



HAMMURABI MEDICAL COLLEGE OF BABYLON UNIVERSITY



GASTROINTESTINAL TRACT

PHASE 1- S4

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Session 8- Anatomy of intestine

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Objectives

- to study the gross anatomy of the small and large intestine
- describe:
 - ❖ the gross differences between the small intestine and large intestine
 - ❖ the jejunum & the ileum and their characteristic features
 - ❖ blood supply (superior mesenteric artery & vein) and its distribution to the small intestine
 - ❖ the parts, appearance and blood supply of the large intestine anastomosing loops of the superior and inferior mesenteric arteries which form the marginal artery
 - ❖ location of the paracolic gutters
 - ❖ recto-vesicle & recto-uterine pouches

Large Intestine

consists of the **Caecum, Appendix, Ascending, Transverse, Descending** and **sigmoid colon, Rectum and Anal Canal**.

The large intestine can be distinguished from the small intestine by:

- **Omental Appendices**

- Small, fatty, omentum-like projections

- **Teniae Coli**

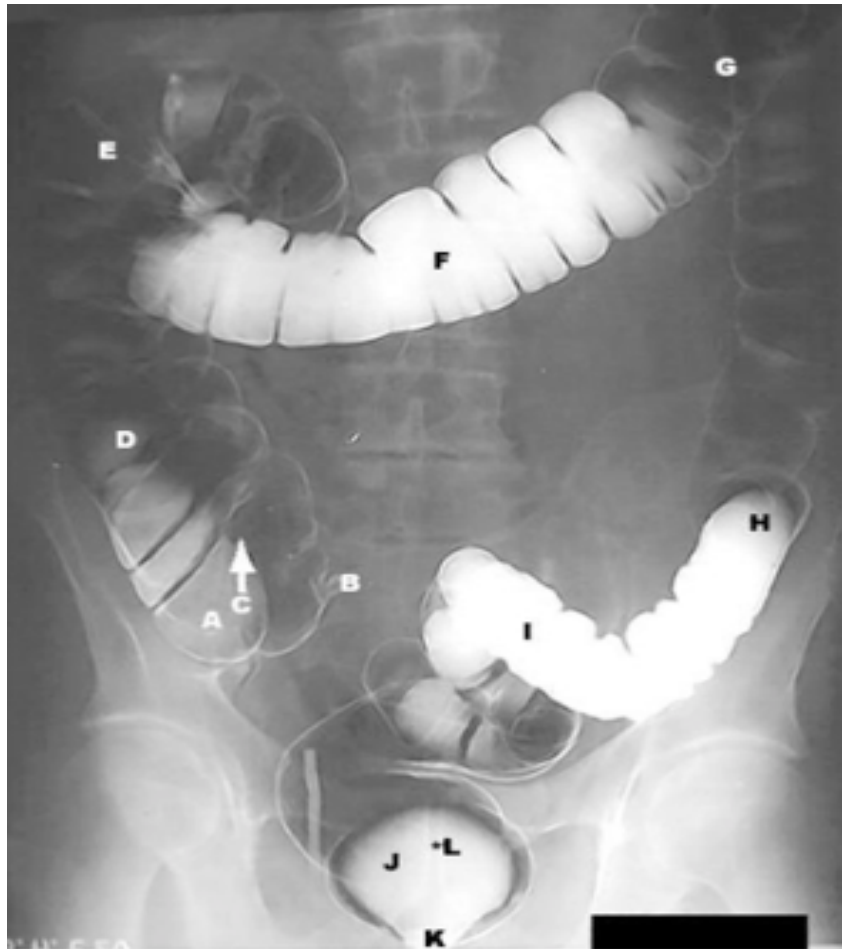
- ❖ Three distinct longitudinal bands of muscle
- ❖ Begin at the appendix, where it's longitudinal muscle splits into 3 bands
- ❖ Run the length of the large intestine
- ❖ Merge together again at the rectosigmoid junction into a continuous layer around the rectum

