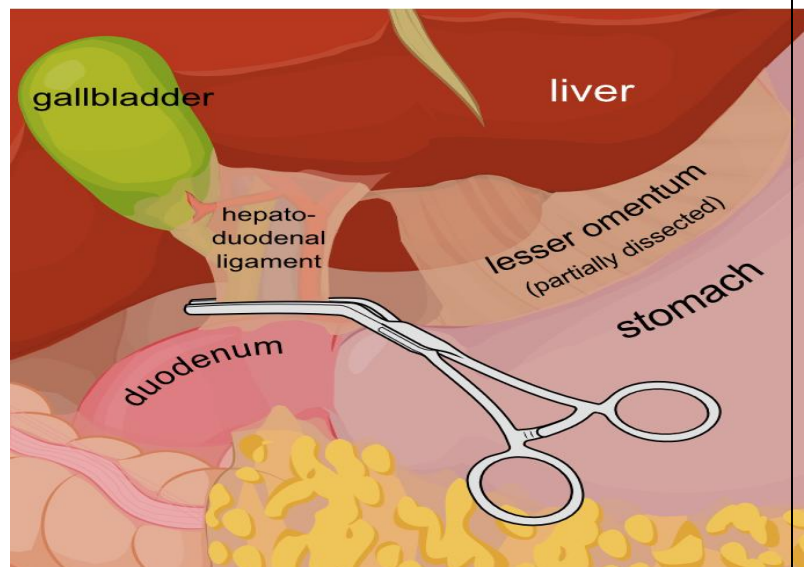


■ To stop liver bleeding we do something called: **Pringle Manoeuvre.**

■ If I put my finger in the foramen of Winslow and clinch it, I block the blood supply to the liver (artery) and the portal vein, so I stop the bleeding.

☆ The omental bursa (lesser sac) communicates with the greater sac through the omental foramen.

☆ Important to know :the structures that run in the anterior wall of this foramen which are : portal vein, common bile duct , and hepatic artery. thus if you tight this wall , the patient will die from acute liver failure , because you cut the blood supply.



Boundaries of the epiploic foramen

- **Anteriorly**

- Free border of lesser omentum contain
 - 1- Bile duct(right & anterior)
 - 2- Hepatic artery(left & anterior)
 - 3- Portal vein (posterior to 1&2)

- **Posteriorly**

- I.V.C

- **Superiorly**

Caudate process of caudate lobe of liver

- **Inferiorly**

First part of duodenum

(if we have a perforation in the second part ; the formation of gas will be behind the duodenum not in front of it .same as in transverse colon and stomach the formation of gas will be in the lesser sac ,thus in the greater sac we won't see anything)

Function of the peritoneum

- **Secretes a lubricating serous fluid** that continuously moistens the associated organs. (because the peritoneum has large surface area , if a patient has peritonitis, he will end up with edema and losing lot of fluid results in hypotension , so you give him fluids)
- **Fat storage**
- **Defense role** → the presence of lymphatic vessels & nodes
- **Support viscera**

The relationship between viscera and peritoneum



■ **Intraperitoneal viscera**

- viscera is almost totally covered with visceral peritoneum

- example, stomach, 1st & last inch of duodenum, jejunum, ileum, cecum, vermiform appendix, transverse and sigmoid colons, spleen and ovary, small bowel.

■ **Retroperitoneal viscera**

- some organs lie on the posterior abdominal wall
- Behind the peritoneum
- they are **partially** covered by peritoneum on their anterior surfaces only
- ☐ Example
- **kidney**, suprarenal gland, **pancreas**, descending and ascending colon, upper 3rd of rectum
duodenum, and ureter, **aorta** and I.V.C

Since the Aorta is retroperitoneal, if we have a ruptured aorta the bleeding will be outside the peritoneal cavity in the back, so the patient will have pain in his back. **thus** the pain of every retroperitoneal structure will give radiation to the back (important).also the collection of blood or pus will be outside the peritoneum

Kidney/ pancreas pain will be in the back as they are retroperitoneal

مهم

■ **Interperitoneal viscera**

- Such organs are not completely wrapped by peritoneum
- one surface attached to the abdominal walls or other organs.
- ☐ Example
liver, gallbladder, urinary bladder and uterus

“the peritoneal reflections or folds”

- Certain terms, often arbitrary, are commonly used for the peritoneal reflections.

