DIGESTIVE SYSTEM

EVERYTHING : ANATOMY
FOR MORE UNDERSTANDING

mid-2023

MOUTH!

The lips are two fleshy folds that surround the oral orifice ,made up by the orbicularis oris muscle , filled with numeruos nerve terminals which make it highly sensetive .

The philtrum is the shallow vertical groove

The mouth is divided into the vestibule (between the lips and the cheeks) and the mouth cavity proper which are connected behind the third molar tooth on each side .

duct of the parotid salivary gland opens on a small papilla into the vestibule opposite the upper second molar tooth

The mouth proper :roof of the mouth (soft & hard palates) ,frenulum (folds- submandibular duct open beside) , ...

innervation

Roof: The greater palatine and nasopalatine nerves from the maxillary

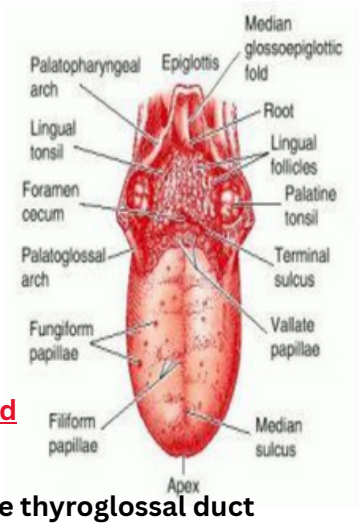
Floor: The lingual nerve (common sensation), a branch of the mandibular

The taste fibers travel in the chorda tympani = facial nerve

Cheek: motor (facial .n) & sensory (mandibular)

Deciduous Teeth : 20 deciduous teeth: four incisors, two canines, and four molars in each jaw

Permanent Teeth : 32 permanent teeth: four incisors, two canines, four premolars, and six molars in each jaw

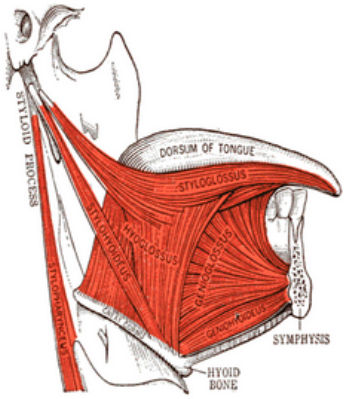


sulcus terminalis divide tongue into anterior mucus 2 thirds (corda tympani & lingual)and posterior third (Glossopharyngeal nerve also innervates vallate papillae anteriorly)

the foramen cecum is an embryologic remnant and marks the site of the upper end of the thyroglossal duct

The muscles of the tongue (innervated by hypoglossal nerve)are divided into two types: intrinsic (longitudinal, transverse, and vertical) and extrinsic :

muscle	action	innervation
GENIOGLOSSUS	PROTRUSION	Hypoglossal nerve
HYOGLOSSUS	Retraction Depression	Hypoglossal nerve
PALATOGLOSSUS	Retraction and elevation	pharyngeal of vagus
STYLOGLOSSUS	RETRACTION	Hypoglossal nerve



The muscles of the soft palate are the tensor veli palatini (tense), the levator veli palatini (raise), the palatoglossus (narrow to tongue), the palatopharyngeus (Elevates pharynx), and the musculus uvulae (Elevates uvula).

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

the nasal and oral parts of the pharynx are connected by pharyngeal isthmus . in nasal part there is pharyngeal tonsil (adenoid) = enlargement = snoring

zzz

SALIVARY GLANDS!

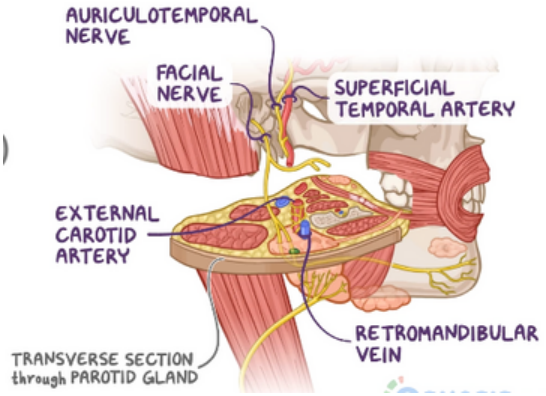
When it comes to function, salivary glands secrete saliva into the oral cavity. Saliva, as you may know, is a clear, tasteless, and odorless fluid that keeps the mouth's mucosa hydrated.

PAROTID GLAND

in front of the sternocleidomastoid muscle

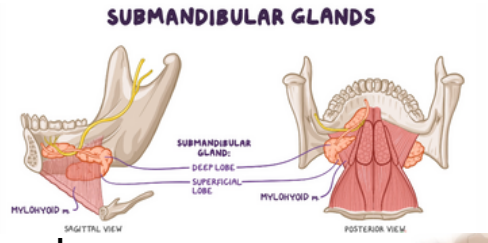
The duct of the parotid salivary gland opens on a small papilla into the vestibule opposite the upper second molar tooth
it is innervated by glossopharyngeal nerve (lesser petrosal nerve, the otic ganglion)