- **Haustra**

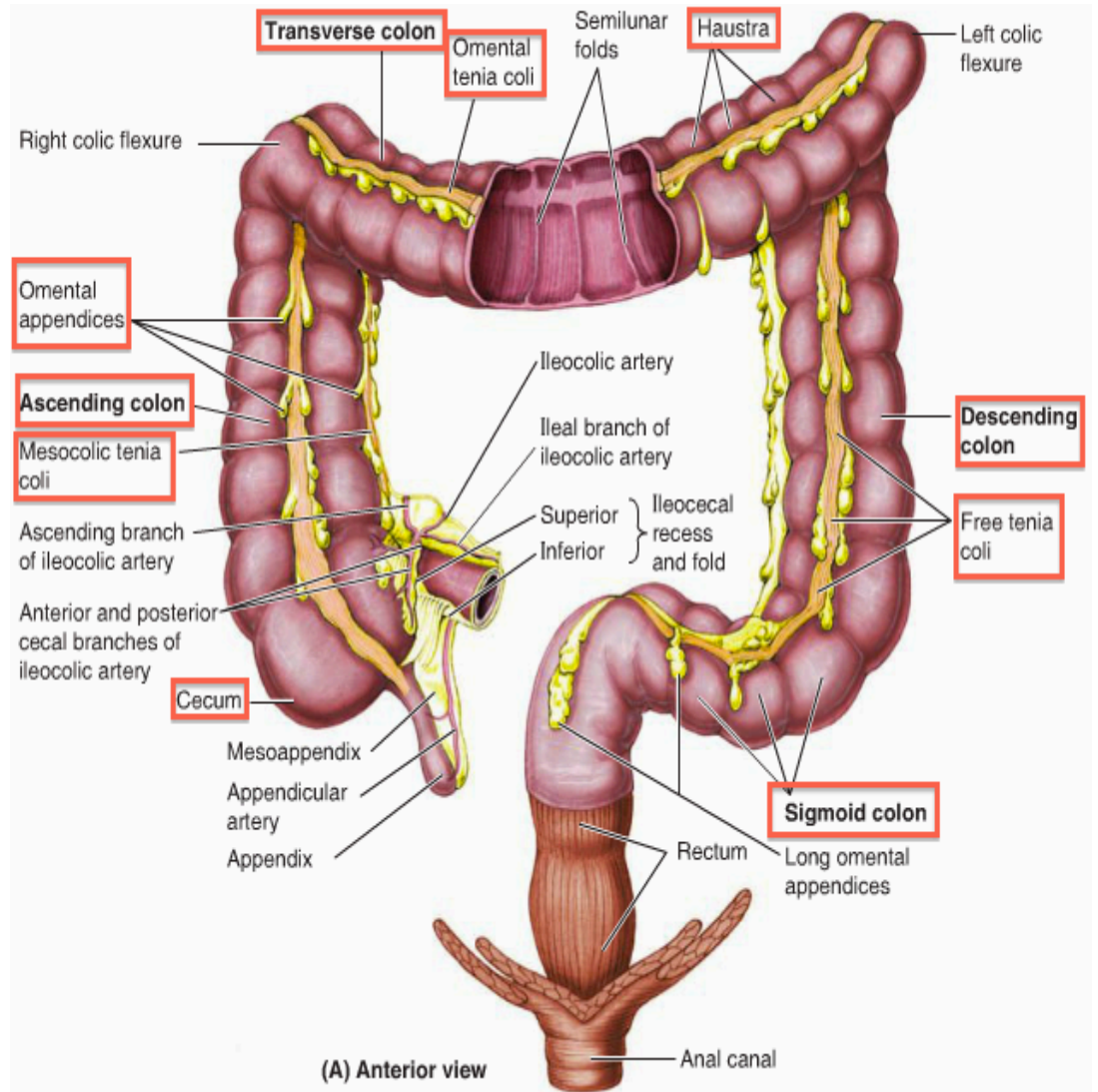
- Sacculations of the wall of the colon between teniae

- **Diameter**

- Much larger than that of the small intestine



A cecum B appendix C gas bubble D ascending colon E hepatic flexure F transverse colon G splenic flexure H descending colon I sigmoid colon J rectum K anal-rectal junction L pubic symphysis



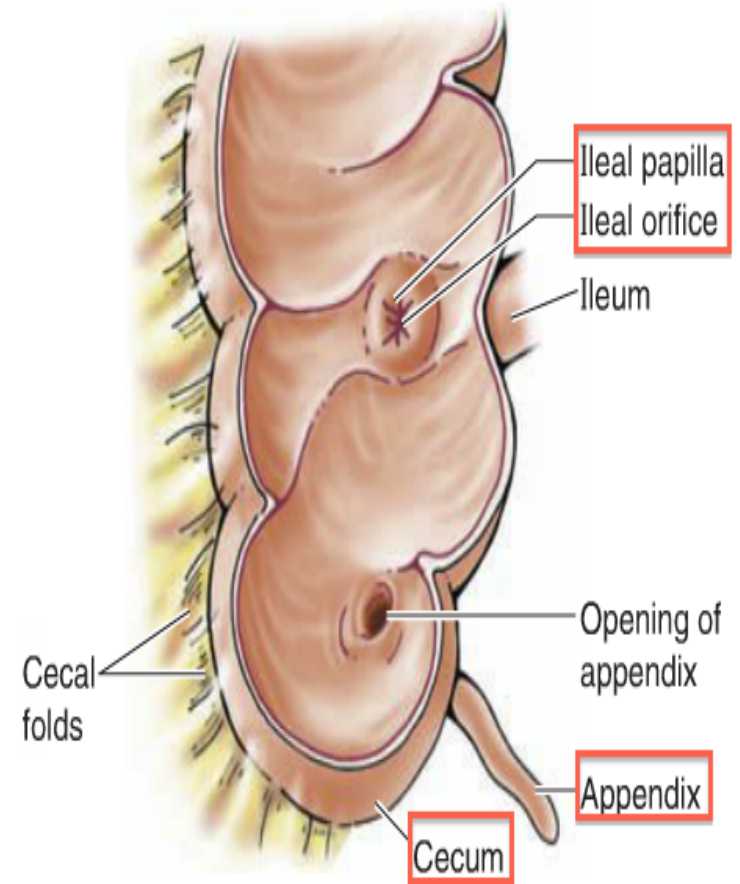
(A) Anterior view

Caecum

first part of the large intestine and is continuous with the ascending colon. It is a blind intestinal pouch, approximately **7.5cm** in both length and breadth.

