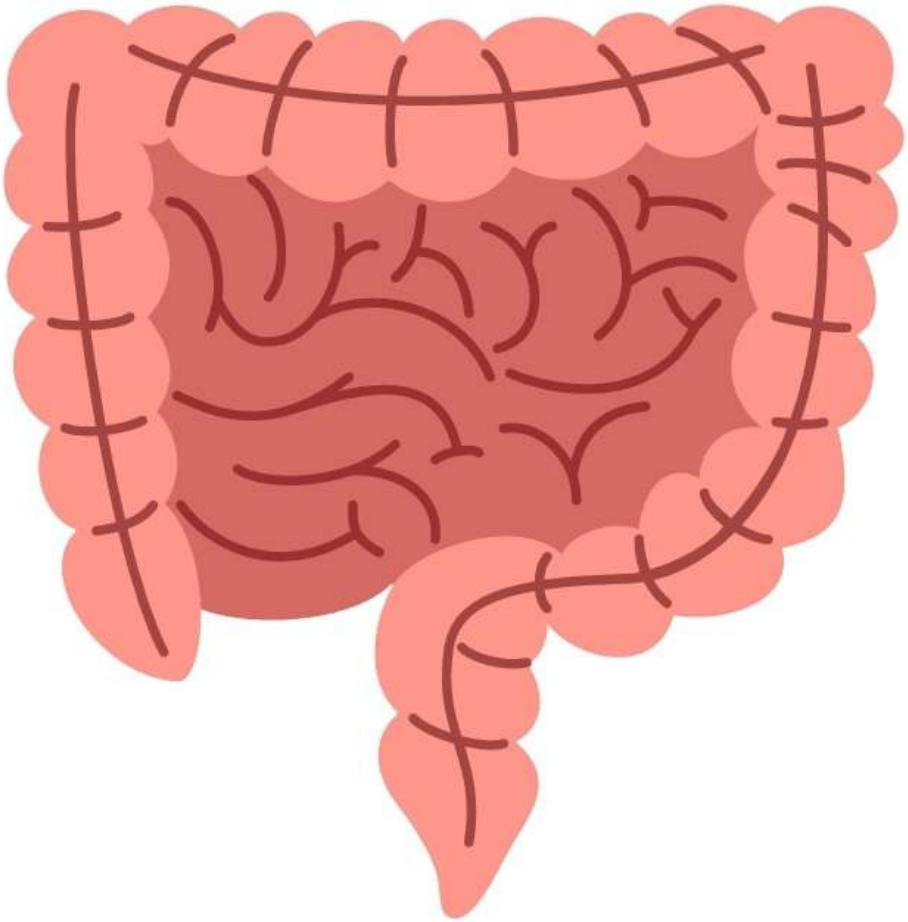
GIS

Sheet no. 1

Anatomy



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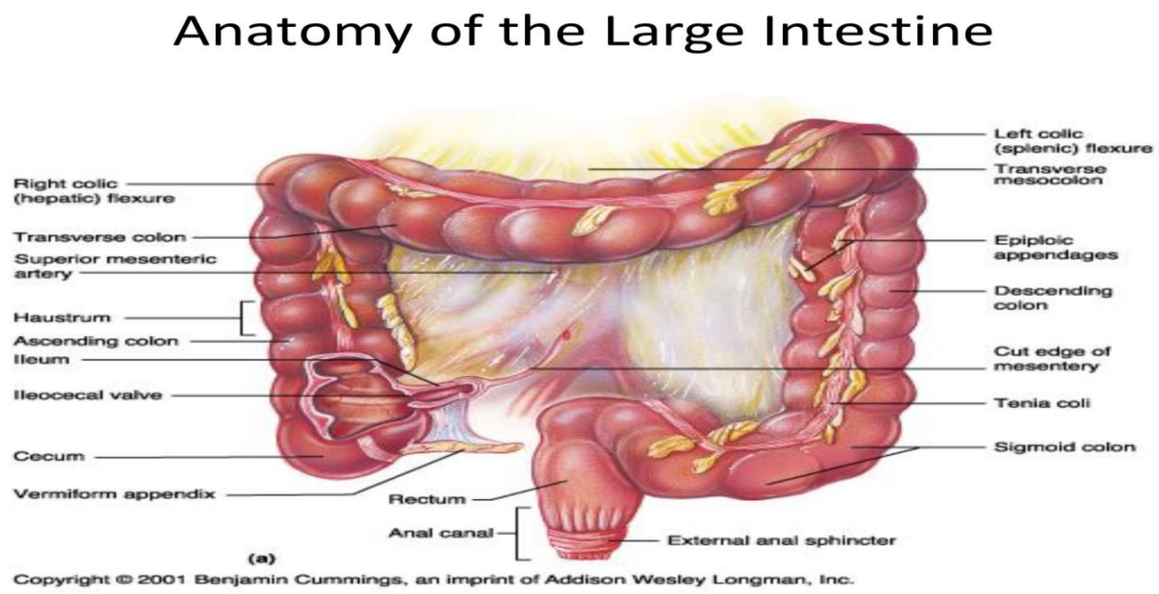
Doctor: Mohammad AlMohtaseb

Large Intestine :

✓ The diameter of large intestine is larger than the small intestine.
✓ The length of small intestine (jejunum and ileum) is 6m while the large intestine is 1.5-2.5m .
✓ Regarding the function :

1- The small intestine mainly for absorption of nutritive material.
2- The large intestine for : absorption of water , formation of feces (stool) .