mostly of serous acini

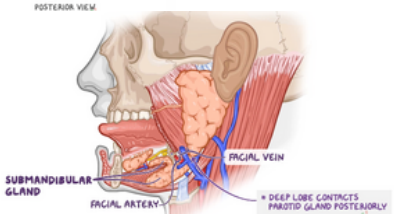


SUBMANDIBULAR GLAND

mixture of serous and mucous acini



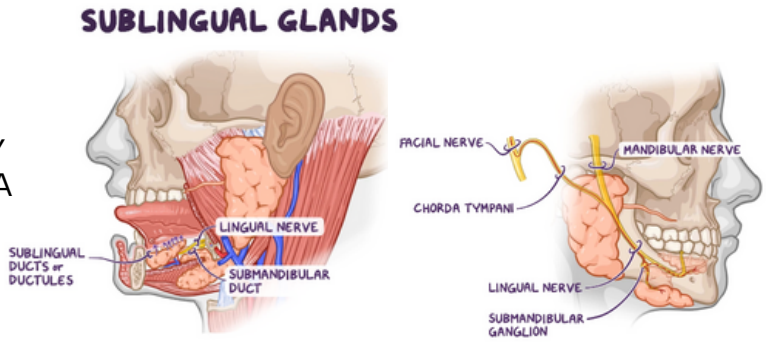
divided into superficial and deep parts by the mylohyoid muscle
from the facial nerve via the chorda tympani, and the submandibular ganglion
the larger arm of the hook is directed forward in the horizontal plane



SUBLINGUAL GLAND

mucous acini

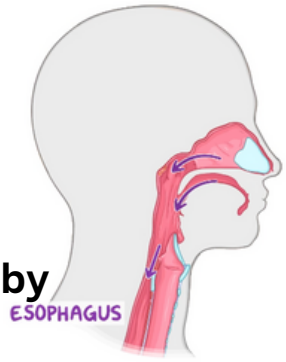
PARASYMPATHETIC SECRETOMOTOR SUPPLY IS FROM THE FACIAL NERVE VIA THE CHORDA TYMPANI



Pharynx!

becoming continuous with the esophagus opposite the sixth cervical vertebra

oropharynx is connected to nasopharynx by choanae



cricopharyngeus muscle :pass horizontally , act as a sphincter (prevents air entry) , under Killian's dehiscence

all pharyngeal muscles are innervated by Pharyngeal plexus except Stylopharyngeus by Glossopharyngeal nerve

oropharynx, On the lateral wall on each side are the palatoglossal and the palatopharyngeal arches or folds and the palatine tonsils between them

the laryngopharynx is posterior to the larynx and extends from the superior border of the epiglottis and the pharyngoepiglottic folds to the inferior border of the cricoid cartilage, where it narrows and eventually becomes the esophagus.

Nasal pharynx: The maxillary nerve

the epiglottis closes entrance into the larynx

Oral pharynx: The glossopharyngeal nerve

Laryngeal pharynx : The internal laryngeal branch of the vagus nerve

Waldeyer's Ring of Lymphoid Tissue :lateral part of the ring is formed by the palatine tonsils (separated capsule ,tonsillar branch of the facial artery) and tubal tonsils

ESOPHAGUS!

Now, let's start with the esophagus, which is a muscular tube that carries food from the pharynx to the stomach. We can think about the esophagus as a subway that our food travels in between these two structures.

The esophagus is made up of two muscular layers: an internal circular layer and an external longitudinal layer.

its proximal or superior third, the external layer consists of striated skeletal muscle, which is under voluntary control while its distal or inferior third is made up of smooth muscle, which is under involuntary control. the middle third is a transitional segment that consists of a mix of both types of muscle.

Once it reaches the diaphragm, it passes through the esophageal hiatus, just to the left of the median plane at the level of the T10 vertebra, where it becomes the abdominal esophagus.

The right border of the abdominal esophagus continues with the lesser curvature of the stomach (longitudinal rogea = pass of water and fluids).

constrictions of the esophagus are areas where food can potentially get stuck. The cervical constriction is located at the pharyngoesophageal junction and is caused by the cricopharyngeus muscle.
The thoracic or the broncho-aortic constriction can occur at two points first by arch of the aorta, and then by the left main bronchus.
Lastly, the diaphragmatic constriction is by esophageal hiatus of the diaphragm .

NOW LET'S TALK ABOUT BLOOD SUPPLY!

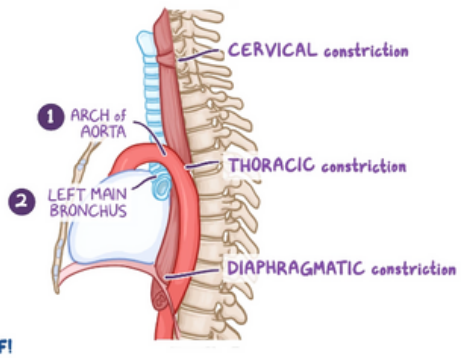
The upper third of the esophagus is supplied by the inferior thyroid artery, the middle third by branches from the descending thoracic aorta, and the lower third by branches from the left gastric artery

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.

