# الجهاز الهضمي

## علم التشريح

رقم المحاضرة : 1


الكُتّاب: زيد المنسي و محمود جرادات

المدقق: محمد علي القيسي

الدكتور: محمد المحتسب

**Black :the text from the slides**

Underlined: what doctor said from the slide

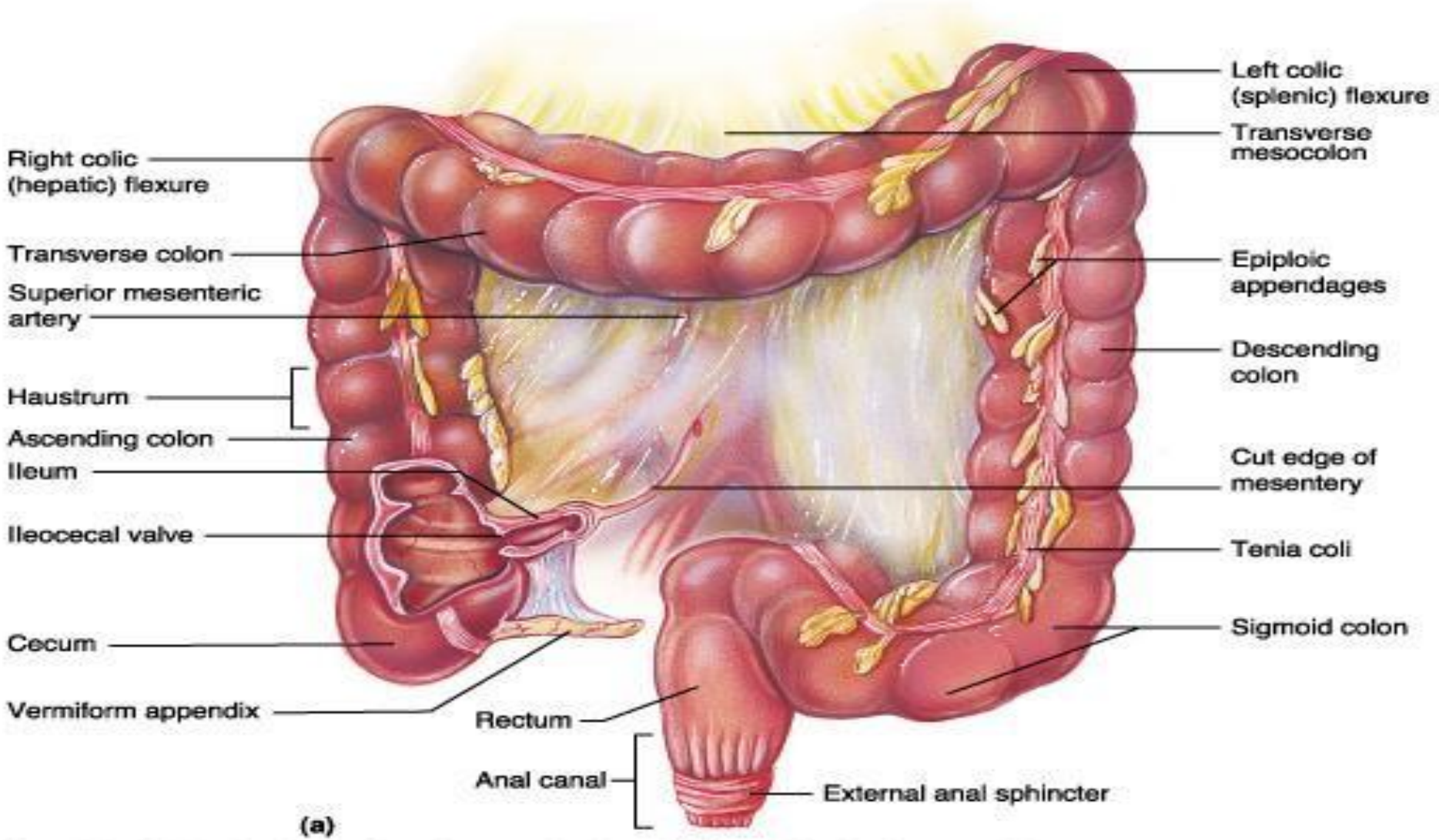
**Red : what the doc said that is not in the slide**

**Purple : IMPORTANT**

Blue : additional

# *Large intestine*

# Anatomy of the Large Intestine



The large intestine consist of :cecum ,appendix ,ascending colon ,transverse colon ,descending colon ,sigmoid , rectum and anal canal

The junction between ascending and transverse colon is called right colic flexure (hepatic).

On the left side the junction between transverse and descending colon is called left colic flexure (splenic),it is attached to it the phrenicocolic ligament which separates upper abdomen from the lower.

The splenic usually higher than the right flexure.

The diameter of the large intestine is larger than small intestine .

The length of the large intestine is 1.5– 2.5m while small intestine is 6m .

The function of the large intestine is: absorption of water and formation of feces.

**The features of the large intestine:**

1:Sacculation(تكيس) : haustration

2:Taenia coli : three bands of smooth muscle, it descends downward to reach the base of the appendix (Founds all over the large intestine except appendix and rectum)

3:Tags of fat (زوائد دهنية) : it’s called epiploic appendices

# Large Intestine

- Extends from ileocecal valve to anus
- Length = 1.5- 2.5m = 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

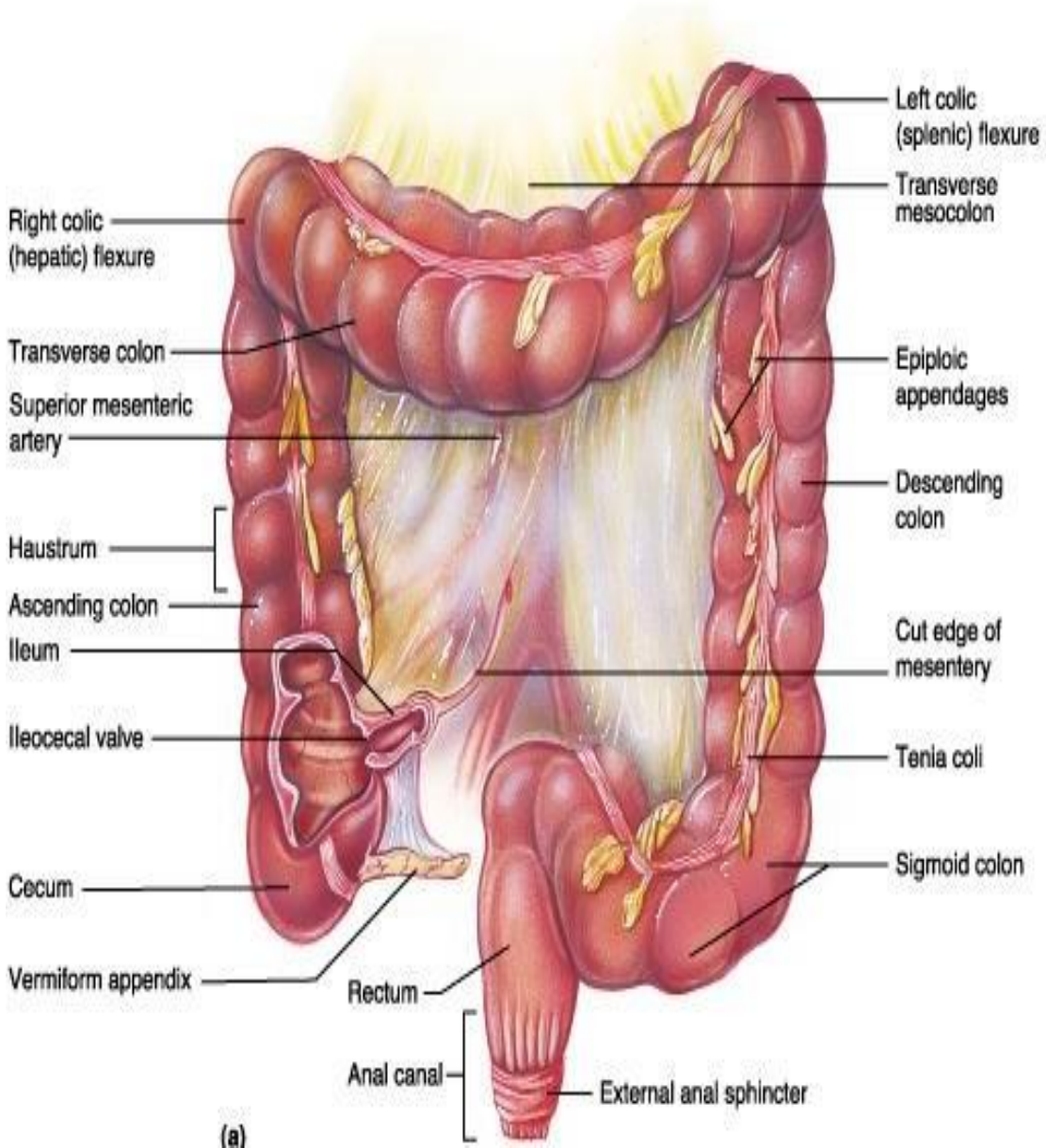
These numbers for memorizing

# General features of large intestine

1 **<u>Sacculation= Haustra</u>**

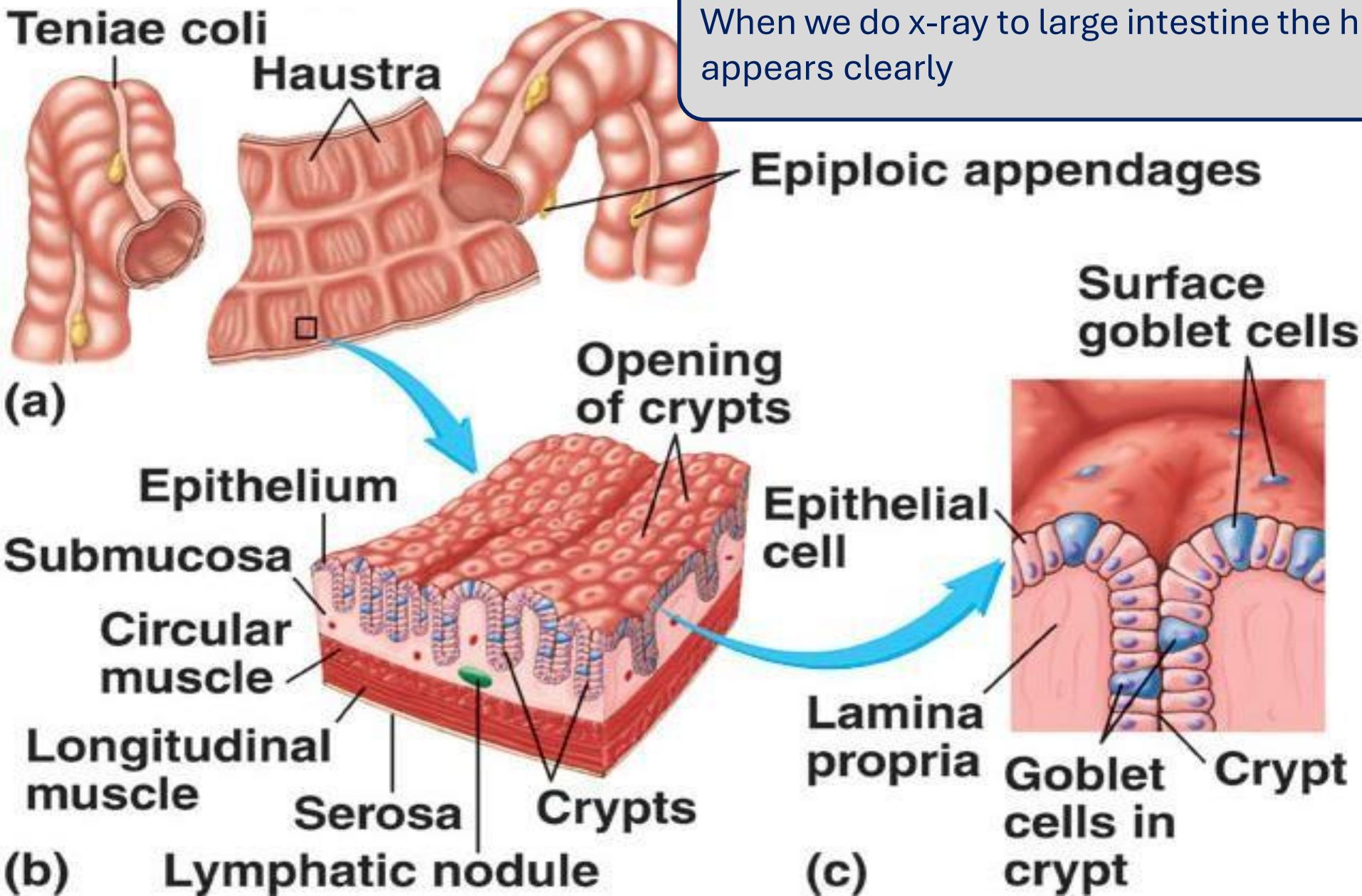
2**<u>Teania coli</u>(**three separate longitudinal ribbons of smooth muscle)→ **<u>except appendex and rectum</u>**

