

## The large intestine

- ★ It is about **150-180 cm** in length & its diameter is **larger** than that of the small intestine.
- ★ It is the **distal part of GIT** and is **formed of** the caecum, appendix, ascending colon, transverse colon, descending colon, pelvic (sigmoid) colon, rectum and anal canal.
- ★ **The large intestine differs from the small intestine in three features:**

### 1. The taeniae coli:

- These are **three bands** of the longitudinal muscle layer of the colon.
- They **start** at the base of the vermiform **appendix** and end in the terminal part of the **sigmoid colon** to be continuous with the longitudinal muscle layer of the rectum.
- The length of the taeniae coli is one foot **shorter** than the length of the large intestine.
- The taeniae coli are **one anterior and 2 posterior except** in the **transverse** colon they are one posterior and two anterior .

### 2. Sacculations (or haustrations):

- The wall of the colon bulges outwards in between the taeniae coli to form pouches called sacculations.
- These sacculations are formed because the **taeniae coli are shorter** than the length of the colon.

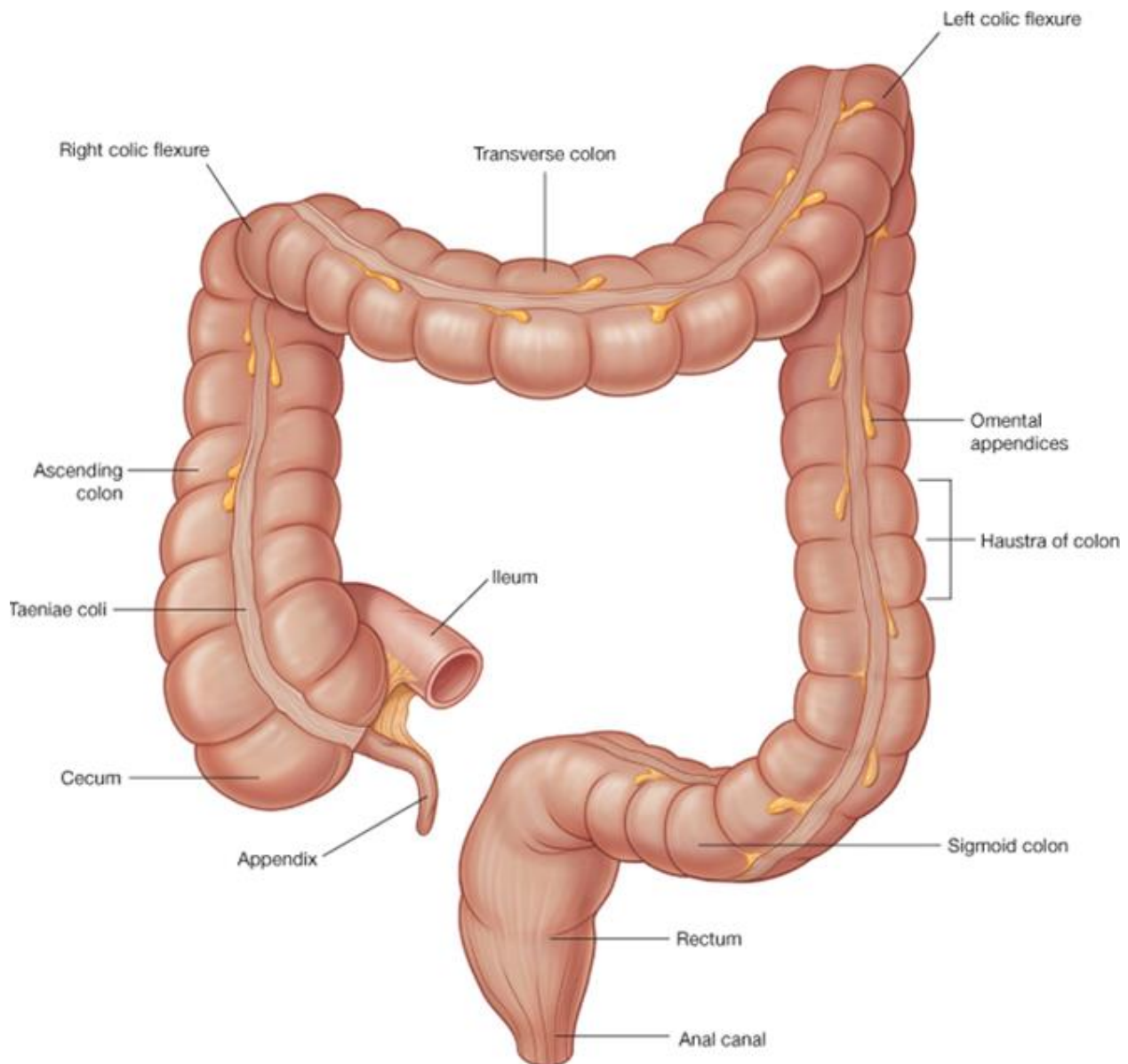
### 3. Appendices epiploicae:

## Anatomy of colon

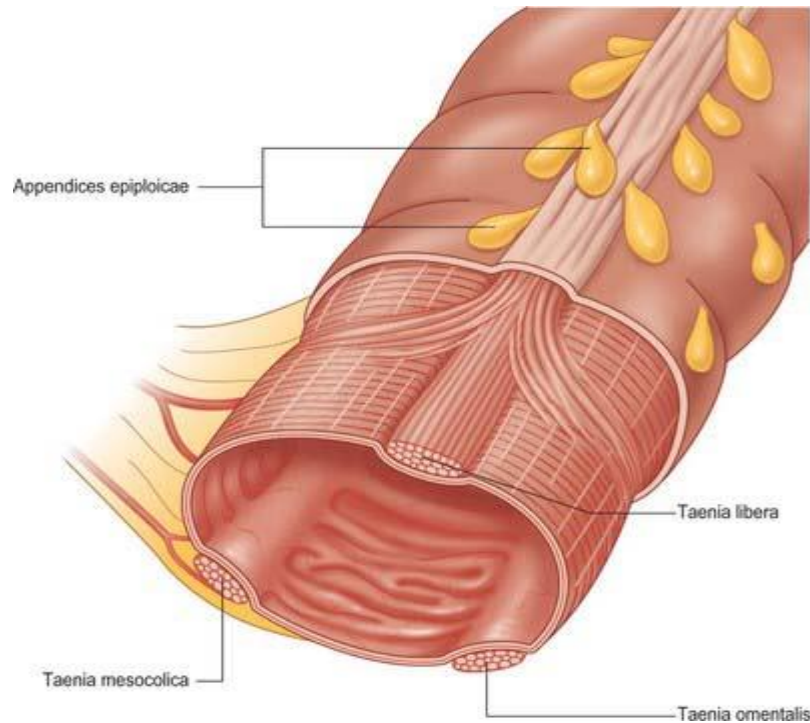
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- These are small **peritoneal projections** filled with fat on the surface of the large intestine.

❖ The three previous features are **absent in** the appendix, rectum and anal canal. In addition , caecum also has no **appendices epiploicae**.



### Features of the large intestine



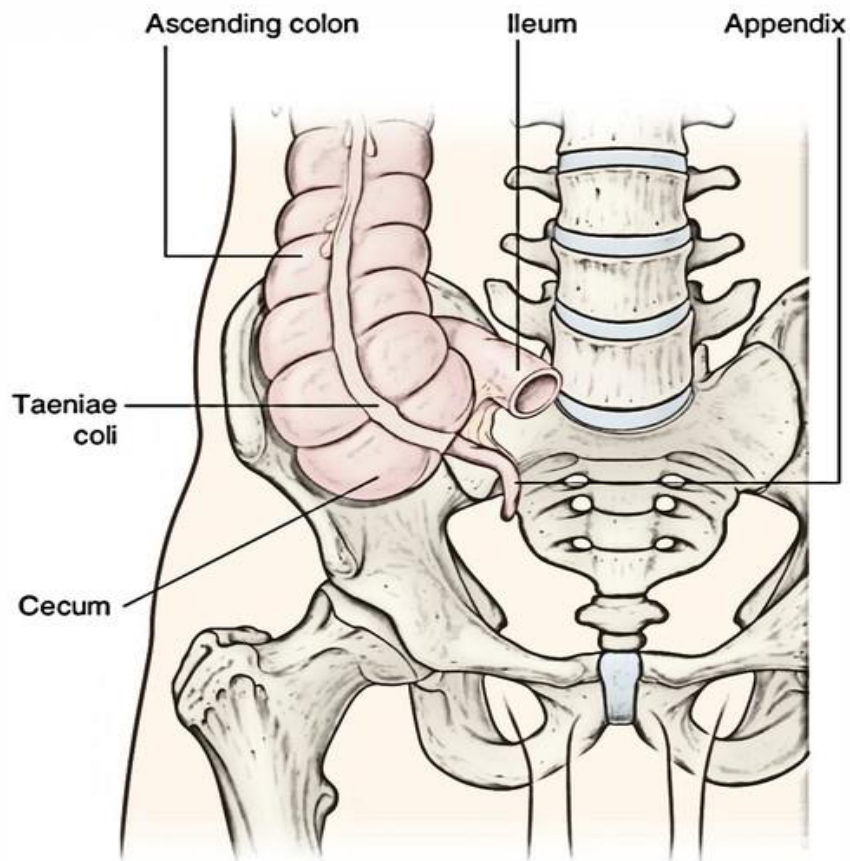
### The caecum

- ★ **Definition:** It is the **most proximal & most dilated** part of the large intestine.
- ★ **Length:** It measures 5-7 cm in length.
- ★ **Site:**
  - It lies in the **right iliac fossa** above the lateral 1/2 of right inguinal ligament.
  - It is closed inferiorly and continuous above the level of **ileocaecal valve** with the ascending colon.
- ★ **Peritoneal covering:**
  - It is **nearly completely covered** by peritoneum but has **no mesentery**.
  - A wide **retrocaecal peritoneal recess** is present behind it, and may

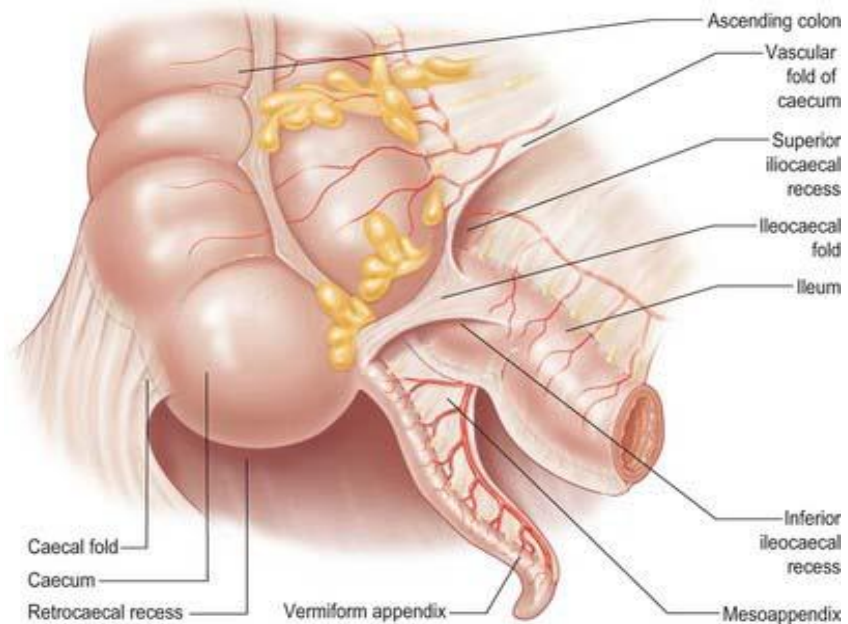
## Anatomy of colon

extend up to the lower part of the ascending colon (retrocolic recess). It is usually **containing the appendix**.