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

The esophagus is supplied by parasympathetic and sympathetic efferent and afferent fibers via the vagi and sympathetic trunks

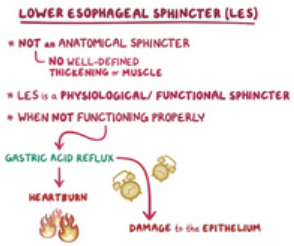
No anatomic sphincter-prevents the stomach contents from regurgitating into the esophagus=gastroesophageal sphincter

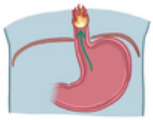


QUIZ YOURSELF!

esophagus pathology

- atresia : noncanalized cord (noncontinuous esophagus) & with/out fistula
- fistula : esophagus connection with trachea .
- stenosis : تضيق = due to thick mucus & muscle atrophy = abstraction
- achalasia : (غصة) : abstraction
- primary achalasia : common , due to no distal relaxation
- secondary achalasia : congenital , (no (degenerative) vagus innervation)
- varices : دوالي : tortures venous dilation , gastroesophageal junction , caused by portal hypertension .
- portal hypertension : closed venous drainage due to cirrhosis , alcoholic liver , (parasite)hepatic schistosomiasis which could lead to massive bleeding and death .
- Esophagitis: infections, injuries , lacerations .
- lacerations : Mallory Weiss tears , forceful vomiting with blood .
- chemical damage : ulcer , infections , hemorrhage
- infections : HSV , CMV , Candida , bacterial
- candidiasis : gray white endomembrane
- CMV : shallower + megalo (large)cells





- Reflux Esophagitis : Reflux of gastric contents into the lower esophagus due to decreased tone , Increased abdominal pressure , which cause heartburn , sore tasting , barrette (malignant redness) , Melna .
- Melna : bleeding in proximal GI tract (dark stool)
- barrette : malignant redness leads to cancer because of repetitive reflux.
- Eosinophilic Esophagitis : rings , just upper & middle esophagus, atopic patient(sensitive)
- Squamous cell carcinoma : common ,
- Adenocarcinoma : From Barrett>>dysplasia , **distal third ,** Invade surrounding , cachexia(هزيل) , invasive , pain .

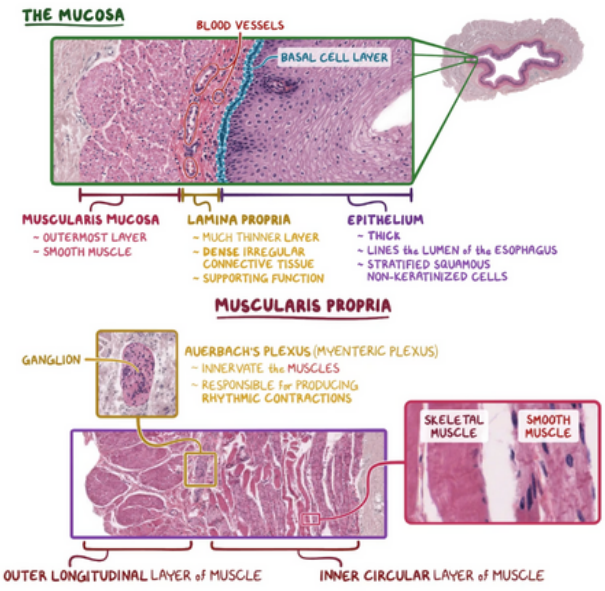
HISTOLOGY

UPPER THIRD : stratified squamous non keratinized cells , outer adventitia layer fast healing , skeletal muscles (peripheral nucleus) .

middle third :stratified squamous non keratinized cells , outer adventitia layer fast healing , mixed muscle cells .

lower third : stratified squamous non keratinized cells , outer adventitia layer fast healing , smooth muscle (spinosal in shape & central nucleus)

esophagus & duodenum are the only organs that have 2 types of glands between their layers



ABDOMEN !

FOREGUT

blood supply : <u>celiac trunk</u>

into three arteries: the left gastric, splenic and common hepatic arteries.

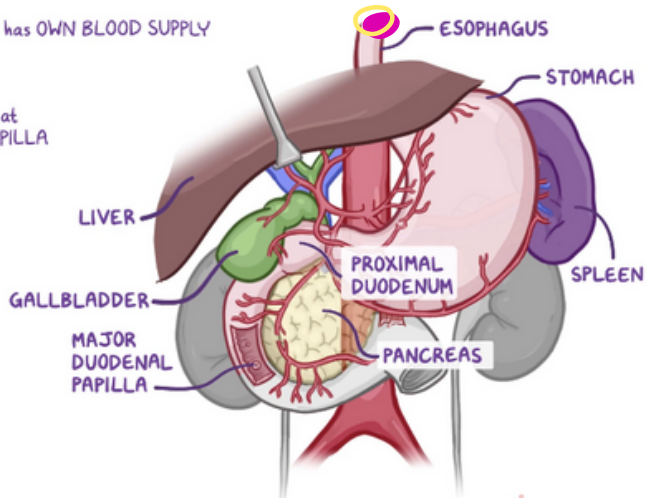
venus drainage :portal vein .