3**<u>Appendices epiplolca</u>(** adipose structures protruding from the serosal surface of the colon )→ **<u>except appendix , Cecum and rectum</u>**



# LARGE INTESTINE ANATOMY

When we do x-ray to large intestine the haustaration appears clearly



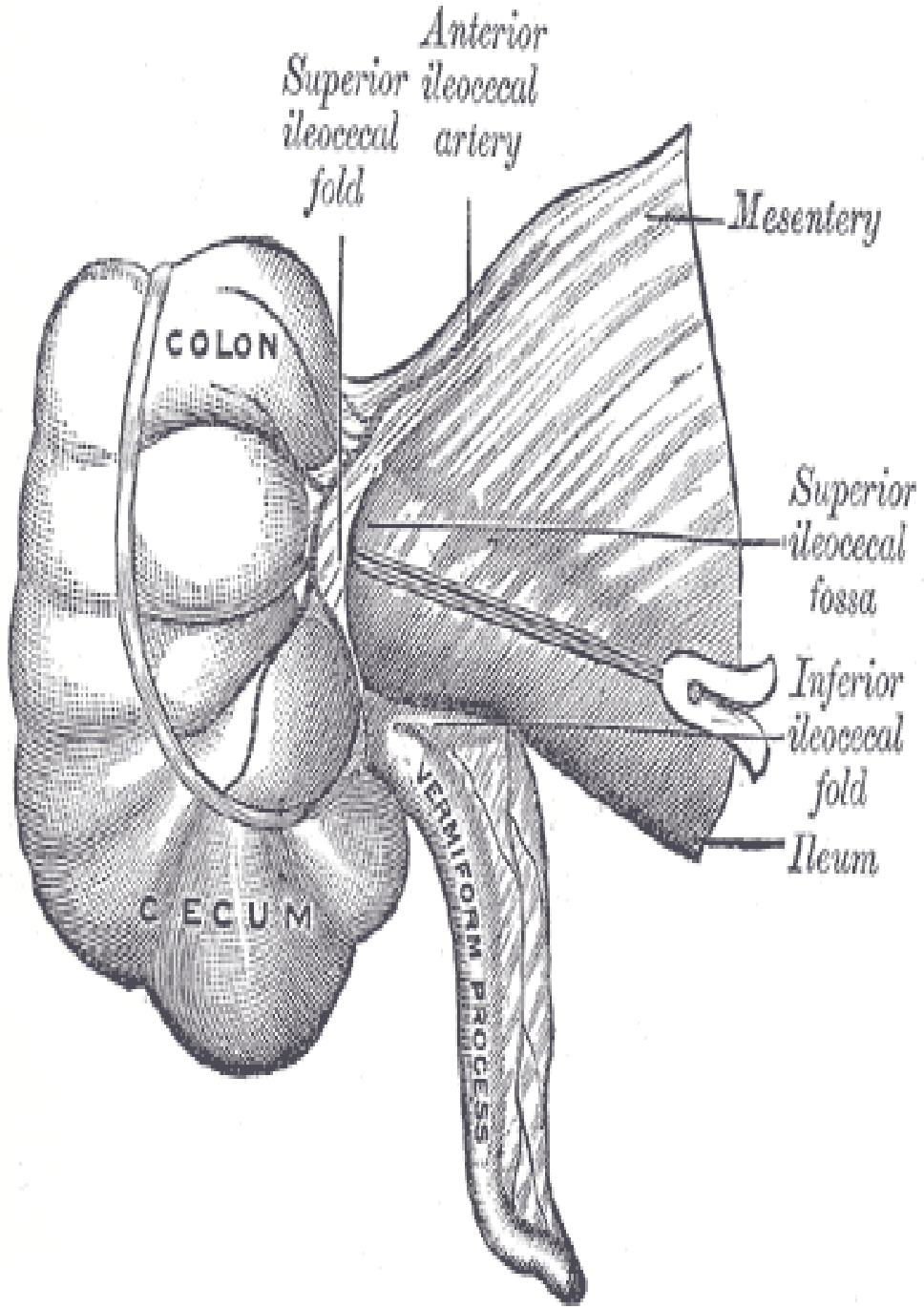
Regarding the histology of the large intestine, it’s lining with a simple columnar epithelium with numerous goblet cells, more abundant than in the small intestine due to differences in function.
Remember The function of the large intestine is: absorption of water and formation of feces,the feces are hard objects, so they need lubrication.
The goblet cells secrete mucus for lubrication
The glands (crypts of Lieberkühn) at the base of the large intestine lack Paneth cells, which are present in the small intestine and have a secretory function.

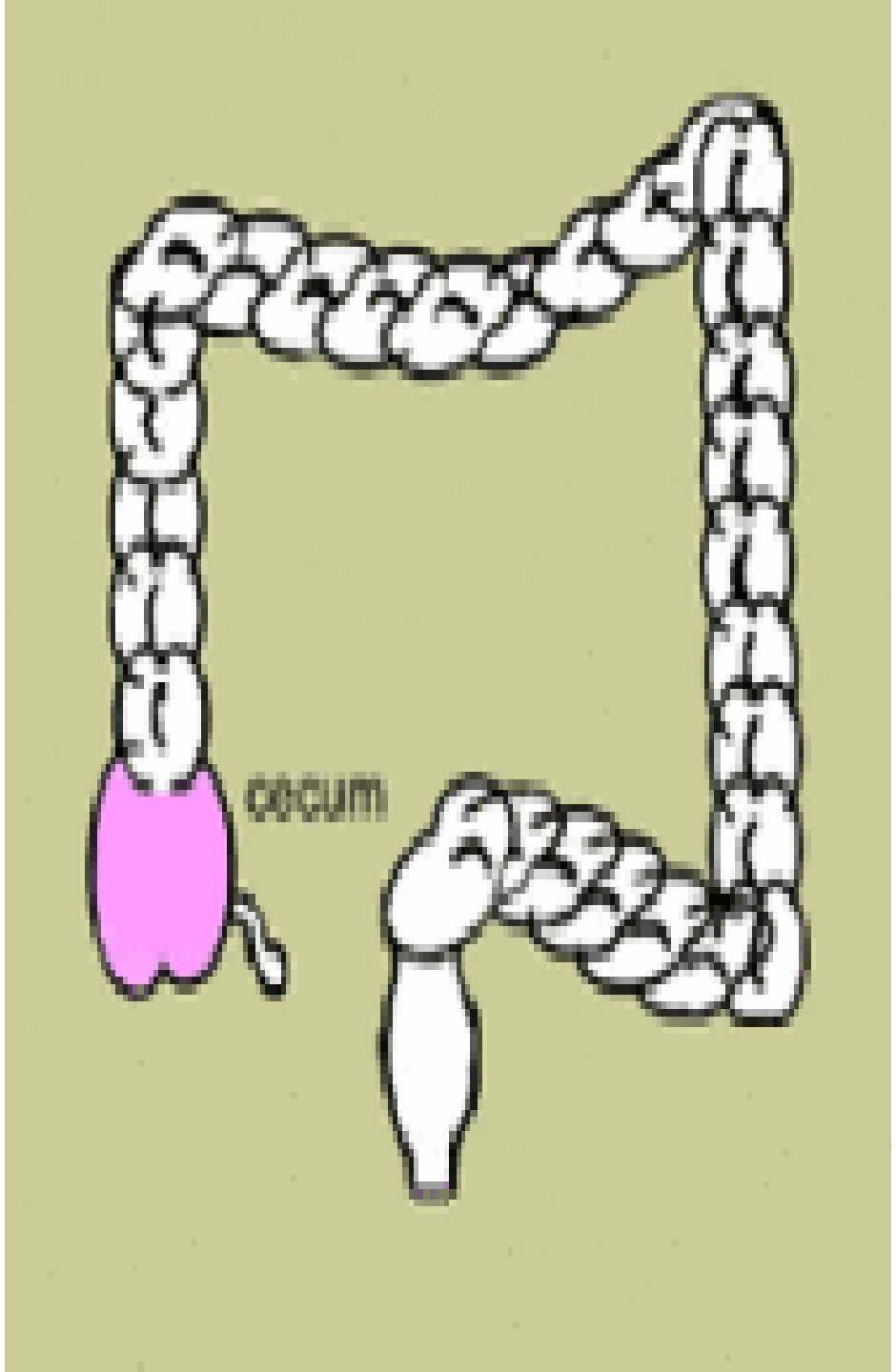
# Cecum

- It is a blind-ended pouch (عامل زي الكيس)
- Site: situated in the right iliac fossa , above the lat ½ of inguinal ligament
- Size: It is about 3 inch in diameter
- Completely covered with peritoneum.
- It possesses a considerable amount of mobility, although it does not have a mesentery.
- Attached to :
  - Ascending colon
  - posteromedially surface is the appendix , 1 inch below ileocoecal valve
  - medially→ Ileum

- The presence of peritoneal folds in the vicinity of the cecum creates
- The superior ileocecal recesses
- The inferior ileocecal recesses
- The retrocecal recesses .

Cecum is intraperitoneual organ but fixed in the right iliac fossa and because it is fixed it forms fold of peritoneal which forms recesses
The common side of appendix is retrocecal
Size: It is about 2.5- 3 inch in diameter.


Anterior ileocecal artery
Superior ileocecal fold
Mesentery
COLON
Superior ileocecal fossa
Inferior ileocecal fold
Ileum
CECUM
VERMIFORM PROCESS


cecum

The cecum has three  openings :
1 - Ascending colon .
2 - appendix.
3 -Ileum.
The cecum always has intracecal pressure inside, which does in two things:
Helps the materials that come to cecum  to ascend upwards in the ascending colon.-
Also helps in the closure of the iliocecal valve (which is a physiological or functional valve not anatomical, there is no thickening in the smooth muscle . But there is a fold of mucosa around the opening, this fold with the intracecal pressure close the ilium so that when the materials reach the cecum they can’t go back to the ilium).

# Cecum....cont

- The longitudinal muscle is restricted to three flat bands, the **taenia coli**, which converge on the base of the appendix and provide for it a complete longitudinal muscle coat .

# Relations of cecum

- **Anteriorly:**

- Coils of small intestine mostly ileum
- the greater omentum (it extends in the greater sac)
- the anterior abdominal wall in the right iliac region ( so the cecum can be palbated because of it's relation to the anterior abdominal wall)

- **Posteriorly:**

- The psoas and the iliacus muscles. (they form iliopsoas muscle)
- the femoral nerve
- and the lateral cutaneous nerve of the thigh .
- External iliac vessels forming the femoral artery.
- Postero- medially → The appendix is commonly →retrocecal common.

