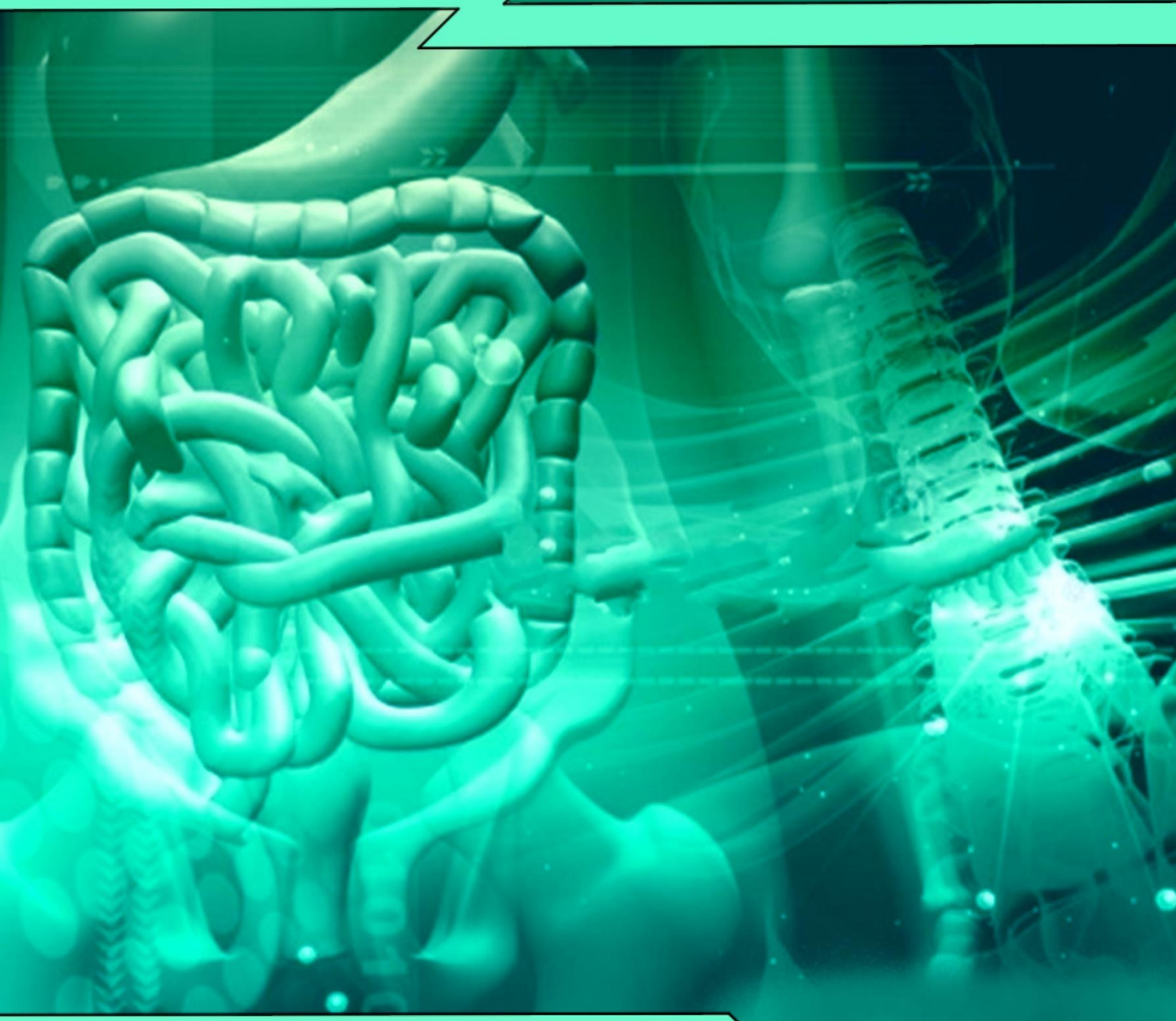
HATAHET ANATOMY



Digestive system (1)

Lecture: 14

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Lecture 14: Digestive system

The digestive system is the system that ingests, grinds, digest and absorb food so the body tissues can benefit from its useful nutrients, and digestive system will eliminate feces. Organs of the digestive system are divided into 2 groups:

1) Gastrointestinal Tract (Alimentary canal)