parasympathetic : vagus

EACH EMBRYOLOGICAL DIVISION has OWN BLOOD SUPPLY

FOREGUT
* from ESOPHAGUS to DUODENUM at LEVEL of MAJOR DUODENAL PAPILLA

CONSISTS of:
* ESOPHAGUS
* STOMACH
* PROXIMAL DUODENUM
* LIVER
* GALLBLADDER
* PANCREAS
* SPLEEN



MIDGUT

blood supply : <u>superior mesenteric artery</u>

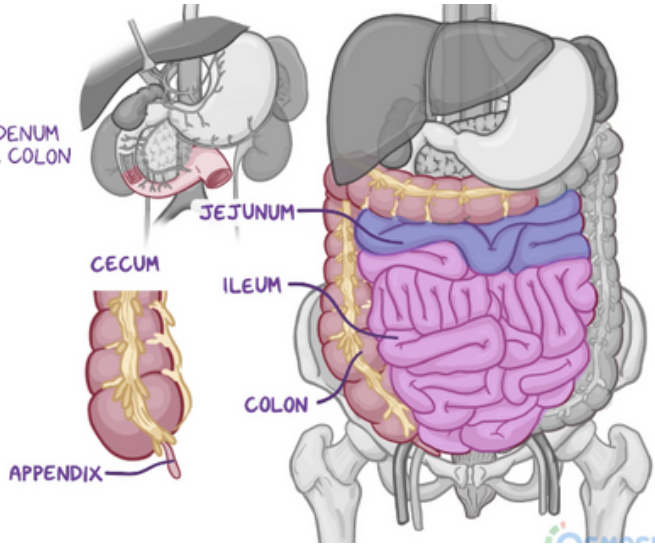
right colic artery &appendicular artery & middle colic artery& ileocolic artery

venus drainage :<u>superior mesenteric</u> vein .

parasympathetic : vagus

MIDGUT
* from DISTAL PORTION of DUODENUM to LAST 1/3 of TRANSVERSE COLON

CONSISTS of:
* DISTAL DUODENUM
* JEJUNUM
* ILEUM
* CECUM
* APPENDIX
* ASCENDING COLON
* PROXIMAL 2/3 of TRANSVERSE COLON



HINDGUT

blood supply :<u>inferior mesenteric artery</u>

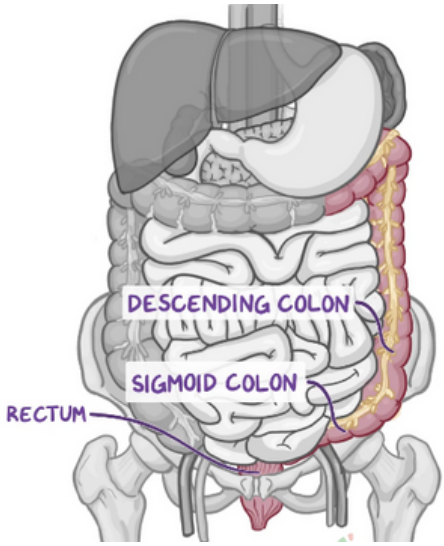
left colic artery &sigmoid arteries& <u>superior rectal artery</u>

venus drainage :<u>inferior mesenteric</u> vein .

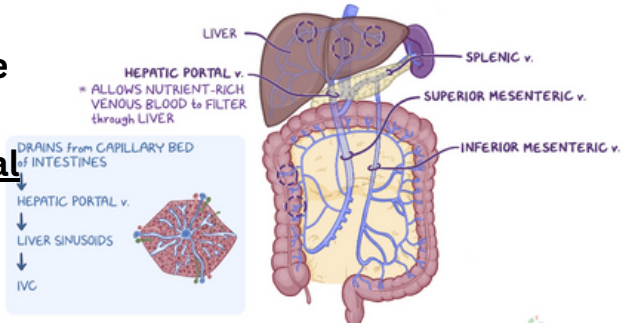
parasympathetic : pelvic (S2-3-4)

HINDGUT
* from DISTAL 1/3 of TRANSVERSE COLON to ANAL CANAL ~ ABOVE PECTINATE LINE

CONSISTS of:
* DISTAL 1/3 TRANSVERSE COLON
* DESCENDING COLON
* SIGMOID COLON
* RECTUM

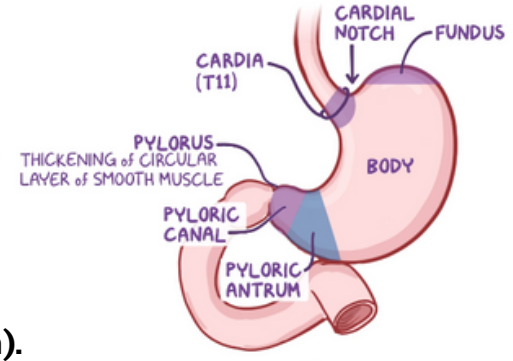


venous blood from these organs is collected into the <u>superior mesenteric vein</u>, <u>inferior mesenteric vein</u>, and <u>splenic vein</u> that together form the <u>hepatic portal vein</u> that drains into the liver then into IVC .