Some specific features (note the coloured parts in the figure**):**

1- Sacculation or haustra .

2- Tenia coli :

- three separate bands or longitudinal ribbons of smooth muscle originate from outer longitudinal muscle.
- Found all over large intestine **except appendix and rectum**.
- It's found only on one side and that's why its contraction causes the formation of sacculation/ haustra .
- It's a landmark for the base of appendix, so when appendix is retrocecal we track tenia coli until reaching the cecum ,it ends and indicates the base of appendix.

3- **tags of fats** (Appendices epiplolca)

- adipose structures protruding from the serosal surface of the colon .
- Found all over large intestine except appendix, Cecum and rectum. ✓ Sometimes needed for energy.

Then notes :
the left colic or (splenic because of the spleen) flexure.
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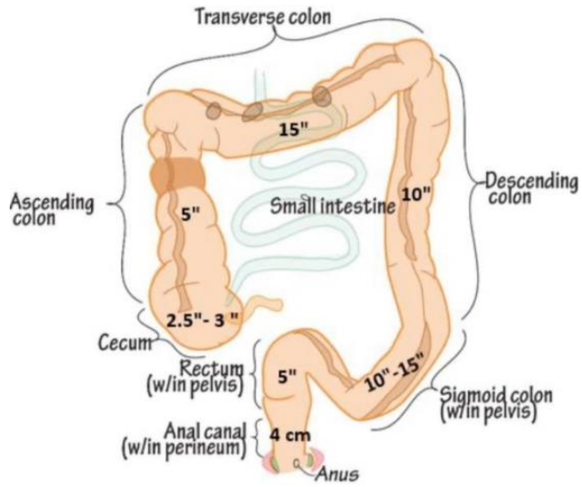
✓ **Extends from ileocecal valve to anus** .

✓ Length = 1.5- 2.5m = no 5 feet.

✓ Regions:

– Cecum = 2.5- 3 inch

– Appendix= 3-5 inch



– Colon:

- Ascending= 5 inch.
- Transverse= 15 inch.
- Descending= 10 inch.
- Sigmoid colon = 10 – 15 inch.

– Rectum= 5 inch.

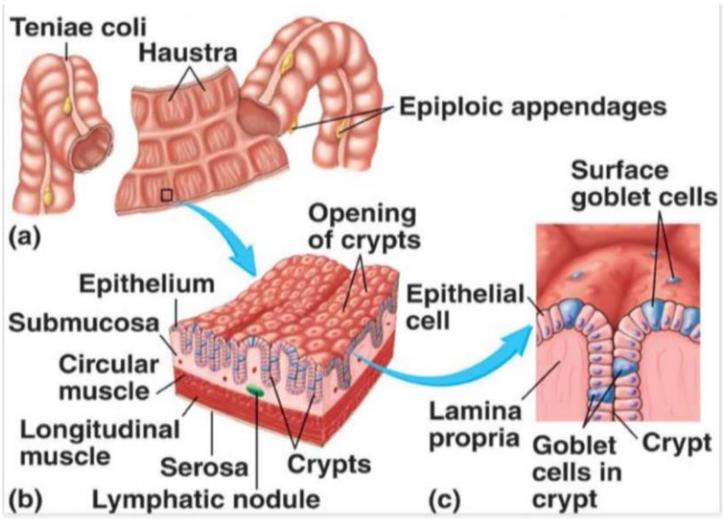
– Anal canal= 4 cm.

Histology : (اذا ناوي تأوّت الهستو ادرس هاي الفقرة ، لأنها مذكورة بالهستو بالتفصيل) .

✓ The layers of large intestine are similar to those of the small intestine.

✓ The large intestine has no villi (it has straight surface).

✓ The lining epithelium of large intestine is the same as the small intestine (simple columnar epithelium with goblet cells, same as small intestine but with **numerous goblet cells**, because they are needed for lubrication of hard pieces of stool).



✓ The Glands (crypts of Lieberkühn) on base but don't have paneth cells but contain lymphatic nodules.

CECUM:

✓ It is a blind-ended pouch.

✓ Location: situated in the right iliac fossa, above the lat 1⁄2 of inguinal ligament lying above iliacus muscle and psoas major muscle.

✓ Size: It is about 3 inch in diameter.

Regarding the peritoneum:

Cecum is fixed to the right iliac fossa , and Completely covered with peritoneum and doesn't have a mesentery.

The cecum has three opening to the structure that's attached with :

1- Superiorly: Ascending colon .

