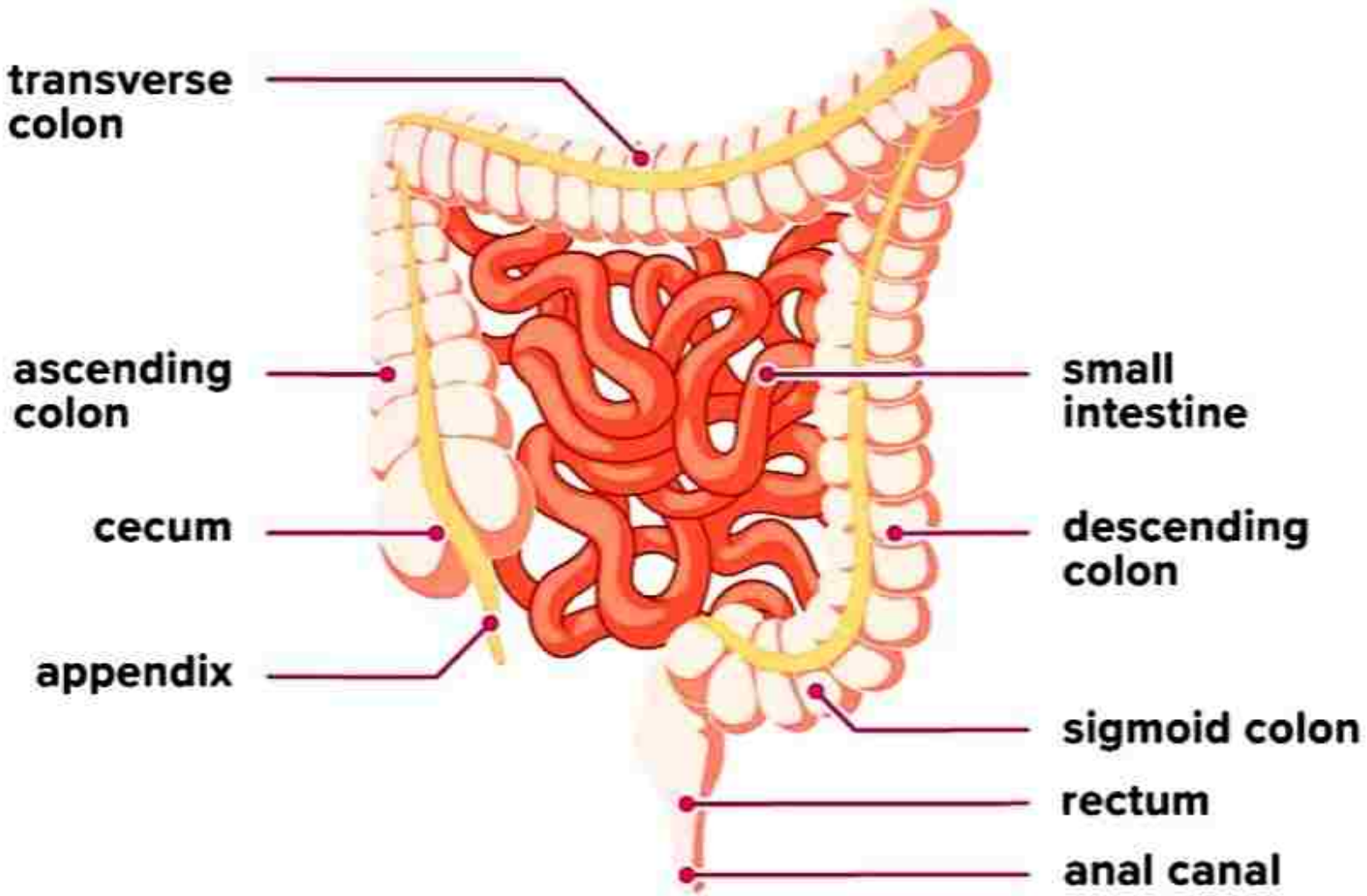
Small and large intestines



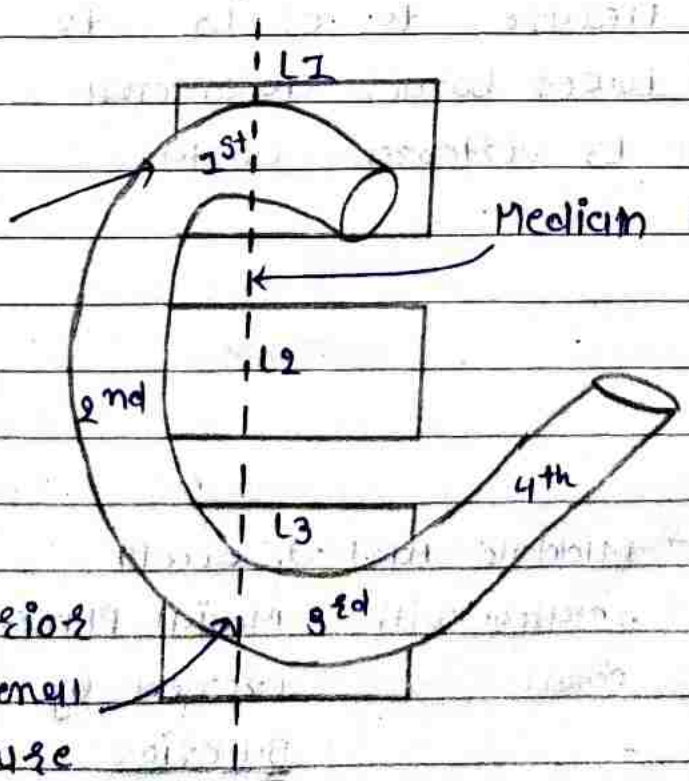
healthline

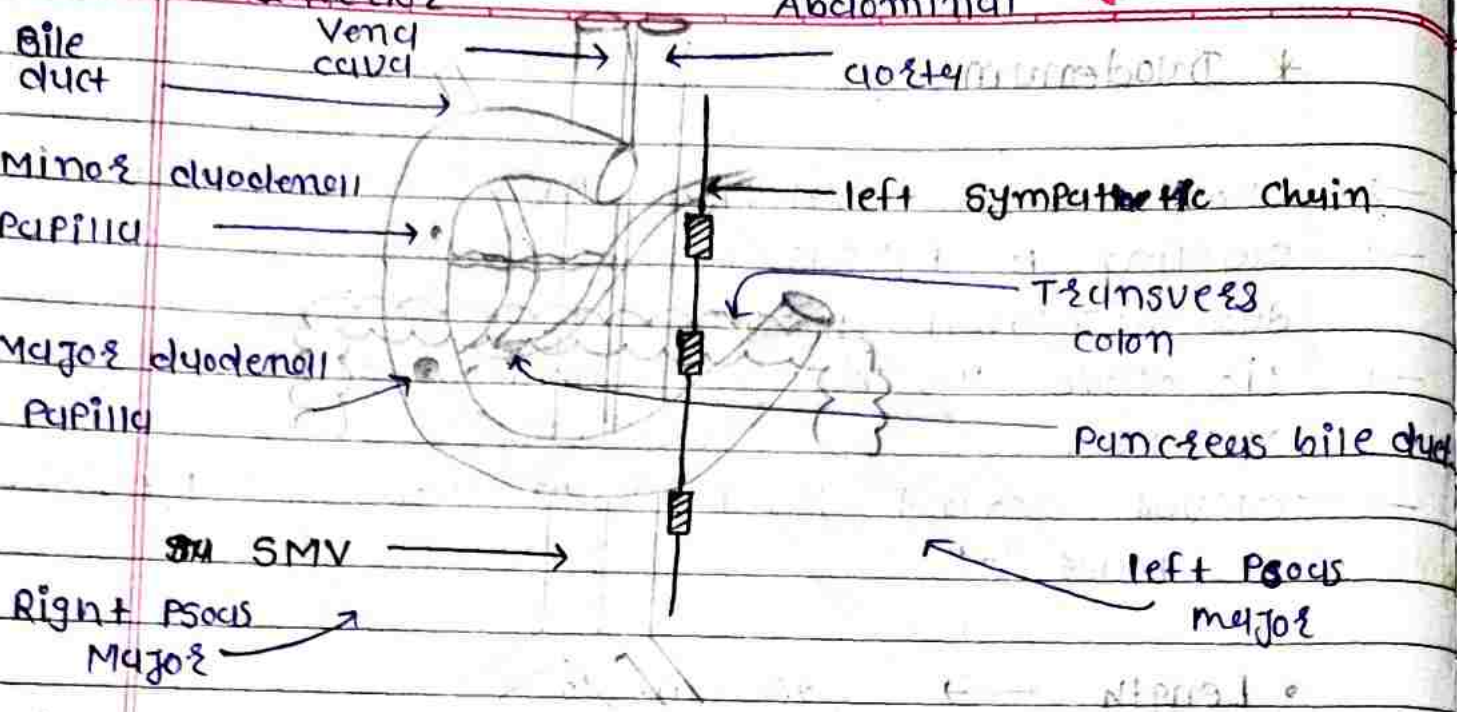
* Duodenum

→ Short, widest and fixed part of small intestine
→ starting to Pylorus part of stomach to duodenojejunal flexure.
→ Lie above the level of umbilicus of L1, L2, L3 vertebral.
→ curved around Head of Pancreas in the form of letter "C".

- Length ⟶ 25 cm long
- Parts ⟶ 4 parts

1) superior part ⟶ 5 cm long
2) descending part ⟶ 7.5 cm long
3) Horizontal part ⟶ 10 cm long
4) ascending part ⟶ 2.5 cm long.





	Superior Part (5 cm)	descending Part (7.5 cm)	Horizontal Part (10 cm)	Ascending (9.5 cm)
• Begin	→ Pylorus to Superior duodenal flexure	→ Superior duod... flexure to Lower border of L3 vertebral.	→ lower border of L3 to abdominal aorta.	→ Run upward to upper border of L2 → continuous with duodenoJejunal flexure.
• Relation 1) Peritoneal. i) Proximal (2.5 cm) movable (Attachment.) above lesser omentum / below greater omentum	→ Middale Part related with colon.	→ except Medial Plane crossed by Superior Mesentric Vessel.	→ upper most Part of the Mesentery is Mobil.	

ii) Distal (2.5 cm) → Retroperitoneal → cover only Anteriorly.	← Retro Peritoneal →		
	← Anterior with	surface covered Peritoneum	→
2) Visceral.			
Anterior • Quadrate lobe of liver • gall bladder	• Right lobe of liver • Transverse colon • loop of Small intestine	• Superior Mesenteric Vessel.	• Transverse colon • Stomach.
Posterior • Gastroduodenal artery • Bile duct • Portal vein	• Surface of Right Kidney • Inferior Vena cava • Right Psoas Major.	• Inferior Vena cava • Right Psoas Major	• left renal artery • left Sympathic chain • Inferior Mesentric vein.