It lies in the **Iliac Fossa of the Right Lower Quadrant** of the abdomen, inferior to the junction of the terminal ileum and caecum (**ileocaecal junction**).

entirely enveloped by peritoneum and is mobile. However, the caecum has no mesentery. Because of this relative freedom, it may be displaced from the iliac fossa, but is commonly bound to the lateral abdominal wall by one or more cecal folds of peritoneum



(B) Anterior view

Appendix

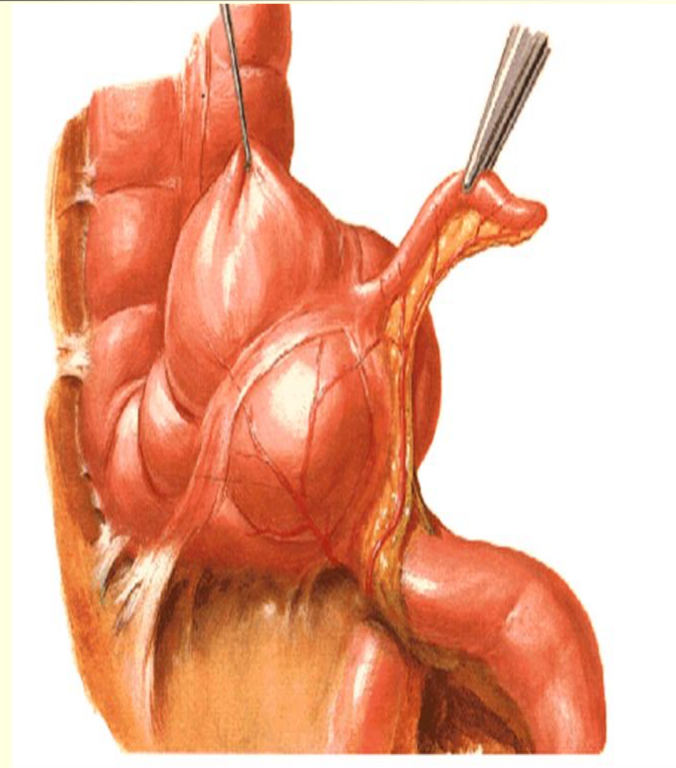
a blind intestinal diverticulum (**6-10cm in length**) that contains masses of lymphoid tissue.

arises from the posteromedial aspect of the caecum inferior to the **ileocaecal junction**. It is usually retrocaecal, but its position is variable.

The appendix has a **short, triangular mesentery, the Mesoappendix**, which derived from the posterior side of the mesentery of the terminal ileum.

The mesoappendix attaches to the caecum and the proximal part of the appendix.

2. The mesoappendix (mesentery of the appendix)



Vasculature of Caecum and Appendix

The **Caecum** is **Midgut derived**, thus receives its blood supply from the SMA, by way of the **Ileocolic** artery (SMA terminal branch).

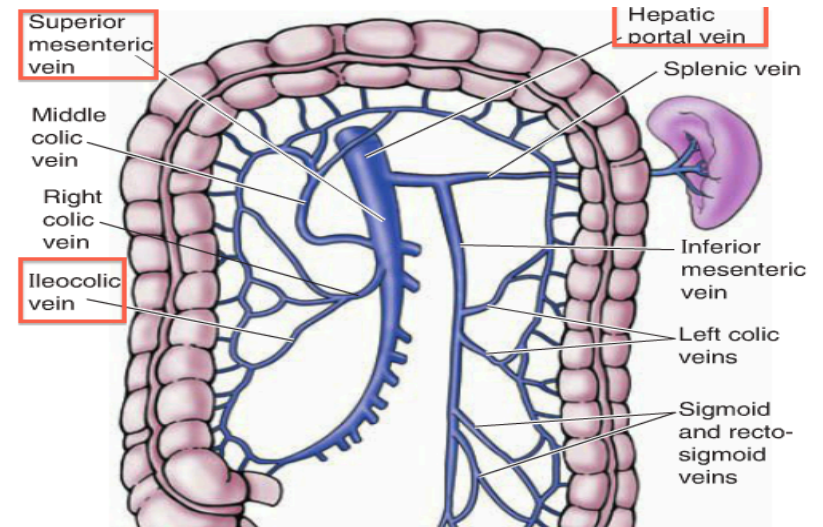
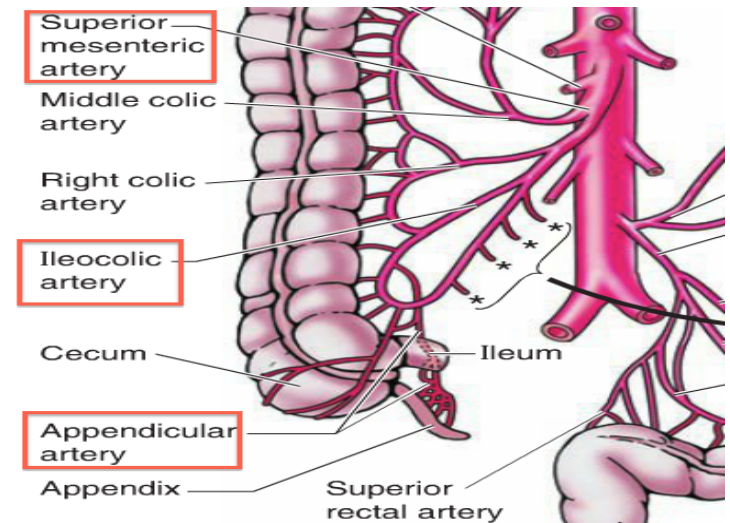
Abdominal Aorta → SMA → Ileocolic

The **Appendix** is **Midgut derived**, thus receives its blood supply from the SMA, by way of the **Appendicular** artery.