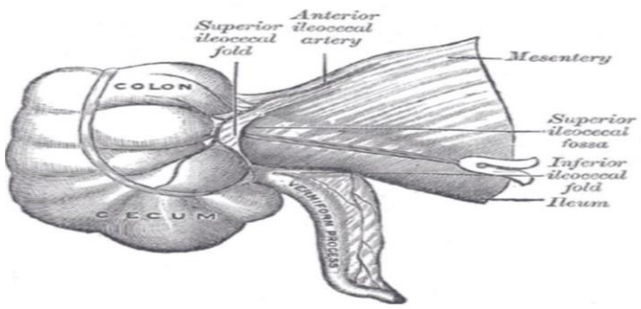
2- posteromedial surface: is the appendi , 1 inch below ileocecal valve .

3- medially: Ileum (what specializes ileocecal opening is the presence of mucosal fold on it that closes the ilium when the pressure inside the cecum increases, so no regurgitation of material from cecum to ilium happens.)

Ileocecal opening is considered physiologically a valve but anatomically it's an opening because there's no circular smooth muscle around it (discussed in previous sheets).

The presence of peritoneal folds in the vicinity of the cecum creates :

- The superior ileocecal recesses.
- The inferior ileocecal recesses.
- The retrocecal recesses.



The retrocecal recesses These recesses can form internal hernia & common sitefor appendix to be hidden there.

Relations of cecum:

Anteriorly:

- Coils of small intestine, specifically ilium.
- the greater omentum
- the anterior abdominal wall in the right iliac region where we test the patient's cecum.

Postero- medially:
The appendix is commonly > retrocecal common.

Medially:
- Small intestine(ileum)

Posteriorly:
- The psoas major and the iliacus muscles.
- the femoral nerve.
- and the lateral cutaneous nerve of the thigh passing to the anterior superior iliac spine.
-external iliac vessels in iliac fossa passing below inguinal ligament to give femoral artery.

Blood Supply of cecum Arteries:

Anterior and posterior cecal arteries >> a branch of Superior mesenteric artery.

Venous drainage:

The veins correspond to the arteries (anterior and posterior cecal veins) and drain into the superior mesenteric vein.

Lymphatic Drainage of cecum :

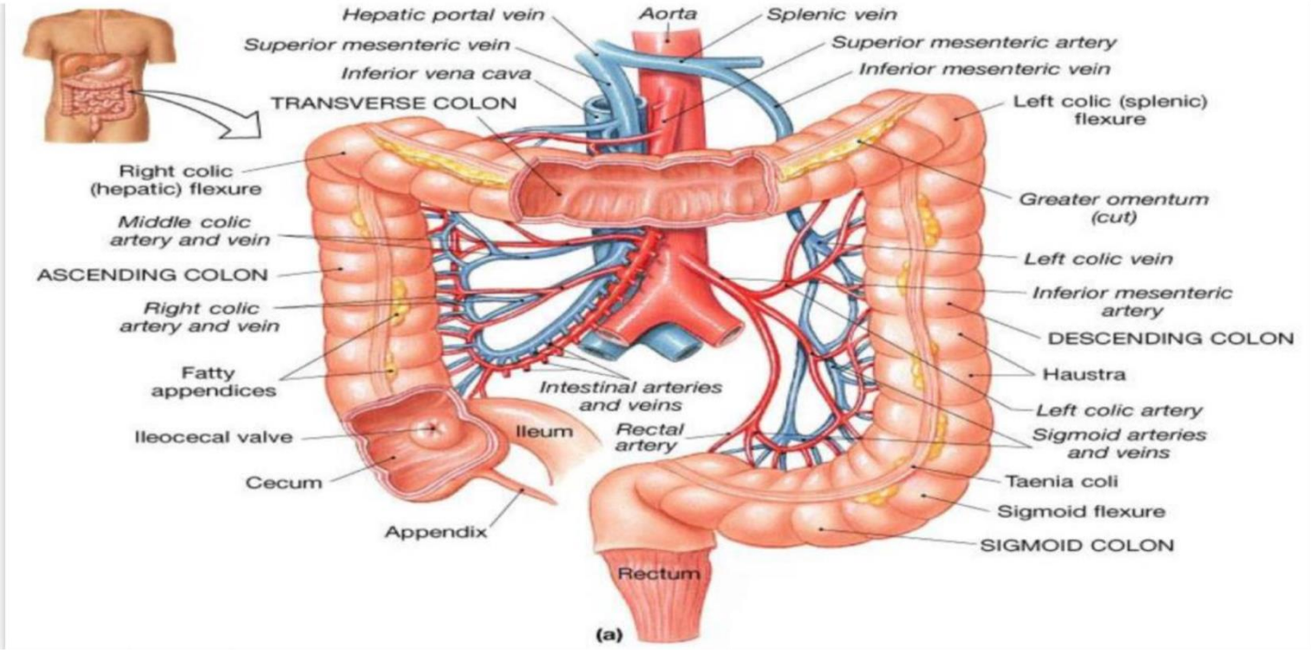
• The lymph vessels pass through several mesenteric nodes & finally reach the superior mesenteric nodes.