- A peritoneal reflection that connects the intestine and body wall is usually named according to the part of the gut to which it is attached.
- For example, the reflection to jejunum and ileum is termed the mesentery, that to the transverse colon is the transverse mesocolon.
- Some peritoneal reflections between organs or between the body wall and organs, are termed **ligaments** or **folds**. Most of such ligaments or folds contain blood vessels. Broad peritoneal sheets associated with stomach are termed **omenta**.

1- Omenta :

- Two-layered fold of peritoneum that extends from stomach to adjacent organs
- Two omenta
 - Lesser omentum
 - Greater omentum

*the doctor did not explain details about the lesser and greater omentum

■ Lesser omentum

- Two-layered fold of peritoneum
- Extends from porta hepatis, fissure of ligamentum venosum and the diaphragm to **lesser curvature** of stomach and superior part of duodenum

انظر للصورة بصفحة ٦

❖ **Hepatogastric ligament:**

- from porta hepatis to lesser curvature of stomach

❖ **Hepatoduodenal ligament:**

- Extends from porta hepatis to superior part of duodenum,
- at its free margine enclose 3 structures(3 key structures)
 - common bile duct**→Anterior
 - proper hepatic a**→ At the Left of the common bile duct
 - hepatic portal v**→ posterior

Contents of lesser omentum

- Blood vessels→ Rt. & Lt. gastric vessels
- Lymph nodes & lymphatic vessels

- Fat
- Autonomic N.S → sympathetic + parasympathetic (vagus nerve)

■ Greater omentum

- It is the largest peritoneal fold.
- It consists of a double sheet(each sheet is double-layered), folded on itself so that it is made up of four layers.
- The anterior two layers descend from the greater curvature of stomach and superior part of duodenum and hangs down like an apron in front of coils of small intestine
- then turn up on the back of itself, and ascend to the transverse. →to see the transverse colon you should cut the greater omentum.
- the two layers are separated to cover the anterior and posterior surfaces of transverse colon. Then they form the transverse mesocolon.
- The upper part of the greater omentum which extends between the stomach and the transverse colon is termed the **gastrocolic ligament**.
- In adult, the four layers of greater omentum are frequently adhered together, and are found wrapped about the organs in the upper part of the abdomen

► suppose I have a patient who had an ulcer which perforated at the back of the stomach, I need to see the ulcer from the back, so I cut the greater omentum and left the stomach up or I can do through the foramen of Winslow..

Contents of greater omentum

- Gastroepiploic vessels
- Lymph nodes & lymphatic vessels
- Fat

- Autonomic N.S→ sympathetic + parasympathetic (vagus nerve)

Function of greater omentum

- ① protective function: The greater omentum contains numerous fixed macrophages, which performs an important protective function.
- ② storehouse for fat: The greater omentum is usually thin, and presents a cribriform appearance, but always contains some adipose tissue, which in fatty people is present in considerable quantity.
- ③ **migration and limitation**: The greater omentum may limit spread of infection in the peritoneal cavity. Because it will migrate to the site of any inflammation in the peritoneal cavity and wrap itself around such a site, the greater omentum is commonly referred to as the “policeman” of the peritoneal cavity.

2- Mesenteries of the peritoneum : *not mentioned*

Two-layered fold of peritoneum that attach the intestines to the posterior abdominal wall

■ Mesentery of small intestine

- suspends the small intestine from the posterior abdominal wall
- Broad and a fan-shaped

- **Root of mesentery**

- 15 cm long
- Directed obliquely from left side of L2 vertebra to right sacroiliac joint

Contents of the mesentery

- the jejunal and ileal branches of the superior mesenteric artery &veins
- nerve plexuses
- lymphatic vessels
- the lymphatic nodes,

- connective tissue
- fat

■ Mesoappendix

- Triangular mesentery — extends from terminal part of ileum to appendix
- Appendicular artery runs in free margin of the mesoappendix

■ The transverse mesocolon

- It is a broad fold
- Connects the transverse colon to the anterior border of the pancreas.
- Contents
 - The blood vessels
 - Nerves
 - lymphatic's of the transverse colon