- **Medially:**

- **Small intestine( ileum)**

# Blood Supply of cecum

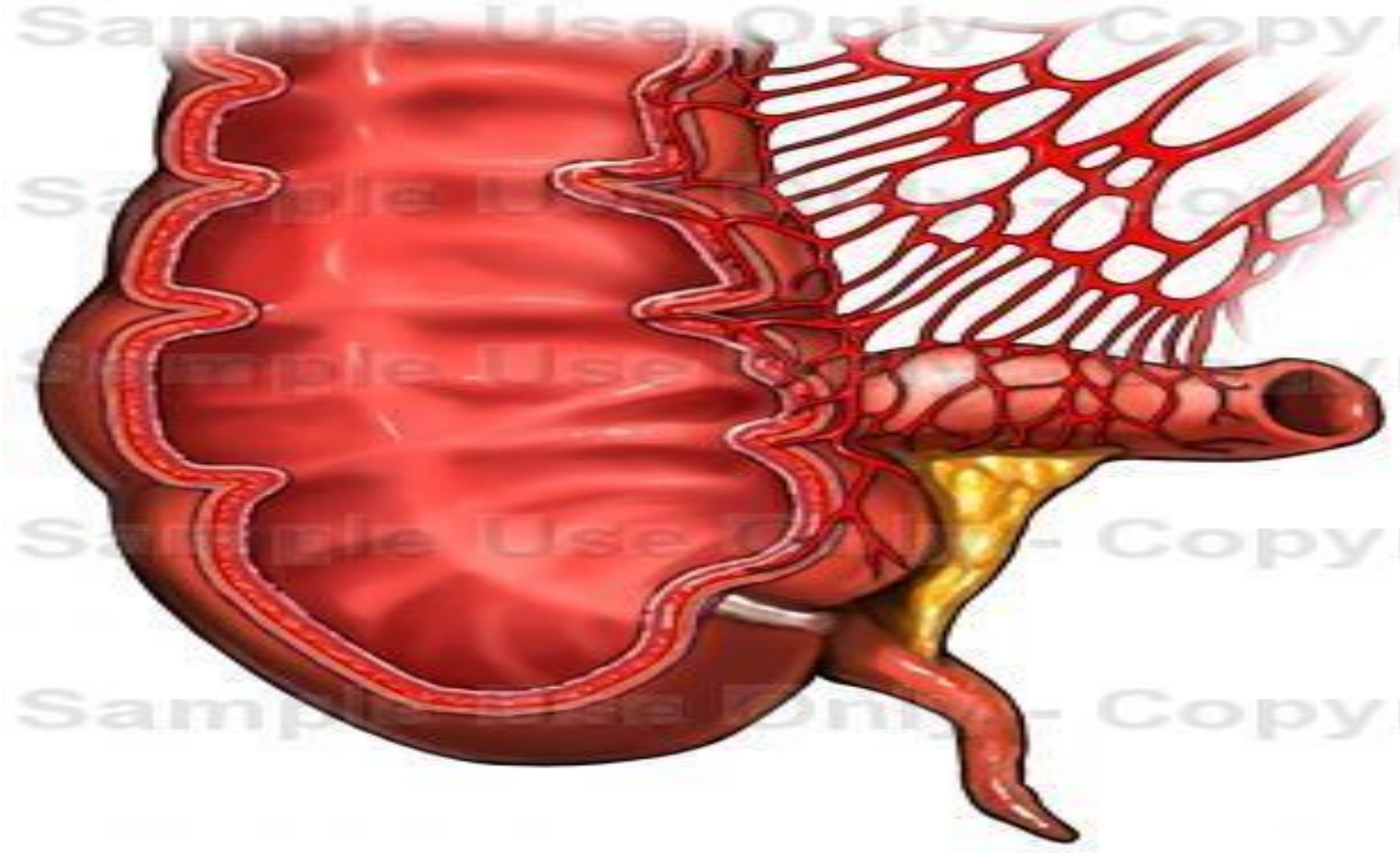
**Arteries**

- Anterior and posterior cecal arteries → a branch of Superior mesenteric artery

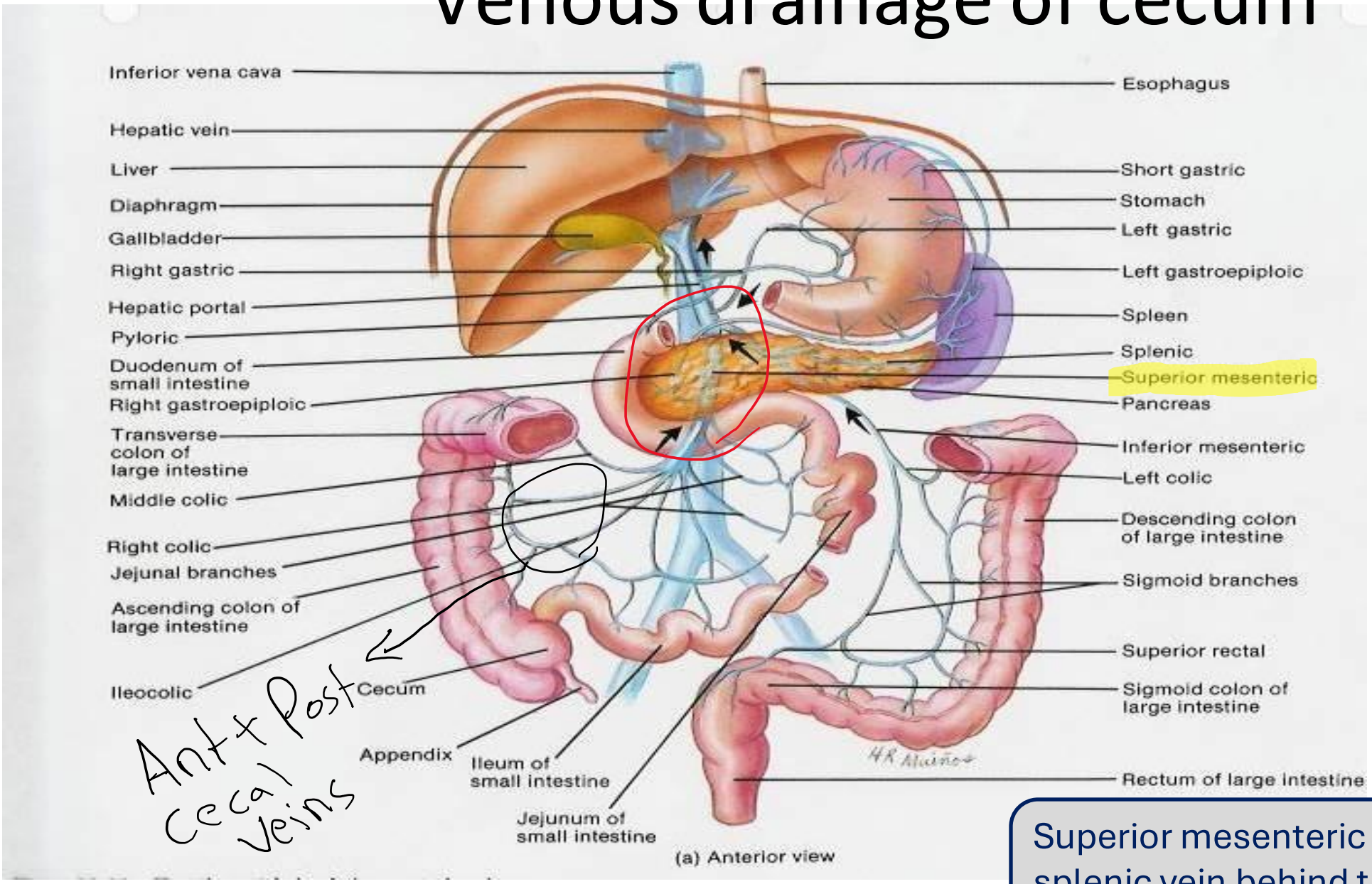
**The veins** correspond to the arteries and drain into the superior mesenteric vein.

tributaries to the superior mesenteric vein

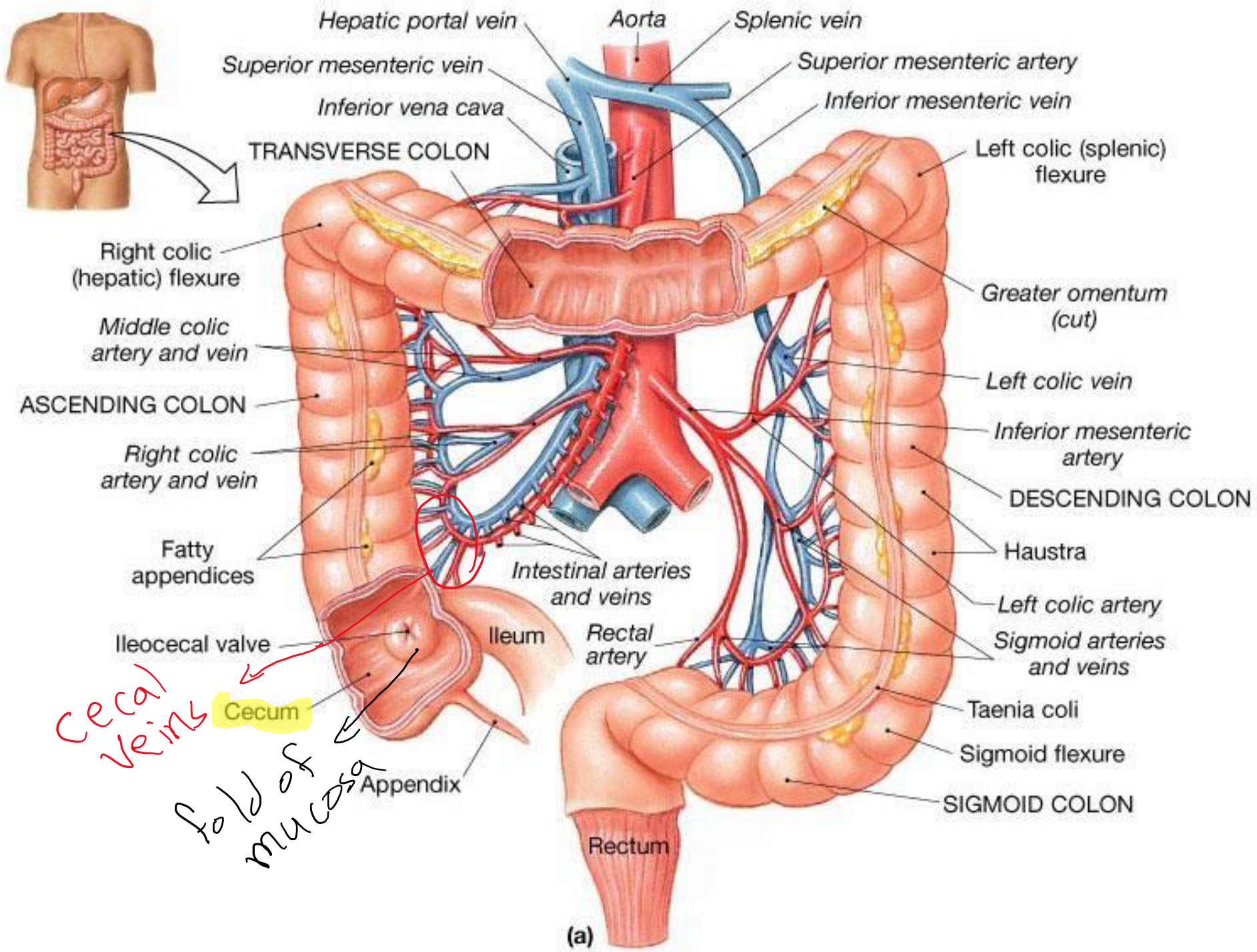
# Blood supply of cecum



# Venous drainage of cecum




Superior mesenteric vein joins with the splenic vein behind the neck of pancreas to form portal vein which goes to the liver


Hepatic portal vein
Aorta
Splenic vein
Superior mesenteric vein
Superior mesenteric artery
Inferior vena cava
Inferior mesenteric vein
TRANSVERSE COLON
Left colic (splenic) flexure
Right colic (hepatic) flexure
Greater omentum (cut)
Middle colic artery and vein
Left colic vein
ASCENDING COLON
Inferior mesenteric artery
Right colic artery and vein
DESCENDING COLON
Haustra
Fatty appendices
Intestinal arteries and veins
Left colic artery
Ileocecal valve
Ileum
Rectal artery
Sigmoid arteries and veins
Cecal veins
Cecum
Taenia coli
Sigmoid flexure
fold of mucosa
Appendix
SIGMOID COLON
Rectum
(a)

# Lymphatic Drainage of cecum

- The lymph vessels pass through several mesenteric nodes → finally reach the superior mesenteric nodes. Because the cecum is midgut

# Nerve Supply of cecum

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

Parasympathetic: from vagus nerve to the glands and smooth muscles (peristaltic movements).
-Sympathetic: from splanchnic nerve to the blood vessels and sphincter

# Ileocecal Valve

- A rudimentary structure ( physiological not anatomical sphincter)
- consists of two horizontal folds of mucous membrane (which works as a valve to prevent the regurgitation of materials, nerves and hormones affect the valve)
- 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

**Location and Description:**

- It is a very narrow, muscular tube
- containing a large amount of lymphoid tissue.
- It varies in length from 3 to 5 inch. (2 -22 cm).
- The base is attached to the posteromedial surface of the cecum about 1 inch. (2.5 cm) below the ileocecal junction .
- The remainder of the appendix is free.