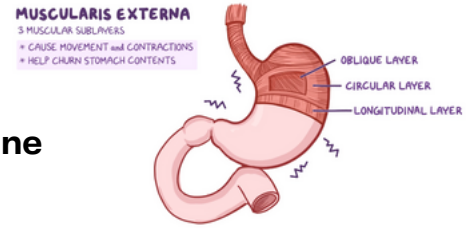


NOW, LET'S MOVE ON TO THE STOMACH,

STOMACH!



in the epigastric region
Steer horn shape in obese person
It stores and mixes food , also control; rate of chyme
The stomach is divided into the following parts :
1- Fundus: full of gas , Dome-shaped
2- Body: -Extends to the level of the incisura angularis (notch).
3- Pyloric region : antrum , Pylorus (sphincter)

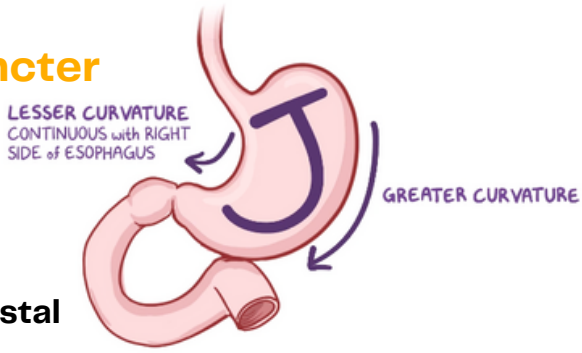


Cardiac orifice – stomach begining –7 th Lt & 1 inch to Lt. of midline &45 cm from incisors (oral)&10 cm from ant. abdominal wal

pyloric orifice – stomach ending = level of L1 & 1" to the Rt. of the midline &

the anatomic and physiologic = pyloric sphincter

receives motor fibers from the sympathetic system and inhibitory fibers from the vagus nerv



RELATIONS :

Anterior- superior : abdominal wall & diaphragm &left costal margin & left pleura and lung & left lobe of the liver

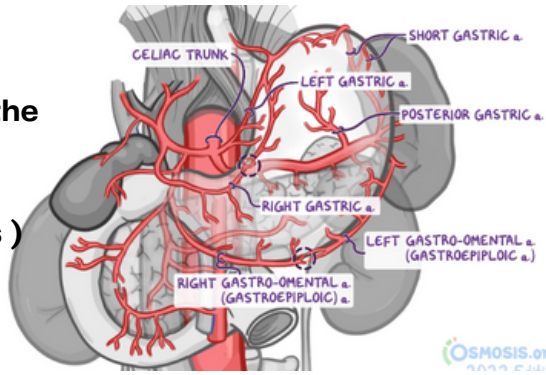
Posteriorly = stomach bed = The lesser sac & Lt. crus of diaphragm & spleen& left suprarenal gland & upper part of the left kidney& body of pancreas& the transverse mesocolon – the transverse colon

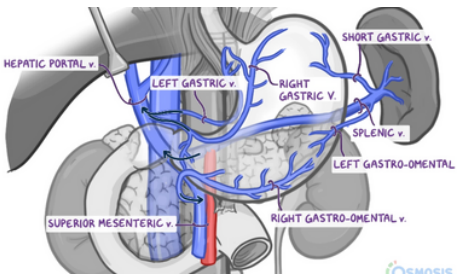
not splenic vein

HISTOLOGY

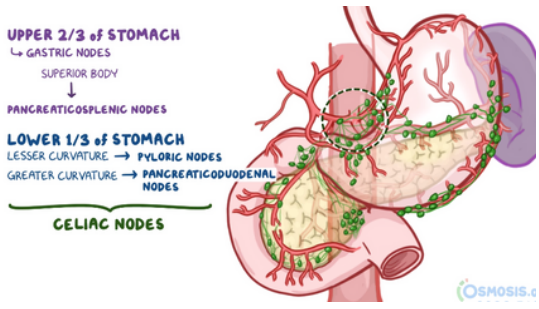
thick and vascular mucus membrane (numerous folds, or rugae)
1- mucus neck cells
2-praetal cells = hcl secretion
3- enteroendocrine cells = gastrin secretion
4- cheif cells = pepsin secretion

branches of the celiac artery
celiac trunk – the abdominal aorta –at the level of T12 to L1 above the pancreas – Its 1 cm long
Main distribution :
Lt.gastric.a = (from celiac – gastroesophageal sphincter)
& Splenic.a = (give left gastroepiploic artery &short gastric arteries)
& Hepatic.a = (give right gastric artery & give right gastroepiploic artery through gastroduodenal)





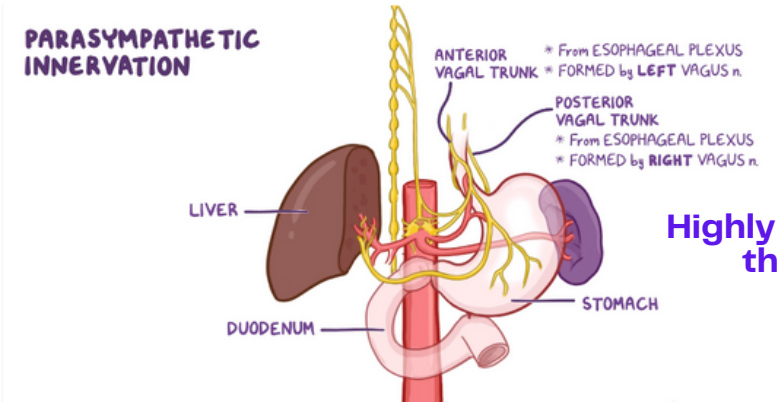
THE VEINS DRAIN INTO THE PORTAL CIRCULATION