■ sigmoid mesocolon

- It is a fold of peritoneum
- attaches the sigmoid colon to the pelvic wall.
- Contents
 - The sigmoid vessels
 - Lymphatic vessels
 - Nerves
 - The left Ureter descends into the pelvis behind its apex

3- ligaments of the peritoneum not mentioned

① the ligaments of the liver:

- 1- The falciform ligament of liver

- 2- The **ligamentum teres hepatis**
- 3- The **coronary ligament**
- 4- The **right triangular ligament**
- 5- The **left triangular ligament**
- 6- The **hepatogastric ligament**
- 7- The **hepatoduodenal ligament**

■ **falciform ligament of liver:**

- Consists of double peritoneal layer
- Sickleshape
- Extends from anterior abdominal wall (umbilicus) to liver
- Free border of the ligament contains **Ligamentum teres** (obliterated umbilical vein)

■ **coronary ligament:**

- the area between upper and lower layer of the coronary ligament is the bare area of liver which contract with the diaphragm;

■ **Left and right triangular ligaments**

- formed by left and right extremity of coronary ligament

■ **Hepatogastric ligament**

■ **Hepatoduodenal ligament**

② the ligaments of spleen:

■ **Gastrosplenic ligament**

- Connects the fundus of stomach to hilum of spleen.
- **Contents:**
the short gastric & left gastroepiploic vessels pass through it.

■ Splenorenal ligament

- extends between the hilum of spleen and left kidney.

- **Contents:**

The splenic vessel Lymphatic vessels ,nodes & nerve
the tail of pancreas

■ Phrenicosplenic ligament

■ Splenocolic ligament

③ the ligaments of stomach.

- Hepatogastric ligament
- Gastrosplenic ligament
- Gastrophrenic ligament
- Gastrocolic ligament
- Gastropancreatic ligament

④ The suspensory ligament of duodenum.

Sometimes named **Treitz ligament** at the junction between
duodenum & jejunum

⑤ The phrenicocolic ligament

It is a fold of peritoneum which is continued from the left colic
flexure to the diaphragm opposite the 10th and 12th ribs.

3- the peritoneal Recesses & Fossa

- In certain parts of the abdomen, peritoneal fold may bound **recesses** or **fossae** of the peritoneal cavity.
- At the junction between intraperitoneal and retro peritoneal organs
- These recesses are of surgical importance since they may become the site of internal herniae, that is, a piece of intestine may enter a recess and

may be constricted (strangulated) by the peritoneal fold granding the entrance to the recess.

- From a surgical point of view the omental bursa can be considered to belong to this category, with its opening at the **epiploic foramen**, bounded in front by the free border of the lesser omentum.
- They are sometimes found in relation to the **duodenum**, **cecum** and **sigmoid colon**.

1. Duodenal Recesses *not mentioned*

- The superior duodenal recess or fossa
- The inferior duodenal recess or fossa
- The paraduodenal recess or fossa
- The duodenojejunal recess or fossa

2. Cecal recesses *not mentioned*

- The superior ileocecal or fossa
- The inferior ileocecal or fossa
- The retrocecal recesses or fossa
- The rectocolic recess or fossa

3. The intersigmoid recess *not mentioned*

Folds and recesses of posterior abdominal wall

- Superior duodenal fold and recess
- Inferior duodenal fold and recess
- Intersigmoid recess: formed by the inverted V attachment of sigmoid mesocolon
- **Retrocecal recess** in which the appendix frequently lies
- **Hepatorenal recess** lies between the right lobe of liver, right kidney, and right colic flexure, and is the lowest parts of the peritoneal cavity when the subject is supine

pouches *not mentioned*

- In the lesser pelvis, the peritoneum dips downwards forming a larger fossa, named pouch.
- Clinical important → internal abdominal hernia

Pouches

- In male
 - **rectovesical pouch**
 - lies between rectum and urinary bladder (or the seminal vesicles and ampullae ductus deferentes).
 - The rectovesical pouch is the lowest part of the peritoneal cavity in anatomical position in male.