- **Peritoneum:**

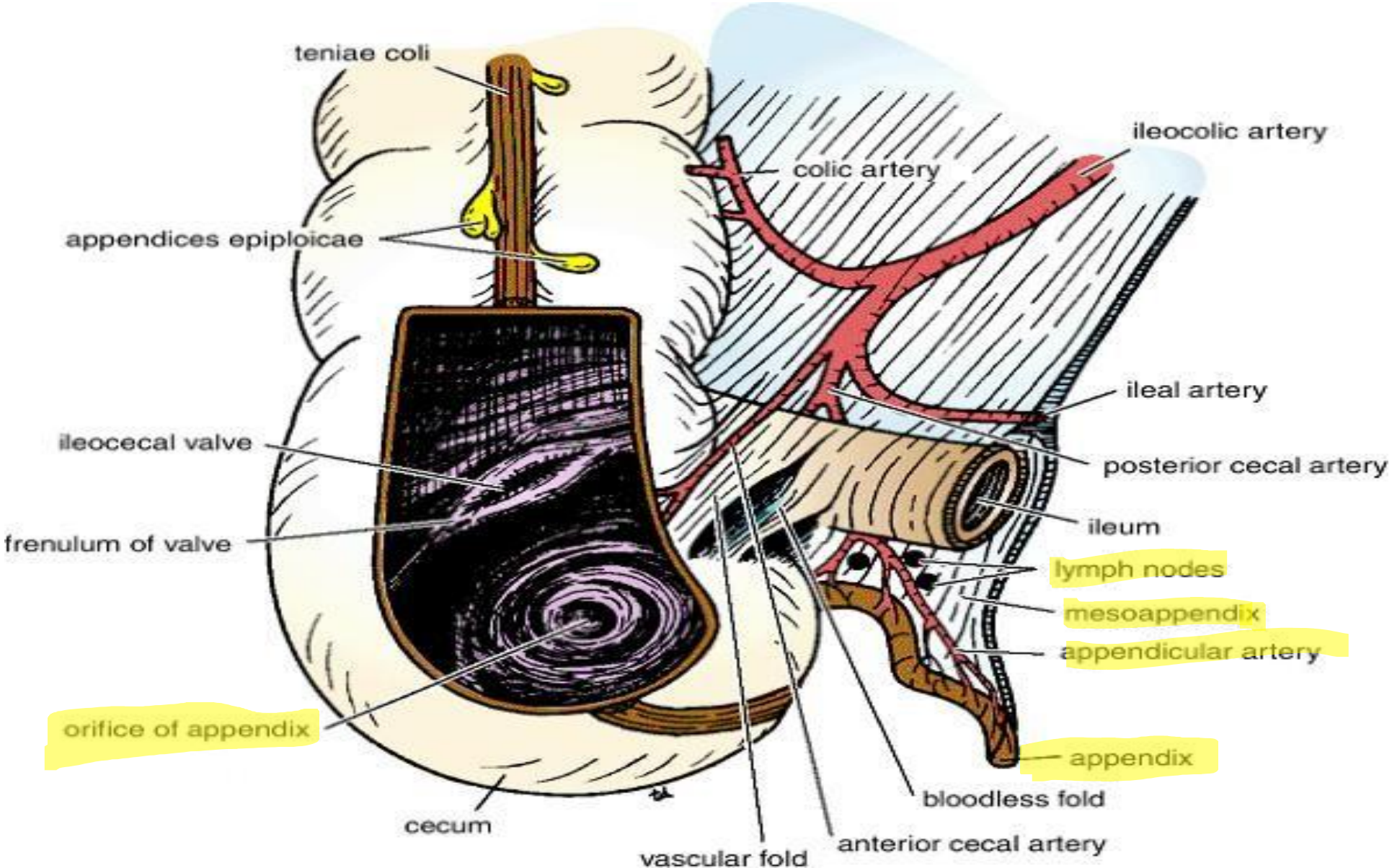
- It has a complete peritoneal covering, which is attached to the mesentery of the small intestine by a short mesentery of its own, **the mesoappendix.**
- The mesoappendix contains the appendicular vessels, nerves and lymph nodes

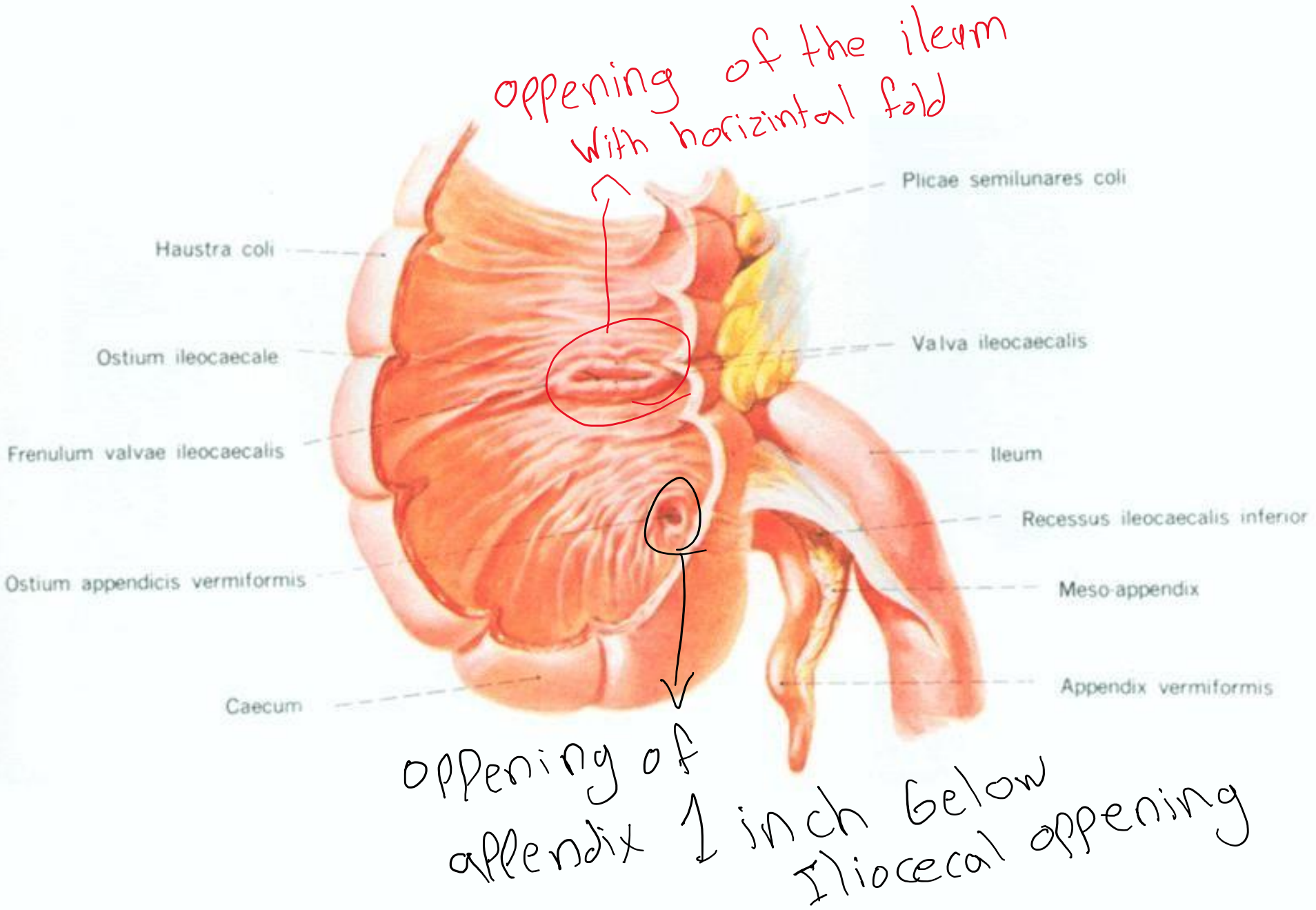
It’s really important because it’s infected a lot and its treatment always is appendectomy.

it is present in the GIT, but has no role in digestion, it is important for the immunity, that is why in children it is important, but there is no problem in removing it because we have other lymphoid organs that can compensate.

it expands when infected that’s why it has a wide range of length, in some people it could be as short as 2cm, and in others 22.

# APPENIX


teniae coli
ileocolic artery
colic artery
appendices epiploicae
ileal artery
ileocecal valve
posterior cecal artery
ileum
frenulum of valve
lymph nodes
mesoappendix
appendicular artery
orifice of appendix
appendix
bloodless fold
cecum
vascular fold
anterior cecal artery


oppening of the ileum
With horizintal fold
Plicae semilunares coli
Haustra coli
Ostium ileocaecale
Valva ileocaecalis
Frenulum valvae ileocaecalis
Ileum
Recessus ileocaecalis inferior
Ostium appendicis vermiformis
Meso-appendix
Appendix vermiformis
Caecum
oppening of
appendix 1 inch below
Iliocecal oppening

# Appendix….cont

- **Position**

- The appendix lies in the right iliac fossa, and in relation to the anterior abdominal wall

1 Retrocecal in retrocaecal recess behind cecum→ in 74% of people

2pelvic: in pelvis related to Rt. Ovary and uterine tube→ in 21% of people

3- Subcaecal: below cecum→ in 3.5%

4 Preileal: infront of ileum → 1%

5 Postileal: behind the ileum→0.5%

Where the ileal meets the cecum either in front or behind it

- **Surface anatomy of appendix= McBurney's point**

- Its base is situated one third of the way up the line joining the right anterior superior iliac spine to the umbilicus
- To reach the appendix during operation follow the taenia coli which converge toward the appendix

if you take a point at the umbilicus and a point at anterior superior iliac spine and you connect between them, between the upper 2/3 and the lower 1/3 is Mc Burney's point
It corresponds to the location of the base of the appendix
McBurney's incision: The incision that is done for appendectomy, it passes through the McBurney's point parallel to the inguinal ligament, this was only done in the past.Now, appendectomy is done by the endoscope through an incision around the umbilicus.

# Blood Supply of appendix

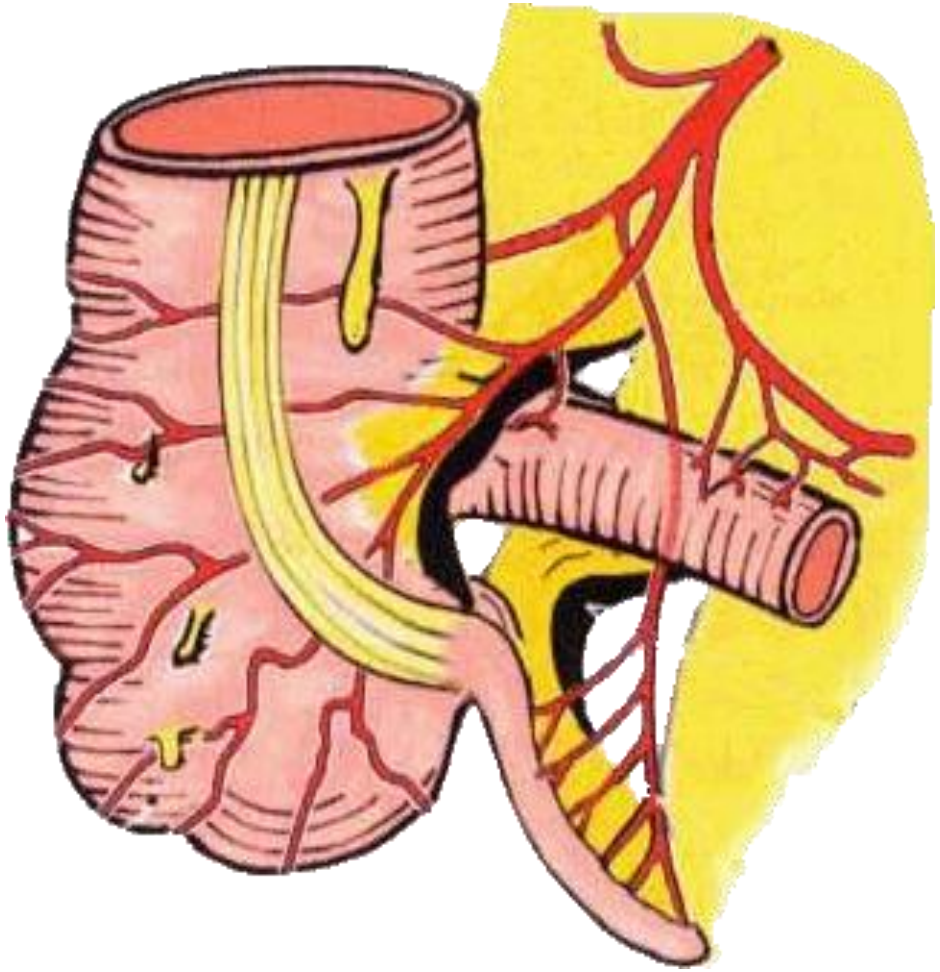
## Arteries

- The appendicular artery is a branch of the posterior cecal artery(ilio-cecal.a)which descends behind the ileum.

## Veins

- The appendicular vein drains into the posterior cecal vein. Finally it goes to superior mesenteric vein

- **Appendicular artery** runs in free margin of the mesoappendix



In appendectomy the most important step is doing 2 ligations of the appendicular artery and 2 ligations for the appendicular vein, then we cut between every two ligations to prevent bleeding, the second step is doing circular stitching ( زي فكرة التخييط بالإبرة)around the base of the appendix, after that the two ends of the suture are pulled and tied to make the base of the appendix small, then it’s cut.

