SAWA UNIVERSITY

DIGESTIVE SYSTEM

جامعة ساوة

كلية الصيدلـــــــــــــــــة

المرحلة الأولى

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Digestive System

It is can be divided into three regions :-

1. **The oral cavity** involved salivary glands and oropharynx .
2. **The tubular digestive tract** , involved esophagus , stomach , small intestine and large intestine .
3. **The associated glands** which are located outside G.I.T. (salivary glands , liver , pancreas , gallbladder) .

The oral cavity , it is divided into :

1. **Vestibule** is the space between the lips , cheeks & teeth .
2. **Oral cavity proper** lies behind the teeth and is bounded by the hard and soft palates , the tongue and the floor of the mouth inferiorly and the entrance to the oropharynx posteriorly .

The oral cavity is lined by ***a masticatory mucosa*** and ***lining mucosa*** .

1. **The masticatory mucosa** has a ***keratinized stratified squamous epithelium*** these mucosa is found on the gingiva (gums) and the hard palate .

- **The lamina propria** consists of a thick layer of ***loose connective tissue*** that contains several papillae.

The submucosa underlying the lamina propria on the hard palate , it is a ***dense irregular collagenous connective tissue*** contains adipose tissue anteriorly **(fatty zone)** and mucosa gland posteriorly **(glandular zone)** which continues with those of the soft palate and in this region a thick collagenous bands extend from the mucosa to the bone .

Pharynx :

It is a transitional space between the oral cavity and respiratory and digestive systems .

It is lined by ***nonkeratinized stratified squamous epithelium*** in the continuous with esophagus and lined by ***ciliated pseudostratified columnar epithelium .***

- **The lamina propria** which composed of *dense connective tissue* , also has many small mucous salivary glands .

Tongue :

The tongue is a striated muscular organ projecting into the oral cavity from its inferior and covered by a mucous membrane which is smooth on the lower surface of the tongue and the dorsal surface is irregular , covered anteriorly by a great number of small eminences called papillae .

Papillae :

The papillae are numerous mucosal irregularities and elevations called lingual papillae cover the dorsal surface of the tongue anterior to the sulcus terminalis .

There are four types of papillae :

- ***Filiform papillae*** are the smallest and most numerous in humans they are conical elongated projections of connective tissue that are covered with highly (heavily)keratinized stratified squamous epithelium which gives their a gray or whitish appearance and doesn't contain taste buds .

Fungiform papillae resemble mushrooms shape that have a narrow stalk and smooth surface , dilated upper part and less numerous, lightly keratinized but larger , broader and taller than the filiform papillae and more prevalent in the anterior region of the tongue . These papillae has scattered taste buds on their upper surface and these papillae are interspersed among the filiform papillae .

Circumvallate papillae are largest circular lingual papillae and least numerous whose flattened surface and form a V-shaped that reside in the mucosa just anterior to the sulcus terminalis . The tongue has 8 – 12 of these papillae, each papillae is surrounded by deep moat like invagination completely encircle them , lined with stratified squamous epithelium that contain numerous taste buds .

Foliate papillae are poorly developed in adult and consist of two or more parallel ridge and furrows on the dorsolateral surface of the tongue and contain many taste buds .

Esophagus

The part of the gastrointestinal tract called the esophagus is a muscular tube whose function is to transport food stuffs from the mouth to the stomach and to prevent the retrograde flow of gastric contents .

The esophagus is composed of four concentric layers :-

A. *Mucosa :*

The mucosa has three regions (epithelium , lamina propria and muscularis mucosae),it is thrown into longitudinal folds , and as follows :-

Epithelium : The epithelium is ***stratified squamous nonkeratinized*** .

Lamina propria : The lamina propria is a ***loose connective tissue*** that contains mucus-producing ***esophageal cardiac glands*** in regions near of the stomach .

The muscularis mucosae : is composed of a single layer of longitudinally smooth muscle .