Pouches

- In female
 - 1- Rectouterine pouch** :between rectum and uterus
 - 2- Vesicouterine pouch** :between bladder and uterus
 - The rectouterine pouch is formed between the anterior surface of the rectum and the posterosurface of the uterus and the upper part of vagina.
 - The Vesicouterine pouch is formed between the anteroinferior surface of the uterus and the superior surface of the urinary bladder

Peritoneal subdivision

The transverse colon and transverse mesocolon divides the greater sac into

- Supracolic compartments
- Infracolic compartments.
- Rt.extraperitoneal space.(bare area of liver & diaphragm)

■ Supracolic compartments

Subphrenic space (below the spleen)

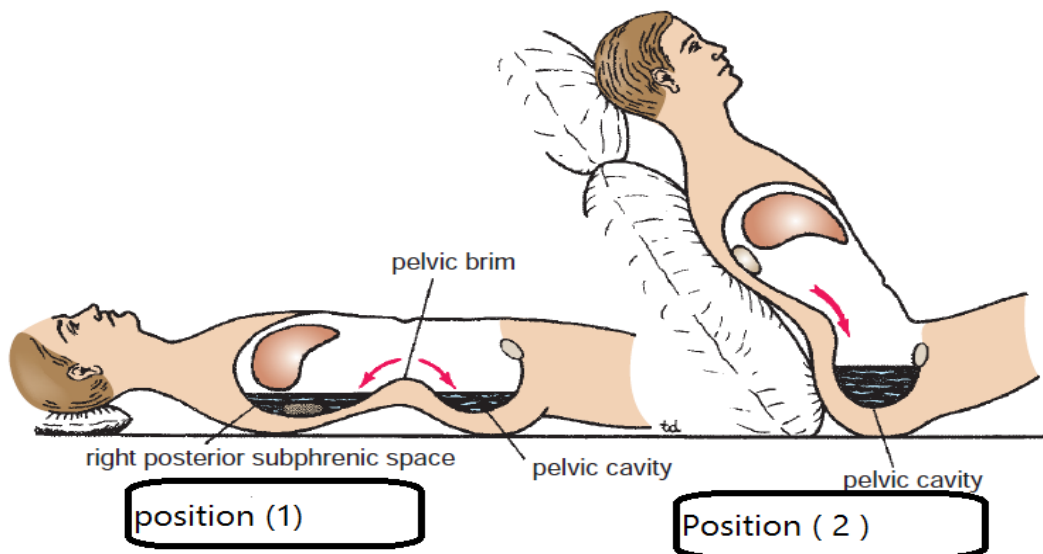
Sub hepatic space(below the liver)

◎Subphrenic space

- Divided by the attachment of Falciform ligament into
 - Rt.subphrenic space
 - Lt.subphrenic space

◎Subphrenic space

- divided into:
 - Rt.subhepatic space(morison's pouch), (hepatorenal pouch).
 - Lt.subhepatic space(lesser sac)



If you are in spine position, and there is fluid in the peritoneal cavity, the fluid will be collected at

Hepatorenal pouch.

In the pelvic

"the first position "

“the second position”

The fluid will be collected in the pelvic .

→ Suppose I have a patient with appendicitis and it is badly inflamed with bad fluid, the fluid will be either in the hepatorenal space or in the pelvic.

→ So, if I want to put something to drain the fluid, I put it in areas where I suspect the fluid will be collected there.

→ (the hepatorenal space or in the pelvic).

Infracolic compartment

- lies below the transverse colon and transverse mesocolon

- Divided by root of the mesentery of small intestine into:
- Rt. Infracolic compartment
- Lt. infracolic compartment

Infracolic compartments

❖ **Right paracolic sulcus (gutter)**, (lateral to the ascending colon)

Subdivide into:

- Rt.medial.paracolic
- Rt.Lateral.paracolic
- Rt.Lateral.paracolic communicates with the hepatorenal recess and the pelvic cavity.
- It provides a route for the spread of infection between the pelvic and the upper abdominal region.
- **Note :If there is a perforation in the stomach , the pus will move through this sulcus causing pain in the right.**

**The doctor only
mentioned the notes**

❖ **Left paracolic (gutter)**, (lateral to the descending colon)

Note : there is an interruption of flow due to adhesion with the posterior abdominal wall .

Subdivide into:

- Lt.medial.paracolic
- Lt.Lateral.paracolic

- Lt. lateral paracolic separated from the area around the spleen by the phrenicocolic ligament(a fold of peritoneum that passes from the colic flexure to the diaphragm)
- Lt.medial.paracolic open to the outside through the pelvis

Note : if there is a patient with perforated anterior wall of sigmoid (diverticulitis) , that will cause peritonitis , and you will find the gas in the greater sac .