Superiorly. • epiploic foramen	Medially • Head of Pancreas • bile duct	Superiorly • Head of Pancreas	To left • left Kidney • left ureter (ureter)
Inferior. • Head & neck of Pancreas	Laterally • Right colic flexure	Inferior • colic Jejunum	Superiorly • Body of Pancreas.

- Interior of 2nd part of duodenum.

i) Major duodenal papilla → Main pancreatic duct
→ 8 - 10 cm distal to pylorus.
→ Posteromedially

ii) Minor duodenal papilla → Accessory pancreatic duct
→ 6 - 8 cm distal to pylorus.

iii) Below Major duodenal papilla →
A longitudinal fold → called plica longitudinalis

- Blood supply

i) Arterial supply.

- Develop - Party from → foregut
→ Midgut

Re presence of opening of Bile duct into 2nd part
→ Junction between foregut & midgut

- above opening supplied by → superior pancreaticoduodenal artery
- Below → Inferior pancreaticoduodenal artery

ii) Venous.

- Veins of duodenum drain into → Splenic Superior mesentric Potell vein

- Nerves supply.

i) Sympathetic → T9 and T10 → Spinal

ii) Parasympathetic → from Vagus pass through Coeliac Plexus.

- Suspensory muscle of duodenum

→ Fibromuscular band
→ suspends & support the duodenojejunal flexure.
→ origin from the - Right crus of diaphragm
- Right side of oesophagus
- Passes downwards behind the pancreas.
- attached to the Posterior surface of the duodenojejunal flexure and the 3rd & 4th parts of the duodenum.

- Lymphatic drainage.

→ Most of the lymp vessels from the duodenum end in the pancreaticoduodenal nodes present along the inside of the curve of the duodenum.
- at the Junction of the Pancreas and the duodenum

→ Some lymph passes → hepatic nodes.
→ coeliac nodes
→ superior mesenteric nodes
via intestinal lymph trunk → cisterna chyli.