- a 5-7m long tube that extends from the mouth to the anus
- further divided into:
  - **A. Upper GIT**: Mouth, Teeth, Tongue, Pharynx, Esophagus, Stomach, Small intestine (Duodenum)
  - **B. Lower GIT**: Small intestine (Jejunum & Ileum), Large intestine, Rectum, Anus

2) Accessory digestive organs

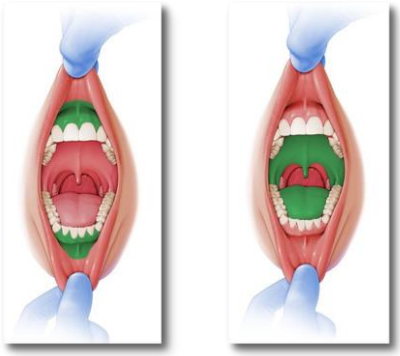
- organs that aid in the digestive system activities, located outside the GIT
- **composed of**: Salivary glands, Liver, Gall bladder, Pancreas

Upper GIT Organs

Oral cavity (Mouth)

The cavity that extends from lips anteriorly to pharynx posteriorly, composed of 2 main regions:

Oral vestibule **Oral cavity proper**



❖ Oral vestibule

- the space between lips and cheeks externally & teeth and gingiva internally
- divided into 2 sulci: Labial & Buccal
- oral vestibule contains the following structures:

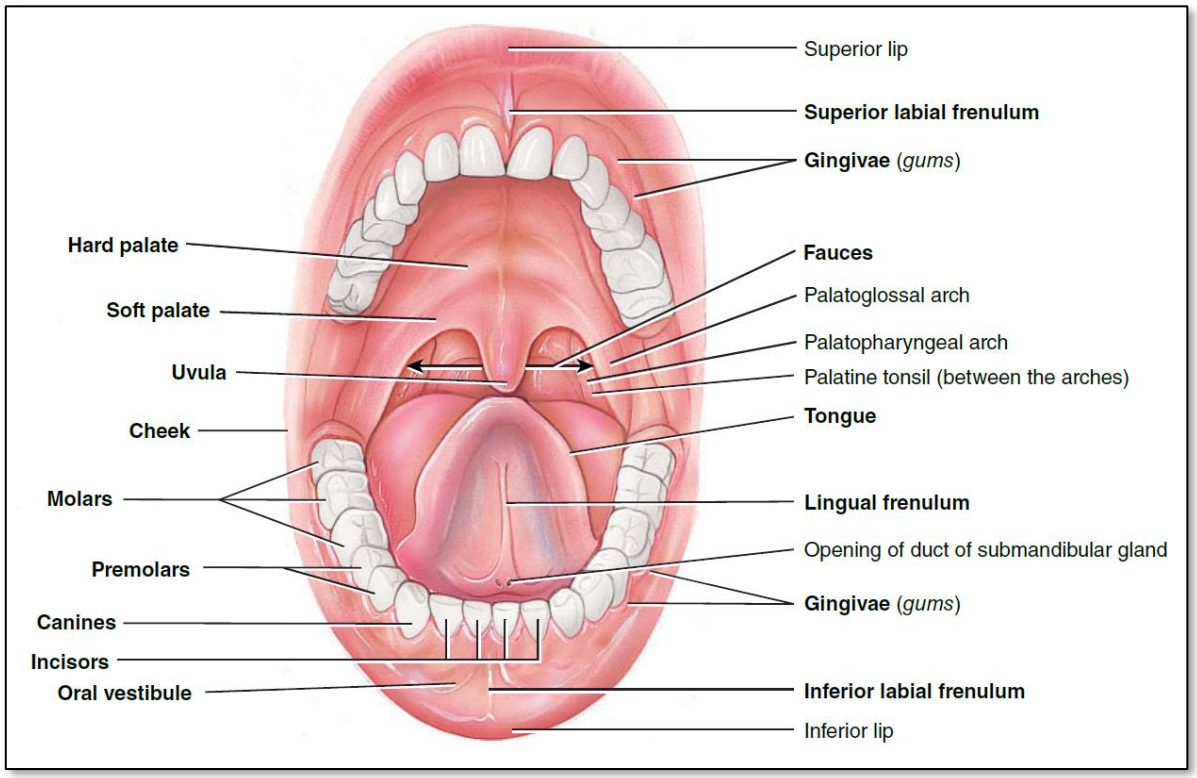
- **Lips** (Superior & Inferior)
- **Cheeks** (Right & Left)
- **Oral fissure**, the space between lips; the opening of the mouth
- **Gingiva (Gum)**, the mucosal tissue that surrounds and protects the teeth
- **Labial frenulum** (Superior & Inferior), folds of the mucus membrane of the mouth that anchor the lips to the Gingiva
- **Parotid papilla**, a small elevation on the inner mucosa of the cheeks lateral to each 2nd upper molar tooth, it represents the opening of the parotid duct into the oral cavity