If a patient has lower rectal injury , you will find the gas in retroperitoneal or specifically called retrorectal or pararectal (around the rectum).

Large intestine

- ✓ Extends from **ileocecal** valve to **anus**
- ✓ **Length** = 1.5- 2.5m = 5 feet
- ✓ **The primary function** of the large intestine is the absorption of water and electrolytes and the storage of undigested material until it can be expelled from the body as feces.
- ✓ **Regions** : The large intestine is divided into the **cecum**, **appendix**, ascending colon, transverse colon, descending colon, sigmoid colon, **rectum**, and **anal canal**.
 - Cecum = 2.5- 3 inch → **Intraperitoneal**
 - Appendix= 3-5 inch → **Intraperitoneal**
 - Colon
 - Ascending= 5 inch → **retroperitoneal**
 - Transverse= 15 inch → **Intraperitoneal**
 - Descending= 10 inch → **retroperitoneal**
 - Sigmoid colon = 10 – 15 inch → **Intraperitoneal**
 - Rectum= 5 inch
 - Anal canal= 4 cm

General features of large intestine

- 1- **Sacculation= Haustra**
- 2- **Tenia coli** (three separate longitudinal ribbons of smooth muscle)→except **appendix** and **rectum**
- 3- **Appendices epiploica**(adipose structures protruding from the serosal surface of the colon)→**except appendix , Cecum and rectum**
- 4- **Intraperitoneal** and **retroperitoneal** parts

★ The large intestine arches around and encloses the coils of the small intestine and tends to be more fixed than the small intestine.

1- Cecum

- The **cecum** is a blind-ended sac that projects downward in the **right iliac region** below the ileocecal junction
- The cecum is situated in the right lower quadrant(4 region system)
- It is a blind-ended pouch
- Site: situated in the **right iliac fossa** , above the lateral ½ of inguinal ligament
- Size: It is about 3 inch in diameter
- Completely covered with peritoneum. → **Intraperitoneal**
- It possesses a considerable amount of mobility, although it **does not have a mesentery**.
- Attached to its posteromedial surface is the appendix.
- Attached to :
 - Ascending colon
 - posteromedially surface is the appendix , 1 inch below ileocecal valve
 - medially→Ileum
- The presence of peritoneal folds in the vicinity of the cecum creates
 - The superior ileocecal recesses
 - The inferior ileocecal recesses
 - The retrocecal recesses .

Cecal Recesses

Folds of peritoneum close to the cecum produce three peritoneal recesses called the **superior ileocecal**, the **inferior ileocecal**, and the **retrocecal recesses**

→Cecum....cont

- As in the colon, the longitudinal muscle is restricted to three flat bands, the **teniae coli**, which converge on the base of the appendix and provide for it a complete longitudinal muscle coat .
 - The terminal part of the ileum enters the large intestine at the junction of the cecum with the ascending colon. The opening is provided with two folds, or lips, which form the so-called **ileocecal valve**

Relations of cecum

Anteriorly:

- Coils of small intestine
- the greater omentum
- the anterior abdominal wall in the right iliac region

Posteriorly:

- The psoas and the iliacus muscles
- the femoral nerve
- and the lateral cutaneous nerve of the thigh .
- **Postero- medially** →The appendix is commonly →retrocecal common.

Medially:

- Small intestine(ileum)

Anterior and posterior cecal arteries form the ileocolic artery, a branch of the superior mesenteric artery

Blood Supply of cecum

Arteries

- Anterior and posterior cecal arteries →a branch of **Superior mesenteric artery**

Veins

- correspond to the arteries and drain into the **superior mesenteric vein**.

Lymphatic Drainage of cecum

- The lymph vessels pass through several mesenteric nodes → finally reach the **superior mesenteric nodes**.

Nerve Supply of cecum

- Branches from the sympathetic and parasympathetic (vagus) nerves form the **superior mesenteric plexus**.