ALL LYMPH FROM THE STOMACH EVENTUALLY PASSES TO THE CELIAC NODES

STOMACH INNERVATION

sympathetic : motor – pain sensation – celiac ganglia



parasympathetic : right and left vagus nerves

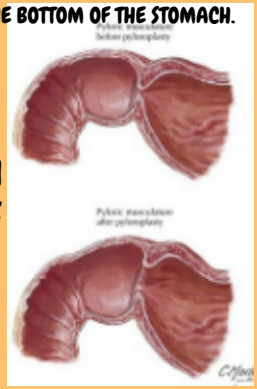
Nerve Laterjet ➡pylorus
Highly selective vagotomy : we cut all nerves except this one in order to reduce stomach acidity (emptying) in gastric ulcers patients .

H. pylori

is the cause of gastric ulcers (which are malignant)
so instead of Trunkal vagotomy which has many side effects , antibiotics is the solution .

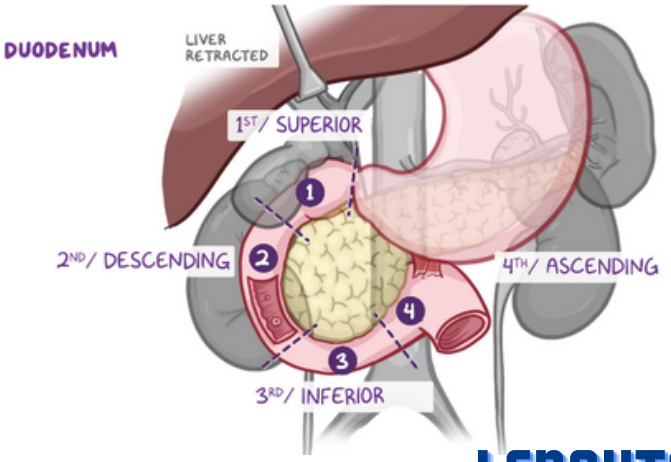
SURGERY THAT WIDENS THE OPENING AT THE BOTTOM OF THE STOMACH.

Pyloroplasty(drainage)= gastro- jejunostomy when pylorus is tightly closed which cause projective reflux of milk in babies .



The small intestine has three major components: the duodenum, which can be divided into four parts, the jejunum and the ileum.

DUODENUM!



About 10” in length.
curves around the head of the pancreas
is retroperitoneal except the 1 st inch & last inch
In the epigastric and umbilical regions

FIRST part

not retroperitoneum , 2 inches ,1 lumber ,
superior to it : epiploic foramen , posterior: IVC ,
bile duct (to pierce second part) , ...

second part

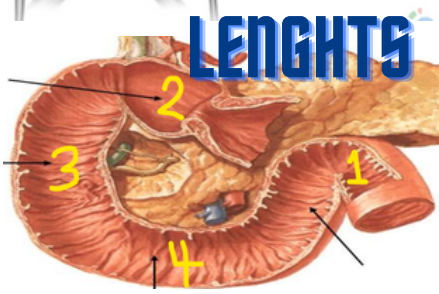
3 inches , 3&4 lumber , is pierced by The bile duct and the main pancreatic duct medialy , Posterior to it Hilum of Rt. Kidney & Rt. Ureter ,

third part

4 inches , subcostal plane , superior mesenteric artery is anteriorly .

fourth part

1 inch , not retroperitoneum . is held & ended by ligament of Treitz



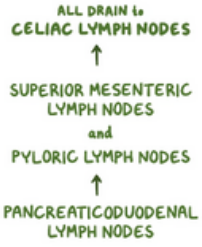
SUPERIOR PANCREATICODUODENAL ARTERY → gastroduodenal artery

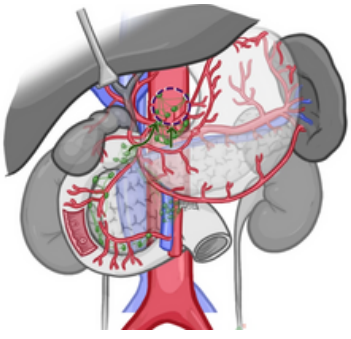
lower half

INFERIOR PANCREATICODUODENAL ARTERY → superior mesenteric artery

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

Lymphatic drainage :
1 - upward : pancreaticoduodenal nodes >>> celiac nodes
2- downward : pancreaticoduodenal nodes >>>superior mesenteric nodes





JEJUNUM & ILEUM!