Parotid papilla

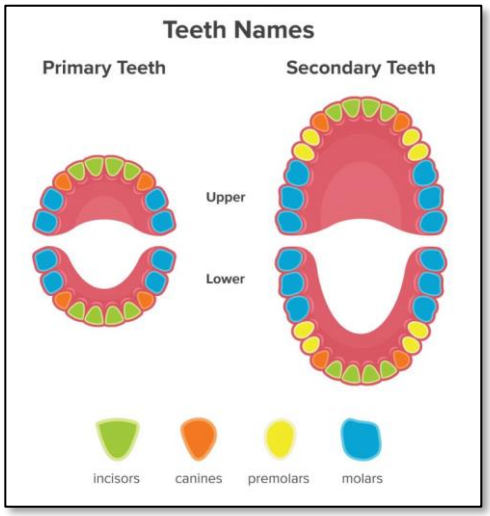
❖ Oral cavity proper

- the inner space enclosed by the teeth
- contains the tongue and the palate
- bounded by:

- **Roof** → hard palate
- **Floor** → mucous membrane beneath the tongue
- **Anterior** → communicates with vestibule by the (Interocclusal space)
- **Posterior** → communicates with pharynx by the (Palatoglossal arches)
- **Lateral** → teeth



Teeth



- located in the alveolar sockets of both maxilla and mandible
- all alveolar sockets are covered by the gingiva (Gum)
- **TEETH ARE NOT BONES**
- there are 2 sets of teeth in the individual's lifetime:

❶ Primary teeth

- also known as: (Baby teeth, Milk teeth, Deciduous teeth)
- 20 teeth; 5 on each quadrant
- erupt between (6 months - 2.5 years)
- eruption of teeth takes a certain order:
  - Central incisors → Lateral incisors → 1st Molar → **Canine** → 2nd Molar
  - mandibular (lower) teeth erupt first & before maxillary (upper) teeth, **for the same type of teeth (يعني المتقابلين)**

❷ Permanent teeth

- also known as: (Secondary teeth)
- 32 teeth; 8 on each quadrant
- erupt between (6-12 years) **except** for the 3rd molar "**Wisdom teeth**" which fully erupts at (21-23 years)
- types of teeth:

  ➢ **8 Incisors (Central & Latera)** → for cutting food
  ➢ **4 Canines** → for tearing food apart
  ➢ **8 Premolars & 12 Molars** → for crushing and grinding food

***Notes:**

- The reason why the eruption skips/delays the canines in the primary teeth is because they have the longest root
- The 3 molars of the permanent teeth have **NO** precursors in the primary set

Tongue

Tongue is a muscular organ composed of skeletal muscles covered with mucous membrane, it is responsible for manipulating and forming the Bolus (food ball). Anatomy of the tongue:

✪ Parts

- **Oral part** → the anterior 2/3 of the tongue, located in oral cavity proper
- **Pharyngeal part** → the posterior 1/3 of the tongue, located in oropharynx