# Lymphatic Drainage of appendix

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

# Nerve Supply of appendix

- The appendix is supplied by the sympathetic and parasympathetic (vagus) nerves from the superior mesenteric plexus.
- Afferent 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.
- The peritoneum over the appendix is innervated by the $10^{th}$ intercostal nerve**= skin of umbilicus**

T10 ( thoracic spine nerve number10) innervates the appendix and the skin around it. that’s why in case of appendicitis, the pain starts at first around the umbilicus then it concentrates in the right iliac fossa.

# Clinical notes

- Acute appendetitis→ uncommon in the two extremes of life
- Thrombosis of appendicular .a→ gangrene(just one artery for appendix) →perforation →Lt.paracolic gutter while in Acute cholecystitis→ no gangrene( more than one artery supply the gallbladder)
- Appendiectomy

No gangrene in gallbladder because it is attached to the liver and receive direct blood supply from the liver
The appendix has mesoappendix and far away from other organs so if there is appendicular artery thrombosis it will cause gangrene
That is why the only solution for appendicitis is appendectomy not antibiotics, since it has a very narrow lumen and when it gets infected, the lumen closes and ruptures causing peritonitis.

Appendicitis treatment = Appendectomy
Why???
Because lumen of appendix is very narrow lumen ----- infection --- engorgement of blood --- edema --- obstruction of lumen ---- rupture of appendix --- peritonitis.

Appendix removal don’t have any disadvantages, because we have many lymphoid tissues in our body.

Thrombosis of Appendicular artery will end in gangrene formation, this is not the case in Acute cholecystitis (التهاب المرارة) , why???

Because gall bladder is embedded in liver, so it will have a direct blood supply from liver despite thrombosis in cystic artery = no gangrene.

# Ascending Colon

**Location and Description:**

- The ascending colon is about 5 inch. (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**
- Then becomes continuous with the transverse colon.
- Taenia coli, sacculation & appendeces epiplolca are present

**The peritoneum**

- Covers the front and the sides of the ascending colon
- Binding it to the posterior abdominal wall.

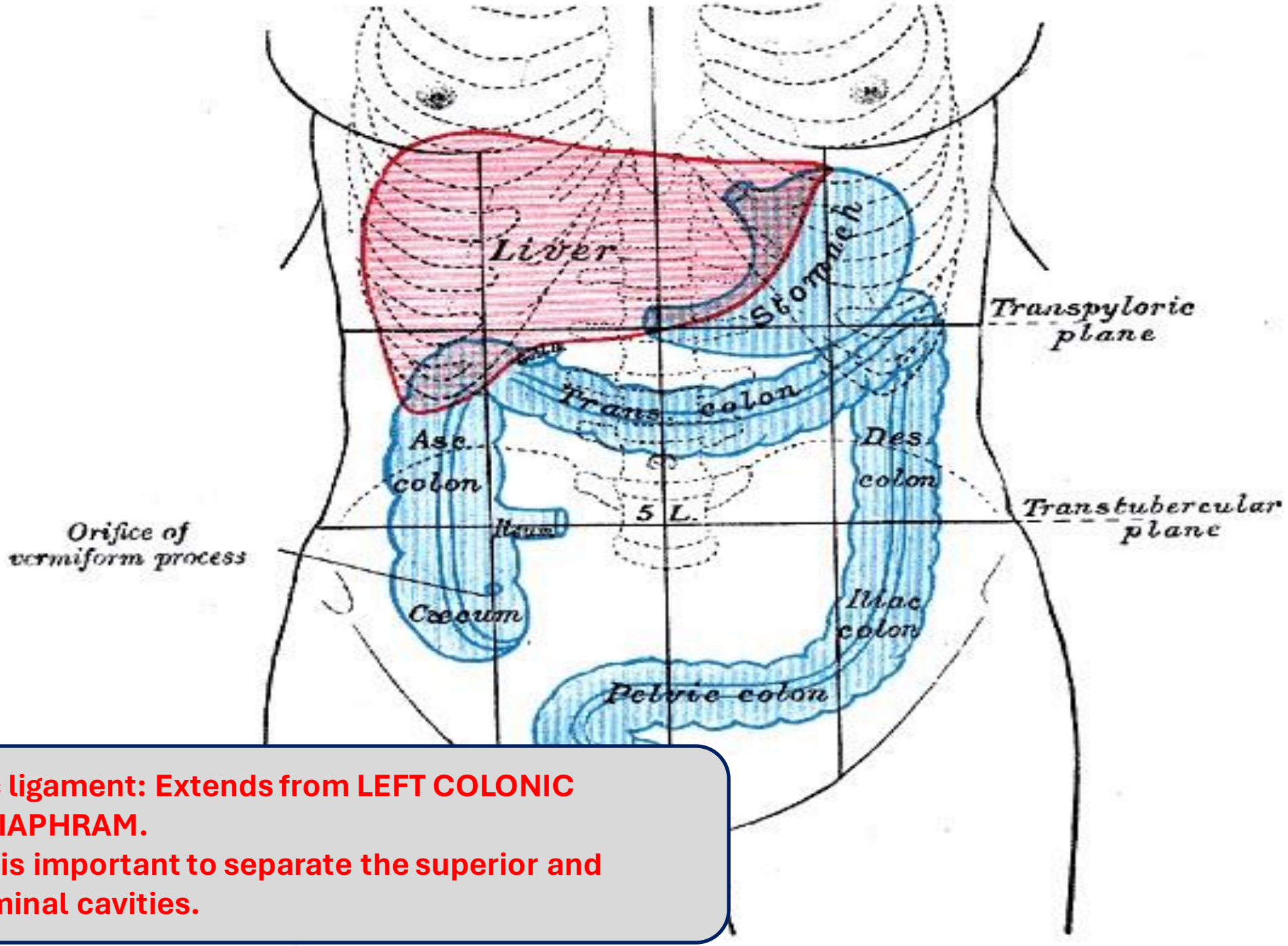
Ascending colon starts from caecum in right iliac fossa (upward: extends to the lower surface of the liver forming = right colonic flexure).
Right colonic ( hepatic ) flexure = Ascending colon + transverse colon .
Left colonic ( splenic ) flexure = Transverse colon + descending colon.

Ascending colon is retroperitoneal organ.
Peritoneum covers the anterior surface and fixes the ascending colon on both sides. The same story with Descending colon.

Ascending and Descending colon are fixed in posterior abdominal wall.

This fixation forms GUTTER ( groove for fluid and pus to move ).
We have 2 GUTTERS: Medial and Lateral
Or Right and left

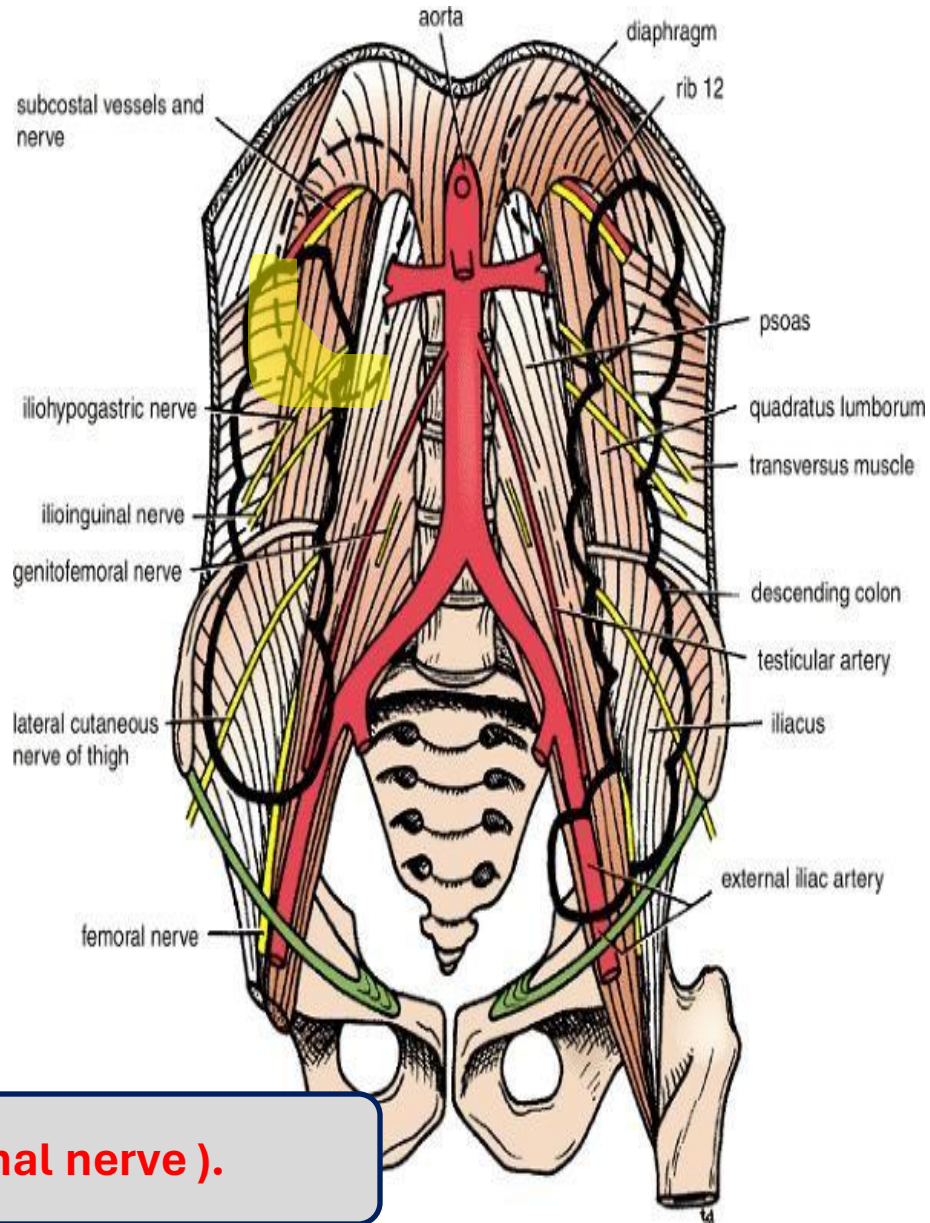
IMPORTANT: Left colonic flexure is higher than the Right one.
Descending colon is longer than Ascending.




**Phrenicocolic ligament: Extends from LEFT COLONIC FLEXURE to DIAPHRAM.**
**This ligament is important to separate the superior and inferior abdominal cavities.**

# Relations of ascending colon

- **Anteriorly**:
- Coils of small intestine
- The greater omentum
- The anterior abdominal wall
- **Posteriorly**:
- The iliacus
- The iliac crest
- The quadratus lumborum
- The origin of the transversus abdominis muscle,
- The lower pole of the right kidney.
- The iliohypogastric .n
- The ilioinguinal nerves cross behind it .