Abdominal Aorta → SMA → Ileocolic → Appendicular art.

Venous drainage from the Caecum and Appendix flows through a tributary of the **SMV**, the **Ileocolic vein**.

appendix & caecum → ileocolic v. → SMV



Colon

The Colon has **4 Parts**, the **Ascending**, **Transverse**, **Descending** and **Sigmoid**.

Ascending Colon

passes superiorly on the right side of the abdominal cavity from the **Caecum** to the right lobe of the liver, where it turns to the left at the **Right Colic Flexure** (hepatic flexure).

The flexure lies deep to the 9th & 10th ribs and is overlapped by the inferior part of the liver.

❖ narrower than the caecum .

❖ **secondarily retroperitoneal** part along the right side of the posterior abdominal wall,

❖ covered by peritoneum anteriorly and on its sides. It is separated from the anterolateral abdominal wall by the greater omentum.

The ascending colon has a **short mesentery** in **25%** of people.

Right Paracolic Gutter: deep vertical groove lined with parietal peritoneum, the, lies between the lateral aspect of the ascending colon and the adjacent abdominal wall.

Transverse Colon

- 3rd, **longest** and **most mobile** part of the large intestine.
- It crosses the abdomen from the **Right** → **Left colic flexures**, where it turns inferior to become the descending colon.
- The **Left Colic Flexure (splenic flexure)** is usually more superior, more acute and less mobile than the right.
- It lies anterior to the inferior part of the left kidney and attaches to the diaphragm through the **Phrenicocolic Ligament**.
- **Transverse Mesocolon**, loops down often inferior to the level of the iliac crests.
- The root of the transverse mesocolon lies along the inferior border of the pancreas and is continuous with the parietal peritoneum posteriorly.
- Being freely movable, the transverse colon is variable in position, usually hanging to the level of the umbilicus (**L3**), but in tall, thin people it may extend down into the pelvis.