Nerve Supply of cecum :

Branches from the sympathetic and parasympathetic (vagus) nerves form the superior mesenteric plexus.

-Parasympathetic: from vagus nerve.

-Sympathetic: from greater splanchnic nerve.



In this figure :

✓ Note the abdominal aorta and the inferior vena cava.

✓ Note the inferior mesenteric artery **At the L3**

✓ Note also the superior mesenteric artery & its branches jejunal and ilial Intestinal arteries and veins and The ileocolic.

✓ Relation between mesenteric arteries and veins (either superior or inferior) :

Arteries are medial and veins are lateral.

Ileocecal Valve

✓ A rudimentary structure.

✓ consists of two horizontal folds of mucous membrane.

✓ Project around the orifice of the ileum.

✓ The valve plays little or no part in the prevention of reflux of Cecal contents into the ileum.

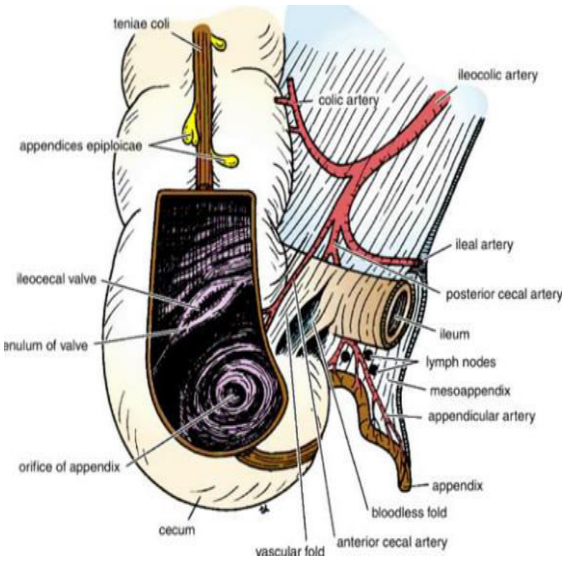
✓ The circular muscle of the lower end of the ileum (called the ileocecal sphincter by physiologists) serves as a sphincter and controls the flow of contents from the ileum into the colon.

✓ The smooth muscle tone is reflexly increased when the cecum is distended; the gastrin hormone, which is produced by the stomach , causes relaxation of the muscle tone.

Appendix (from mid gut)

Location and Description:

- **Description** it is a narrow (with a very narrow lumen), muscular tube, containing a large amount of lymphoid tissue (it is considered as lymphatic tissue), but if it resected other lymphoid tissues in the body can compensate its function.
- Although it is a part of GI tract (mid gut), it has no role in digestion. It is involved in immunity.
- Its length from 3 to 5 inches, another books state from 2 to 22cm; it may be very short or very long due to the variation. (in infection the size is increased due to edema and inflammation)
- It has base, apex and mesoappendix(mesentery):
  -The base is attached to the posteromedial surface of the cecum about 1 in. (2.5 cm) below the ileocecal opening (junction/valve)
  -The remainder of the appendix is free.
- It has a complete peritoneal covering (intraperitoneal organ), which is attached to the mesentery of the small intestine by a short mesentery of its own, the mesoappendix.
- The mesoappendix contains the appendicular vessels, nerves, lymph nodes.

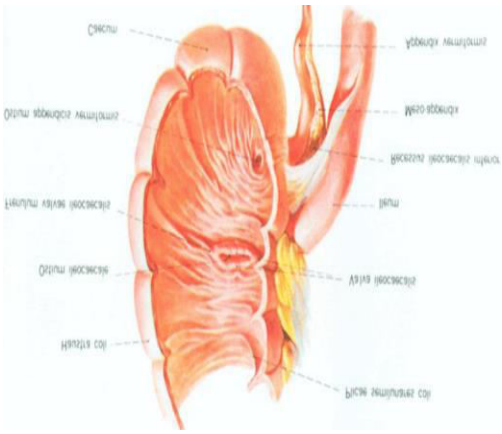


Position:

- The appendix is part of the large intestine, lies in the right iliac fossa, and in relation to the anterior abdominal wall, it may be found in different positions, including:

1. Retrocecal: in retrocecal recess, behind cecum in 74% of people. (most common site).

-- Note: Cecum has fold of peritoneum, and this peritoneum form fossae and recesses like superior ileocecal, inferior ileocecal and retrocecal fossa.



2. Pelvic: in pelvis related to Rt. Ovary and uterine tube in 21% of people.
3. Subcecal: below cecum in 3.5% of people.
4. Preileal: infront of ileum in 1% of people.
5. Postileal: behind the ileum in 0.5% of people.

- To determine the location of appendix in retrocecal fossa: by tracking the tenia coli to the base until it converges around the appendix.

Surface anatomy of appendix – (McBurney's point):

>>McBurney is the finder of this point

- McBurney's point: the point between the upper 2 thirds and the lower third of the line joining the right anterior superior iliac spine to the umbilicus, where the base of the appendix is situated.

- Clinical case:

-when a patient with appendicitis ,after admitting him 24hours and analyzing his blood, if his WBC count was high and after following him, we are 50% sure that he has appendicitis, the only treatment we have is appendectomy, why?