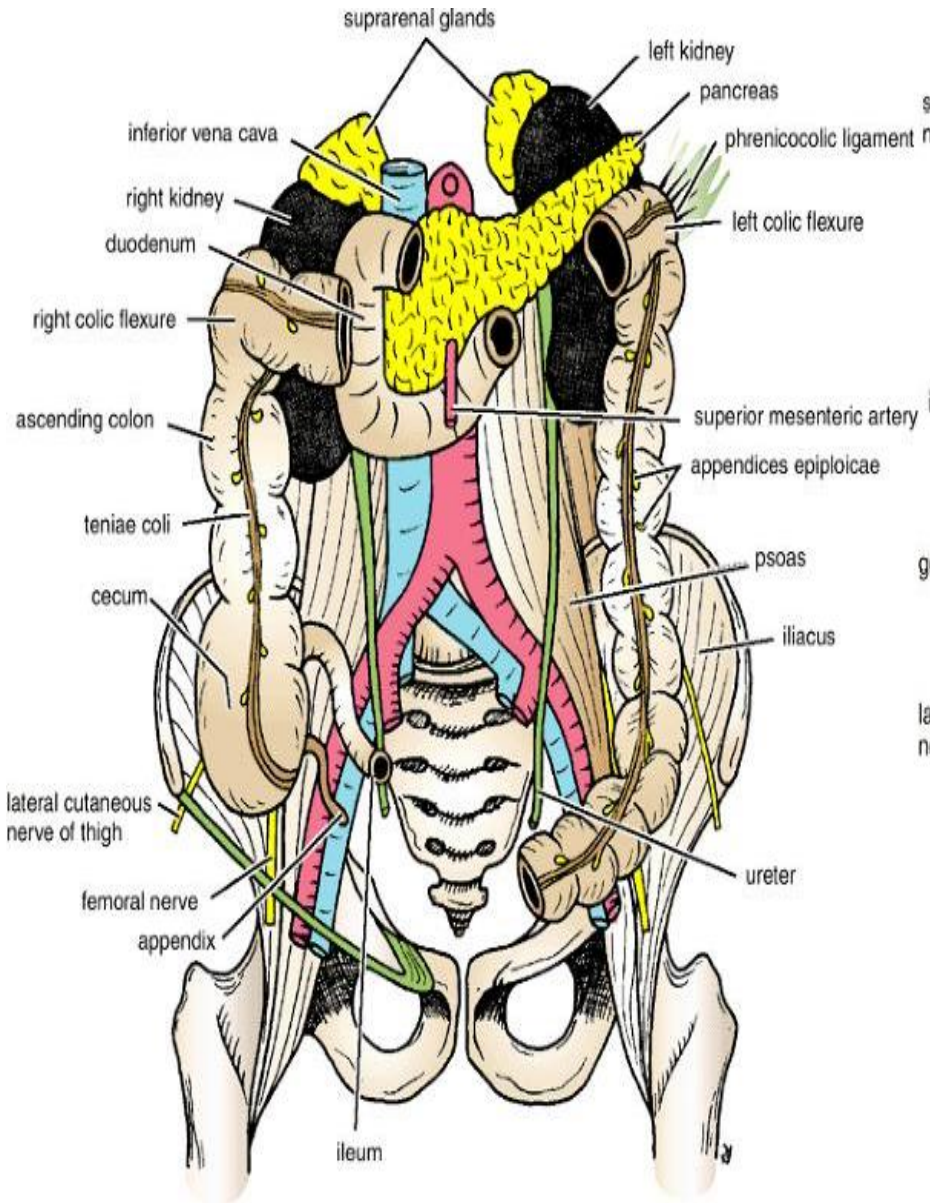


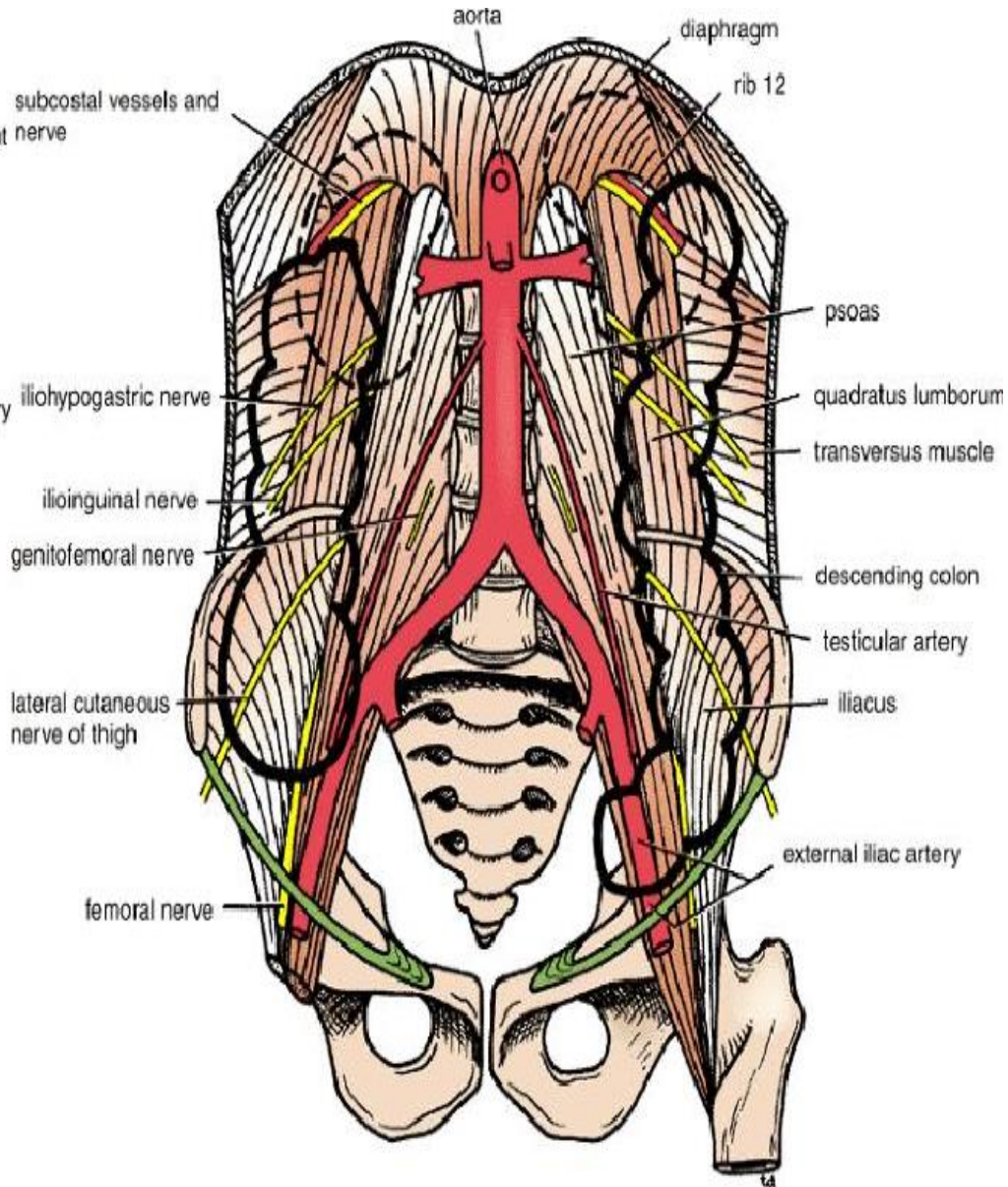

**Iliohypogastric and ilioinguinal come from L1 ( lumbar spinal nerve ).**

**Greater omentum: Long, composed of two layers.**
**It reaches caecum, appendix and ascending colon.**
**As what we said if we have infection it (greater omentum) will localize the infection**

**Because descending colon is longer than ascending colon, its posterior relation is same as ascending plus: Psoas major muscle + lateral cutaneous nerve + femoral nerve.**

# Relations of ascending colon



# Blood Supply of Ascending colon

**Arteries**

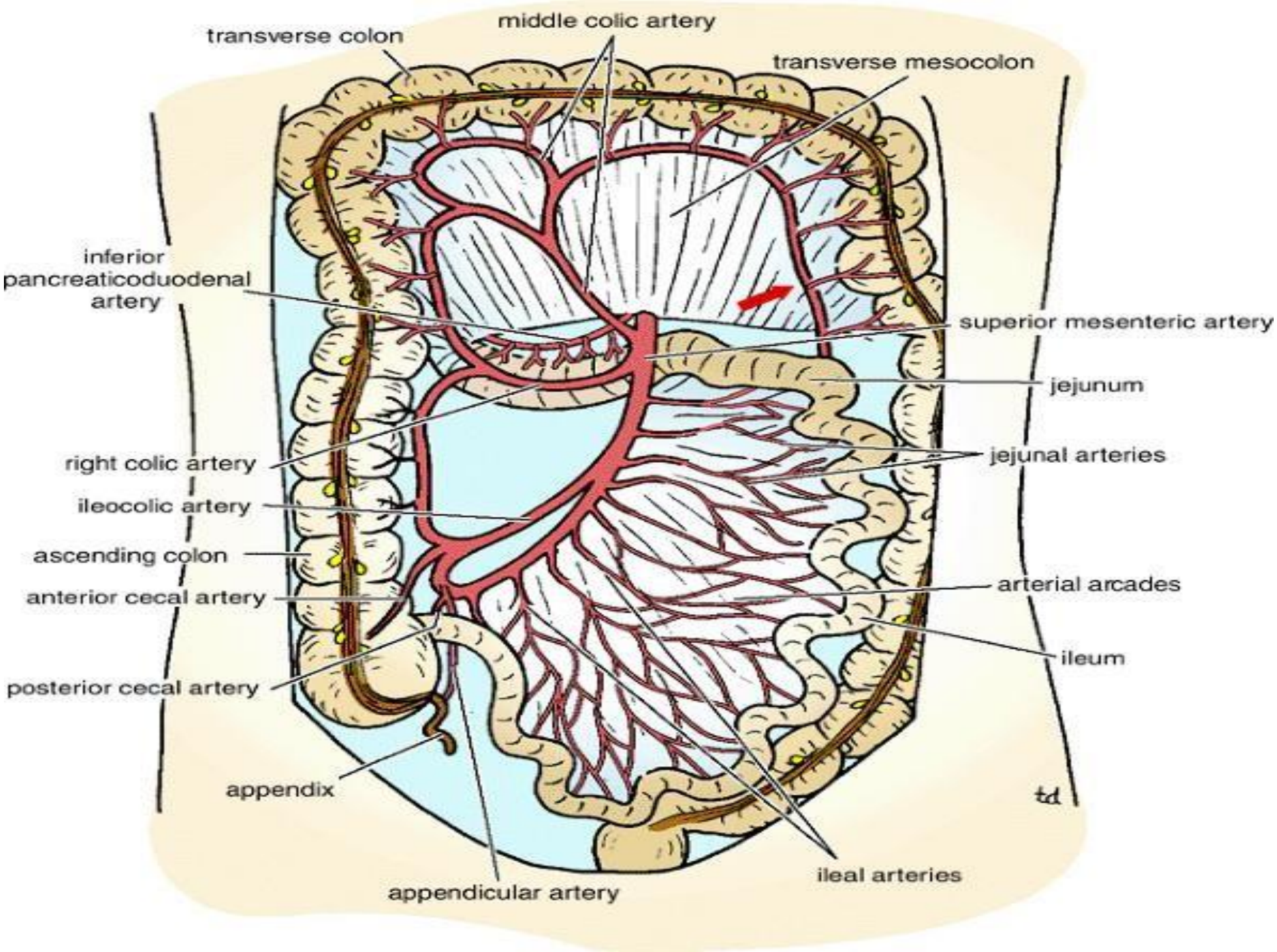
- The ileocolic & right colic branches of the **superior mesenteric artery** supply this area.

**Veins**

- The veins correspond to the arteries and drain into the superior mesenteric vein.

Ascending colon is part of midgut:
Blood supply: Superior mesenteric artery
Venous drainage: Superior mesenteric vein
Lymphatic drainage: Superior mesenteric lymph nodes.

Iliocolic artery: Supplies ileum and Ascending colon.
Right colic: Supplies Ascending colon.
Midcolic: Supplies Transverse colon till lateral 3rd ( because lateral 3rd and descending colon are part of hindgut ).
Inferior mesenteric artery: Supplies lateral 3rd of transverse colon and all Descending colon.

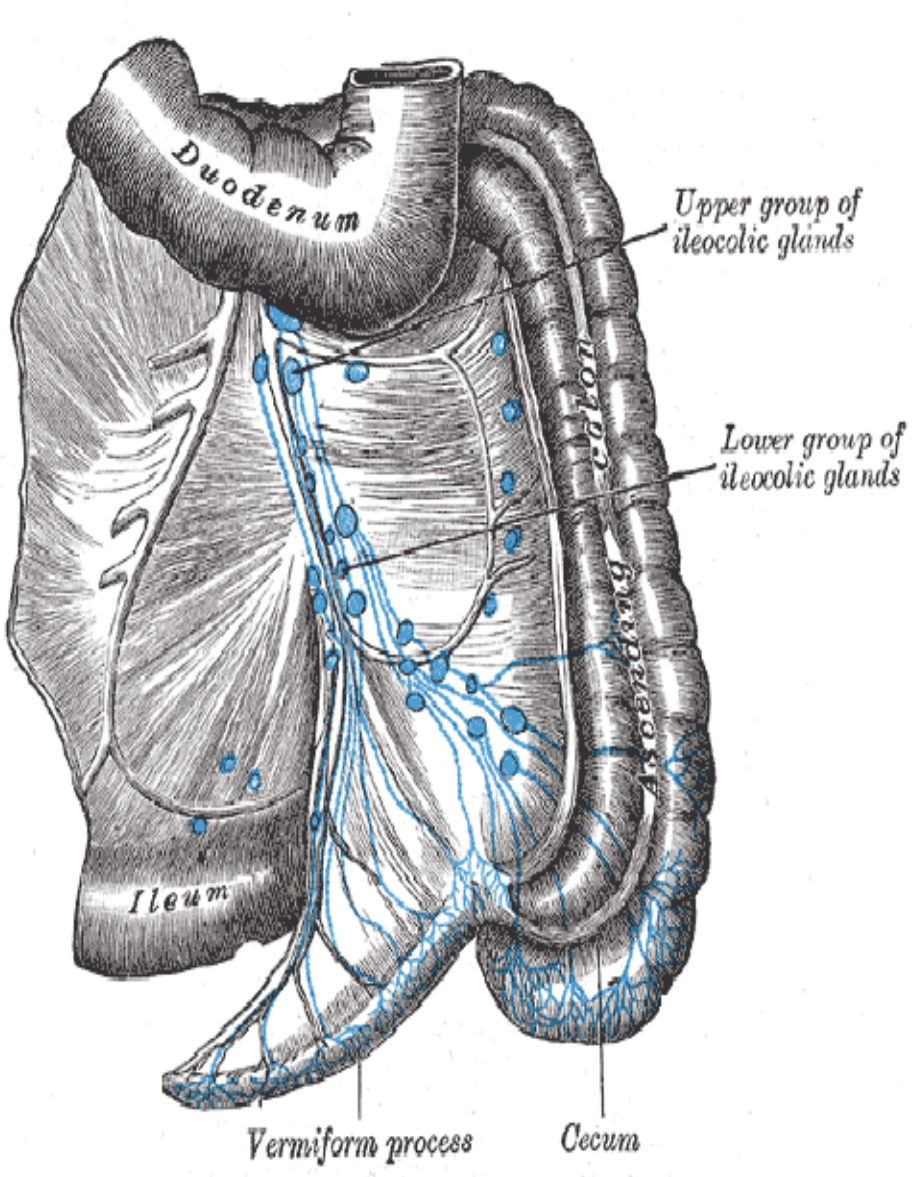

transverse colon
middle colic artery
transverse mesocolon
inferior pancreaticoduodenal artery
superior mesenteric artery
jejunum
jejunal arteries
right colic artery
ileocolic artery
ascending colon
anterior cecal artery
arterial arcades
ileum
posterior cecal artery
appendix
appendicular artery
ileal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