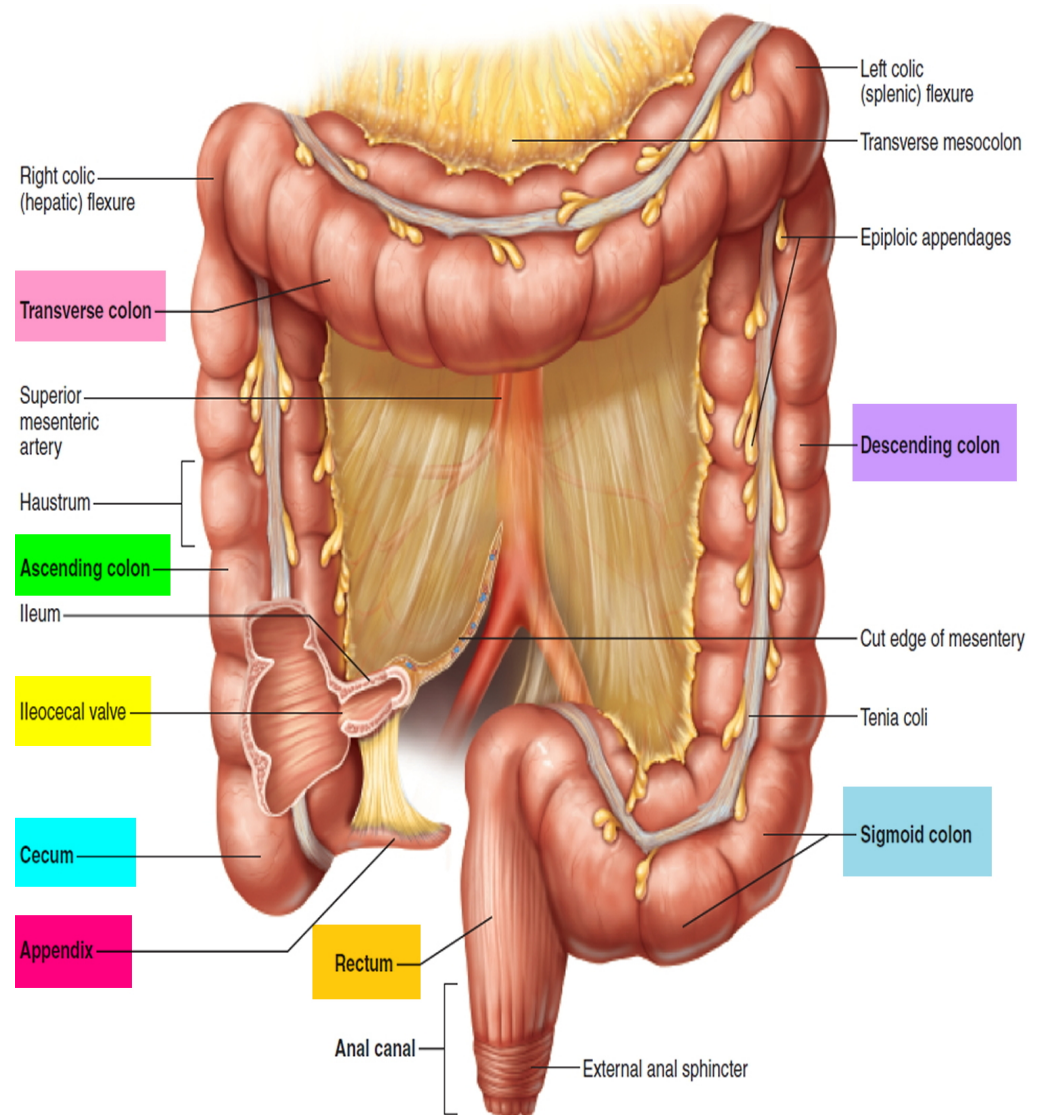
Descending Colon

- occupies a **secondarily retroperitoneal** position (covered by peritoneum anteriorly and laterally, binding it to the posterior abdominal wall), between the **Left Colic Flexure** to the **Left Iliac Fossa**, where it is continuous with the sigmoid colon.
- As it descends, the colon passes anterior to the lateral border of the left kidney.
- The descending colon has a **short mesentery** in **33%** of people.
- As with the ascending colon, a deep vertical groove lined with parietal peritoneum, the **Left Paracolic Gutter**, lies between the lateral aspect of the ascending colon and the adjacent abdominal wall.

Sigmoid Colon

its **S-Shaped** loop of **variable length**, links the **Descending Colon** and the **Rectum**, running from the iliac fossa to the **S3** vertebra.

- The **termination of teniae coli**, approximately 15cm from the anus, indicates the **rectosigmoid junction**.
- The Sigmoid Colon usually has a **long mesentery**, the **Sigmoid Mesocolon**, and therefore has **considerable mobility**, especially its **middle part**. This can lead to **Volvulus of the Sigmoid Colon**.



Vasculature of the Colon

Ascending Colon, Right Colic Flexure

are **Midgut** derived, thus receive their blood supply from the **SMA**, via the Ileocolic and Right Colic arteries.

Abdominal Aorta → SMA → Ileocolic

Abdominal Aorta → SMA → Right Colic

These arteries anastomose with each other, and with the right branch of the **Middle Colic artery**. This forms the first of a series of anastomotic arcades, that continues round the large intestine to form a continuous arterial channel, the **Marginal Artery**.

Venous drainage

is through the **Ileocolic** and **Right Colic Veins**, which drain into the SMV and subsequently the portal vein.

transverse colon

derived from both the **Midgut** and **Hindgut** (Division after proximal 2/3rd), thus receives its blood supply from both the **SMA** and **IMA**.

It's main supply is from the SMA, via the **Middle Colic** artery, however it may also receive arteries blood from the **Right** (SMA) and **Left** (IMA) **Colic** arteries by way of the **Marginal** artery

Abdominal Aorta → SMA → Middle Colic

Abdominal Aorta → SMA → Right Colic

Abdominal Aorta → IMA → Left Colic

Venous drainage is through the **Middle Colic Vein**, → **SMV** and → **portal vein**.