Because when the appendix is inflamed, it will be expanded, and has a congested lumen filled with fluids and blood. So, it is very important to treat it immediately to avoid its rupture that causes a very dangerous condition known as peritonitis.

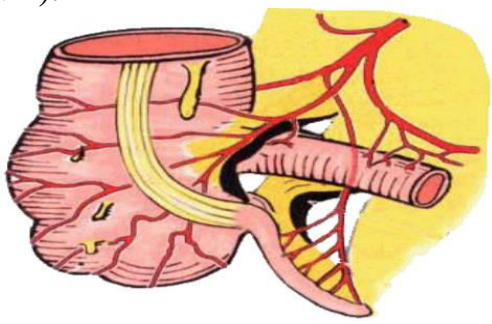
- No sedative drugs or antibiotics must be given to avoid masking the symptoms.

- In the past, appendectomy was done by making an incision parallel to inguinal ligament and passes through McBurney's point. This incision, called McBurney's incision. Nowadays, endoscope is used instead, accompanied by surgical instruments passing through 4 openings around the umbilicus (6hs hospitalization).

Blood Supply of appendix:

- Arteries:

-The appendicular artery (A branch from posterior cecal artery (ilio-cecal artery), which descends behind the ileum).



- Note: Appendicular artery runs in a free margin of the mesoappendix

-Note: the superior mesenteric artery gives off a branch that is called the ileocecal artery which gives off a branch called posterior cecal artery.

- Veins:
  -The appendicular vein drains to posterior cecal vein.

Lymphatic Drainage of appendix:

-The lymph vessels drain into one or two nodes lying in the mesoappendix→ eventually into the superior mesenteric nodes around the origin of superior mesenteric artery.

Nerve supply of the appendix:

- The appendix is supplied by the sympathetic(vasomotor) and parasympathetic (vagus) nerves from the superior Mesenteric plexus.

- Afferent sensory nerve fibers concerned with the conduction of visceral pain from the appendix accompany the sympathetic nerves and enter the spinal cord at the level of the 10th thoracic segment.

- Also, the skin over umbilicus is innervated by T10 dermatome.

⟶ So, appendicitis patients will feel pain around the umbilicus at the beginning of the appendicitis after that it will be concentrated in the region of the right iliac fossa.

Clinical notes:

- **Acute appendicitis is uncommon in the two extremes of life; it affects old adults and young children.

- Thrombosis of appendicular artery completely cuts off the blood supply which results in gangrene since there is just one artery for appendix. This results in perforation and drainage of fluids from the appendix into the right paracolic gutter.

- While in acute cholecystitis, there will be no gangrene because more than one artery supplies the gallbladder (cystic artery + arterial supply directly from the liver (as it is embedded in the liver).

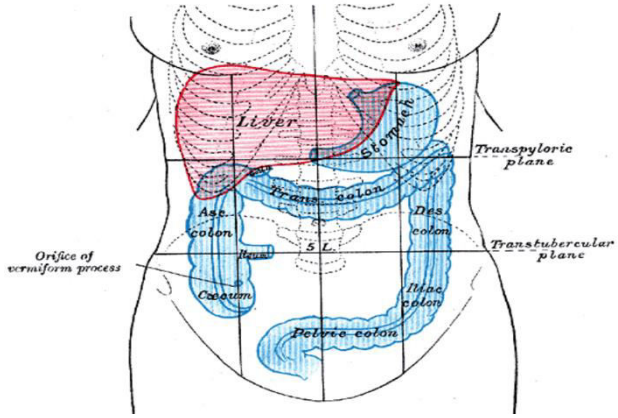
****The dr said (also the slides) that acute appendicitis is uncommon in the two extremes of life. However, he continued that it affects old adults and young children >_<**

Ascending Colon **(from midgut)**

Location and Description:

- The ascending colon is about 5 inches (13 cm) long.
- lies in the right lower quadrant.
- It extends upward from the cecum to the inferior surface of the right lobe of the liver, where it turns to the left forming the right colic flexure (right hepatic flexure), then continues with the transverse colon.
- Taenia coli, sacculation & appendeces epiplolca are present.
- The peritoneum covers the front and both sides of the ascending colon, fixing it to the posterior abdominal wall (Therefore, the ascending colon is retroperitoneal organ).

➟ Paracolic gutter presents on medial and lateral sides, this aids in the passage of fluid and infections.



- From the pic. above, note that the left colic flexure (splenic flexure) is higher than the right colic flexure and is attached to phrenicocolic ligament.