Jejunum	Ileum
Proximal 2/5	Distal 3/5
thicker wall& redder	Thinner & less redder
Long vase recta	Short vase recta
simple ,only one or two arcades	numerous short terminal vessels
appear window , less fat	No window appear , big amount fat
Plicae circularis	**Peyer's patches**

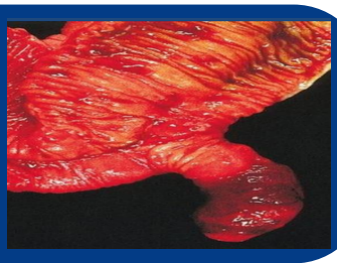
The arterial supply is from branches of the superior mesenteric artery .

venus drainage into the superior mesenteric vein.

lymphatic drainage in the superior mesenteric nodes

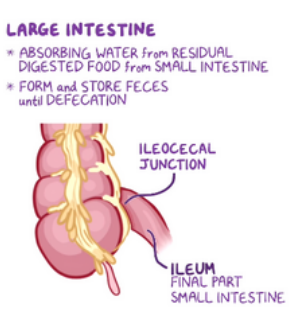
Congenital anomaly

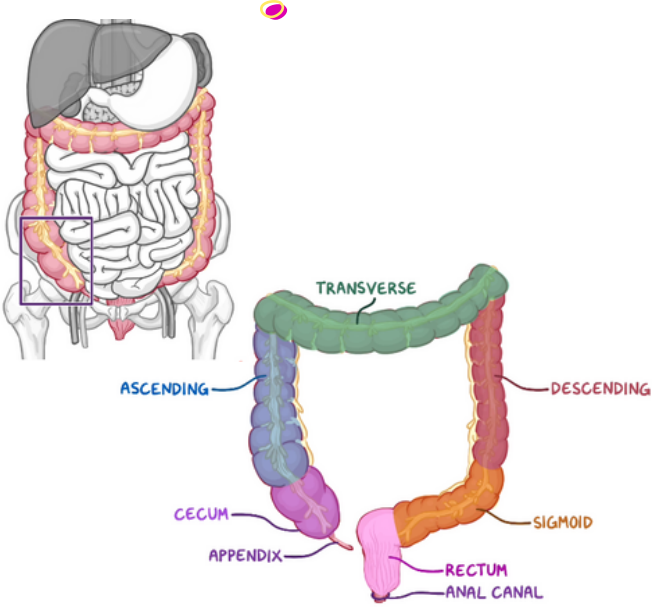
Meckel's Diverticulum:
2 feet from iliocecal junction , Remains of vitelline duct of embryo



LARGE INTESTINE!

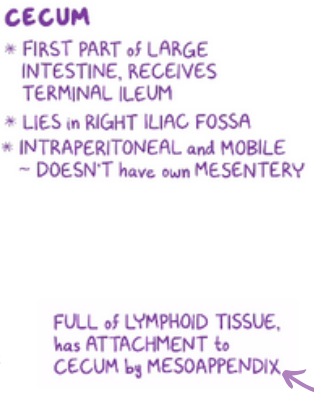
The large intestine is a part of the digestive tract specialized in absorbing water from the residual digested food coming from the small intestines, while forming and storing feces until defecation occurs.

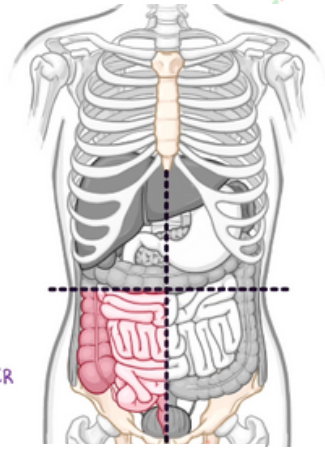




CECUM

above the lat ½ of inguinal ligament
Completely covered with peritoneum.
artery , vein , lymph : superior mesenteric
Posteriorly: the femoral nerve

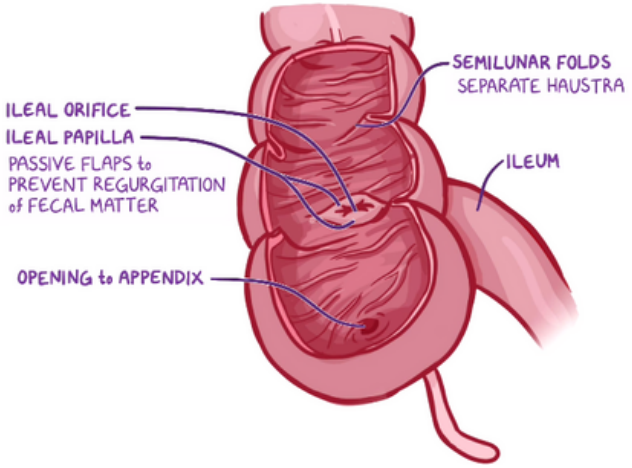




Appendix

lymphoid tissue ,retrocecal , complete peritoneal covering , attached to the mesentery , McBurney's point , appendicular artery & vein = superior mesenteric . (pain = 10th intercostal nerve= skin of umbilicus) . Thrombosis of appendicular .a causes gangrene . surgeon cut it of before in cause peritonitis

The orifice is usually closed due to tonic contraction, and the lips of the ileal papilla serve as passive flaps to prevent regurgitation of fecal matter from the cecum into the ileum. Just inferior to the ileal orifice, there's the opening to the appendix.