❖ Ileocecal Valve

- A rudimentary structure
- consists of two horizontal folds of mucous membrane that project around the orifice of the ileum..
- •The valve plays little or no part in the prevention of reflux of Cecal contents into the ileum.
- The circular muscle of the lower end of the ileum (called the ileocecal sphincter by physiologists) serves as a sphincter and controls the flow of contents from the ileum into the colon.

- The smooth muscle tone is reflexly increased when the cecum is distended; the **gastrin hormone**, which is produced by the stomach, causes relaxation of the muscle tone.

2- Appendix

Location and Description:

- The appendix is a narrow, muscular tube containing a large amount of lymphoid tissue.
- Has its own mesentery.
- The appendix lies in the right lower quadrant(4region system)
- containing a **large amount of lymphoid tissue**.
- It varies in length from 3 to 5 inch. (8 -13 cm).
- The base is attached to the posteromedial surface of the cecum about 1 inch. (2.5 cm) below the ileocecal junction .
- The remainder of the appendix is free.

Peritoneum: → Intraperitoneal

- It has a complete peritoneal covering(→**Intraperitoneal**), which is attached to the mesentery of the small intestine by a short mesentery of its own, **the mesoappendix**.
- The mesoappendix contains the appendicular vessels and nerves.

→Appendix....cont

Appendicular artery :runs in free margin of the mesoappendix

•**Position**

The appendix lies in the right iliac fossa, and in relation to the anterior abdominal wall its base is situated one third of the way up the line joining the right anterior superior iliac spine to the umbilicus (McBurney's point).

Common Positions of the Tip of the Appendix

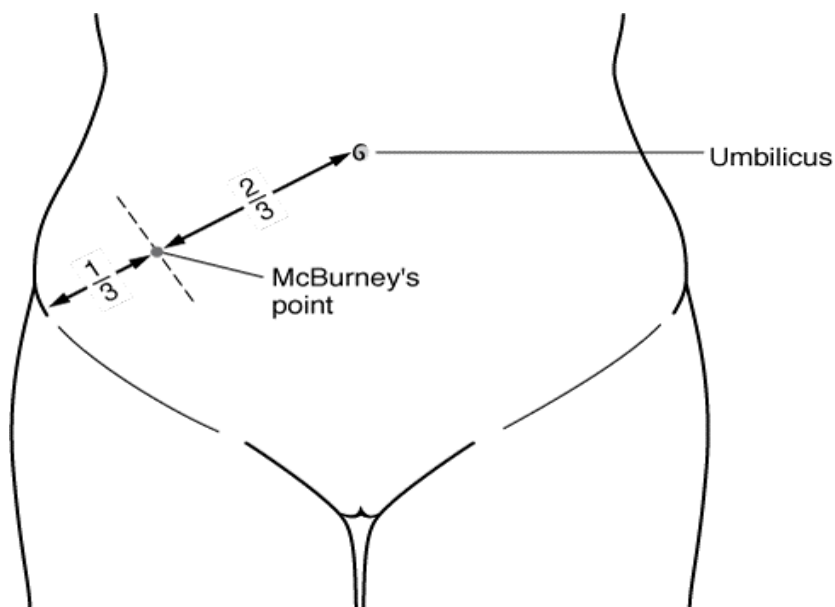
The tip of the appendix is subject to a considerable range of movement and may be found in the following positions:

- **Retrocecal** (in retrocecal recess) : posterior to the cecum → in 74% of people
- **Pelvic:** in pelvis related to right ovary and uterine tube →in 21% of people
- **Subcecal:** below cecum→ in 3.5%

- **Preileal:** in front of ileum → 1%
- **Postileal:** behind the ileum → 0.5%

■ Surface anatomy of appendix= McBurney's point مهم

- Its base is situated one third of the way up the line joining the right anterior superior iliac spine to the umbilicus
- To reach the appendix during operation follow the taenia coli which converge toward the appendix



Blood Supply of appendix

Arteries

- The **appendicular artery** is a branch of the **posterior cecal artery** (ilio-cecal.a) which descends behind the ileum.


Veins

- The **appendicular vein** drains into the **posterior cecal vein**.

Lymphatic Drainage of appendix

- The lymph vessels drain into one or two nodes lying in the mesoappendix
→ eventually into the **superior mesenteric nodes**.