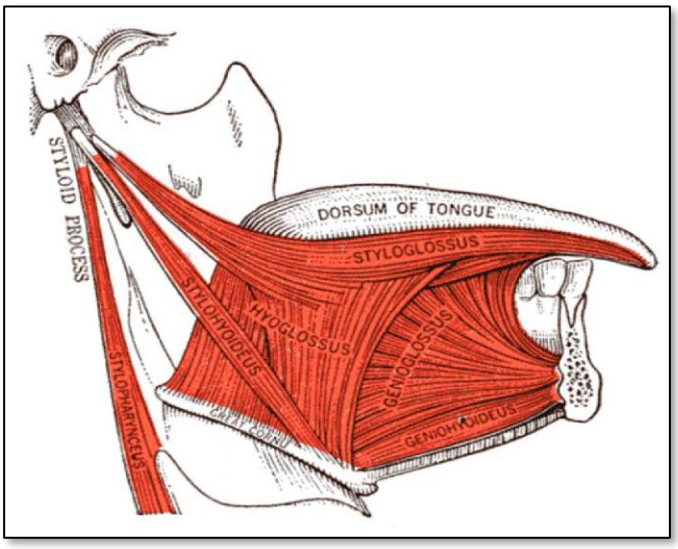
  - both parts of the tongue are divided by the (**Terminal sulcus**), a V-shaped groove that contains a bling foramen called the (**Foramen cecum**) which marks the (**Thyroglossal duct**)

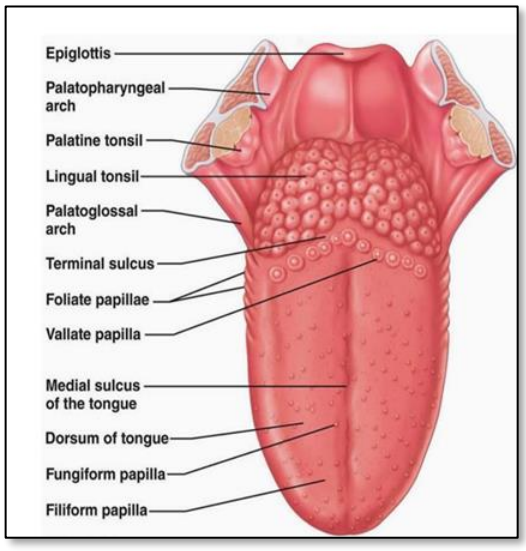
▪ **Thyroglossal duct:** the embryological passageway for the thyroid gland to descend at the base of the neck

✪ Muscles

Intrinsic muscles			
Muscle	**Origin**	**Insertion**	**Action**
Longitudinal	Tongue	Tongue	Manipulate the shape of the tongue
Vertical			
Oblique			

Extrinsic muscles			
Muscle	**Origin**	**Insertion**	**Action**
Palatoglossus	Hard palate	Tongue	Move tongue in different directions; change tongue position
Genioglossus	Mandible		
Styloglossus	Styloid process		
Hyoglossus	Hyoid bone		

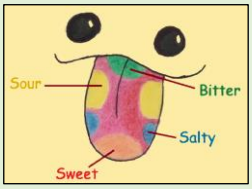




***Note**: Genioglossus muscle is the most important muscle of the tongue; because it retracts the tongue and keeps it away from the airways posteriorly and obstructs them (بلع اللسان), a property called "Constant Tunic Contraction"

✪ Surfaces

➢ **Dorsal surface**, contains the **Lingual papillae**, which are of 4 types:

Lingual papillae				
Papilla	**Location**	**Shape**	**Taste buds**	**Illustration**
Filiform	whole dorsal surface	microscopic & white	devoid (Keratinized)	
Fungiform	tips and margins	macroscopic & red	present	
Vallate	Infront to terminal sulcus	macroscopic (8-12 as a **V**)	present	
Foliate	lateral sides of tongue	macroscopic	present	

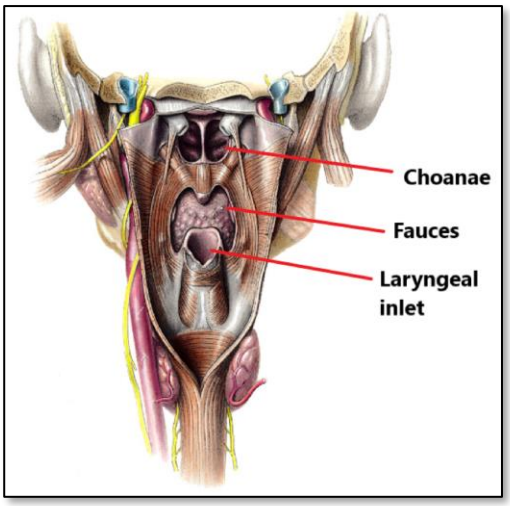
➢ **Ventral surface**, covered by smooth and thin mucosal membrane, contains:

- **Lingual frenulum**, the fold of mucosal membrane that anchors the tongue to the floor of the mouth
- **Deep lingual vessels**, they are the site of absorption for some medications (Sublingual drugs)

Pharynx

- Pharynx is the funnel-shaped muscular tube
- extends from **base of the skull** to **C6** (**Cricoid cartilage**)
- it continues as the esophagus, just posterior to the larynx
- it is deficient (opened) anteriorly in 3 places:

  ➢ in the nasopharynx → **Choanae (Internal nares)**
  ➢ in the oropharynx → **Fauces**
  ➢ in the laryngopharynx → **Laryngeal inlet**



- divided into the 3 main regions:

  ❶ **Nasopharynx** → contains Pharyngeal tonsil & Auditory tube
  ❷ **Oropharynx** → contains Lingual & Palatine tonsils
  ❸ **Laryngopharynx**

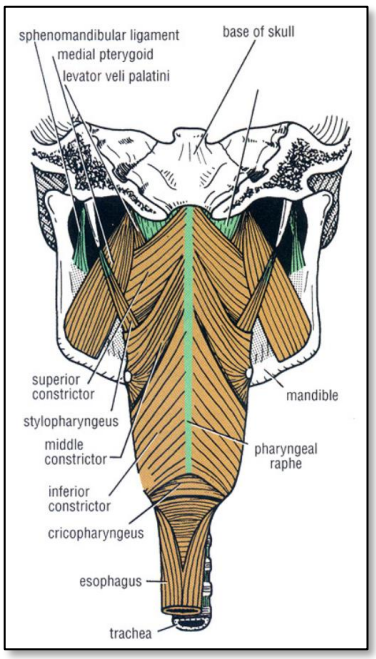
- muscles of pharynx:

➢ Extrinsic muscles (Constrictors)

- 3 circular muscles overlapping each other
- their successive contraction causes the action of swallowing
- these muscles are:

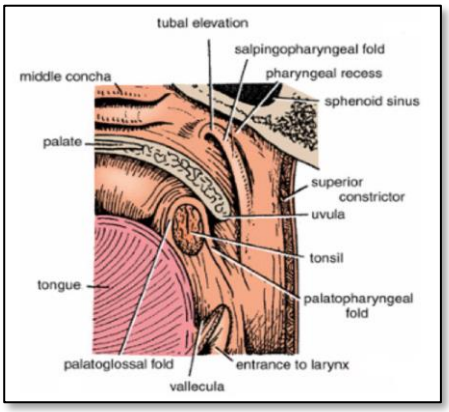
  - **Superior constrictor**, attaches to the base of skull
  - **Middle constrictor**, attaches to hyoid bone
  - **Inferior constrictor**, attaches to the larynx cartilages, composed of 2 parts:

    A. **Thyropharyngeus**, the upper part
    B. **Cricopharyngeus**, the lower part, makes up the UES



➢ Intrinsic muscles, 6 longitudinal bilateral muscles; 3 on each side

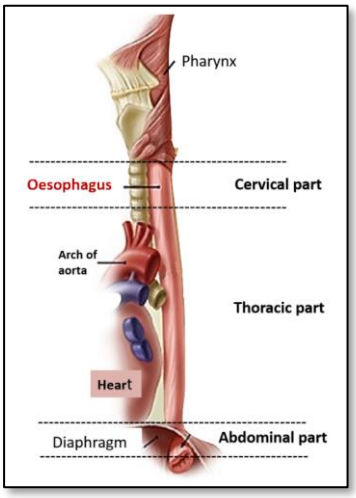
✪ Palatine tonsils in situ:



- Palatine tonsils are located in the lateral walls of the oropharynx
- between the **palatoglossal & palatopharyngeal arches**
- has a small fossa to sit in called (Tonsillar fossa) which lies against the mucous membrane covering the **superior constrictor**
- inflammation of this tonsil is called **(Tonsillitis)**

***Reminder: Palatoglossal arch is a part of **oral cavity**, whereas Palatopharyngeal arch is a part of the **oropharynx**

Esophagus



- Esophagus is a muscular tune that lies posterior to trachea
- extends from **C6 to T11** as it enters the stomach
- it transports the bolus from pharynx to stomach
- passes through diaphragm through the medial hiatus [**T10**]
- has 2 physiological sphincters:

  ❶ **Upper Esophageal Sphincter (UES)**, made by the Cricopharyngeus
  ❷ **Lower Esophageal Sphincter (LES)**, made by the right crus of diaphragm

- has 3 parts/regions:

  ❶ **Cervical part**, located in the neck & superior mediastinum
  ❷ **Thoracic part**, located in the thorax & inferior mediastinum
  ❸ **Abdominal part**, located in the abdominal cavity

Layers of GIT

❖Types of sphincters in the human body❖

➢ **Anatomical sphincter**, acts as a sphincter; due to a thickening of the inner cricoid layer of muscularis

➢ **Physiological sphincter**, acts as a sphincter **WITHOUT** a thickening; due to a skeletal muscle, smooth muscle, or a kink in the tube

Stomach

- Stomach is a J-shaped enlarged sac of the GIT that functions in digestion and as a reservoir for food
- located at the: (ULQ - 4 quadrant region / Epigastric & L. hypochondrial - 9 regions system)
- anatomy of stomach:

➢ 4 Regions:

- **Cardia**, the part of the stomach that surrounds the esophageal opening
- **Fundus**, the dome-shaped superior part of the stomach
- **Body**, the central and the largest part of the stomach
- **Pylorus**, the funnel distal part of the stomach, composed of 2 regions:

  ① **Antrum**
  ② **Pyloric canal**
  ③ **Pyloric sphincter**, both anatomical & physiological sphincter

➢ 2 Curves

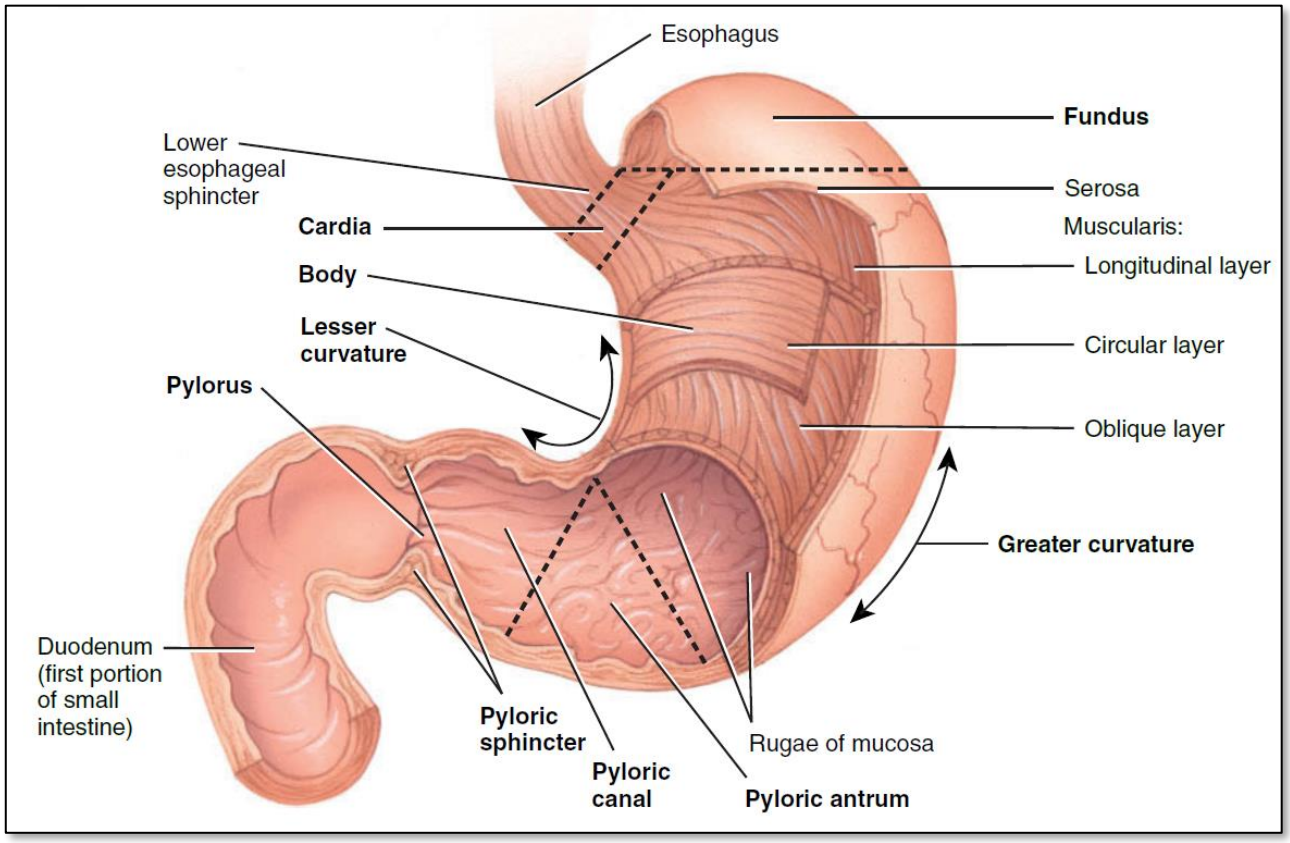
- **Greater curve**, the left/lateral convex curve of the stomach, extends across: (**Fundus → Pylorus**)
- **Lesser curve**, the right/medial concave of the stomach, extends across: (**Cardiac notch → Pyloric sphincter**)