→ First part of duodenum drain into → Pyloric nodes → hepatic nodes.
coelicac nodes. ← drain into

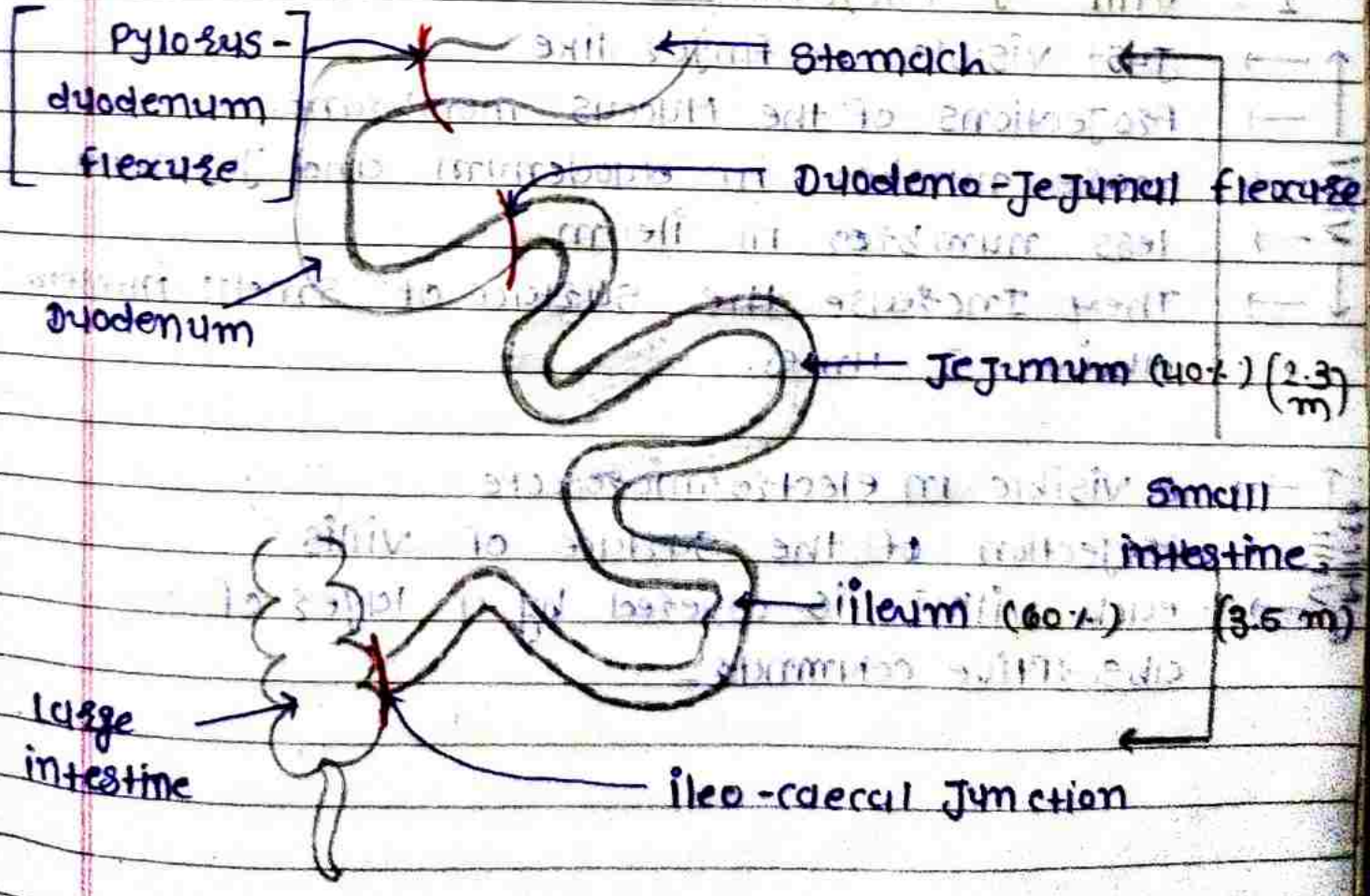
- clinical anatomy.

→ first part of the duodenum → Peptic ulcer
because
- acidic contents reaching from Stomach.

→ duodenal carcinoma.

* Jejunum & ILEUM :-

- The small intestine extends from the Pylorus to ileocaecal Junction
- it is about 6 meters long
- divided into 3 Part.
  1. Duodenum → upper fixed Part.
  2. Jejunum → lower (Midal) mobile Part (2/5) (Medial)
  3. ileum → lower mobile Part (3/5)
- The Jejunum & Ileum are suspended from the Posterior abdominal wall by the mesentery.
- Jejunum begins at the duodenojejunal flexure.
- The ileum terminates at the ileocaecal Junction



* Features

1. circular folds of Mucous membrane

→ These are the Permanent folds which from complete or incomplete circles. ( )

→ Begin in the 2nd Part of duodenum, become large and closely set below the Major duodenal Papilla.

→ They continue to be closely set in the Proximal half of the Jejunum.

→ and Almost absent in the distal half of the ileu

→ function :- absorption surface Increase
:- food Partical slowing down.

2. Villi & Microvilli

Villi:
↑ → Just visible, finger like
→ Projections of the Mucous membrane
→ more number in duodenum and Jejunum.
→ less number in ileum.
↓ → They Increase the surface of small intestine about 6 times.

Microvilli:
↑ → Visible in electro microscope.
→ Projection of the surface of villis.
↓ → each villus is covered by a layer of absorptive columnar

3) CRYPTS of Liberkuhun / Intestinal glands

→ These are simple tubular glands distributed over entire mucous membrane of the J. & I.

→ Open by small circular apertures on the surface of mucous membrane b/w the villi.

→ Secrete :- digestive enzymes and mucus.

4) Lymphatic follicles

→ 2 types.

1. Solitary lymphatic follicles.
:- diameter :- 1 to 2 mm
:- distributed in small & large intestine.

2. Aggregated lymphatic follicles.
:- form circular & oval patches
:- 2 to 10 cm in length, containing 10 to 200 follicles.

→ Peyer's patches are largest in the ileum & less small in Jejunum & more

→ It gets ulcerated in the typhoid fever forming the oval ulcers.

→ each villus has a central lymph vessel called lacteal

→ lacteal → lymph → intestine → Peristalsis → regional lymph nodes.

5) Vasa Recta.

→ The arterial supply of jejunum and ileum are derived from the jejunal & ileum branches of the superior mesenteric artery.

→ The vasa recta are distributed alternately to the opposite surface of the gut

→ They Run b/w the serous and Muscular coats and give off numerous branches which supply and pierce the muscular coat. and form a plexus in submucosa.

→ from this plexus minute branches pass to the glands and villi.

- Blood supply:-

→ Superior mesenteric artery

- lymphatic drainage.

→

1. Juxta - Intestinal :- first drainage lymph nodes
   site :- location - close to the Intestinal wall
2. Intermediate :- location - Along the arterial mesenteric arcades of the Jej. & ile.. lymph nodes
   :- Receives lymph from Juxta intestinal nodes.
3. central superior mesenteric lymph.. :- Around SMA (location) :- final mesenteric drainage.