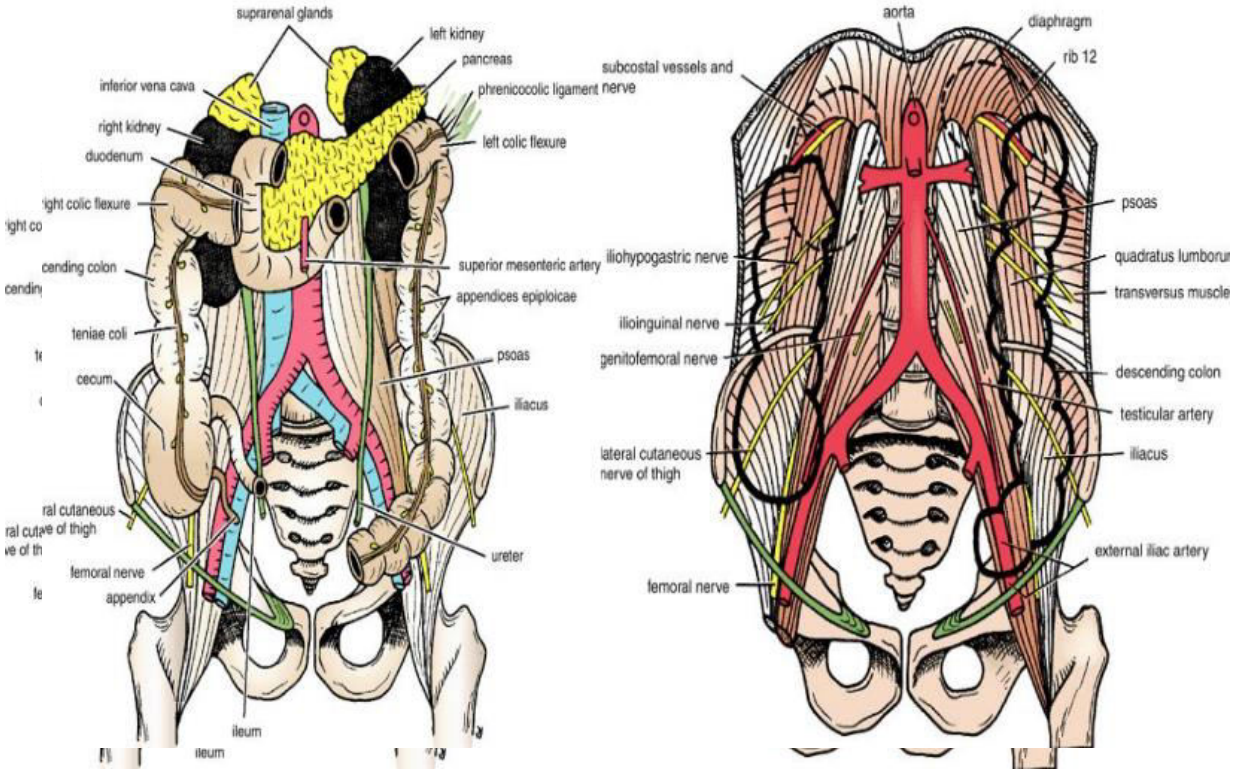
- Phrenicocolic ligament (between the diaphragm and splenic flexure) has three functions:
  1. Fixation of the left colic flexure.
  2. Holding the spleen which lies above it.
  3. Prevent infection to pass upward under diaphragm.

Relations of ascending colon:

NOTE: The ant. Relations are (same for both ascending and descending colons

- Anteriorly:
  1. The anterior abdominal wall
  2. The greater omentum
  3. Coils of small intestine(ilium)

- Posteriorly:
  1. The iliacus muscle
  2. The iliac crest
  3. The quadratus lumborum
  4. The origin of the transversus abdominis muscle
  5. The lower pole of the right kidney
  6. The ilioinguinal and iliohypogastric nerves (L1) cross behind it.



Blood Supply of Ascending colon:

- Arteries

- The ileocolic & right colic branches of the superior mesenteric artery supplies this area.

NOTE:

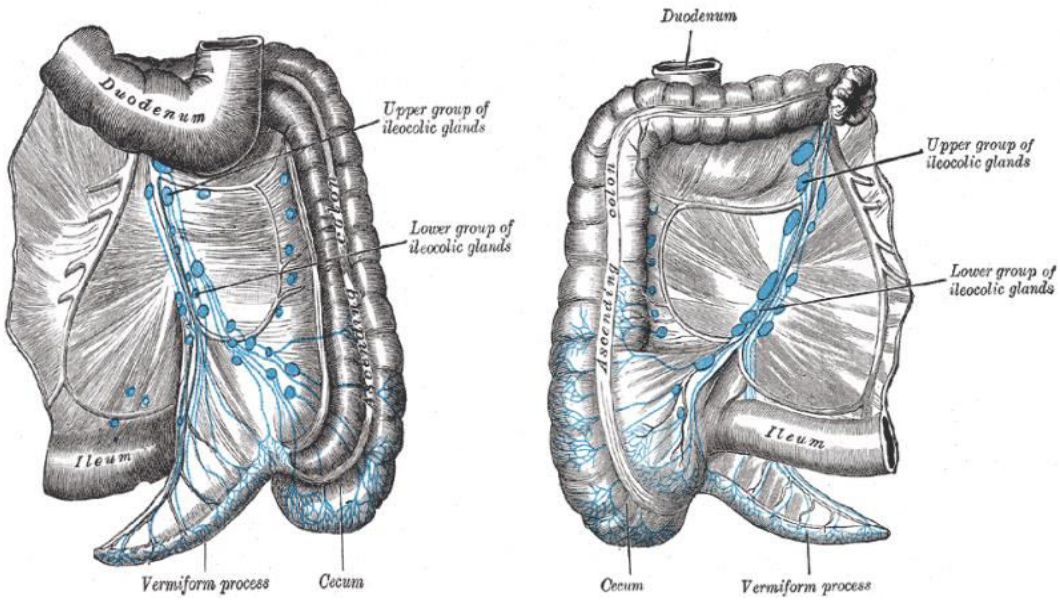
- The ileocolic artery supplies the ileum, caecum and the beginning of the ascending colon.