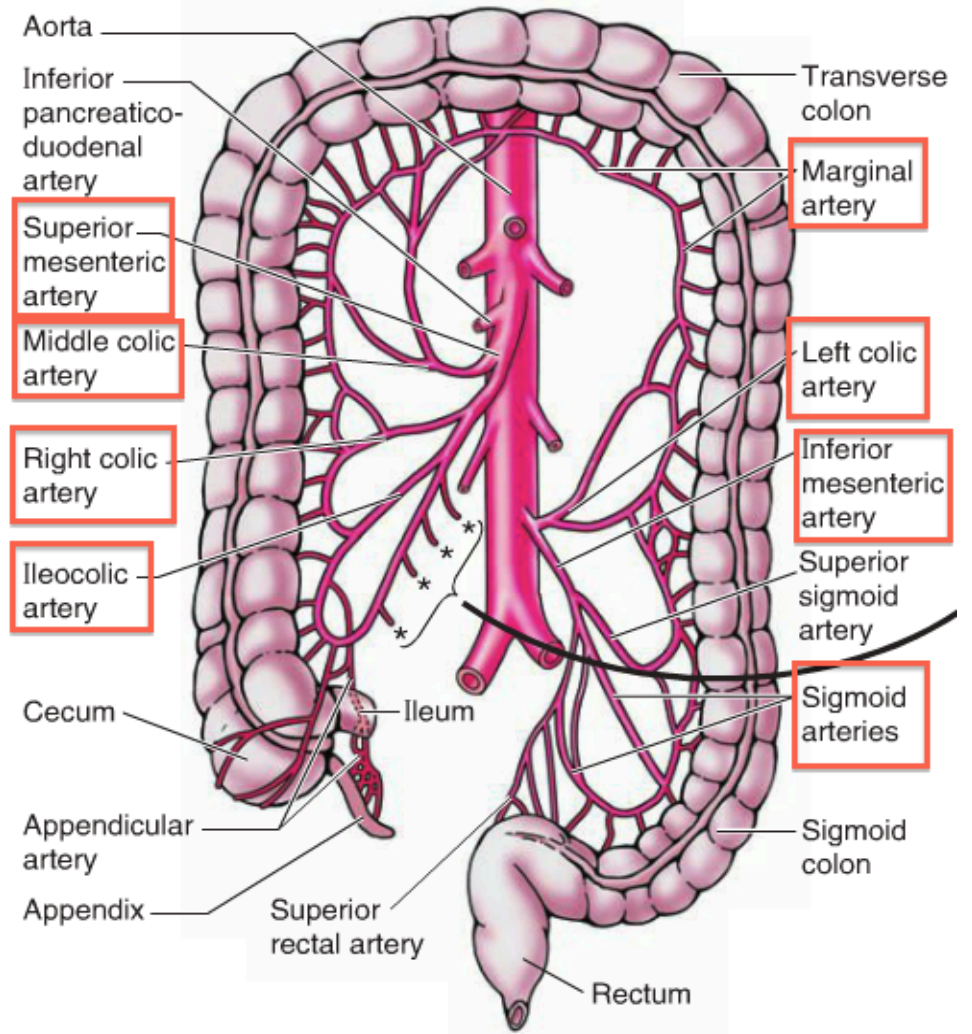
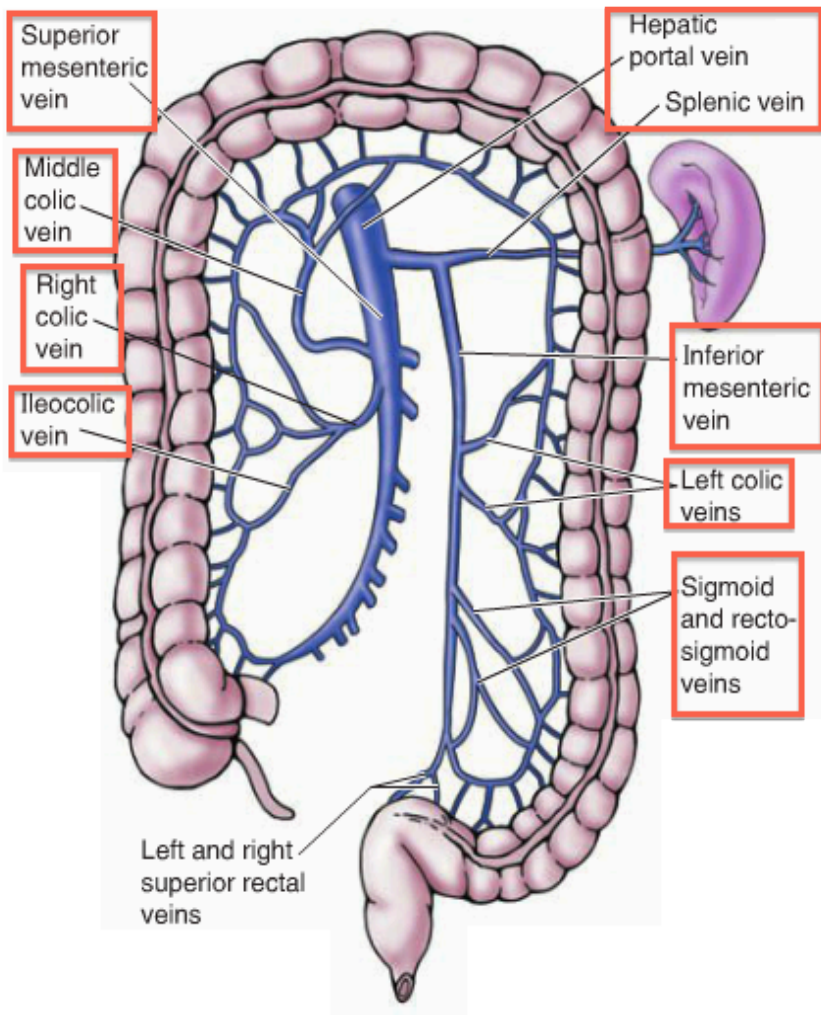
Descending and Sigmoid Colon

derived from the **Hindgut**, thus receive their blood supply from the **IMA**, via the **Left Colic** and **Sigmoid** arteries.

Abdominal Aorta → IMA → Left Colic

Abdominal Aorta → IMA → Sigmoid

Venous drainage is through the **Left Colic** and **Sigmoid Veins**, → **IMV** → **Splenic** → **Portal Veins**.



Rectum

is the fixed, primarily **retroperitoneal** and **subperitoneal**, terminal part of the large intestine.

- First Third
 - Peritoneum covers the anterior and lateral surfaces
- Middle Third
 - Peritoneum only covers the anterior surface
- Final third
 - No covering, as it is subperitoneal
- The rectum is continuous with the sigmoid colon at the level of **S3** vertebra. At this point, the **rectosigmoid junction**, the teniae coli of the sigmoid colon spread to form a continuous outer longitudinal layer of smooth muscle.