### Position of the caecum

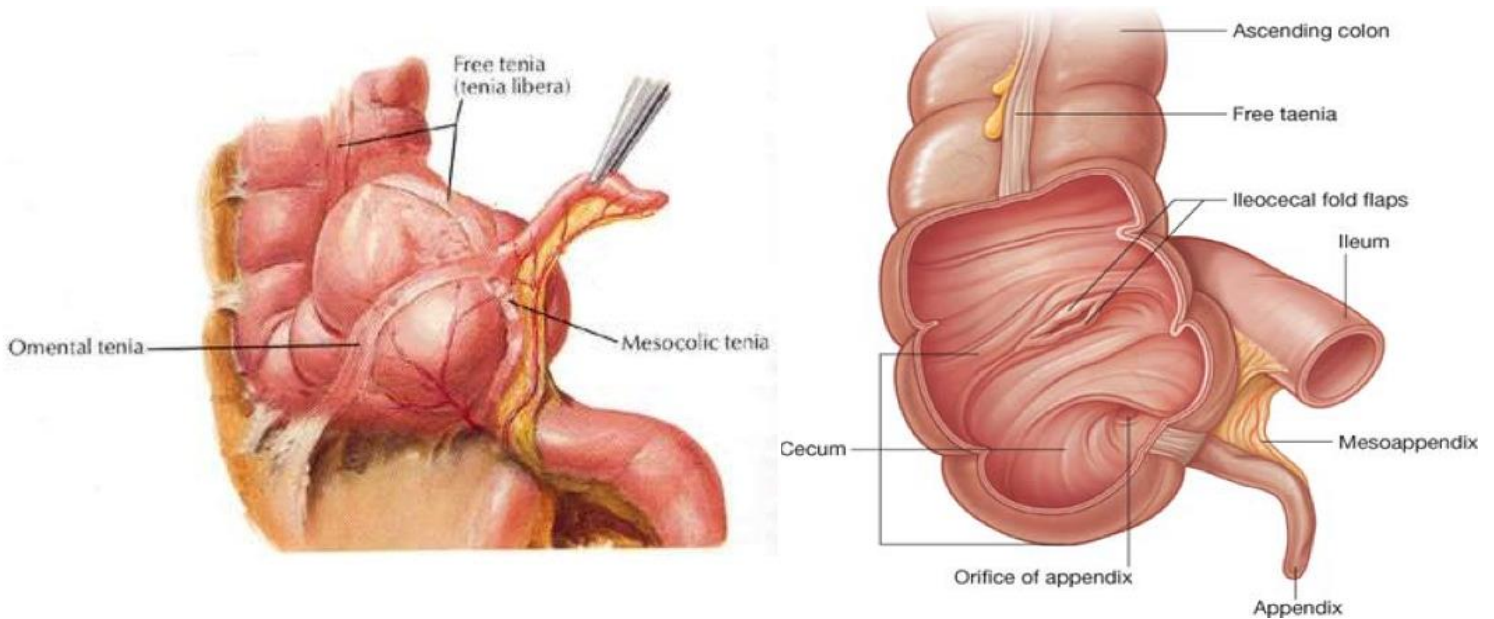


### Peritoneal covering



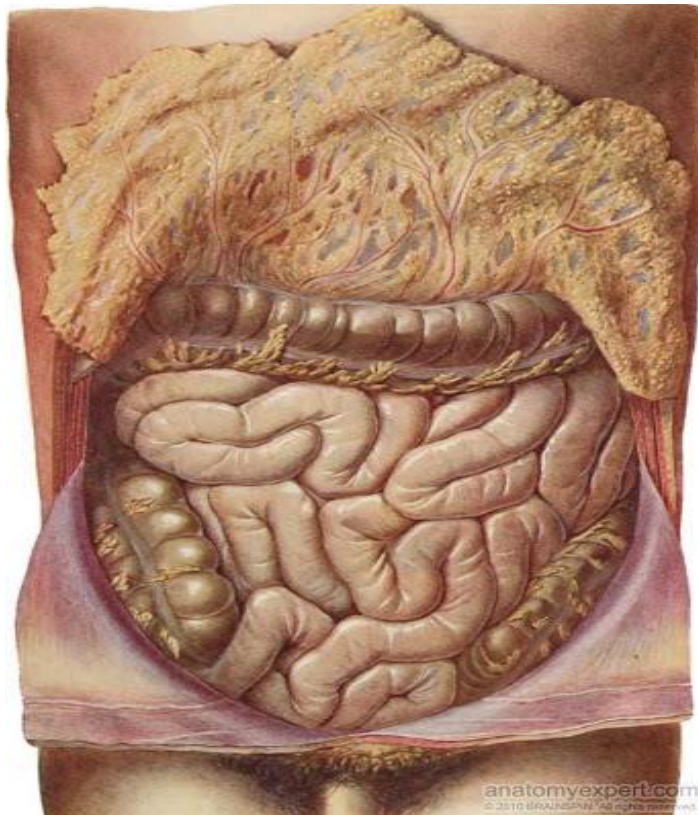


## Anatomy of colon



### ★ Caecal orifices:

1. **Ileocaecal orifice:** opens into the posteromedial aspect of the upper end of the caecum. It is guarded by the ileocaecal valve.
2. **Vermiform appendix:** opens into the posteromedial aspect of the caecum, 2 cm below and lateral to the ileocaecal valve.
3. **Colic orifice:** the caecum is continuous at its upper end with the ascending colon.



## Anatomy of colon

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### ★ Relations:

#### • Anteriorly:

1. Anterior abdominal wall.
2. Small intestine.
3. Greater omentum.

#### • Posteriorly:

##### a. Three muscles:

1. Iliacus.
2. Psoas major.
3. Psoas minor.

##### b. Three nerves:

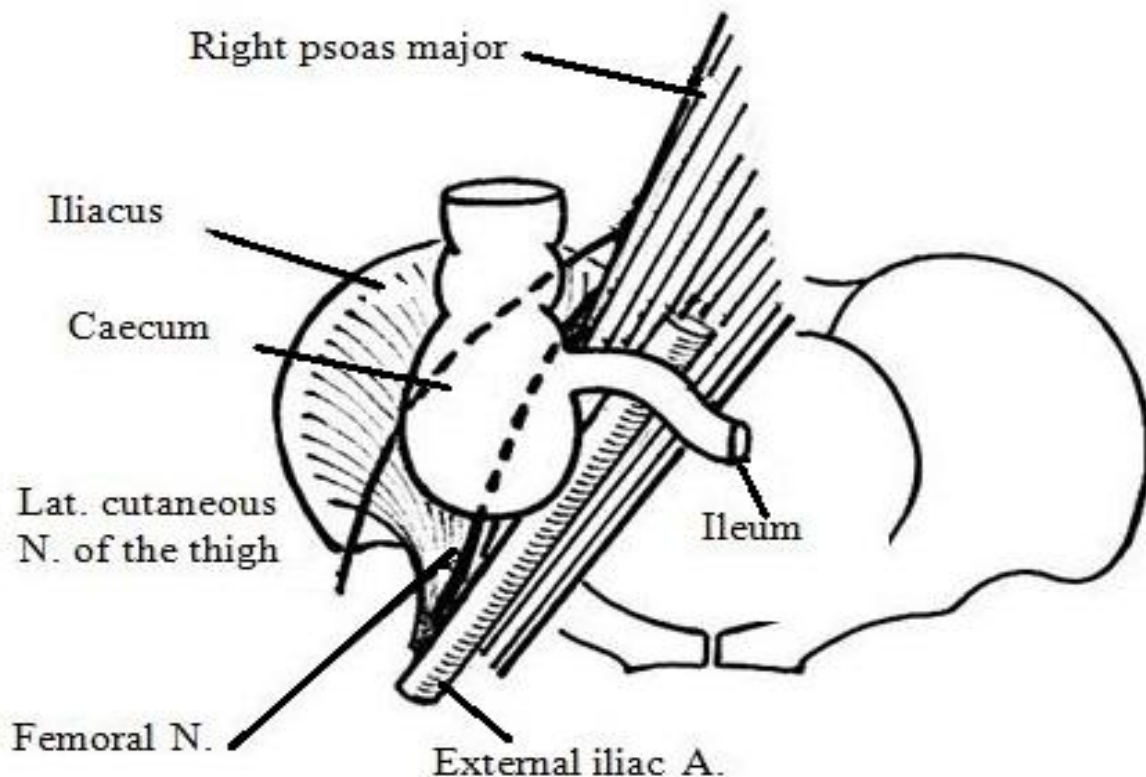
1. Femoral nerve.
2. Genitofemoral nerve.
3. Lateral cutaneous nerve of the thigh.