➢ 2 openings

- **Cardiac orifice (Gastroesophageal junction)**, has a PHYSIOLOGIC sphincter
- **Pyloric sphincter (Gastroduodenal junction)**, has an ANATOMIC sphincter

➢ 2 Notches

- **Cardiac notch**, indicates the junction between **Fundus & Body**
- **Angular incisure (notch)**, indicates the junction between **Body & Pylorus**



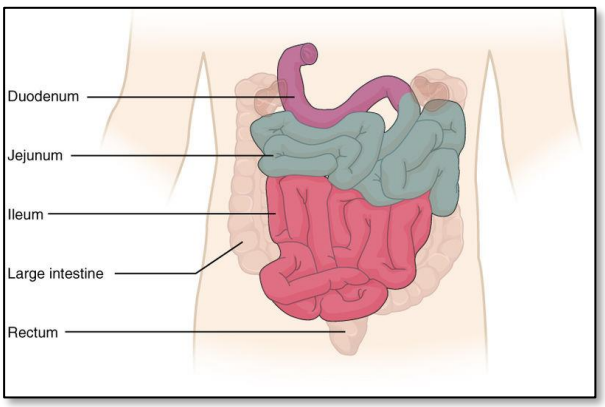
***Note: When the stomach is empty (non-stretched), rugae will manifest in the inner mucosa of the stomach

Small intestine

- a 3m long tube that covers a large area of abdominal cavity
- it is the major site of nutrients absorption
- composed of 3 main parts:

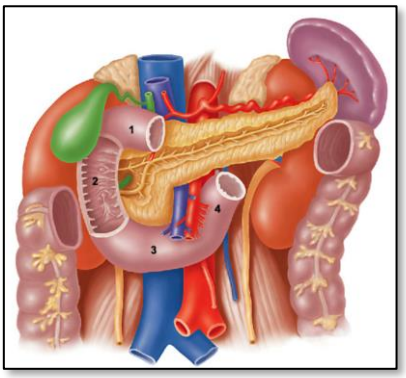
  ❶ Duodenum
  ❷ Jejunum
  ❸ Ileum

- it ends at the (Ileocecal junction)



- Anatomy of small intestine:

➢ Duodenum (الإثني عشر)



- the first, C-shaped part of the small intestine
- it is as long as the width of 12 fingers (26 cm)
- has 4 main regions

① **Superior (1st)**, runs horizontally and communicates with the pylorus of stomach
② **Descending (2nd)**, curves around the head of pancreas & receives bile and pancreatic enzymes
③ **Transverse (3rd)**, runs horizontally and anterior to IVC
④ **Ascending (4th)**, communicates with the jejunum at the **Duodenojejunal junction**

➢ Jejunum "Fasting tube"

- occupies the LUQ
- it is usually found empty at death; due to the extensive peristaltic movement of smooth muscles

➢ Ileum

- occupies the RLQ
- it is twisted and highly coiled
- connects to the cecum at the Ileocecal junction (valve)