Vasculature of the Rectum

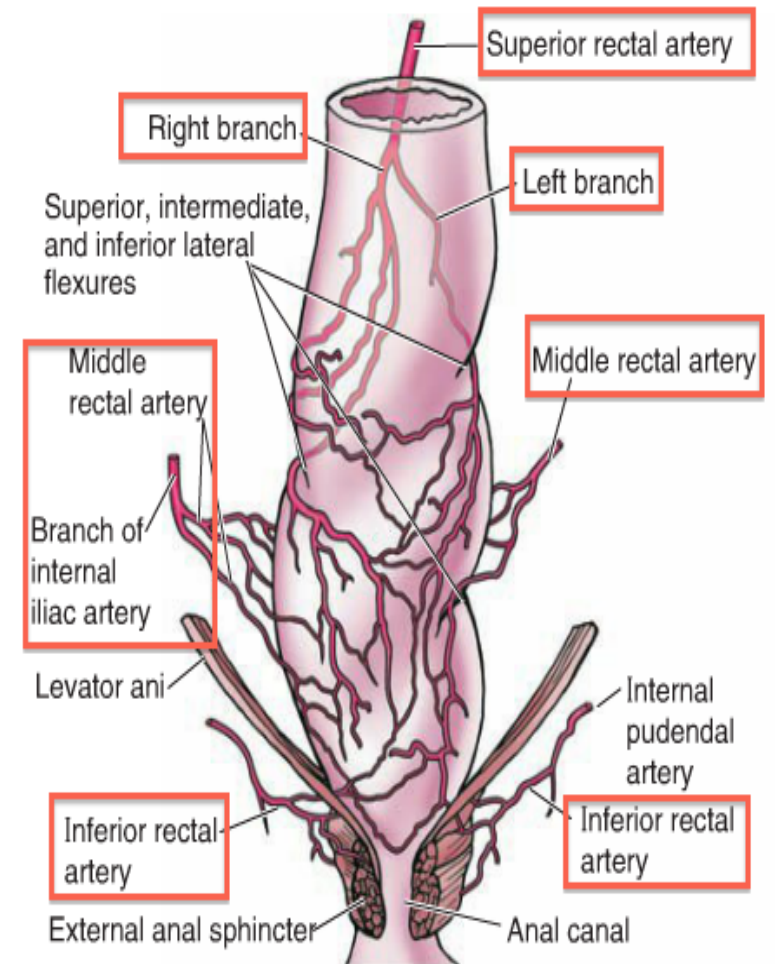
derived from the **Hindgut**, thus it receives its blood supply from the **IMA** via the **Superior Rectal arteries (R+L branches)**.

The distal rectum receives its blood supply from branches off the **Internal Iliac Arteries**, the **Right and Left Middle Rectal**, and off the **Inferior Pudendal Arteries**, the **Right and Left Inferior Rectal Arteries**

Aorta → IMA → Superior Rectal → R+L Branch

Aorta → Common Iliac → R+L Internal Iliac → R+L Middle Rectal

Aorta → Common Iliac → R+L Internal Iliac → Inferior Pudendal → R + L Inferior Rectal



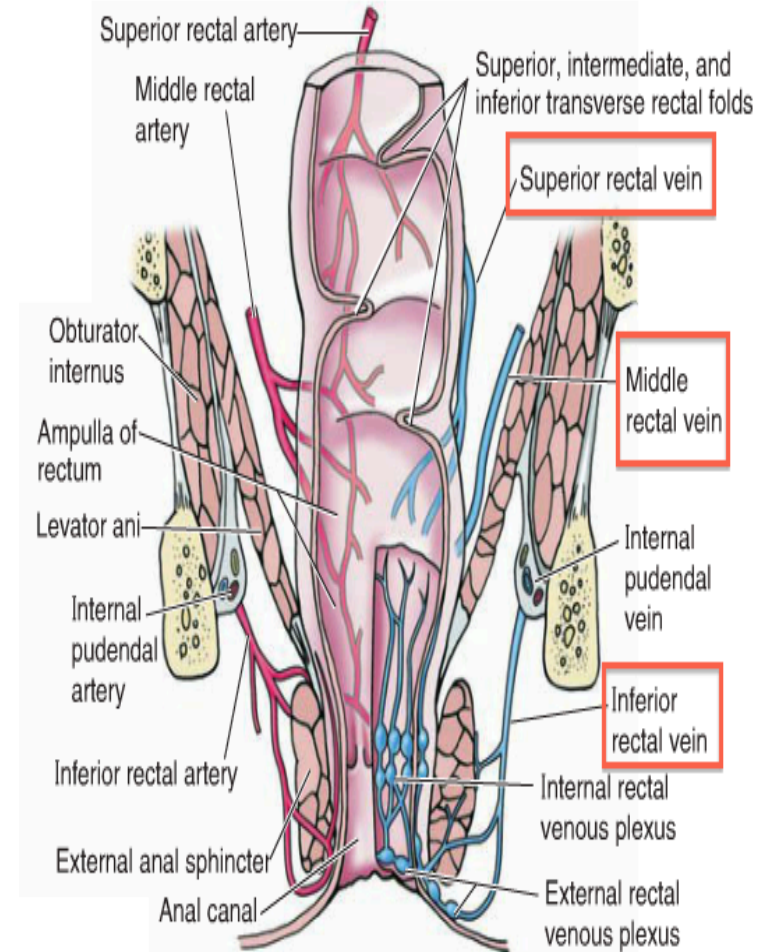
Venous drainage of the rectum

is through the **Superior, Middle and Inferior Rectal Veins.**

The Superior Rectal Vein → IMV → Splenic and Portal vein

The Middle and Inferior Rectal veins → systemic system.

The **anastomoses** between the **Portal and Systemic venous systems** in the Rectum/Anal Canal are clinically important in **Portal Hypertension (varices).**



Anal Canal

is the terminal part of the large intestine and of the entire digestive canal.

The canal begins where the **Rectal Ampulla** narrows at the level of the U-shaped sling formed by the **puborectalis muscle**, and ends at the **Anus**.

The anal canal, surrounded by internal and external anal sphincters, descends posteroinferiorly between the **anococcygeal** ligament and the **perineal body**.

The canal is collapsed, except during the passage of faeces. Both sphincters must relax before defecation can occur.

Internally, the superior half of the mucous membrane of the anal canal is characterised by a series of longitudinal ridges called **anal columns**. These columns contain the terminal branches of the superior rectal artery and vein

The **anorectal junction**, indicated by the superior end of the anal columns is where the rectum joins the anal canal. At this point the rectal ampulla abruptly narrows as it traverses the pelvic diaphragm. The inferior ends of the anal columns are joined by **anal valves** and superior to the valves are **Anal Sinuses**.