- Nerve supply -

1. Sympathetic :- T9 to T11 segment.
2. Parasympathetic :- Vagus.

- Clinical Anatomy

→ meckel's diverticulum (મેકલ ડાયવર્ટિક્યુલમ)
→ Appendicitis (એપેન્ડિક્સ સોજો)

5 MARK'S

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* Differences b/w Jejunum & Ileum

• Macroscopic feature

	Feature	Jejunum	Ileum
1.	Location	Upper left part of intestinal area.	Lower Right part of intestinal area.
2.	Walls	Thicker and more vascular.	Thinner and less vascular.
3.	Lumen	Wider and often empty	Narrower and often loaded
4.	Mesentery	a. Windows Present b. fat less abundant c. Arterial arcades 1 or 2 d. Vasa recta longer and fewer	a. No Windows b. Fat more abundan c. Arterial arcades 3 or 6 d. Vasa recta shorte and more numero
5.	circular mucosal folds	Larger and more closely set	Smaller and sparse.

• Microscopic

1.	Villi	Large, thick and more abundant	Shorter, thinner and less abundant.
2.	Peyer's Patches	Absent	Present
3.	Solitary lymphatic follicles	Fewer	More Numerous.

5 Marks

* difference b/w large & small intestine

	Feature	Small intestine	Large intestine
Macros	1. Appendices epiploicae	Absent	Present
	2. Taenicae coli	Absent	Present
	3. Saccculations	Absent	Present
	4. Distensibility & diameter	Less	more
	5. Fixity	Greater part is freely mobile	Greater part is fixed.
Micros	6. Villi	Present	Absent
	7. Transverse mucosal folds	Permanent	Obliterated & he longitudinal musc
	8. Peyer's patches	Present in ileum	Absent
Clinical	9. common site for	a. Intestinal worms b. Typhoid c. Tuberculosis	a. entamoeba histolytica dysentery b. organisms c. carcinoma
	10. effects of infection and irritation	Diarrhoea	Dysentery

* Large intestine —

→ The structure of the large intestine is adapted for storage of matter reaching it from the small intestine and for absorption of fluid and solutes from it.

→ The epithelium is absorptive, but villi are absent

→ Extension :- Ileocaecal Junction to Anus.

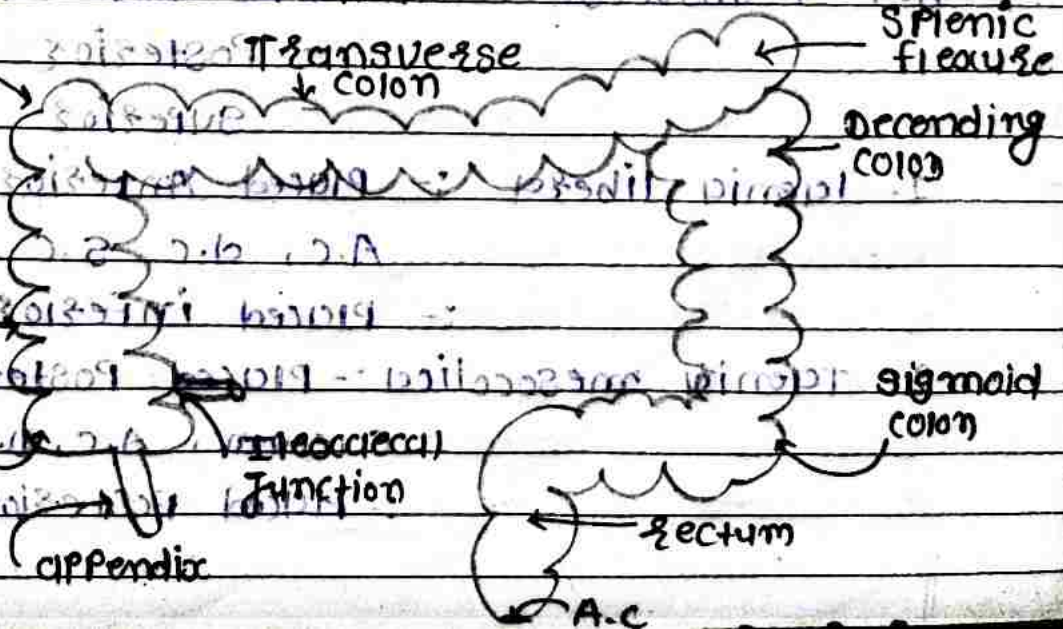
→ Length :- 1.5 m

→ Parts :- 1. Caecum
2. Appendix
3. Ascending colon
4. Hepatic flexure
5. Transverse colon
6. Splenic flexure
7. Descending colon
8. Sigmoid colon
9. Rectum & A.C.

→ The greater part of the intestine is fixed except for the appendix, Transverse colon and Sigmoid colon.

→ The large intestine is wider in calibre than small intestine.

The calibre is high in the beginning, then it decreases, and form rectal ampulla just above the anal canal.



Features

1. Taeniae coli
2. Sacculations
3. Appendices epiploicae
4. Vasa longa & vasa brevia.

1. Taeniae coli.

→ The longitudinal muscle coat forms only a thin layer in gut.

→ The greater part of it forms three ribbon-like bands, called the taenia coli.

→ Proximally the taeniae converge at the base of appendix. (અપેન્ડિક્સ પાસે)

→ distally they spread out on the terminal part of sigmoid colon. to become continuous with the longitudinal muscle coat of the rectum.

Positions of taeniae coli in caecum, A.C, d.c, S.C -

- ascending colon :- Taenia liberi - anterior
- descending colon :- Taenia mesocolica - posteromedial
- sigmoid colon :- Taenia omentalis - posterolateral

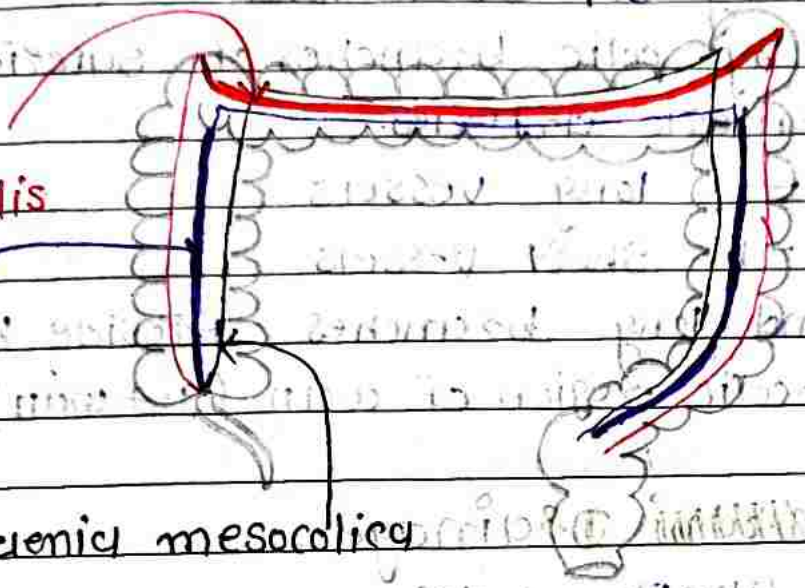
but transverse colon - Inferior
- Posterior
- Superior

(corresponding)

1. Taenia liberi :- Placed Anteriorly to caecum A.C, d.C, S.C
:- Placed inferiorly in T.C

2. Taenia mesocolica :- Placed Posteromedial of caecum, A.C, D.C, SC.
:- Placed Posteriorly in T.C

3. taenia omentalis :- Placed Posterolaterally in caecum, A.C, D.C, S.C
:- Placed Anteromedially in T.C



→ This change in position is due to twisting in T.C.