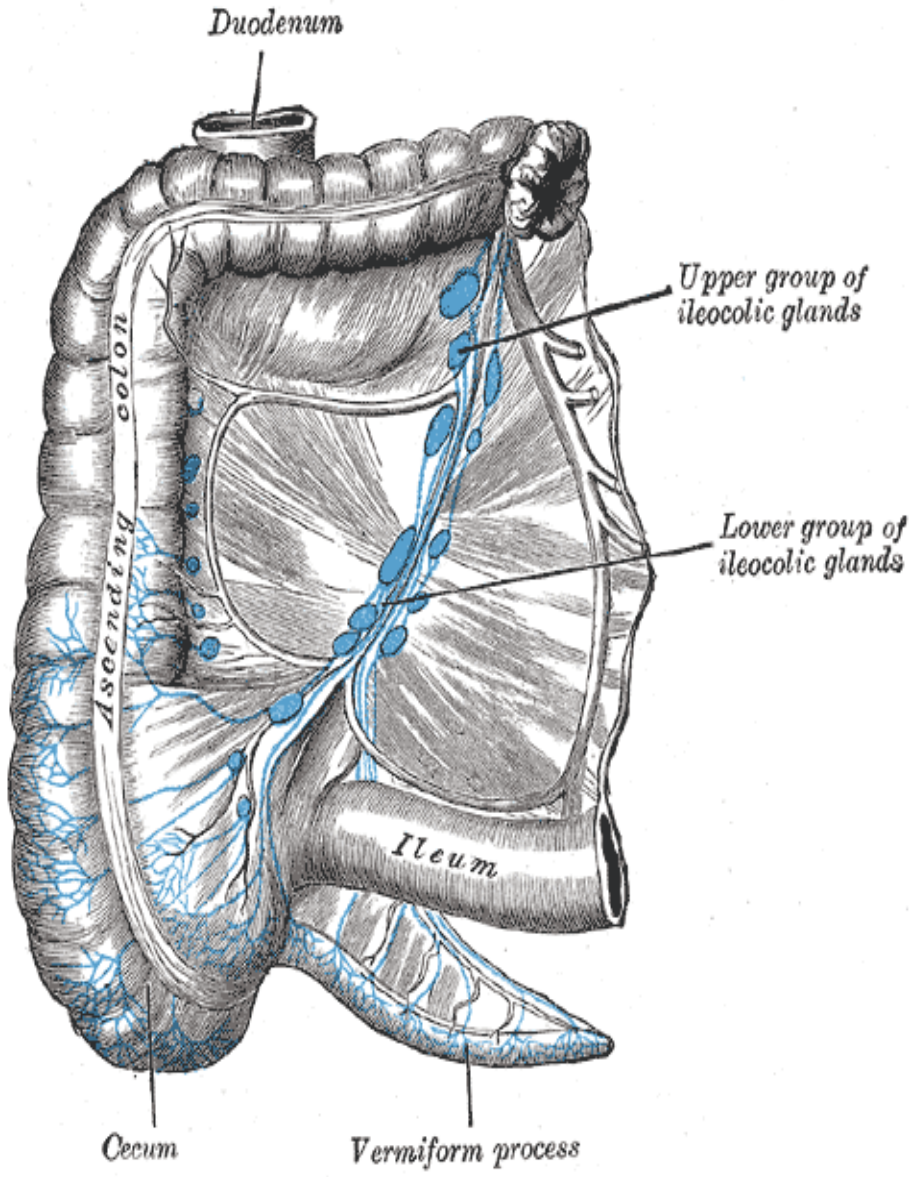
# Lymphatic drainage of Ascending colon

- The lymphatic vessels → lymph nodes lying along the course of the colic blood vessels → the superior mesenteric nodes.

**These lymph nodes are resected in Caseses of colon cancer in colectomy.**

# Lymphatic drainage



# Nerve Supply of ascending colon

- Sympathetic and parasympathetic (vagus) nerves from the superior mesenteric plexus .

**DON'T FORGET: ASCENDING COLON IS PART OF MIDGUT.**
**Sympathetic innervation: Superior mesenteric ganglia.**

**Superior mesenteric ganglia ( sympathetic ganglia ) branches + vagal branches = plexus of nerves ( which move with branches of superior mesenteric artery. )**

*Transverse colon*

# Transverse Colon

**Location and Description**

- 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
- Hangs downward
- Suspended by the transverse mesocolon from the pancreas
- It then ascends to the left colic flexure below the spleen.
- The left colic flexure is higher than the right colic flexure and is suspended from the diaphragm by **the phrenicocolic ligament .**
- Taenia coli, sacculation & appendeces epiplolca are present

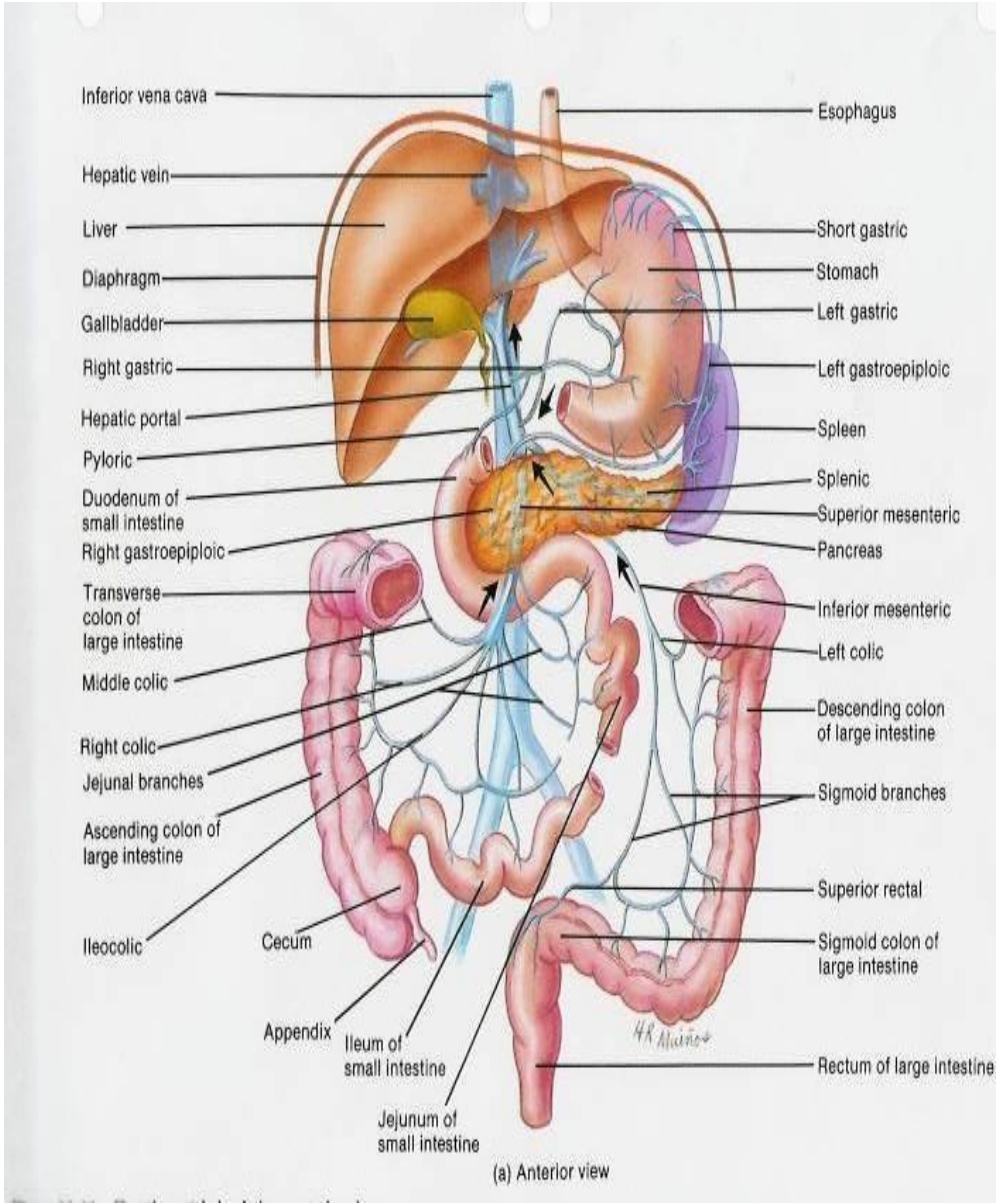
Transverse colon extends from right to left colonic flexure.
It crosses the umbilical region of abdomen.
It is an INTRAPERITONEAL ORGAN that has mesentery called: mesocolon.
The mesentery ( mesocolon ) is formed by greater omentum
The mesentery attach to ( ends at ) the anterior border of pancreas.

**The transverse mesocolon**= mesentery of the transverse colon

- suspends the transverse colon from the anterior border of the pancreas .
- The mesentery is attached to the superior border of the transverse colon
- The posterior layers of the greater omentum are attached to the inferior border .
- The position of the transverse colon is extremely variable and may sometimes reach down as far as the pelvis.

# Relations of Transverse colon

- **Anteriorly:**
- The greater omentum
- The anterior abdominal wall (umbilical and hypogastric regions)
- **Posteriorly:**
- The second part of the duodenum
- The head of the pancreas
- The coils of the jejunum and



**NOTE: Coils of intestine can be anterior and posterior because its motility.**
**NOTE: Mesocolon ( mesentery ) can be short in upper part or very long downward.**
**NOTE: Some intraperitoneal organs are fixed and some are motile, but why???**
**Fixed: To maintain the site of viscera of the abdomen.**
**Motile: For surgeries to see organs behind the motile intraperitoneal organ.**

# Blood Supply of transverse colon

- **Arteries:**

- The proximal two thirds are supplied by the middle colic artery→ a branch of the superior mesenteric artery.
- The distal third is supplied by the left colic artery→ a branch of the inferior mesenteric artery .