##### c. Three vessels:

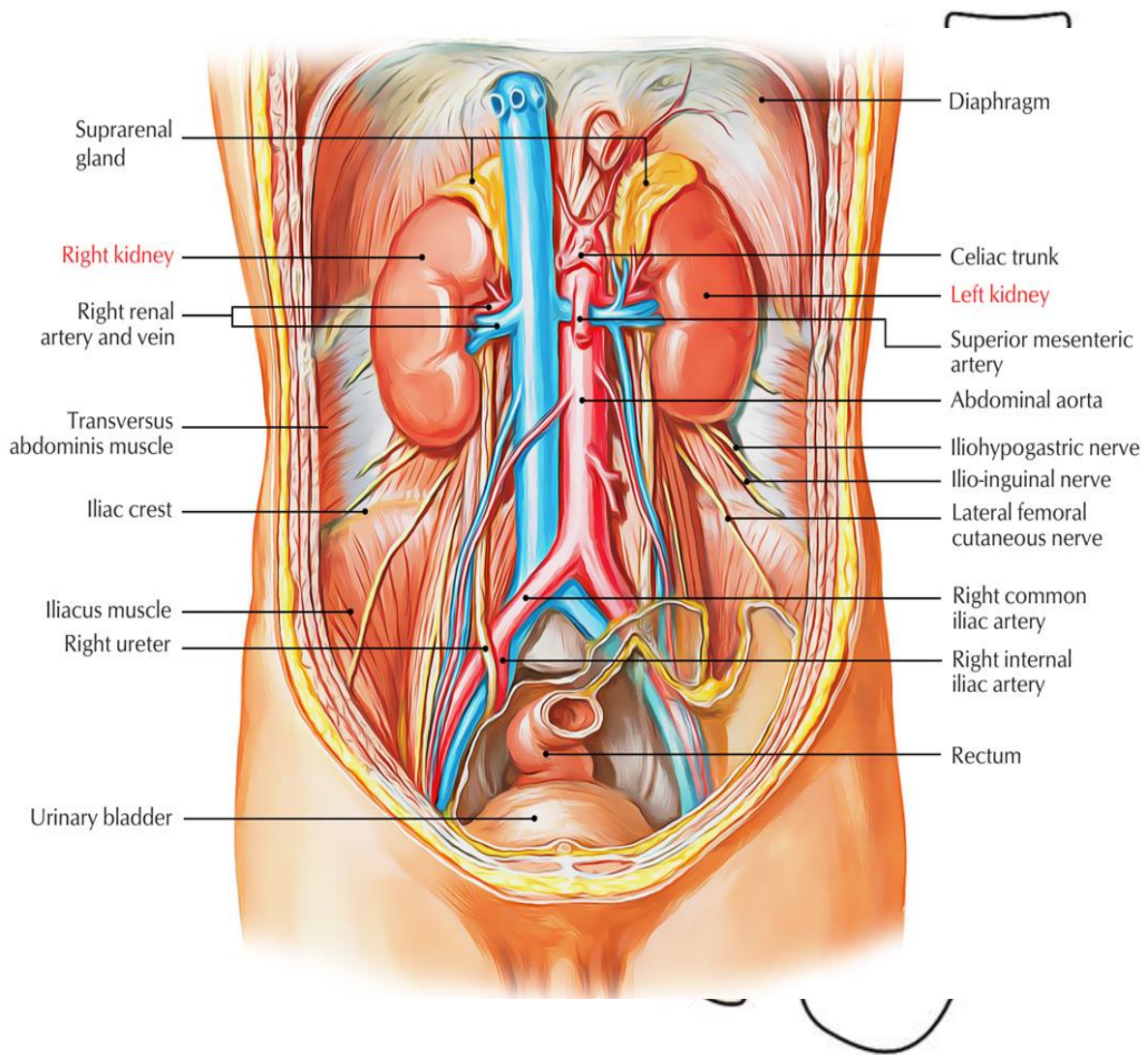
1. External iliac artery.
2. Right gonadal vessels

##### d. Retrocaecal appendix

- **Medially:** coils of ileum.
- **Laterally:** Iliacus muscle.



## Posterior relations of the caecum



★ **Arterial supply:**

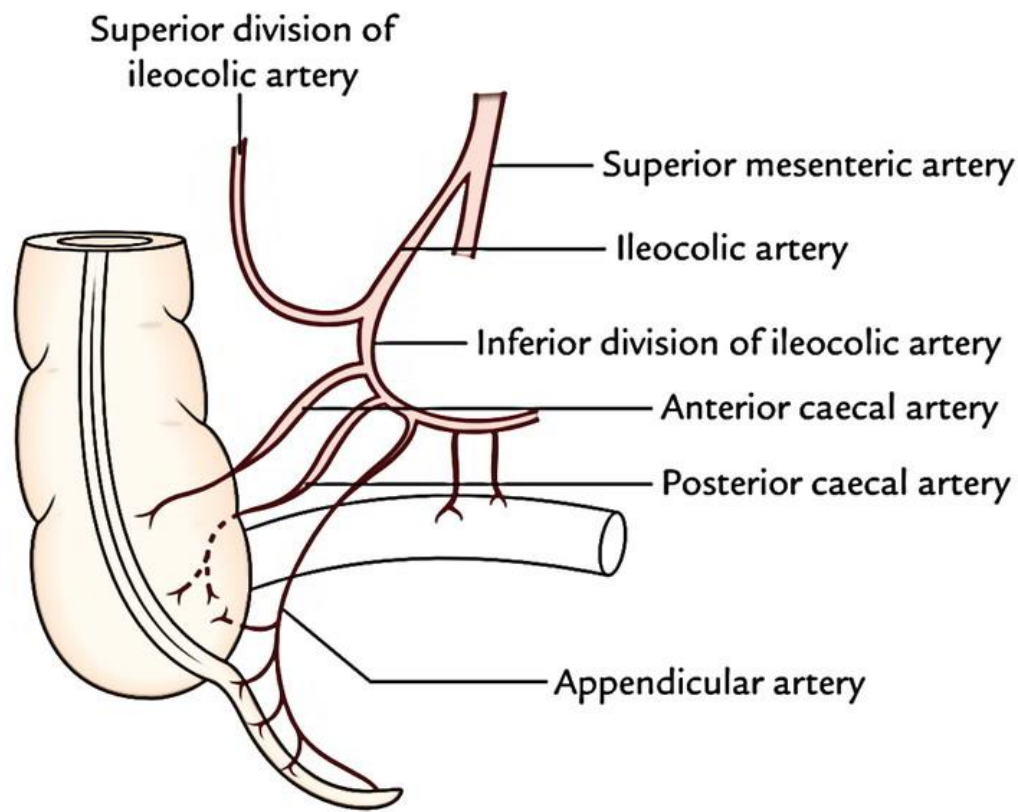
- It is supplied by anterior and posterior caecal arteries which are branches from the ileocolic artery (a branch of the superior mesenteric artery).

★ **Venous drainage:** (follow arteries )

- Caecal veins → ileocolic vein → superior mesenteric vein → portal vein.



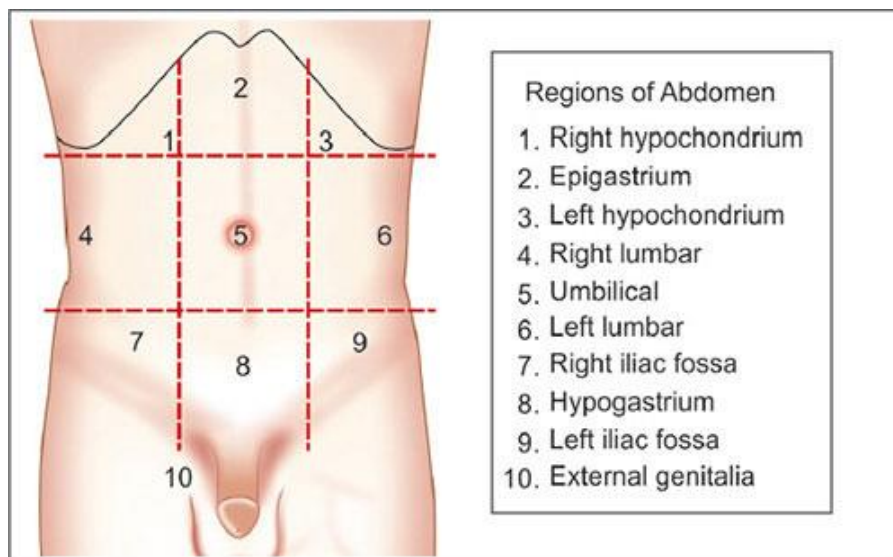
## Anatomy of colon



### ★ Surface anatomy:

The caecum lies within a triangular area bounded by:

1. Lateral 1/2 of right inguinal ligament.
2. Right lateral vertical plane.
3. Intertubercular plane.



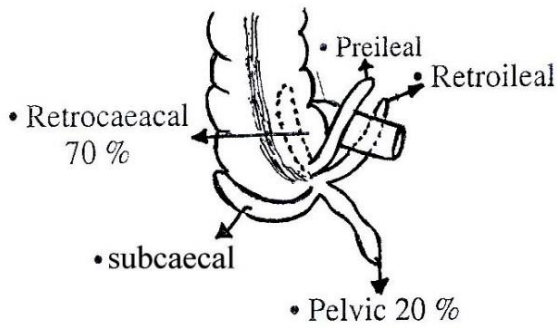
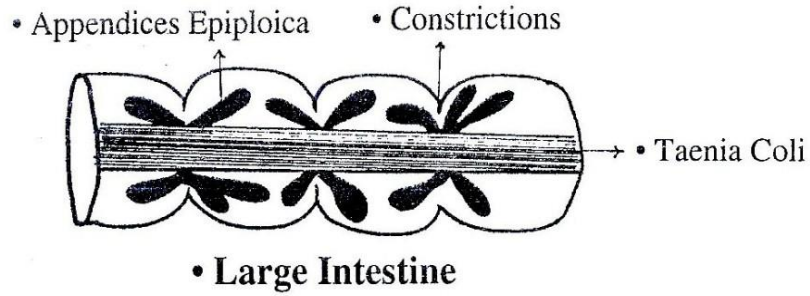
### ★ **The ileocaecal valve:**

- It is the narrowest part of the intestine ( after the appendix).
- The ileum open into the posteromedial wall of the caecum trough the ileocaecal valve which has two folds (an upper and a lower) . The two folds meet medially and laterally in two ridges, called the frenula of the valve.
- Reflux of caecal contents into the ileum is prevented by contraction of the circular muscle of the ileum and by tightening of the frenula which draws the lips of the valve together closing the orifice.

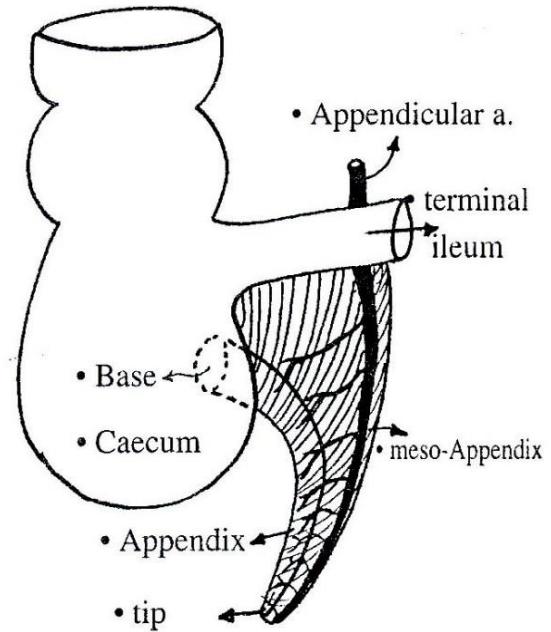
### **Vermiform appendix**

- ★ **Site:** Right iliac fossa , attached to the postero-medial aspect of caecum , 2 cm below the ileocaecal junction.
- ★ **Size:** 2-20 cm (average 10 cm).
- ★ **Shape:** It is the **narrowest part** of gut. A uniform narrow tube which having an attached end to the caecum (base) and a free end (tip).
- ★ **Surface anatomy of base:** McBurny's point (junction between the lateral 1/3 & medial 2/3 of a line extending between A.S.I.S. & the umbilicus).
- ★ **Peritoneal covering:** Completely covered, having a triangular meso-appendix with its base attached to the back of terminal ileum, contains appendix in its free right border & appendicular vessels in its free left border.