2. Succulations (Haustra)
→ The Taenia are shorter than circular muscle coat, hence the colon is puckered and succulated.

3. Appendices epiploicae
→ Small bags of peritoneum filled with fat and called the appendices epiploicae
→ Present to large intestine except for appendix, caecum and rectum
→ most numerous on the sides of sigmoid colon & Posterior surface of transverse colon

• Nerve supply :- Sympathetic - T_{11} to L_1
Parasympathetic - Vegus.

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4) vasa longa and vasa brevia

→ The blood supply to colon is derived from the marginal artery of Drummond.
→ it is formed by colic branches of superior and inferior mesenteric arteries.
→ vasa longa → long vessels
vasa brevia → Short Vessels
→ The short and long branches provide blood supply mesocolic region of wall (gut wall)

• Lymphatic Drainage –
→ 4 sets of lymph nodes.
1. epicolic lymph :- lying on the wall of gut
2. paracolic nodes :- medial side of A.C and d.C, near the mesocolic border of T.C and S.C
3. Intermediate nodes :- on the main branches of vessels.
4. Terminal nodes :- on the superior and inferior mesenteric vessels.

• Clinical Anatomy
- Large intestine can be directly viewed by a procedure called colonoscopy
- Diverticulum is a small evagination of mucous membrane of colon at the entry point of the arteries. Its Inflammation is called diverticulitis

* Part of Large Intestine

1. Caecum
2. Vermiform Appendix
3. Ascending colon
4. Transverse colon
5. Decending colon
6. Sigmoid colon
7. Hepatic Flexure (Right colic Flexure)
8. Splenic Flexure (Left colic Flexure)

I. Caecum — सुंड (च्युरीशांधारा)

- Location :- Right Iliac fossa and above the lateral half of inguinal ligament.

→ Caecum is a large blind sac forming the opening of the Large intestine.

→ Caecum - superiorly - bind to ascending colon, - medially - at level of ileocecal Junction, - Posteromedially → appendix

→ 6 cm Long and 7.6 cm broad.

[• આ શરીર નું એવું organ છે જેની પહોળાઈ લંબાઈ કરતા વધુ છે.]

- Relations

1. Anterior
- coils of intestine and Anterior abdominal wall

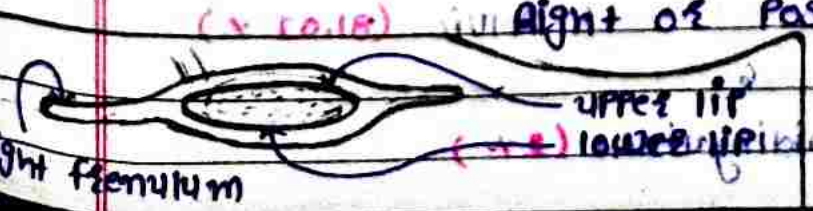
2. Posterior
- Right Psoas and iliacus muscle
- Appendix
- Testicular & ovarian vessels.

• Supply & drain:

• Artery supply :- ileocolic artery branch of SMA
• Vein drain supply :- ileocolic vein branch of SMV.
• nerve supply :- Sympathetic :- T11 to L1
Para sympathetic :- Vagus.
• Lymphatic drain :- ileocolic lymph nodes.

• Ileocaecal valve

→ Location :- Lower Right quadrant of the abdomen
:- At the junction where the ileum meets the cecum.
→ The ileocaecal opening is guarded by ileocaecal valve
→ Structure The valve 2 lip and 2 frenulum.
2 lip :- upper — It is Horizontal
lower — It is longer & concave
2 lip is lies at ileocaecal junction.
→ 2 frenula are formed by fusion of the lip at the end of the apertus.
2 frenula :- left or Anterior — end is rounded
Right or Posterior — end is narrow and Pointed.



- clinical anatomy

1. Amoebiasis, causing amoebic dysentery (amoebic dysentery)
2. Intestinal tuberculosis and carcinoma
3. typhlitis - Inflammation of caecum

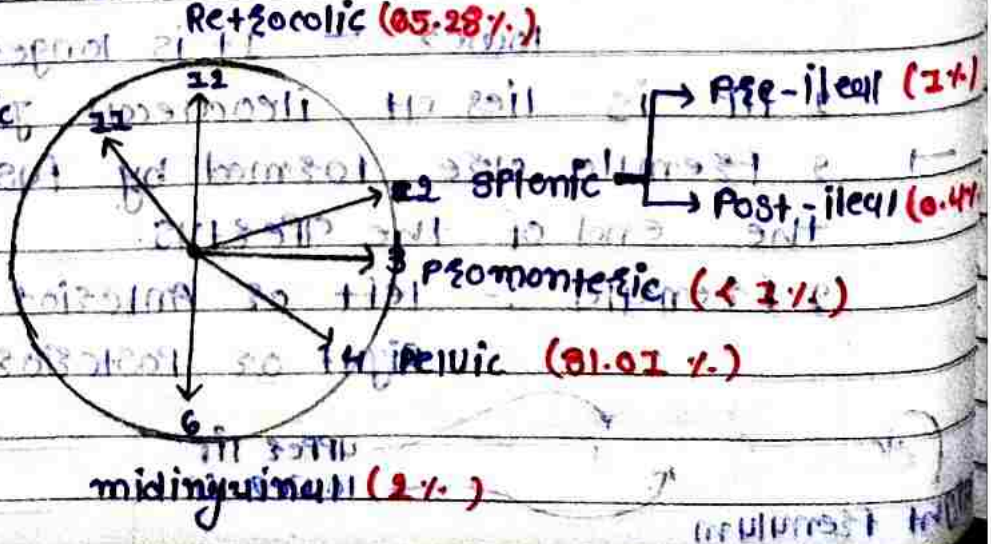
2. **Vermiform Appendix** =

- Location :- Lies in Right iliac fossa.
  Lower Right side of the abdomen near the Hip Bone.
- Shape :- Small tube-shaped organ, about the size of a Finger
- connection :- Attached to the cecum. (Posteromedial wall) and about 2 cm below the ileocaecal orifice.

→ The length varies from 2 to 20 cm with an average of 9 cm.