B. Submucosa :

The Submucosa composed of fibroelastic connective tissue that contains the larger blood, lymphatic vessels, nerves fibers, ganglion cells & lymphatic nodule are present is thrown into longitudinal folds.

C. Muscularis Externa :

The muscularis externa is composed of inner circular and outer longitudinal muscle layers . In the upper one-third of the esophagus these consist of ***skeletal muscle*** , in the middle one-third they consist of ***skeletal and smooth muscle*** , and in the lower one-third they consist of ***smooth muscle*** .

D. Adventitia :

The adventitia of the esophagus is composed of fibrous connective tissue that blends into the surrounding tissue . inferior to the diaphragm in the peritoneal cavity is covered by serosa.

The stomach

The stomach is an expanded hollow organ situated between the esophagus and small intestine . At the esophageal – stomach junction , there is an a abrupt transition from the stratified squamous epithelium to the simple columnar epithelium of the stomach.

The stomach composed of :-

A- Mucosa :

(1) Epithelium :

The gastric mucosa consist of a surface epithelium that invagination to various extents in to the lamina propria , forming gastric pits . Emptying in to the gastric pits are branched , tubular glands (cardiac , gastric , and pyloric) descend through the lamina propria to the muscularis mucosae

(2) Lamina propria :

Itis houses numerous gastric glands (cardiac, fundic and pyloric glands) , slender blood vessels and various connective tissue interspersed with smooth muscle and lymphoid cells .

(3) Muscularis mucosae

The muscularis mucosae is composed of the inner circular and an outer longitudinal smooth muscle . A third layer may be present in certain regions .

B- Submucosa:
Its composed of dense connective tissue containing blood and lymph vessels and no gland . It is infiltrated by lymphoid cells , macrophages and mast cells as well as Meissner's plexus .

C- Muscularis externa :
The Muscularis externa is composed of smooth muscle fibers oriented in three main directions . The external layer is longitudinal , the middle layer is circular , and the internal layer is oblique .

D- Serosa :
The stomach is covered by a thin connective tissue coat enveloped in visceral peritoneum .

Small Intestine

The Small Intestine composed of :-

A- Mucosa : the mucosa consist of :

1- Epithelium : the simple columnar epithelium consist of goblet , surface absorptive , and DNES cells .

2- Lamina propria : the lamina propria composed of loose connective tissue with blood and lymph vessels , nerve fibers and smooth muscle cells , houses simple tubular glands known as the Intestinal glands **(Crypts of LieberKuhn)** are located between the villi throughout the small intestine , these glands open into the intestinal lumen at the base of the villi . The simple columnar epithelium that lines the villi is continuous with that of the intestinal glands .

3- Muscularis Mucosa : the muscularis mucosa consist of an inner circular and an outer longitudinal layer of smooth muscle .

The mucosa of the small intestine exhibits specialized structure modifications that increase the cellular surface areas for absorption of nutrients and fluids , these modifications include :-

Plica Circulares : the lining of the small intestine shows a series of permanent folds plica circulares consisting of mucosa and submucosa and having a semilunar , circular or spiral form and increase the intestinal surface 3-folds . The folds are prominent in the duodenum and more developed in.

Villi : the Villi are permanent finger like projections of lamina propria of the mucosa that extend into the intestinal lumen and increase the intestinal surface 10-folds . They are covered by simple columnar epithelium . The height of the villi decrease toward the ileum of small intestine . The villi in the duodenum are largest and most numerous and leaf shape.

Microvilli : are increase the surface 20-folds . they are visible under light microscopic as striated border .

B- Submucosa : Composed of dense irregular fibro elastic c. t. with a rich lymphatic and vascular supply. The intrinsic innervations of the submucosa is from the parasympathetic submucosal (Meissner,s) plexus. In the initial portion of the duodenum the submucosa contains clusters of ramified , coiled tubular glands . The ducts of these glands penetrate the muscularis mucosa to discharge their secretory product at the base of intestinal glands. These are duodenal or Brunner's glands ,

C-Muscularis externa : Muscularis externa is composed of usual inner circular and outer longitudinal layers of smooth muscle , with Auerbach's mysenteric plexus . the muscle externa is responsible for the peristaltic activity of the small intestine .