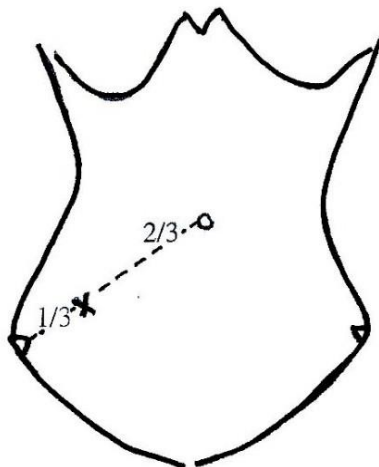
# Anatomy of colon



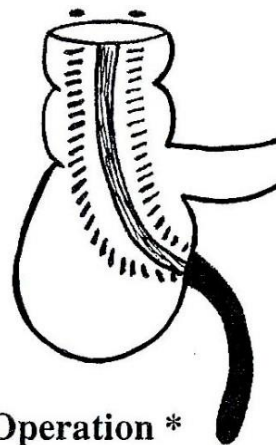
**\* Position Of The Appendix \***



**\* Peritoneal Covering \***



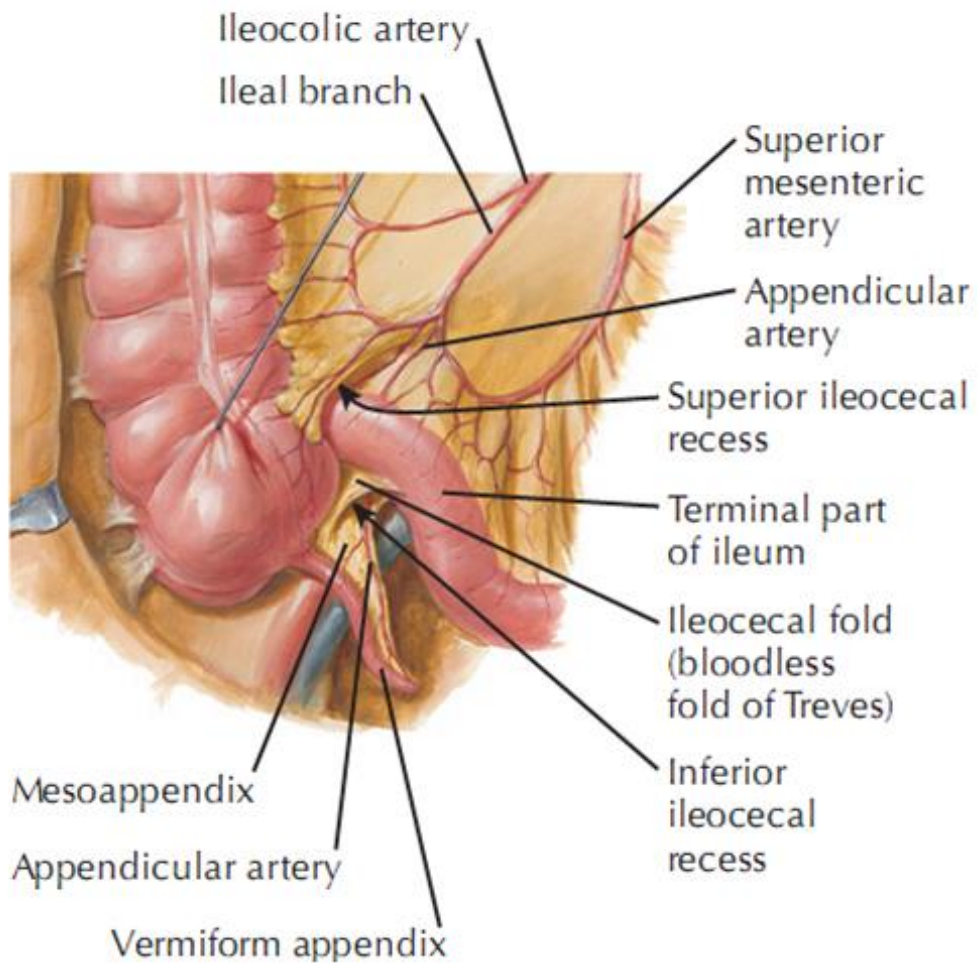
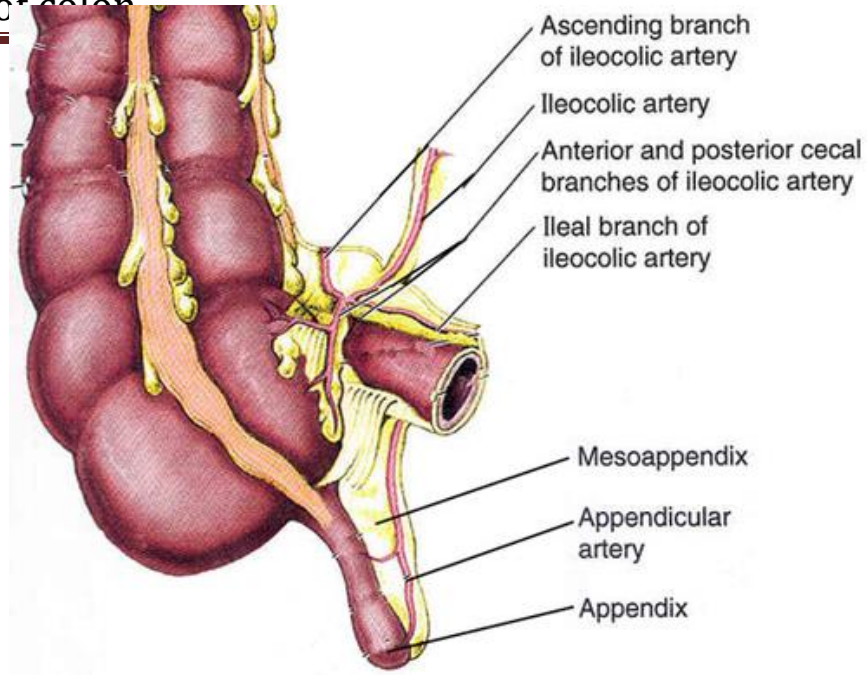
**\* McBurney's Point \***



**\* At Operation \***

**\* Vermiform Appendix \***

# Anatomy of colon



★ **Position:** Variable.

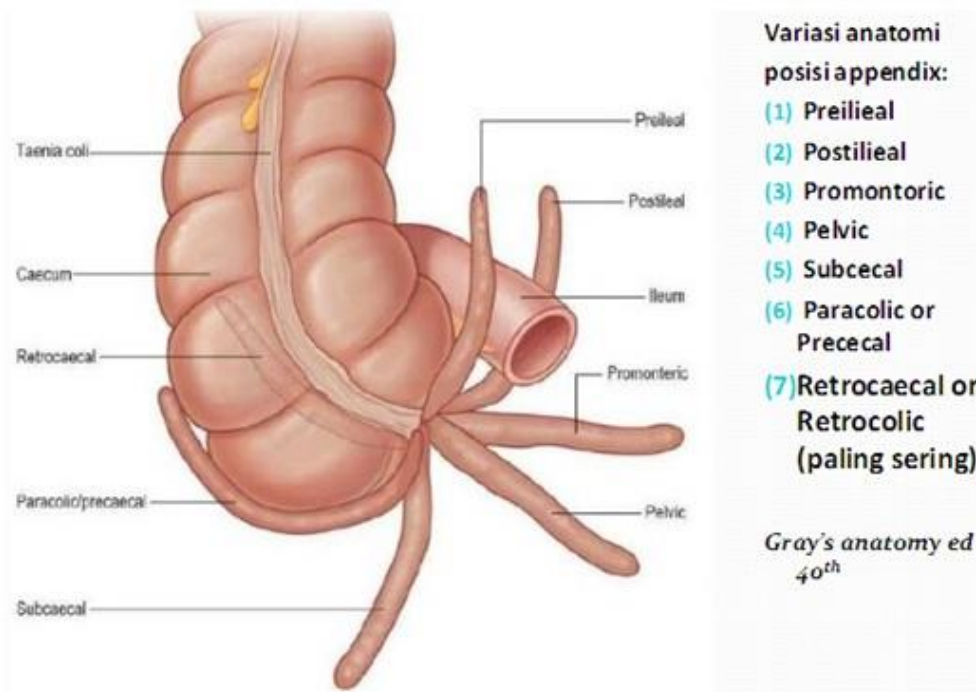
## Anatomy of colon

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1. **Retrocaecal** (75%) behind the caecum and may be related to right proas major, quadratus lumborum, lower pole of kidney & ureter.
  2. **Pelvic** (20%): point down towards the pelvis and may be related to uterine tube, ovary, rectum & obturator internus muscle.
  3. **Pre-ileal**: in the front of terminal ileum.
  4. **Post-ileal**: behind terminal ileum & related to ileo-colic vessels.
  5. **Paracaecal**: On the right side of caecum .
  6. **Subcaecal** : below the caecum .
  7. **Subhepatic**: a congenital anomaly due to failure of descent of the caecum.
  8. **Pregnancy** displaces the caecum & appendix towards the right hypochondrium.
  9. **Subserous appendix** : Meso-appendix may be absent and the appendix lies beneath the serosa of caecum .
- ★ **The submucosa** of the appendix is rich in lymphoid tissue (tonsil of abdomen) which progressively atrophies with age.
- ★ **Blood supply**: Appendicular vessels (from ilio-colic which is from superior mesenteric vessels) .
- ★ **Nerve supply**: T<sub>10</sub> supply the peritoneal covering of appendix (as well as the umbilicus).
- ★ **Identification at operation**: by the 3 taeniae coli which meet at the base of the appendix and form a continuous muscle coat in the wall of the appendix.



## Anatomy of colon



### ★ Applied Anatomy:

- 1) Acute appendicitis is the **commonest** cause for acute abdomen.
- 2) **Narrow lumen and rich lymphoid follicles** in the appendix leading to high incidence of appendicitis.
- 3) The clinical picture of appendicitis **varies according to the position** of the appendix. Therefore, diagnosis of appendicitis may be difficult.
- 4) **Pain** of appendicitis is felt late cases in the right iliac fossa and referred in early cases to the umbilicus (T<sub>10</sub> nerve supply the appendix and umbilicus).
- 5) **Appendicular pain** is early visceral due to stretch of peritoneal covering (generalized abdominal pain especially around umbilicus) and later on somatic (localized in right iliac fossa due to irritation of parietal peritoneum).

- 6) Acute appendicitis may result in **thrombosis of the appendicular artery** (only arterial supply to appendix) causing gangrene and perforation of the appendix, leading to fatal peritonitis.
- 7) Appendicular vessels are distally closely applied to the wall , therefore in acute appendicitis ,thrombosis and gangrene usually affect the **distal part of the appendix** (also least vascular part) .
- 8) **Post-ileal appendix** is closely related to **ileocolic vein** and appendicitis may result in **portal vein thrombosis** and **portal pyemia** leading to **jaundice** , liver abscesses and later on **portal hypertension**.
- 9) **At operation** the appendix is identified by the 3 taeniae coli which meet at its base.

### **The ascending colon**

#### ★ **Position:**

- It **begins** at the level of **ileocaecal junction** as an upward continuation of the caecum.
- It **ascends** in the lumbar region just to right side of the right lateral vertical plane.
- It **ends** at the right colic flexure anterior to the lower part of the right kidney.

★ **Length:** It is about 15-20 cm in length.