→ 5 mm diameter

- Position

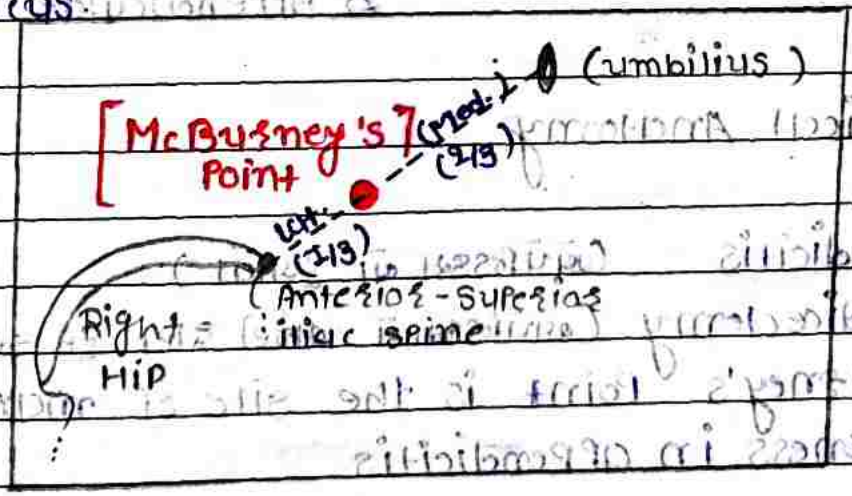


- Appendicular orifice

→ Appendicular orifice situated on the posteromedial aspect of the caecum 2 cm below the ileocaecal orifice.

→ It is incidentally guarded by an indistinct semilunar fold of the mucous membrane, known as the valve of Gerlach.

→ McBurney's point is the site of maximum tenderness in appendicitis. the point lies at the junction of lateral 1/3rd and medial 2/3rd of line joining the Right Anterior Superior iliac spine of Hip bone to umbilicus.



- Lumen of appendix :- It is quite small and may be partially or completely obliterated after mid-adult life.

- Peritoneal Relations :- The appendix is suspended by a small triangular fold of peritoneum called the mesoappendix or appendicular mesentery.

- Supply & Drain -

1) Blood Supply :- Appendicular artery is branch of ileocolic artery it is branch of SMA.

2) Vein drain :- Appendicular vein branch of ileocolic vein it is branch of SMV.

3) Nerve supply :- • Parasympathetic - Vagus.
• Sympathetic :- T9 and T10 Segments through the coeliac plexus.

4) Lymphatic drain :- 1) Ileocolic nodes
2) Appendicular nodes.

- Clinical Anatomy

1) Appendicitis. (એપેન્ડિક્સમાં સોજો)
2) Appendicectomy (એપેન્ડિક્સ ને કાઢવો દૂર કરવો)
3) McBurney's Point is the site of maximum tenderness in appendicitis.

- Physical signs of acute appendicitis (નિદાન)
1. Hyperaesthesia in the right iliac fossa
2. Tenderness at McBurney's Point
3. Rebound tenderness over the appendix

- Retrocaecal appendix :- pain on Hip joint
- Pelvic appendix :- pain obturator internus bcz it is stretched.

a) colon

	Ascendic colon	Transverse colon	Descending colon	Sigmoid colon
Length	12.5 cm	50 cm	25 cm	37.5 cm
Extends	Caecum to Hepatic flexure	Hepatic flex.. to Splenic flex.	Splenic flex.. to Sigmoid colo.	Pelvic brim to Rectum
Relations Anterior	- coils of small intestine - anterior abdominal wall - greater omentum	- greater omentum - anterior abdominal wall	- coils of small intes...	- loops of small intestine
Posterior	- Right kidney - transverse abdominis	- Second part of duodenum - Head of Pancreas - coils of small intes..	- Psoas major - Transverse abdominis	- Posterior Pelvic wall - Sacrum
~→		Actually it is not transverse but, hends loco as a loop to a variable extent ~→ It is mobil part of large...		

- Supply & drain of all part of large Intestine -

1) Blood supply :- SMA and IMA.

SMA :- Cecum, ascendic colon, first 2/3rd of transverse colon.

IMA :- distal 1/3rd of transverse colon, descending colon, sigmoid colon and Rectum.

2) Vein drain :- SMV and IMV

SMV :- ascending and transverse colon

IMV :- descending, sigmoid colon and Rectum.

* Rectum *

→ The Rectum is the distal part of the large gut

• Location :- at the end of the large intestine within the pelvic cavity b/w the sigmoid colon and the Anal canal.

→ The three cardinal features of large intestine eg. i) sacculations ii) appendices epiploica iii) taenia are ABSENT in the Rectum.

• Extent :- The Rectum begins as a continuation of the sigmoid colon at the level of 3rd sacral vertebra.

→ The Rectum ends by becoming continuous with anal canal at the Anorectal Junction The Junction lies 2 to 3 cm in front and a little below the tip of the coccyx.

• Dimensions :- 12 cm Long.
:- upper Part Diameter 4 cm
:- Lower Part dilated to rectal Ampulla

• Course :- First downwards & backwards
then downwards
finally downwards & forwards
→ ~~2 curvatures are present~~
→ The beginning and End of Rectum lie in the MEDIAN PLANE

→ two types of curvatures are present.

i) 2 Antero Posterior curves.

1) Sacral Flexure :- follows the concavity of the sacrum & coccyx.

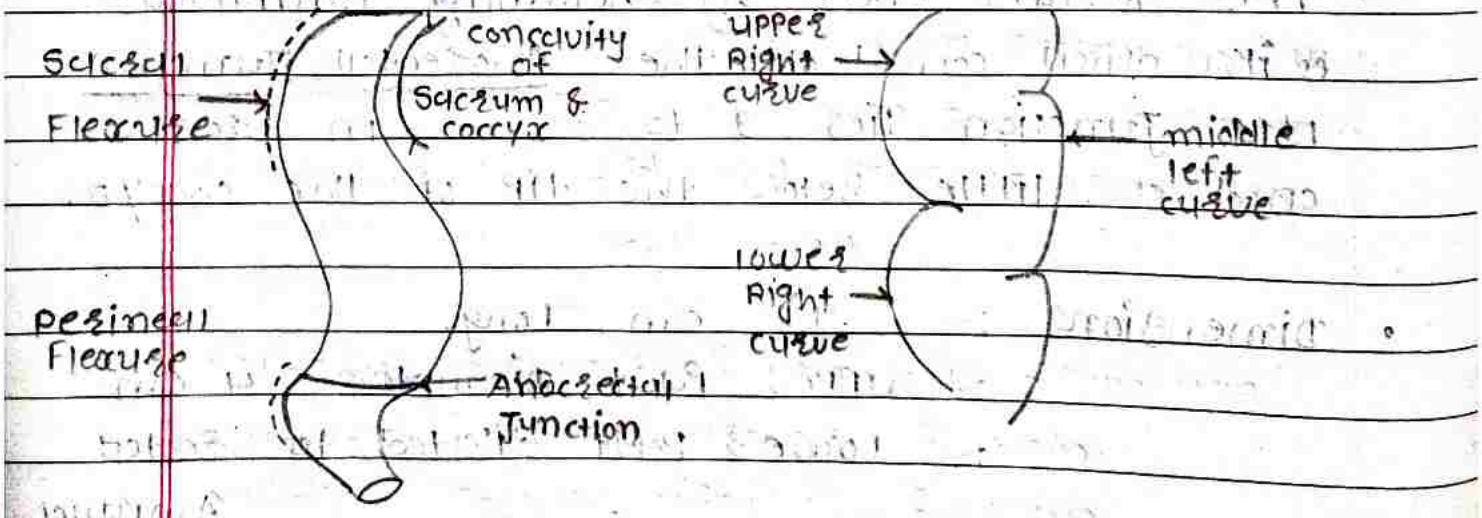
2) Perineal Flexure :- Backward bend at the anorectal Junction