- Veins

- The veins correspond to the arteries and drain into the superior mesenteric vein. The superior mesenteric V. meet the splenic V. behind neck of pancreas to form the portal vein.

Lymphatic drainage of Ascending colon

-The lymphatic vessels drain into lymph nodes lying along the course of the colic blood vessels then the superior mesenteric nodes around the origin of the superior mesenteric artery.



Nerve Supply of ascending colon:

-Sympathetic (from greater and lesser splanchnic nerves, from superior mesenteric ganglia, from (T6-T9)) and parasympathetic (vagus) nerves from the superior mesenteric plexus.

Transverse colon

- The transverse colon is about 15 in. (38 cm) long.
- extends across the abdomen.
- occupying the umbilical region.
- It begins at the right colic flexure below the right lobe of the liver then ascends to the left colic flexure below the spleen.
- Hangs downwards.
- It is intraperitoneal organ (completely covered by peritoneum), has a mesentery called transverse mesocolon.
- Suspended by the transverse mesocolon from the pancreas.
  - Transverse mesocolon is formed by the two ascending layers of greater omentum (anterior and posterior) covering superior and inferior surfaces of the transverse colon, respectively.
  Then, these two layers blend together and go to posterior abdominal wall, specifically the anterior border of pancreas.
  Some books state: it begins from the anterior border of pancreas as two layers reaching the two layers of greater omentum to surround the transvers colon
  - It contains blood vessels, lymphatic vessels, lymph nodes, sympathetic and parasympathetic fibers
- The position of the transverse colon is extremely variable and may sometimes reach down as far as the pelvis.
- Taenia coli, sacculation & appendeces epiplolca are present

Relations of Transverse colon:

- Anteriorly:
  1. The greater omentum
  2. The anterior abdominal wall (umbilical and hypogastric regions)
- Posteriorly:
  1. The second part of duodenum
  2. The head of pancreas
  3. The coils of jejunum and ilium

Blood Supply of transverse colon:

- **Arteries:**

-The transverse colon: is divided into:

- The proximal(medial) two thirds (mid gut): is supplied by the middle colic artery, a branch of the superior mesenteric artery.

- The distal(lateral) third (hind gut): is supplied by the left colic artery (has superior & inferior branches), a branch of the inferior mesenteric artery.

- **Veins:**
  - The veins correspond to the arteries and drain into the superior & inferior mesenteric veins.

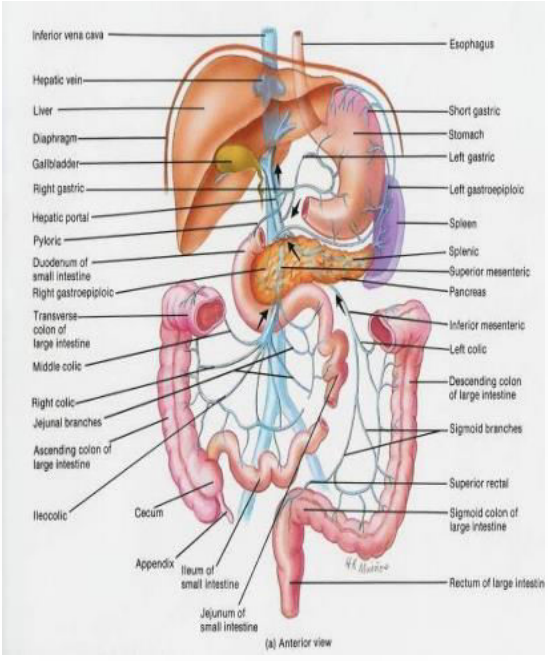
Lymphatic Drainage of transverse colon:

- The distal third drains in the colic nodes and then into the inferior mesenteric nodes
- The proximal two thirds drain in the colic node and then into the superior mesenteric nodes.

Nerve Supply of transverse colon:

- The proximal two thirds are innervated by sympathetic (superior mesenteric ganglia) and parasympathetic (vagus nerves) fibers through the superior mesenteric plexus around superior mesenteric artery.

- The distal third is innervated by sympathetic (inferior mesenteric ganglia L1-L2) and parasympathetic (Sacral spinal nerves S2-S4) fibers through the inferior mesenteric plexus around inferior mesenteric artery.



Descending Colon **(from hind gut)**

Location and Description:

- The descending colon is about 10 in. (25 cm) long.
- It extends downward from the left colic flexure to the pelvic brim (inlet of pelvis), where it continues as sigmoid colon.