D-Serosa : thin , loose c. t. .The duodenum is covered by serosa and adventitia while the jejunum and ileum are covered by a serosa .

Regional Differences :-

1- the duodenum is the shortest segment of the small intestine .

2- the duodenum receives bile from the liver and digestive juices from the pancreatic duct .

3- the villi in duodenum differs from the jejunum and ileum in that are broader, taller, and more numerous .

4- its has fewer goblet cells than other segments

5- there are Brunner's glands in its submucosa .

6- the villi of the jejunum are narrower , shorter , and sparser than those of the duodenum .

7- the villi of the ileum are the sparsest, shortest and narrowest of the three regions of the small intestine .

8- the lamina propria of the ileum houses permanent clusters of lymphoid nodules , known as Peyer's patches

Large Intestine

The large intestine is composed of the appendix , cecum , (ascending , transverse , descending) colon , rectum and anal canal . The main functions of large intestine : absorption of water , formation of the fecal mass and production of mucus . The structure of the cecum is similar to that of the colon

The large intestine(Colon and Cecum) consist of :-

A-Mucosa : The mucosa present no villi. No specialized folds except in distal (rectal) portion and thicker than that of the small intestine . The mucosa composed of :

1-Epithelium : The simple columnar epithelium has goblet cells and columnar cells .

2-Lamina propria : Its contains straight tubular intestinal glands are longer than those of the small intestine and characterized by a great abundance of goblet and absorptive cells and small number of enteroendocrine cells and stem cells and no paneth cells are present and rich in lymphoid cells and nodules that frequently extend into submucosa .

3-Muscularis Mucosa : It is consist of inner circular and outer longitudinal smooth muscle layers .

B-SubMucosa : resembles that of the jejunum and ileum . contains connective tissue and a dispose tissue and blood vessels and lymphatic nodule , no glands present .

C-Muscularis Externa : It is composed of inner circular and outer longitudinal smooth muscle layers. In cecum and colon the muscularis externa differs from that of the small intestine , because the outer longitudinal muscle is modified into three flat ribbons of longitudinally arranged smooth muscles called teniae coli .

D-Serosa : The colon and cecum posses serosa. In the intraperitoneal portions (3portions) of the colon is not attached to the posterior abdominal wall,

Appendix

It is evagination of the cecum . it is composed of :-
A- Mucosa : The lumen of the appendix characterized by a relatively small , narrow , and irregular .
1- Epithelium : It is lining by simple columnar epithelium
2- Lamina propria : It is contain connective tissue rich with lymphatic nodules with germinal centers and extend to submucosa and lymphatic tissue and some crypts of lieberkun (intestinal glands) are fewer , less well developed .
3- Muscularis mucosa : It is consist of inner circular and outer longitudinal smooth muscle layers and incompleted because occupies by large masses of lymphatic tissues.

B-Submucosa : It is consist of irregular dense C.T. and has blood vessels and lymphatic tissues .
C-Muscularis Externa : It is consist of inner circular layer and uniform outer longitudinal layer . The parasympathetic ganglia of the myentric plexus are located between the inner and outer smooth muscle layers .
D-Serosa : It is covered by serosa contain adipose cells .

The rectum
is the dilated distal portion of the alimentary canal . The upper part of rectum is distinguished from the large intestine by presence of folds called transverse rectal folds The structure of the rectum is similar to that of the colon except for the following :-
1- A continuous coat of longitudinal muscle is present and there are no taenia .
2- Peritoneum covers the front and sides of the upper one- third of the rectum ,and only the front of the middle third . the rectum is devoid of a serous covering .
3- There are no appendices epiploicae .