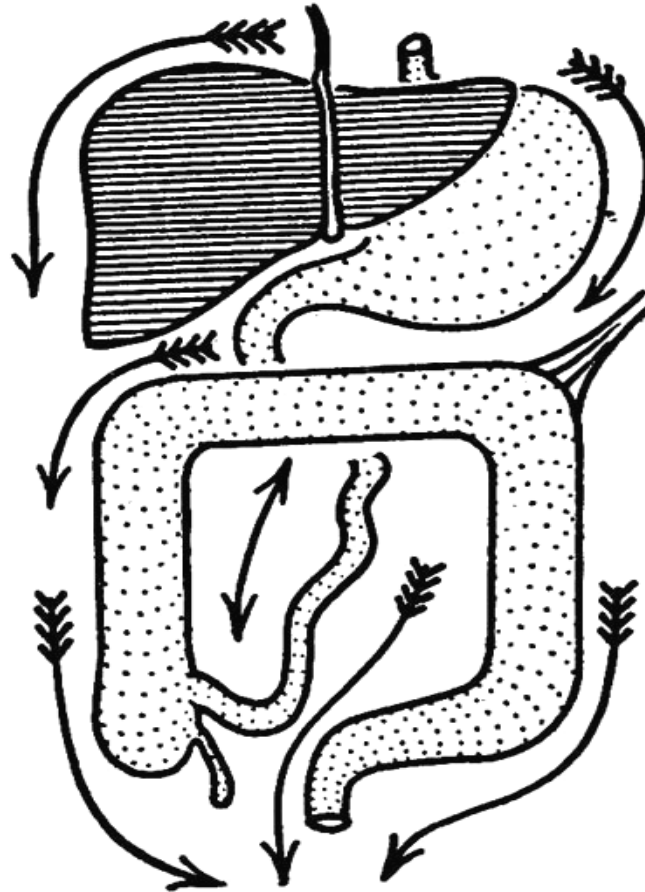
#### ★ **Peritoneal covering:**

- It is covered by peritoneum along its anterior surface and on its sides.
- **Right paracolic gutters** are found along its lateral and medial sides.

## Anatomy of colon

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- **Applied Anatomy:** Fluid collection in the upper part of the abdomen can pass downwards along right lateral gutters to the pelvis (e.g. in perforated peptic ulcer).



**\*Compartment of the peritoneum  
and paracolic gutter\***

★ **Relations:**

- **Anteriorly:**

1. Anterior abdominal wall.

## Anatomy of colon

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2. Coils of small intestine (mainly ileum).
3. Greater omentum.

- **Posteriorly:**

1. Right iliacus muscle.
  2. Right iliac crest.
  3. Right transversus abdominis muscle.
  4. Right quadratus lumborum muscle.
  5. The previous structures are separated from the ascending colon by three nerves:
    - a. Iliohypogastric nerve.
    - b. Ilio-inguinal nerve.
    - c. Lateral cutaneous nerve of the thigh.
  6. Lower part of the right kidney.
- **Medially:** coils of small intestine (mainly ileum).

- ★ **Arterial supply:**

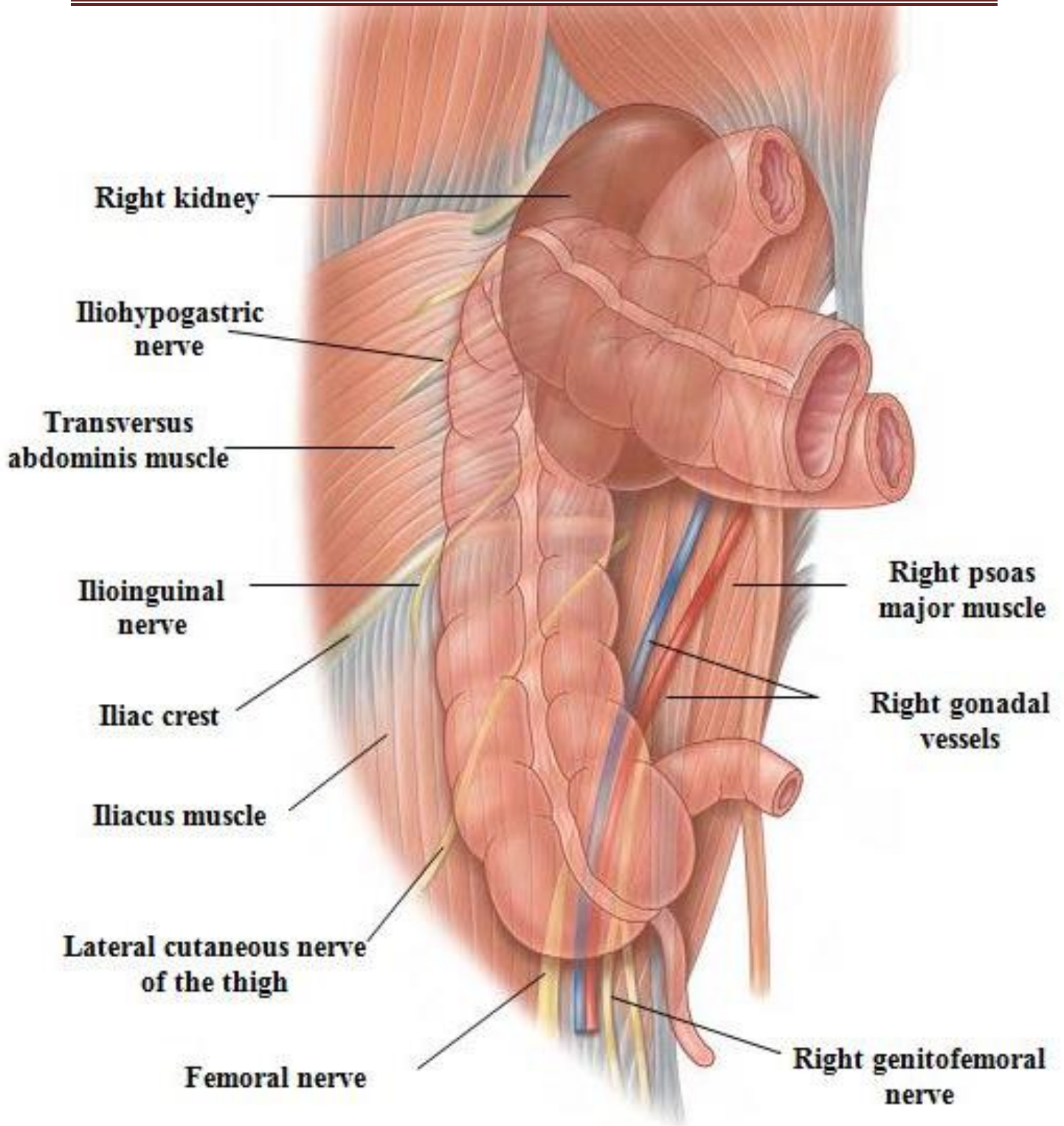
- Ileocolic & right colic branches from superior mesenteric artery.

- ★ **Venous drainage:**

- It follows the arterial supply (i.e. ileocolic and right colic veins) to the superior mesenteric vein (portal circulation).

## Anatomy of colon

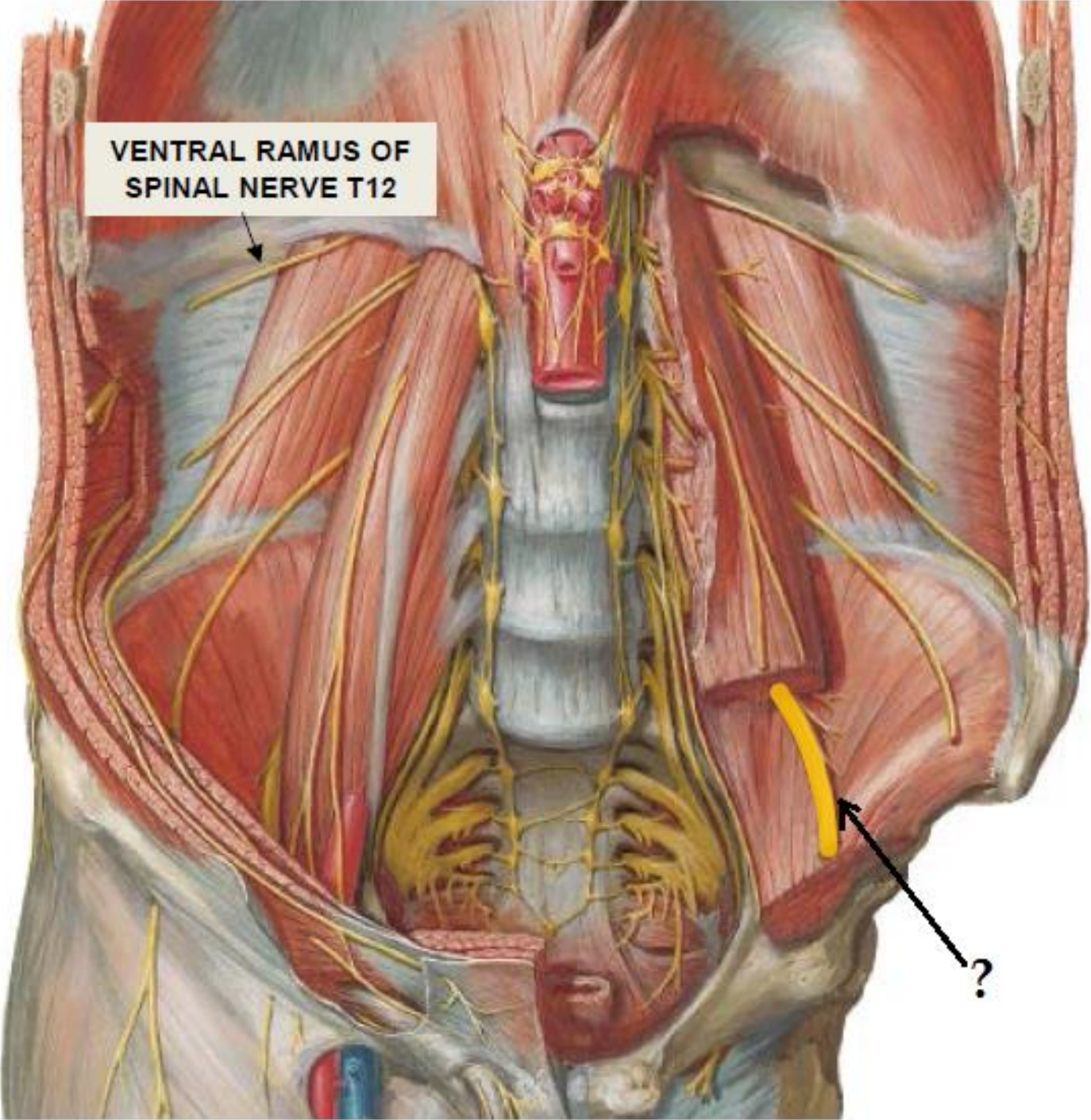
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**Posterior relations of the caecum and ascending colon**