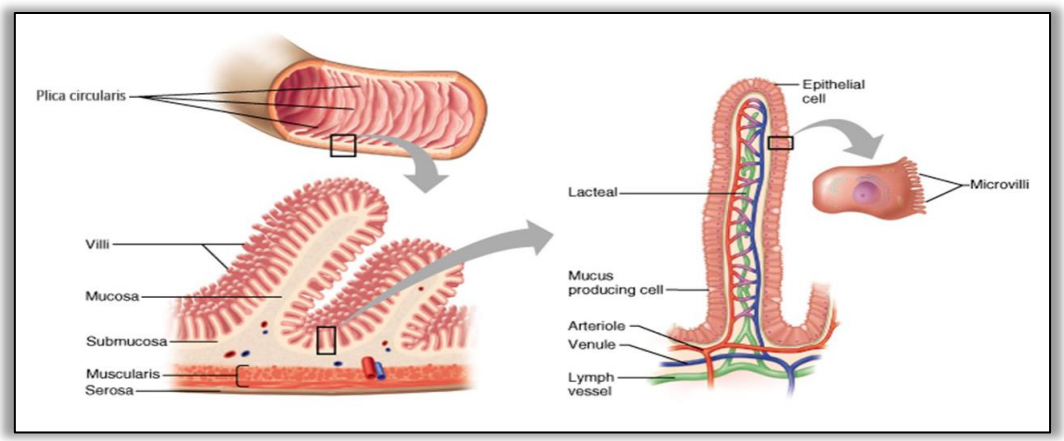
***Note: There is no external demarcation b/w jejunum & ileum, so we distinguish them by the inner luminal structure:

Jejunum	Ileum
- lumen is **wide** - **thick** wall - **high blood supply**; appear dark grossly - **more** plica circularis	- lumen is **narrow** - **thin** wall - **low blood supply**; appear pale pink grossly - **less** plica circularis

- Histology of small intestine:

- **Plica circularis**, folds of mucous membrane found in the small intestine, they increase the surface area of absorption, extends within mucosa and submucosa
- **Villi**, finger-like projections that protrude toward the lumen of intestine, made up of absorptive cells
- **Microvilli**, microscopic projections on the cell membrane of the absorptive cells, can be scene using EMS

▪ **Brush border**: the rough surface that is made by the villi, it is called so; due to its rough appearance under LMS



***Note: There is NO plica circularis in the Duodenum

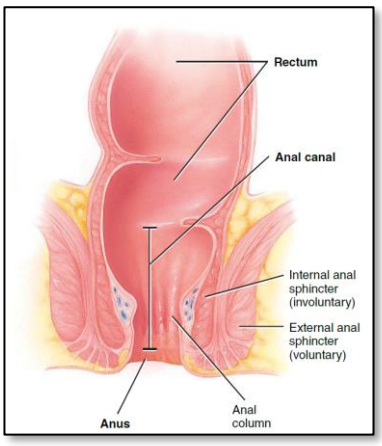
Large intestine (Colon)

- Large intestine are the last part of the GIT
- it is about 1.5m in length
- starts at the cecum and ends at the anus
- Anatomy of Large intestine:

➢ Large intestine tract

- **Cecum (الأعور)**, blind pouch in the RLQ, it connects to small intestine via the (Ileocecal sphincter - ICS). Attached to the cecum is the **(Vermiform appendix - الزائدة الدودية)**
- **Ascending colon**
- **Transverse colon**
- **Descending colon**
- **Sigmoid colon**, the distal S-shaped segment of large intestine, it extends from L. iliac fossa and slightly ascends to the level of S3 vertebra (جاي عليه سؤال و هاي شواربي 〰), then it joins the rectum at the **Rectosigmoidal junction**
- **Rectum**, begins at the level of S3 and follows the curve of sacrum and coccyx, it stores feces until defecation
- **Anus**, the terminal opening of the GIT, has 2 sphincters:

① **Inner involuntary (Anatomical) sphincter**, formed by the **levator ani muscle**
② **Outer voluntary (Physiological) sphincter**



➢ Special features

- **Haustra**, sacculated pouches of the colon, formed by the continuous tunic contraction of tinea coli
- **Teniae coli**, 3 longitudinal bands of smooth muscles that extend from the appendix until **Rectosigmoidal junction**
- **Colic flexures**, 2 bends of the colon, these are:

① **Right (Hepatic) colic flexure** ② **Left (Splenic) colic flexure, a bit higher that the right flexure, due to liver**

- **Epiploic (Omental) appendices**, finger-like projections attached to the outer wall of the colon