**Veins**

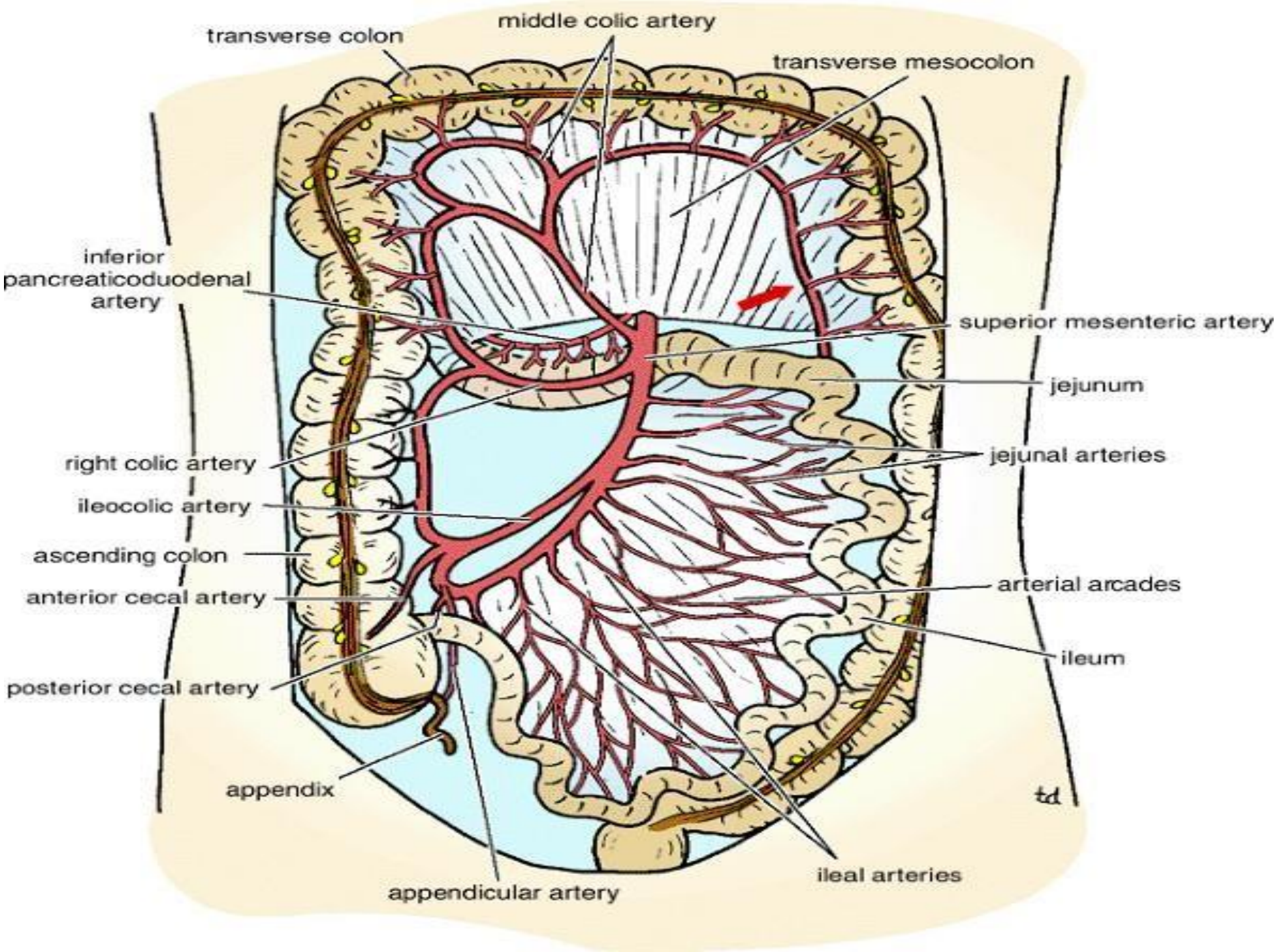
- The veins correspond to the arteries and drain into the superior & inferior mesenteric veins.

**Inferior and superior mesenteric veins will drain finally into portal vein.**

**Transverse colon is divided into:**
**Proximal 2/3 + distal 1/3**

**Proximal 2/3 follows MIDGUT**
**Distal 1/3 follows HINDGUT**

**Proximal 2/3 Blood supply: Branches from superior mesenteric artery ( middle coli )**
**Distal 1/3 : Branches from inferior mesenteric artery ( left coli ).**


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

# Lymphatic Drainage of transverse colon

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

# Nerve Supply of transverse colon

- The proximal two thirds are innervated by sympathetic and vagal nerves through the **superior mesenteric plexus**
- The distal third is innervated by sympathetic and parasympathetic pelvic splanchnic nerves through **the inferior mesenteric plexus.**

**Transverse colon is divided into:**
**Proximal 2/3 + distal 1/3**

**Proximal 2/3 follows MIDGUT**
**Distal 1/3 follows HINDGUT**

**Proximal 2/3 nerve supply: parasympathetic: from vagus.**
**Sympathetic: superior mesenteric ganglia.**

**Distal 1/3 : parasympathetic: S2.3.4 ( S = SEGMENT OF SPINAL CORD )**
**Sympathetic: Inferior mesenteric ganglia**
**Finally: Sympathetic and parasympathetic form plexus with branches of inferior mesenteric artery ( along with descending, sigmoid colon and rectum).**

# Descending Colon

Pelvic brim: starting point of pelvic

**Location and Description:**

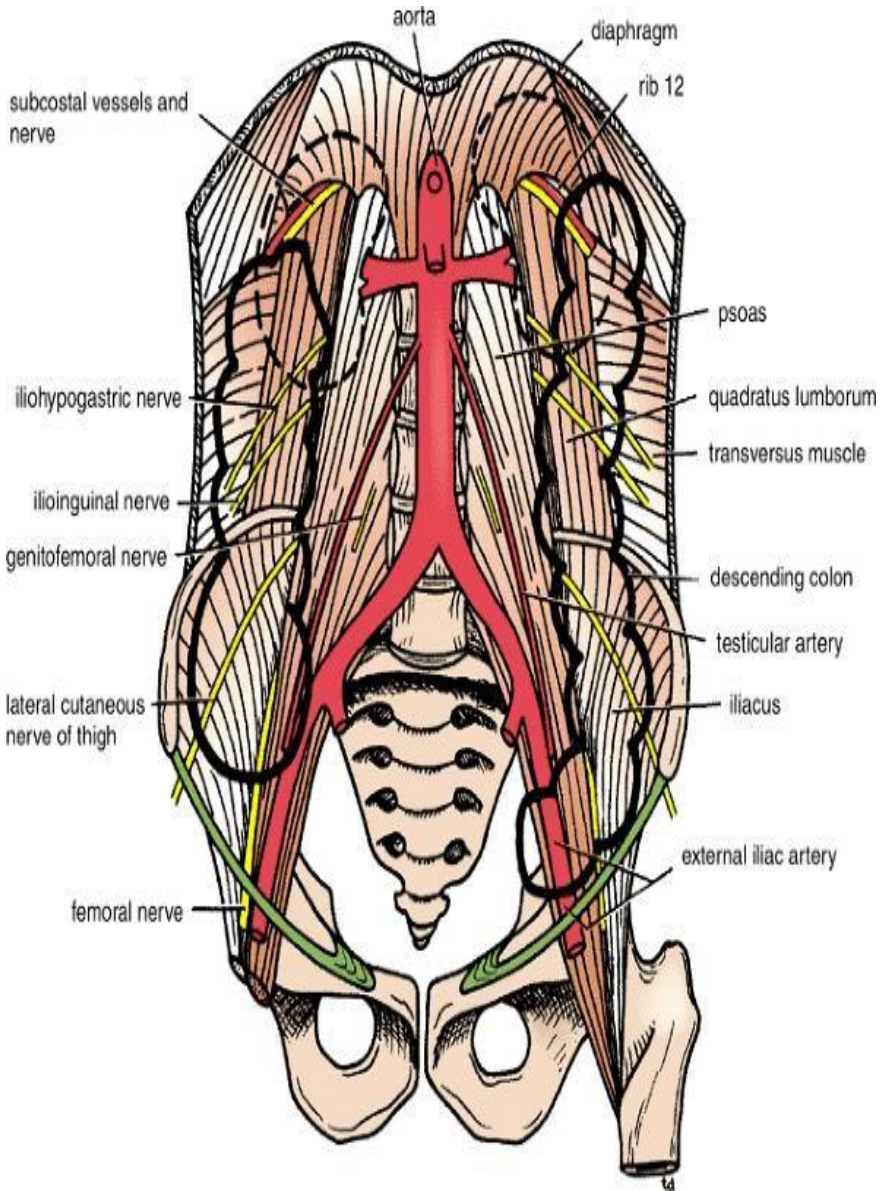
- The descending colon is about 10 in. (25 cm) long
- It extends downward from the left colic flexure, to the pelvic brim, where it becomes continuous with the sigmoid colon.
- Taenia coli, sacculation & appendeces epiplolca are present
- **The peritoneum**

- Covers the front and the sides and binds it to the posterior abdominal wall.

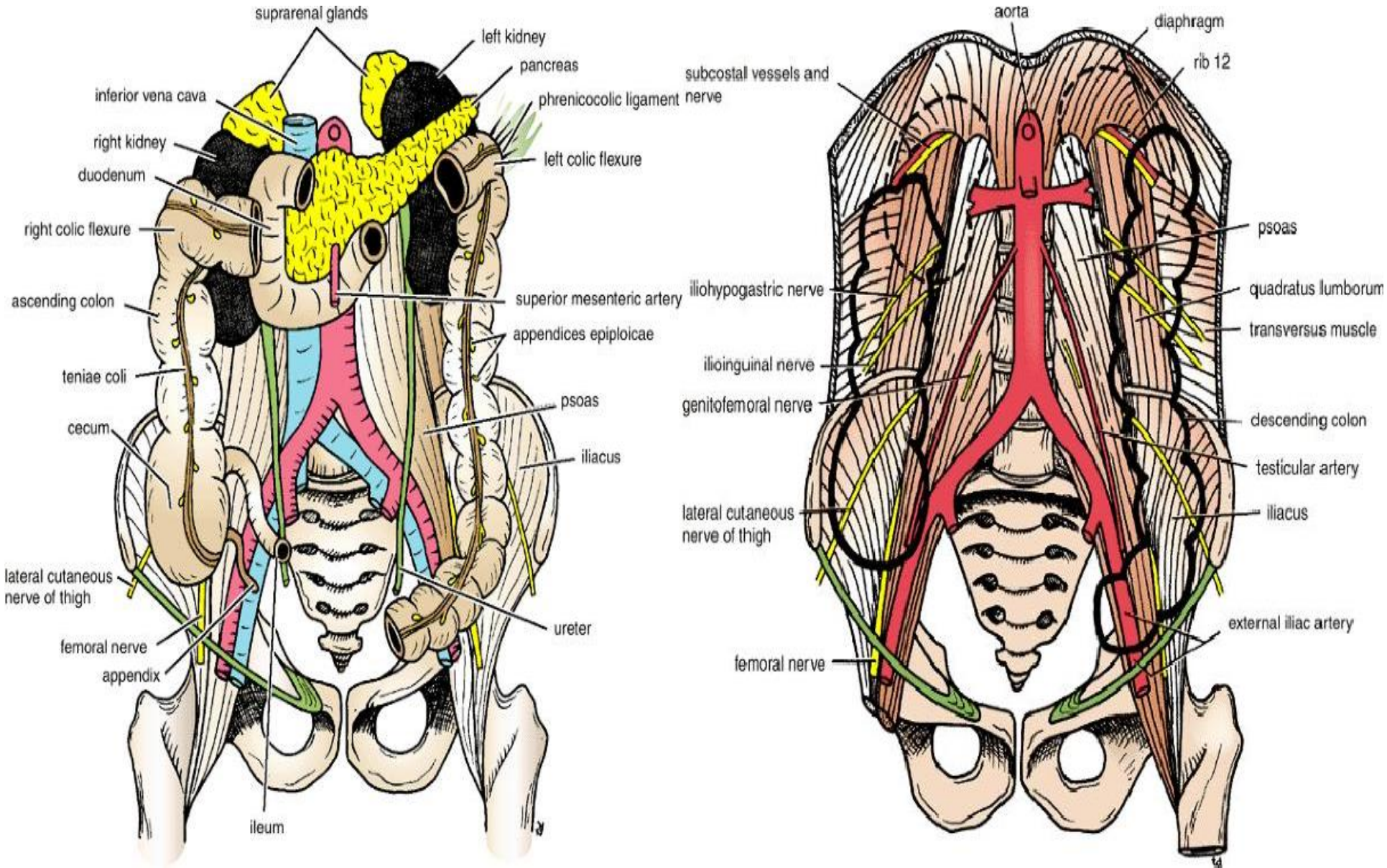
The peritoneum of Descending colon is same as ascending
Remember it will form 2 gutter

# Relations of Descending colon

- **Anteriorly:**
- Coils of small intestine
- the greater omentum
- the anterior abdominal wall
- **Posteriorly:**
- The lateral border of the left kidney
- the origin of the transversus abdominis muscle
- the quadratus lumborum
- the iliac crest
- the iliacus
- the left psoas
- The iliohypogastric and the ilioinguinal nerves
- the lateral cutaneous nerve of the thigh
- the femoral nerve



# Relations of Descending colon



# Blood Supply of Descending colon

Descending colon follows HINDGUT

- **Arteries**

- The left colic and the sigmoid branches of the inferior mesenteric artery.

- **Veins**

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

Portal vein transfer the absorbative material into the liver.
Hepatic vein contains the waste product of liver and transfer it to the inferior Venna cava.

Inferior mesenteric vein ends in splenic vein.

Splenic vein meets with superior mesenteric vein ---- end as portal vein

# Lymphatic Drainage of descending colon

- Lymphatic drains →the colic lymphatic nodes & the inferior mesenteric nodes around the origin of the inferior mesenteric artery.

# Nerve Supply of descending colon

- The nerve supply is the sympathetic and parasympathetic pelvic
- Splanchnic nerves through the inferior mesenteric plexus

**Parasympathetic: S2.3.4**
**Sympathetic: Inferior mesenteric ( come from L1,L2).**
**Form plexus of nerves called inferior mesenreric plexus**

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