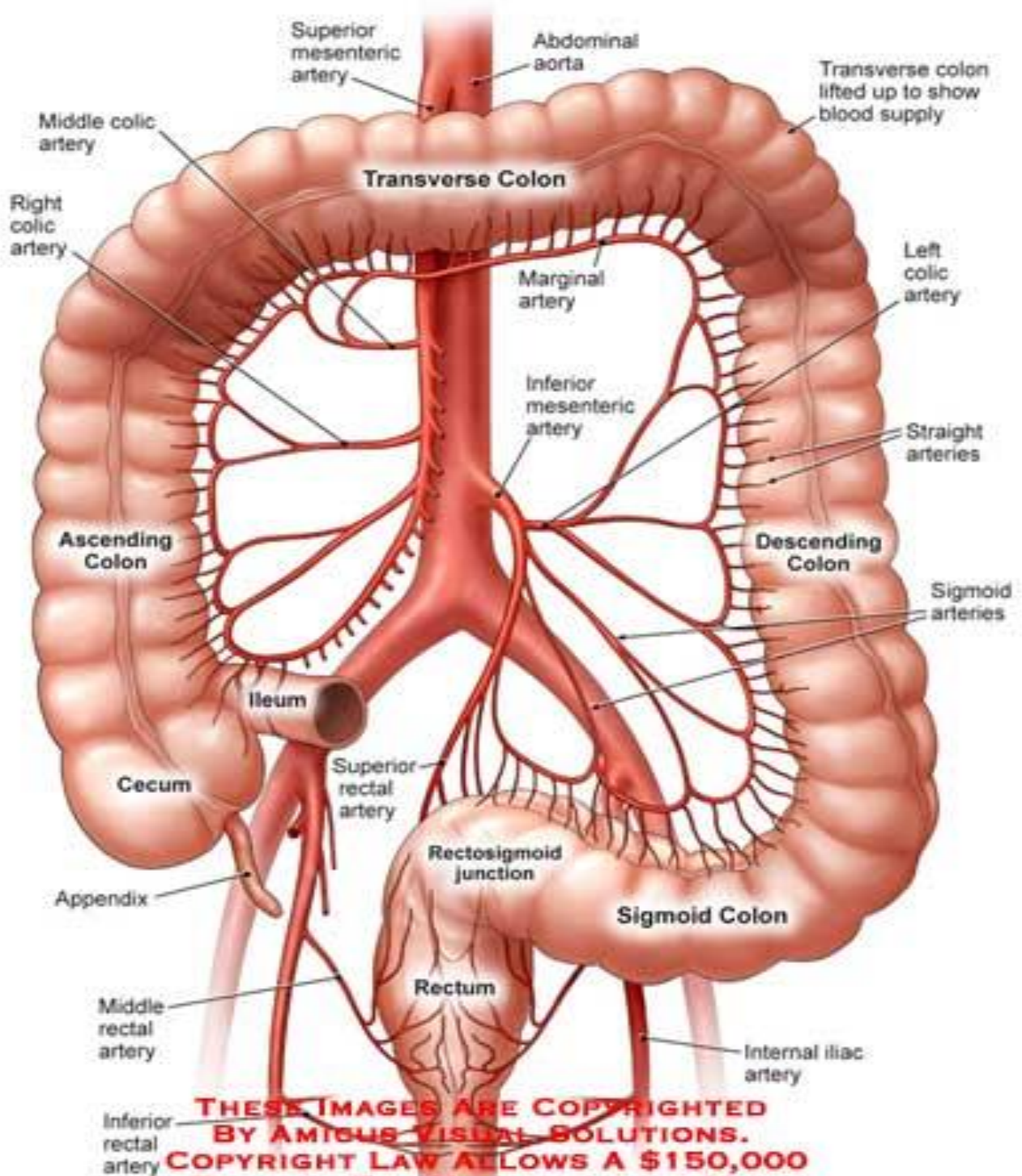


Anatomy of colon



ANTERIOR VIEW

## Blood Supply to the Colon



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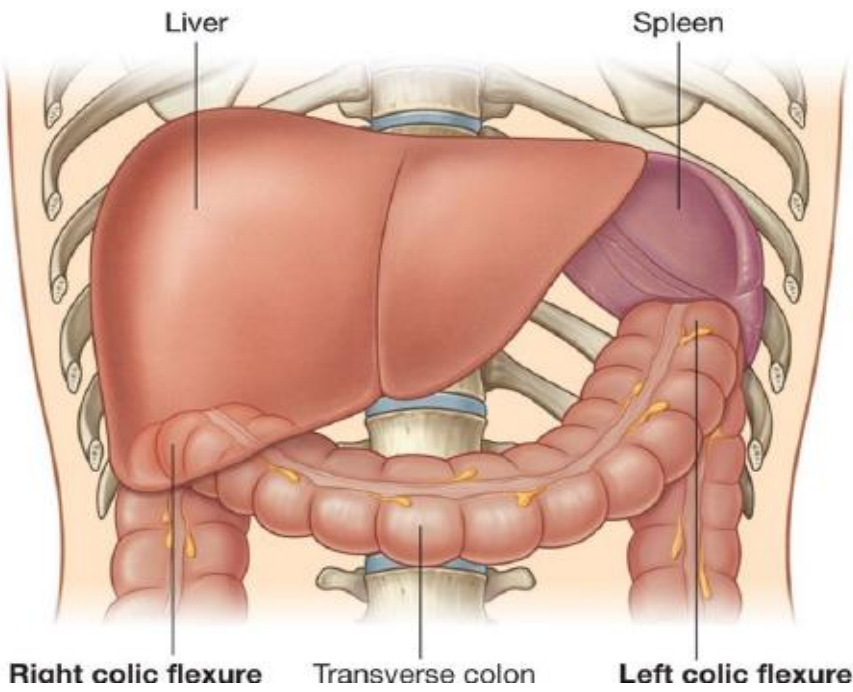
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## Colic Flexures

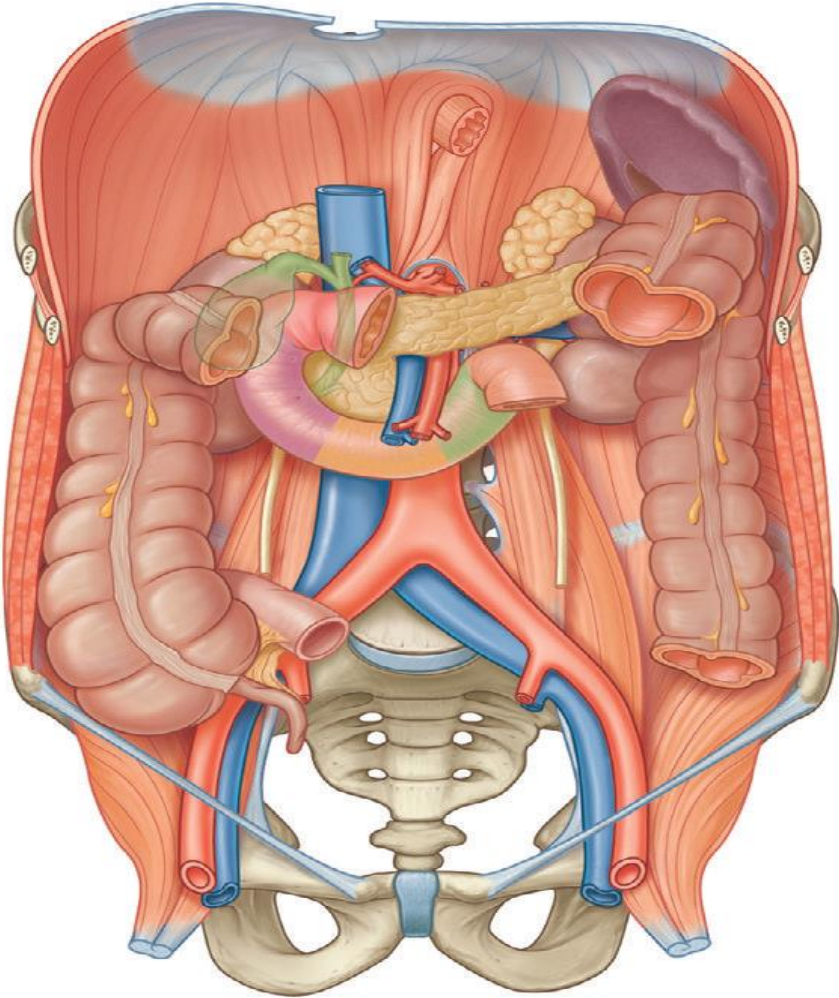
	<b>Right colic (hepatic) flexure</b>	<b>Left colic (splenic) flexure</b>
<b>Position</b>	<ul style="list-style-type: none"> <li>• In the <b>right</b> hypochondrium</li> <li>• Under cover of the right lobe of liver which push it downwards</li> <li>• It lies at a <b>lower</b> level</li> </ul>	<ul style="list-style-type: none"> <li>• In the <b>left</b> hypochondrium</li> <li>• At the anterior (lateral) end of the spleen</li> <li>• It lies at a <b>higher</b> level</li> </ul>
<b>Shape</b>	• <b>Right</b> angle.	• <b>Acute</b> angle.
<b>Peritoneum</b>	• Covered with peritoneum <b>except posteriorly</b>	<ul style="list-style-type: none"> <li>• Covered with peritoneum except posteriorly</li> <li>• It is attached to the diaphragm by a peritoneal fold called <b>phreno-colic ligament</b></li> </ul>
<b>Relations</b>	<ul style="list-style-type: none"> <li>• <b>Above</b>, in front and laterally: right lobe of liver</li> <li>• <b>Posteriorly</b>: lower part of the right kidney</li> <li>• <b>Medially</b>: 2<sup>nd</sup> part of the duodenum and coils of small intestine</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Above</b>: spleen and tail of pancreas</li> <li>• <b>Posteriorly</b>: diaphragm</li> <li>• <b>Medially</b>: left kidney and coils of small intestine</li> </ul>
<b>Arterial supply</b>	• Ascending branch of the right colic artery	• Ascending branch of the upper left colic artery