Nerve Supply of appendix

- The appendix is supplied by the sympathetic and parasympathetic (vagus) nerves from the superior mesenteric plexus.
- **Afferent nerve fibers** concerned with the conduction of **visceral pain** from the appendix accompany the sympathetic nerves and enter the spinal cord at the level of the 10th thoracic segment.
- The peritoneum over the appendix is innervated by the 10th intercostal nerve=**skin of umbilicus** 

Clinical notes

- Acute appendicitis → uncommon in the two extremes of life
- Thrombosis of appendicular .a → gangrene (just one artery for appendix) → perforation → Lt. paracolic gutter while in Acute cholecystitis → no gangrene (more than one artery supply the gallbladder)
- Appendectomy
 - ❖ A 15-year-old boy complaining of pain in the lower right part of the anterior abdominal wall was seen by a physician. On examination, he was found to have a temperature of 101°F (38.3°C). He had a furred tongue and was extremely tender in the lower right quadrant. The abdominal muscles in that area were found to be firm (rigid) on palpation and became more spastic when increased pressure was applied (guarding). A diagnosis of acute appendicitis was made. Inflammation of the appendix initially is a localized disease giving rise to pain that is often referred to the umbilicus. Later, the inflammatory process spreads to involve the peritoneum covering the appendix, producing a localized peritonitis. If the appendix ruptures, further spread occurs and a more generalized peritonitis is produced. Inflammation of the peritoneum lining the anterior abdominal wall (parietal peritoneum) causes pain and reflex spasm of the anterior abdominal muscles. This can be explained by the fact that the parietal peritoneum, the abdominal muscles, and the overlying skin are supplied by the same segmental nerves. This is a protective mechanism to keep that area of the abdomen at rest so that the inflammatory process remains localized. The understanding of the symptoms and signs of appendicitis depends on having a working knowledge of the anatomy of the appendix, including its nerve supply, blood supply, and relationships with other abdominal structures.
 - ❖ **Predisposition of the Appendix to Perforation**

The appendix is supplied by a long small artery that does not anastomose with other arteries. The blind end of the appendix is supplied by the terminal branches of the appendicular artery. Inflammatory edema of the appendicular wall compresses the blood supply to the appendix and often leads to thrombosis of the appendicular artery. These conditions commonly result in necrosis or gangrene of the appendicular wall, with perforation. Perforation of the appendix or transmigration of bacteria through the inflamed appendicular wall results in infection of the peritoneum of the greater sac. The part that the greater omentum may play in arresting the spread of the peritoneal infection is described on page 165.

3- Ascending Colon

Location and Description:

- The ascending colon is about 5 inch. (13 cm) long
- lies in the **right lower quadrant**.
- It extends upward from the cecum to the inferior surface of the right lobe of the liver, where it turns to the left, forming the **right colic flexure**
- Then becomes continuous with the transverse colon.
- Taenia coli, sacculations & appendices epiploica are present
- **The peritoneum** → **retroperitoneal**
 - Covers the front and the sides of the ascending colon
 - Binding it to the posterior abdominal wall.

Relations of ascending colon

Anteriorly:

- Coils of small intestine
- The greater omentum
- The anterior abdominal wall

Posteriorly:

- The iliacus
- The iliac crest
- The quadratus lumborum
- The origin of the transversus abdominis muscle,
- The lower pole of the right kidney.
- The iliohypogastric .n
- The ilioinguinal nerves cross behind it .

Blood Supply of Ascending colon

Arteries

- The **ileocolic and right colic branches** of the **superior mesenteric artery** supply this area.

Veins

- The veins correspond to the arteries and drain into the **superior mesenteric vein**.

Lymphatic drainage of Ascending colon

- The lymph vessels drain into lymph nodes lying along the course of the colic blood vessels and ultimately reach the superior mesenteric nodes.

Nerve Supply of ascending colon

- Sympathetic and parasympathetic (vagus) nerves from the superior mesenteric plexus .