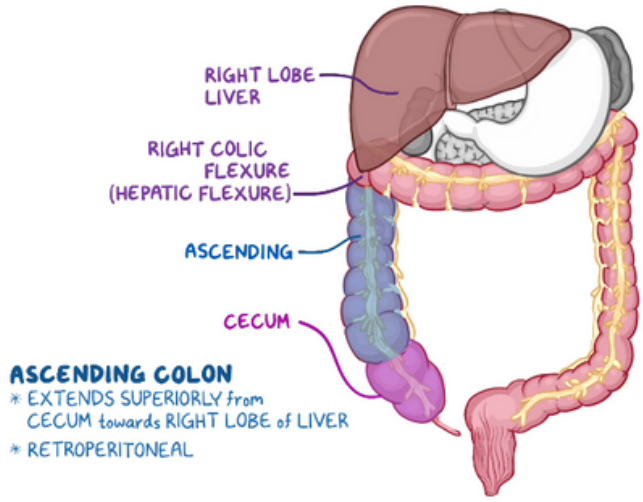


appendix is supplied by one single artery (appendicular artery) , so if there is thrombosis, it will cause gangrene . not like gallbladder which has direcit blood supply from the liver , so in Acute cholecystitis>>> no gangrene

appendix is a narrow lumen , lymphatic tissue , infection could cause rupture in it which will cause peritonitis

Ascending Colon

5 inch , retroperitoneal ,lower than left one , has middle and lateral gutter which collect pus or fluids , Anteriorly: Coils of ileum , Posteriorly :The iliohypogastric .n & The ilioinguinal nerves



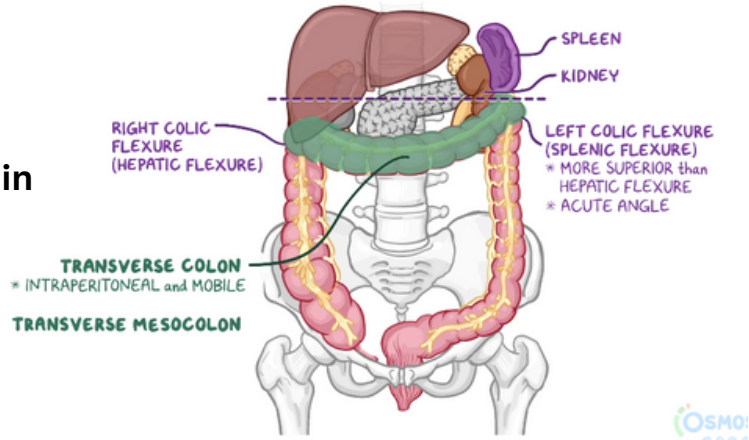
femoral nerve & lateral cutaneous nerve of thigh are not behind it

superior mesenteric artery & vein & nodes

Transverse colon

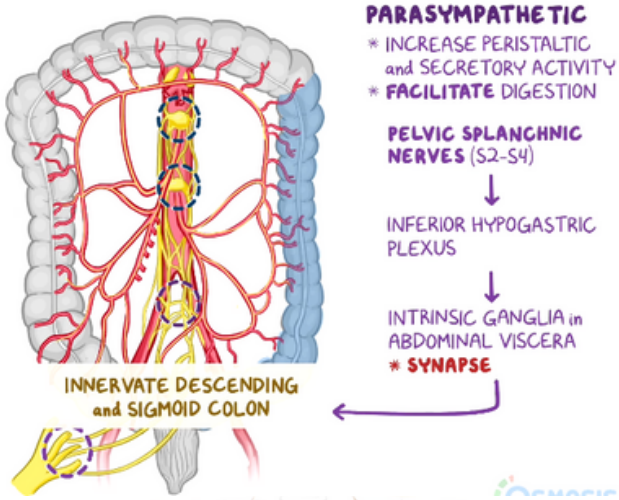
15 inches ,intraperitoneal , Suspended by the transverse mesocolon , could be down in pelvic (length of mesentery of anterior border of the pancreas) .

posteriorly :The coils of the jejunum &ileum , head of the pancreas , second part of duodenum .



proximal 2 thirds : superior mesenteric artery , vein , nodes .
lateral third : inferior mesenteric artery (hindgut), vein , nodes .

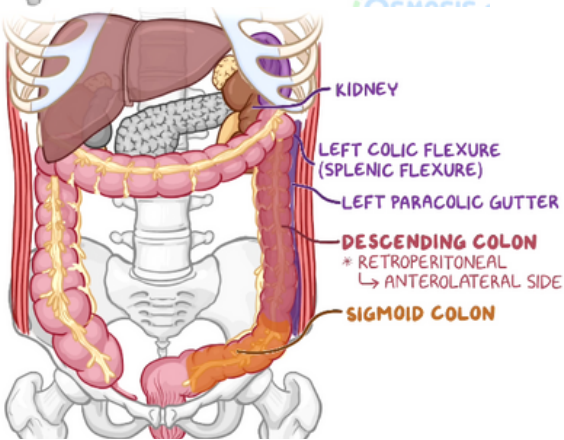
nerves :
proximal 2 thirds : vagus
lateral third : pelvic (S2-3-4)



Descending Colon

10 inches , retroperitoneal ,Anteriorly: Coils of jejunum . Posteriorly: left psoas, *lateral cutaneous nerve of the thigh & the femoral nerve* , subcostal nerve

inferior mesenteric artery , vein , nodes



PARASYMPATHETIC PELVIC (S2-3-4)