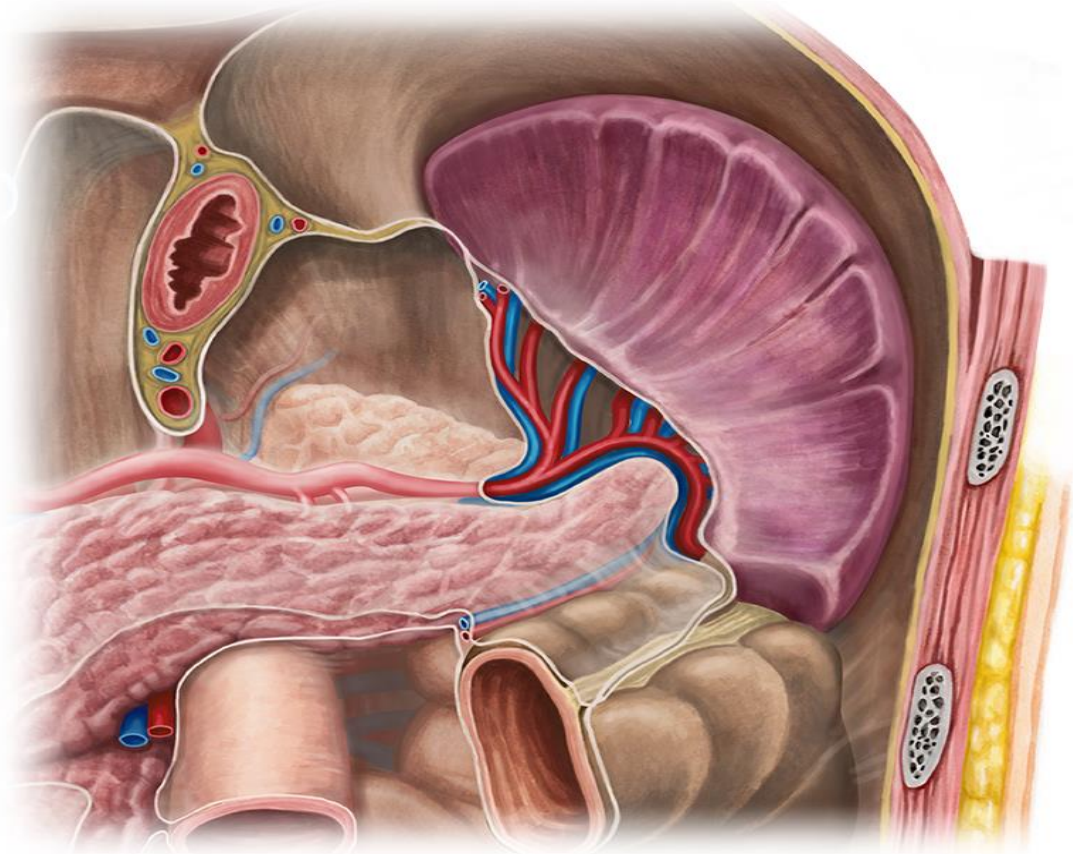
# Anatomy of colon



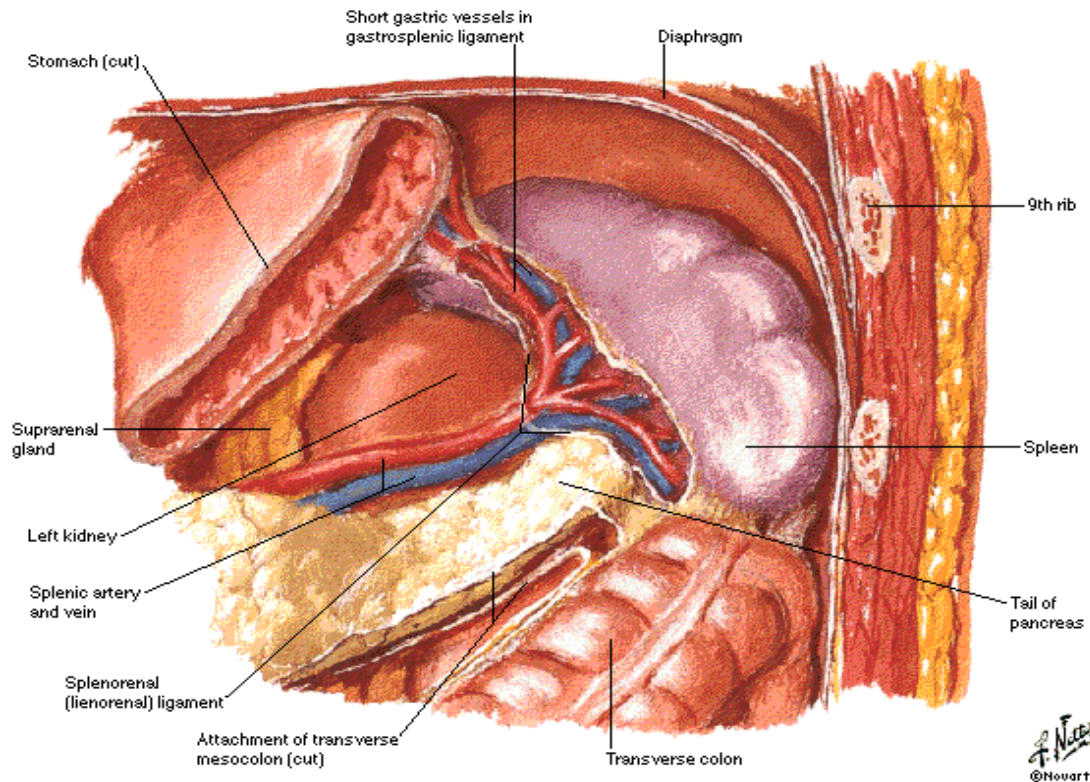
## Transverse Colon and Colic Flexures



# Anatomy of colon



## Spleen in Situ





## Transverse Colon

### ★ Position:

- It **starts** from the right colic flexure in the right lumbar region and **descends** down to the umbilical region.
- It **ends** at the left colic flexure in the left hypochondrium.

★ **Length:** It is about 40-50 cm long.

### ★ Peritoneal covering:

- It is completely covered by peritoneum and has a mesentery called the "transverse mesocolon".

- **Transverse mesocolon:**

- It is a fold of peritoneum formed of two layers. It is formed by the ascending posterior two layers of the greater omentum.

- It has **two borders:**

1. **Free border** containing the transverse colon (except the first two inches of the transverse colon which covered anterior only and lie posteriorly directly on the 2<sup>nd</sup> part of the duodenum).

2. **Attached border** (root) is attached to the posterior abdominal wall along the following structures from right to left:

- a) Anterior surface of the head of pancreas.

- b) Anterior border of the body of pancreas.

- **Contents:**

1. Transverse colon in the free border (except its first two inches).

2. Ascending branches of the right colic & ascending branch of superior left colic arteries.

3. Branches of the middle colic artery: run from behind forwards.

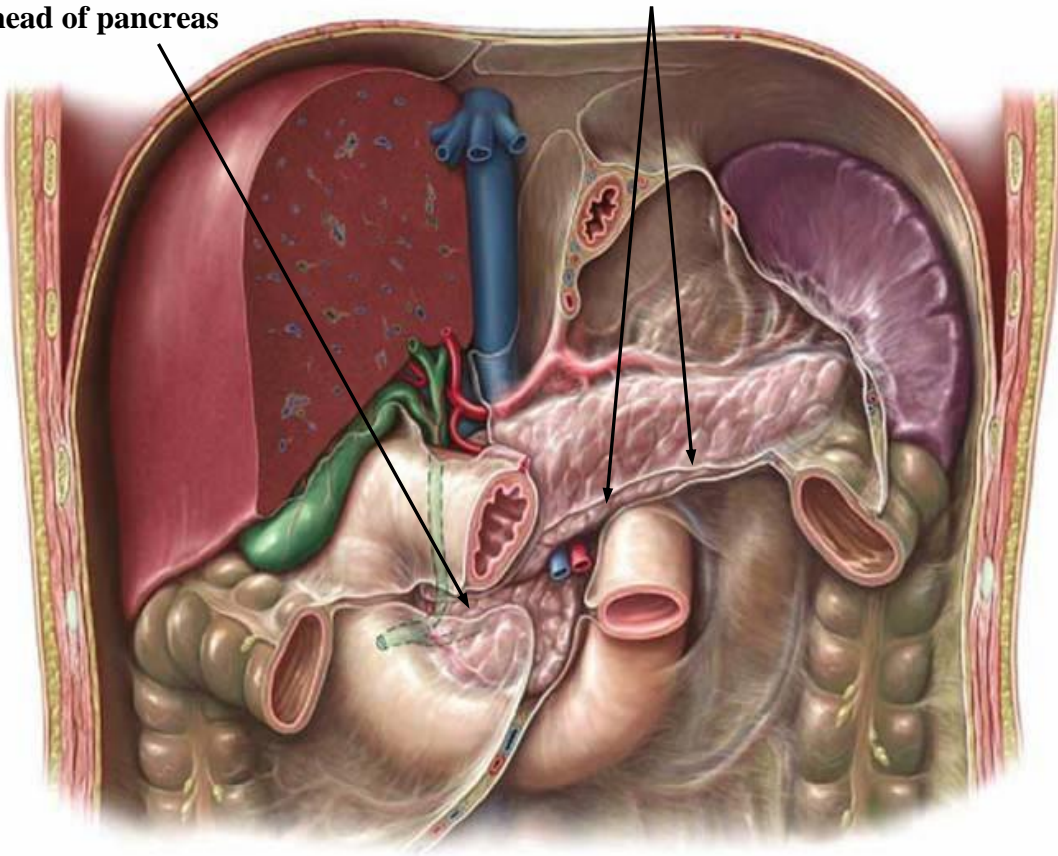
## Anatomy of colon

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4. Lymph vessels and lymph nodes , sympathetic plexuses & extraperitoneal fatty tissue .

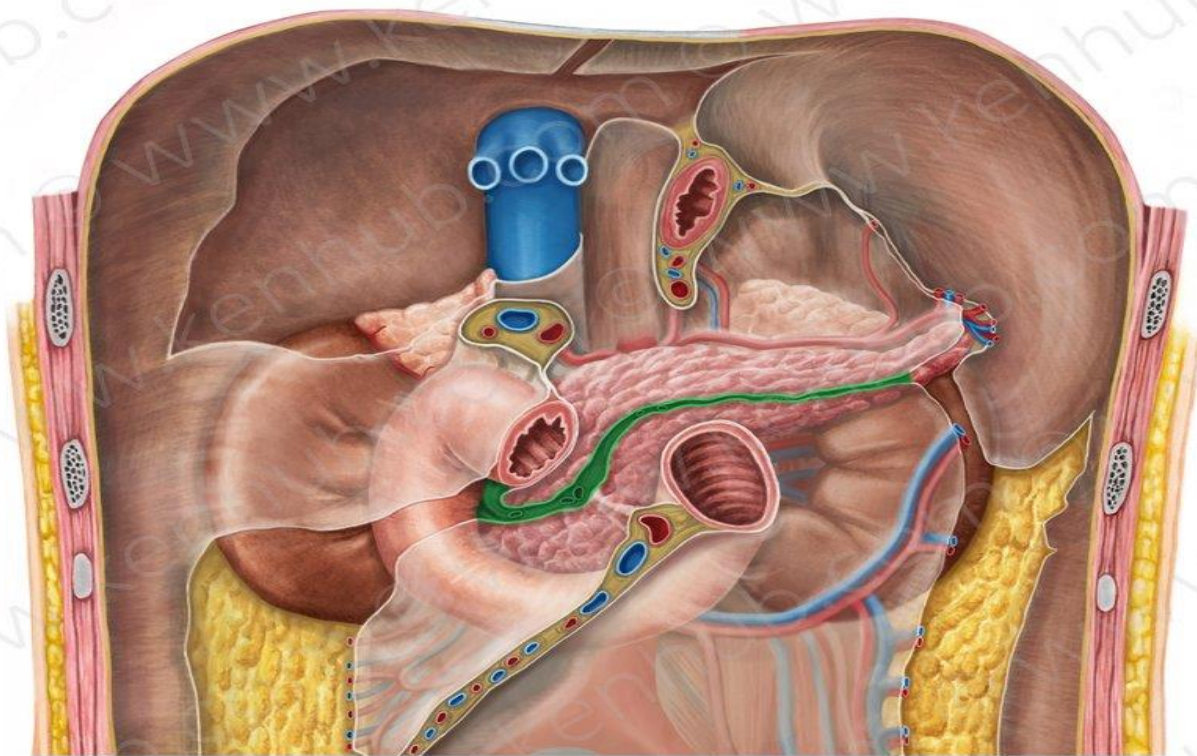
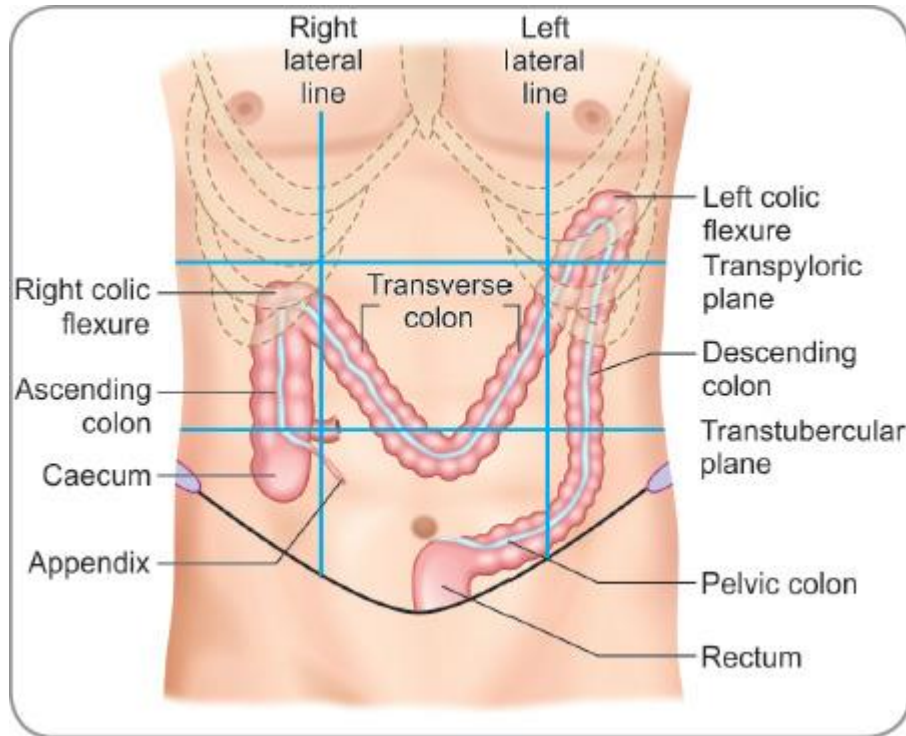
**Attachment of root of transverse mesocolon to the head of pancreas**