iii) 3 Lateral curves.

1) The upper lateral curve of Rectum is convex to the Right.

2) The middle lateral curve is convex to the left and most Prominent.

3) The lower lateral curve is convex to the Right.



• Antero-Posterior curves

• Lateral curves.

• Relations

i) Peritoneal Relations

→ upper 1/3 rd. covered by peritoneum on its anterior and lateral surfaces.
→ middle 1/3 rd. covered only anteriorly
→ lower 1/3 rd not covered by peritoneum also known as the ampulla.

ii) Visceral Relations

→ Anterior

· males.	· females.
= upper 2/3 rd.	= upper 2/3 rd.
· Rectovesical Pouch	· Rectouterine Pouch
· coils of intestine	· coils of intestine
· Sigmoid colon	· Sigmoid colon
= lower 1/3 rd.	= lower 1/3 rd.
· base of urinary bladder	· lower part of vagina.
· terminal part of ureters.	
· Seminal vesicles	
· deferent ducts and Prostate	

→ Posterior

- Posterior Relations are same in male and female.
= lower 3 pieces of sacrum and coccyx
= Piriformis

• Mucosal Folds

→ 2 types of Folds i) longitudinal
ii) Transverse.

i) The Longitudinal Folds are transitory, present in lower part of an empty Rectum and obliterated by distension.

ii) The Transverse Horizontal Folds of Houston's Valves are most marked when Rectum in distended.

i) 1st small transverse fold :- 12 - 14 cm above anal canal.
ii) 2nd transverse fold :- 7.5 cm away to anal canal.
iii) 3rd large transverse fold :- lies at upper end of the Rectal ampulla.
iv) 4the transverse fold :- 2.5 cm below the 3rd fold. Projects from the left wall.

• Arterial Supply & Venous drainage.
- Superior rectal artery & vein
- Middle rectal artery & vein
- Median sacral artery & vein

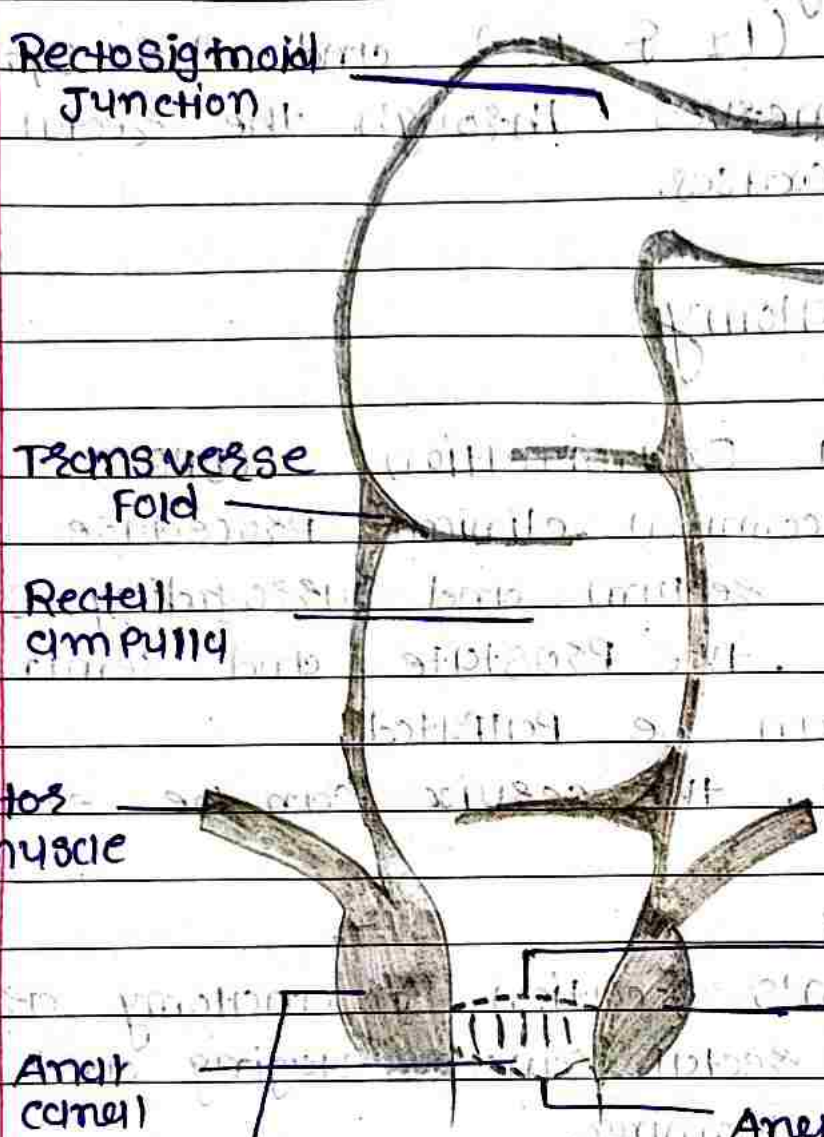
• Lymphatic drainage
- Inferior mesenteric nodes
- Internal iliac nodes
- Superior inguinal nodes.

- Nerve Supply
  - Sympathetic (L_1 & L_2) and Parasympathetic (S_2, S_3, S_4) nerves through the rectal Hypogastric Plexuses.

- Clinical Anatomy

i) Digital Rectal Examination (DRE)
- it is the common clinical procedure used to assess the rectum and surrounding structure
- In male, the Prostate and Seminal vesicles can be palpated
- In Female, the cervix can be examined.

ii) Rectal cancer
- The Rectum's location & anatomy are crucial in rectal cancer staging and treatment planning.
- Surgical approaches such as total mesorectal excision (TME), aim to remove the Rectum and its surrounding tissue en bloc to improve outcomes.