4- Transverse colon

Location and Description

- The transverse colon is about 15 in. (38 cm) long
- extends across the abdomen, occupying the umbilical region.
- It begins at the right colic flexure below the right lobe of the liver
- It begins at the right colic flexure below the right lobe of the liver and hangs downward, suspended by the transverse mesocolon from the pancreas. It then ascends to the **left colic flexure** below the spleen.
- The left colic flexure is higher than the right colic flexure and is suspended from the diaphragm by **the phrenicocolic ligament** .
- Taenia coli, sacculations & appendices epiploicae are present

The transverse mesocolon= mesentery of the transverse colon

- suspends the transverse colon from the anterior border of the pancreas .
- The mesentery is attached to the superior border of the transverse colon
- The posterior layers of the greater omentum are attached to the inferior border
- The position of the transverse colon is extremely variable and may sometimes reach down as far as the pelvis.

Relations of Transverse colon

•Anteriorly:

- The greater omentum
- The anterior abdominal wall (umbilical and hypogastric regions)

•Posteriorly:

- The second part of the duodenum
- The head of the pancreas
- The coils of the jejunum and ileum

Blood Supply of transverse colon

Arteries:

- The proximal two thirds are supplied by the middle colic artery→ a branch of the superior mesenteric artery.
- The distal third is supplied by the left colic artery→ a branch of the inferior mesenteric artery .

Veins:

- The veins correspond to the arteries and drain into the superior & inferior mesenteric veins.

Lymphatic Drainage of transverse colon

- The proximal two thirds drain→ the colic nodes and then into the superior mesenteric nodes
- The distal third drains → the colic nodes → the inferior mesenteric nodes.

Nerve Supply of transverse colon

- The proximal two thirds are innervated by sympathetic and vagal nerves through the **superior mesenteric plexus**
- The distal third is innervated by sympathetic and parasympathetic pelvic splanchnic nerves through **the inferior mesenteric plexus**.

The **descending colon** extends from the left colic flexure to the pelvis below. It occupies the left upper and lower quadrants.

5- Descending Colon

Location and Description:

- The descending colon is about 10 in. (25 cm) long
- It extends downward from the left colic flexure, to the pelvic brim, where it becomes continuous with the sigmoid colon.
- Taenia coli, sacculations & appendices epiploicae are present

The peritoneum → Retroperitoneal

Covers the front and the sides and binds it to the posterior abdominal wall.

Relations of Descending colon

•Anteriorly:

- Coils of small intestine
- the greater omentum
- the anterior abdominal wall

•Posteriorly:

- The lateral border of the left kidney
- the origin of the transversus abdominis muscle
- the quadratus lumborum
- the iliac crest
- the iliacus
- the left psoas
- The iliohypogastric and the ilioinguinal nerves
- the lateral cutaneous nerve of the thigh
- the femoral nerve

The **descending colon** extends from the left colic flexure to the pelvis below. It occupies the left upper and lower quadrants.

Blood Supply of Descending colon

•Arteries

- The left colic and the sigmoid branches of the inferior mesenteric artery.

•Veins

- The veins correspond to the arteries → drain into the inferior mesenteric vein.

Lymphatic Drainage of descending colon

•Lymphatic drains →the colic lymphatic nodes & the inferior mesenteric nodes around the origin of the inferior mesenteric artery.

Nerve Supply of descending colon


- The nerve supply is the sympathetic and parasympathetic pelvic
- Splanchnic nerves through the inferior mesenteric plexus

TABLE III **Lengths and Capacities**

Region	Lengths (approx.)	Capacities (approx.)
Esophagus	10 in. (25 cm)	—
Stomach ^a	Lesser curvature 4.8–5.6 in. (12–14 cm)	1500 mL
Duodenum	10 in. (25 cm)	—
Jejunum	8 ft. (2.4 m)	—
Ileum	12 ft. (3.7 m)	—
Appendix	3–5 in. (8–13 cm)	—
Ascending colon	5 in. (13 cm)	—
Transverse colon	15 in. (38 cm)	—
Descending colon	10 in. (25 cm)	—
Sigmoid colon	10–15 in. (25–38 cm)	—
Rectum	5 in. (13 cm)	—
Anal canal	1.5 in. (4 cm)	—
Gallbladder	2.8–3.9 in. (7–10 cm)	30–50 mL
Cystic duct	1.5 in. (3.8 cm)	—
Bile duct	3 in. (8 cm)	—

The end

Done by : Dawood Alatefi



لنا احبة تحت التراب ... إدعوا لهم بالرحمة
اللهم يا كريم أكرم خالي اكرم بالجنة
ويا عالاً أعلي مقام خالي علي
بالجنة...