The anal canal superior to the Pectinate line differs from the part inferior to the Pectinate line in its **arterial supply, innervation and lymphatic drainage**.

Vasculature of the Anal Canal

Above the Pectinate line, the Anal Canal is derived from the **Hindgut**, thus its blood supply is from the IMA, via the **Superior Rectal** artery .

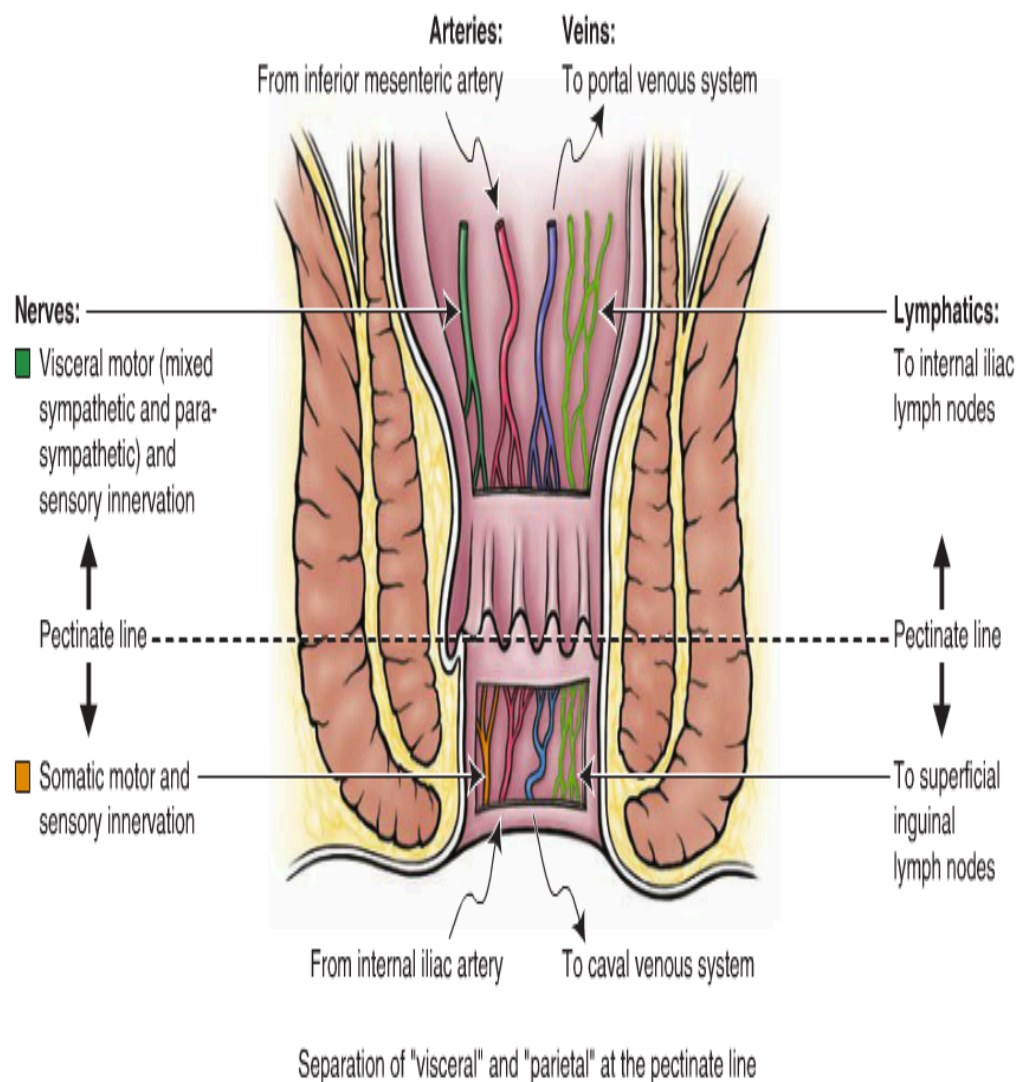
Below the Pectinate line, the Anal Canal is derived from **Endoderm** and gains its blood supply from the two **Inferior Rectal Arteries**.

The **Middle Rectal Arteries** assist with the blood supply to the anal canal by forming **anastomoses** with the Superior and Inferior Rectal Arteries.

Innervation of the Anal Canal

Above the Pectinate line, nerve supply is visceral. Therefore superior to the Pectinate line, the anal canal is sensitive only to stretching. All visceral afferents travel with the parasympathetic fibres to spinal sensory ganglia S2-S4 (referred pain).

Below the Pectinate line, nerve supply is somatic, derived from the Inferior Anal Nerves, branches of the Pudendal Nerve. Therefore, below the Pectinate line, the Anal Canal is sensitive to pain, touch and temperature, and pain is well localised.



Rectovesical Pouch

In males, after the second third of the rectum, the peritoneum **reflects into the posterior wall of the bladder, forming the floor of the rectovesical pouch.**

Rectouterine Pouch (Pouch of Douglas)

In females, after the second third of the rectum, the peritoneum **reflects** onto the posterior part of the **fornix of the Vagina**, forming the floor of the **rectouterine pouch**.

Vesicouterine Pouch

The peritoneal reflection in females between the **Uterus** and **Urinary Bladder**