Rectosigmoid Junction
Sigmoid colon
Transverse Fold
Rectal ampulla
Internal anal Sphincter
Levator ani muscle
Anorectal Junction
Anal canal
Anal valve
External anal Sphincter

[· Rectum ·]

• Anal Canal :

→ Anal canal is terminal part of GIT.
→ lies in Anal triangle b/w ischioanal fossa.
→ Extend from anorectal junction to Anus.
→ Surrounding → outer - voluntary
& inner - involuntary } Sphincter

• Relation
→ Anteriorly :- Both Sex :- Perineal Body.
:- In male :- membranous urethra & bulb of Penis
:- In Female :- Lower end of vagina.

→ Posteriorly :- Both Sex :- Anococcygeal ligament
:- Tip of coccyx.

→ Laterally :- Ischioanal fossa

• Inferior of Anal canal.
- Divide into 3 part → upper (15 mm)
→ middle (15 mm)
→ lower (8 mm)

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• Characteristic Epithelium •

i) Upper mucous part
- Line by columnar epithelium [mucous membrane]
- 6 - 10 vertical ridge - anal column
- lower end of anal column united by short transverse fold called Anal valves.
- Above valve depression - anal sinus.
- Anal valve together from transverse line → ★ Pectinate line.

ii) Middle part
- Non - keratinizing squmous epithelium (also mucous)
- Anal columns are not present.
- mucosa Bluish appearance because, dense venous plexus.
- This Region → Referred to Pecten or transitional zone.
- lower limit of Pectin often has whitish ★ appearance also Refered " white line of Hilton

iii) Lower Part.
- line by true skin → containing sebaceous gland [keratinizing squmous epithelium]

- Arterial Supply.

→ Superior Rectal artery.
Pectinate line
→ Inferior Rectal artery.

- Vein: Supply.

Anal vein

Internal Rectal Venous Plexus
↓
Superior Rectal vein
↓
Inferic mesenteric vein
↓
Splenic vein
↓
Portal vein

External Rectal Venous Plexus.
↓
Inferior Rectal Vein
↓
Inferior Pudendal vein
↓
Internal iliac
↓
common iliac
↓
Inferior Venal cava.

- Nerve

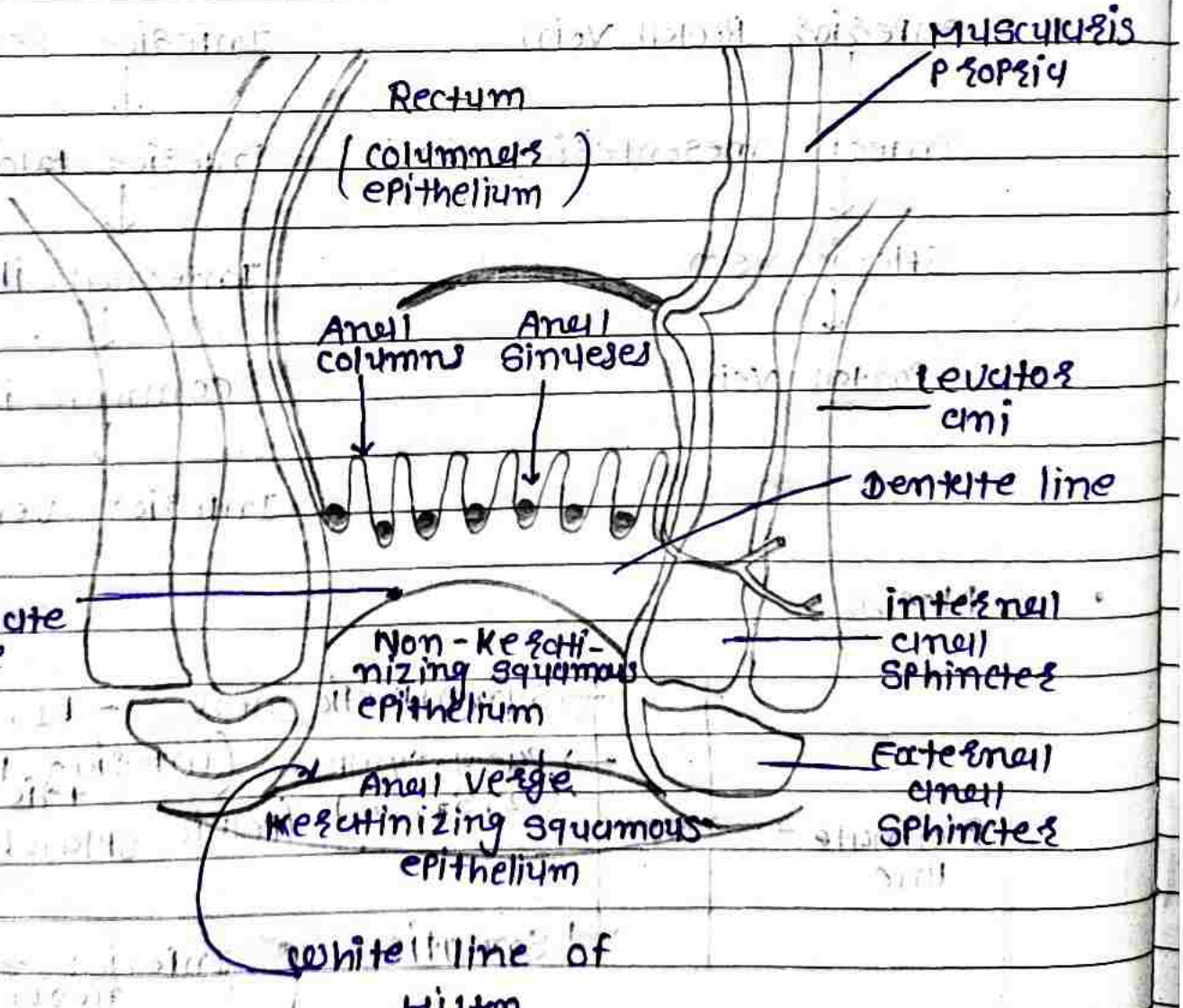
Pectinate line →
→ sympathetic nerve - L1, L2
→ Para symp... (S2, S3, S4) (inferic Hypogas-tric plexus) (pelvic splanchnic)
→ Somatic (Inferior rectal nerve S2, S3, S4)

• Clinical Anatomy —

i) Digital Rectal Examination (DRE) :- A common clinical examination used to assess the anal canal and Rectum.

ii) Anal Fistulae :- Abnormal connections b/w (abscess) the anal canal and the perineal formation.

iii) Hemorrhoids :- Dilated veins in the anal canal, (pain) which can be internal or external



(• Anal canal •)