- the peritoneum covers the anterior and both sides of descending colon (retroperitoneal organ).

➡ Paracolic gutters present on medial and lateral borders of descending colon

- Taenia coli, sacculation & appendeces epiplolca are present

Relations of Descending colon:

- Anteriorly
    1. Anterior abdominal wall
    2. The Greater omentum
    3. Coils of small intestine

- Posteriorly
    1. The later border of the left kidney
    2. The origin of the transversus abdominis muscle
    3. The quadratus lumborum
    4. The iliac crest
    5. The iliacus muscle
    6. The left psoas
    7. The ilioinguinal and iliohypogastric nerves
    8. The lateral cutaneous of the thigh
    9. The femoral nerve

Blood Supply of Descending colon:

- **Arteries:**

  - The left colic(mainly)and the sigmoid branches (mainly supplying sigmoid colon, but some branches supply the end of descending colon), which are branches of the inferior mesenteric artery.

- **Veins:**

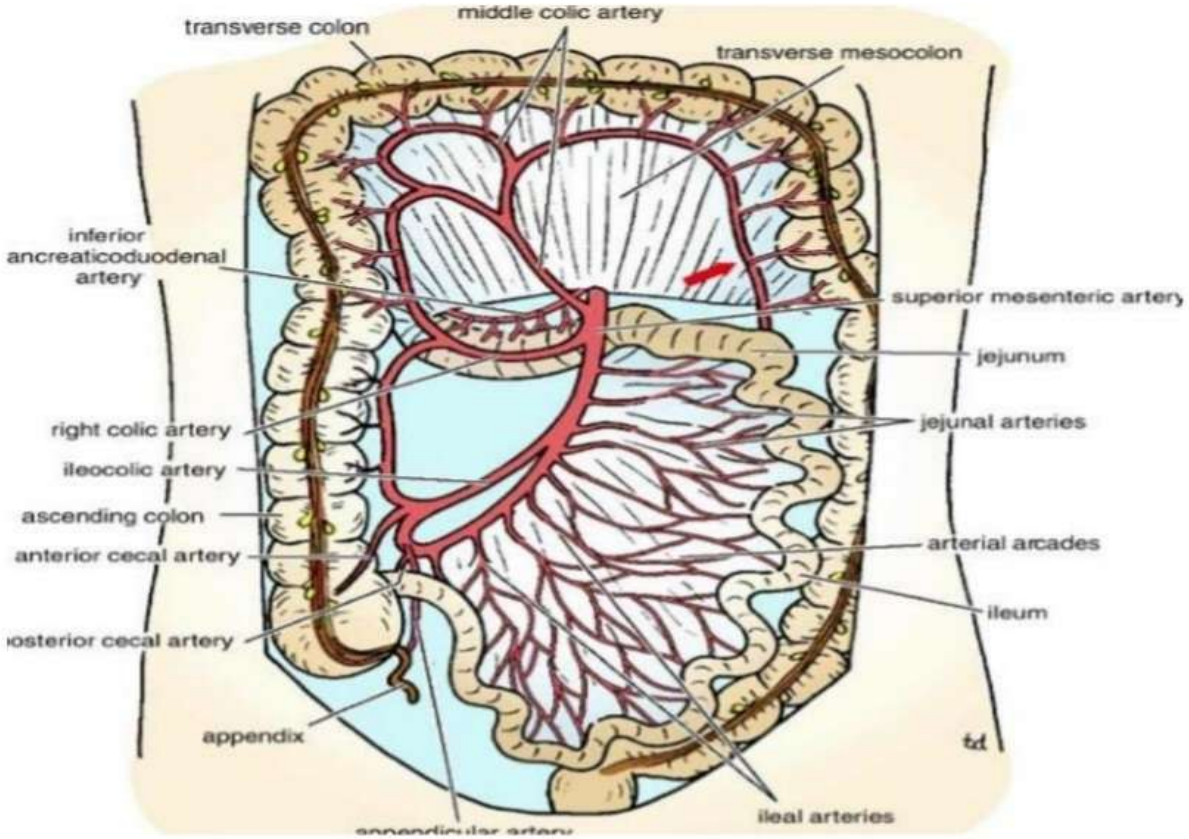
  -The veins correspond to the arteries→ into the inferior mesenteric vein.

Lymphatic Drainage of descending colon:

-The colic lymphatic nodes &the inferior mesenteric nodes around the origin of the inferior mesenteric artery.

Nerve Supply of Descending Colon:

-The sympathetic (inferior mesenteric ganglia L1-L2) and parasympathetic (sacral spinal nerves S2-S4) through the inferior mesenteric plexus around inferior mesenteric artery.


transverse colon
middle colic artery
transverse mesocolon
inferior
ancreaticoduodenal
artery
superior mesenteric artery
jejunum
jejunal arteries
right colic artery
ileocolic artery
ascending colon
anterior cecal artery
arterial arcades
ileum
osterior cecal artery
appendix
ileal arteries