**Attachment of root of transverse mesocolon to anterior border of body of pancreas**

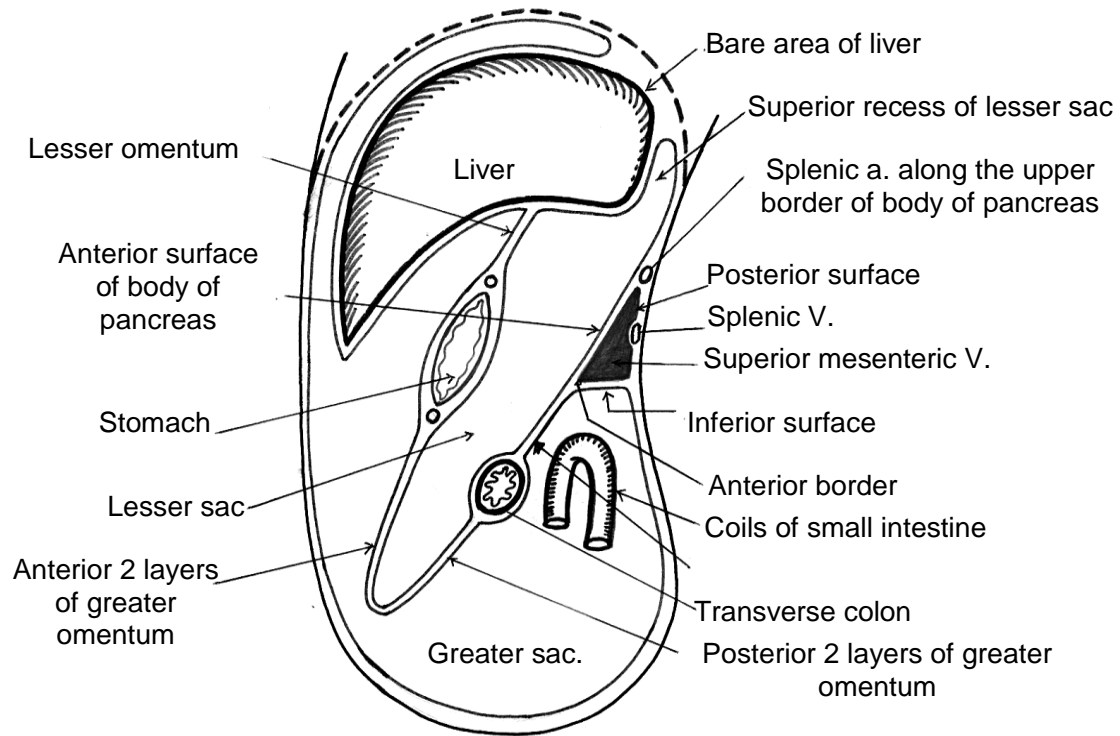


**Attachment of the root of the transverse mesocolon**

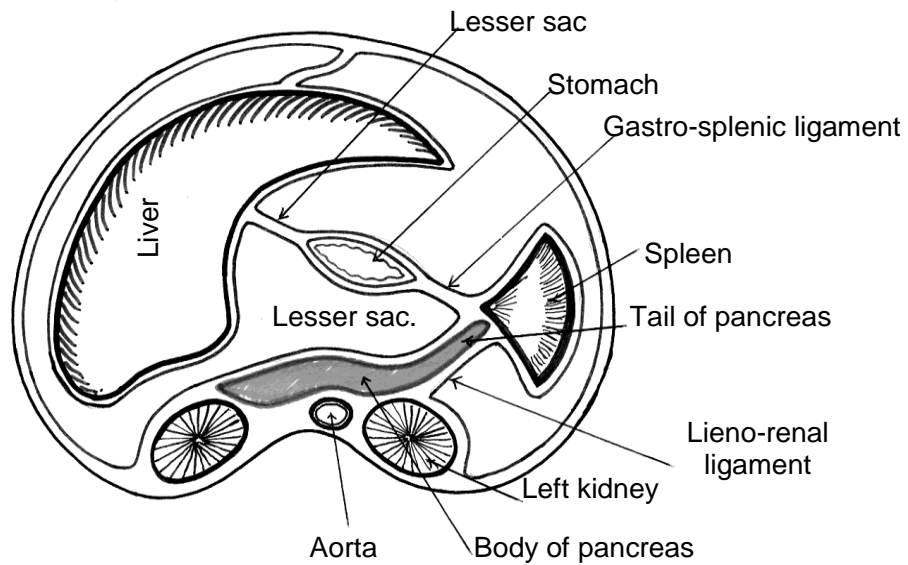
# Anatomy of colon



# Anatomy of colon



**\* Surfaces and borders of body of pancreas \*  
(Sagittal Section)**



**\* Transverse section at the level of the body of pancreas \***

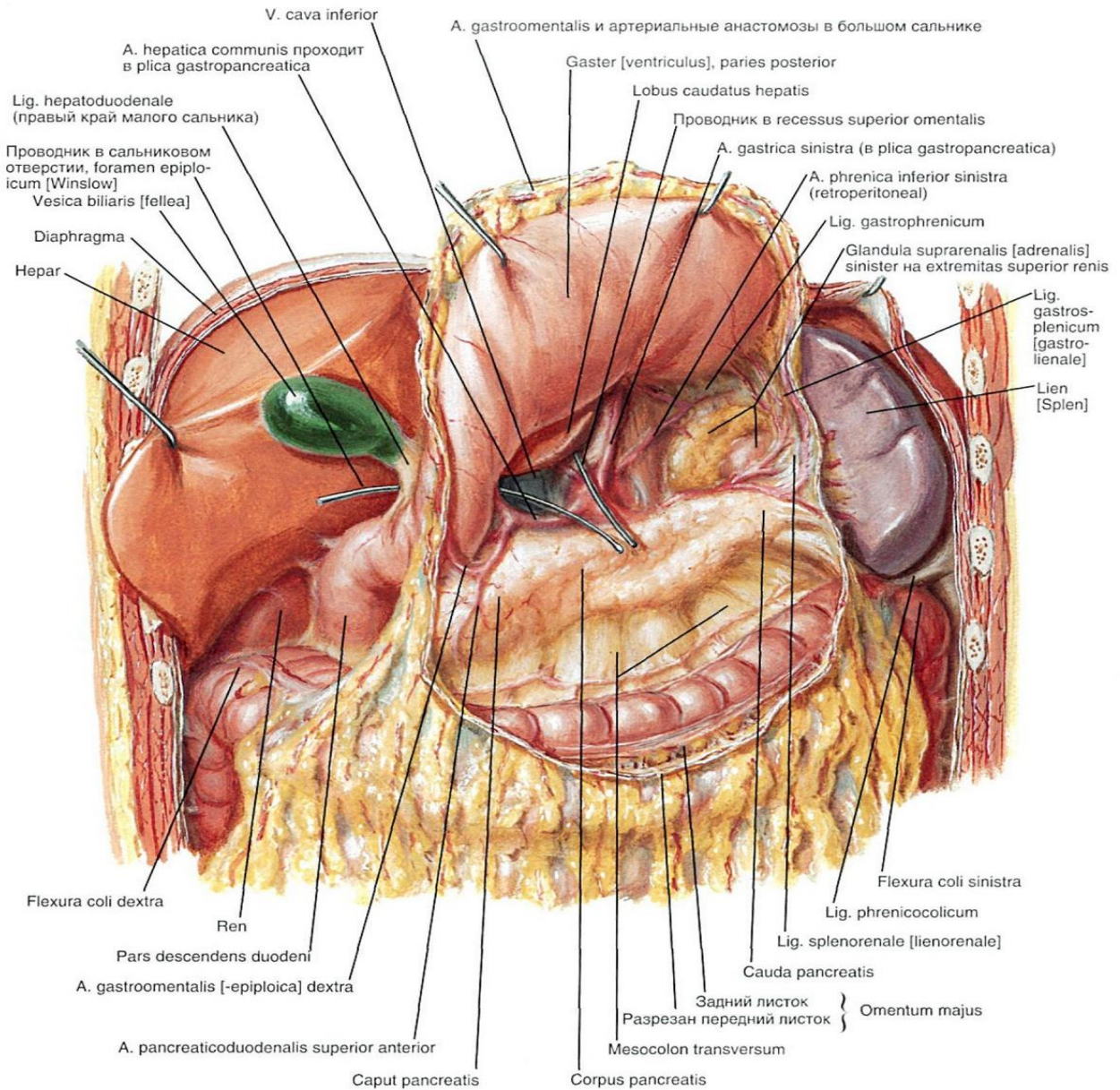


# Anatomy of colon

## ★ Relations:

### • Anteriorly:

1. Inferior surface of the right lobe of the liver.
2. Body and fundus of the gall bladder.
3. Greater omentum.
4. Greater curvature of the stomach.

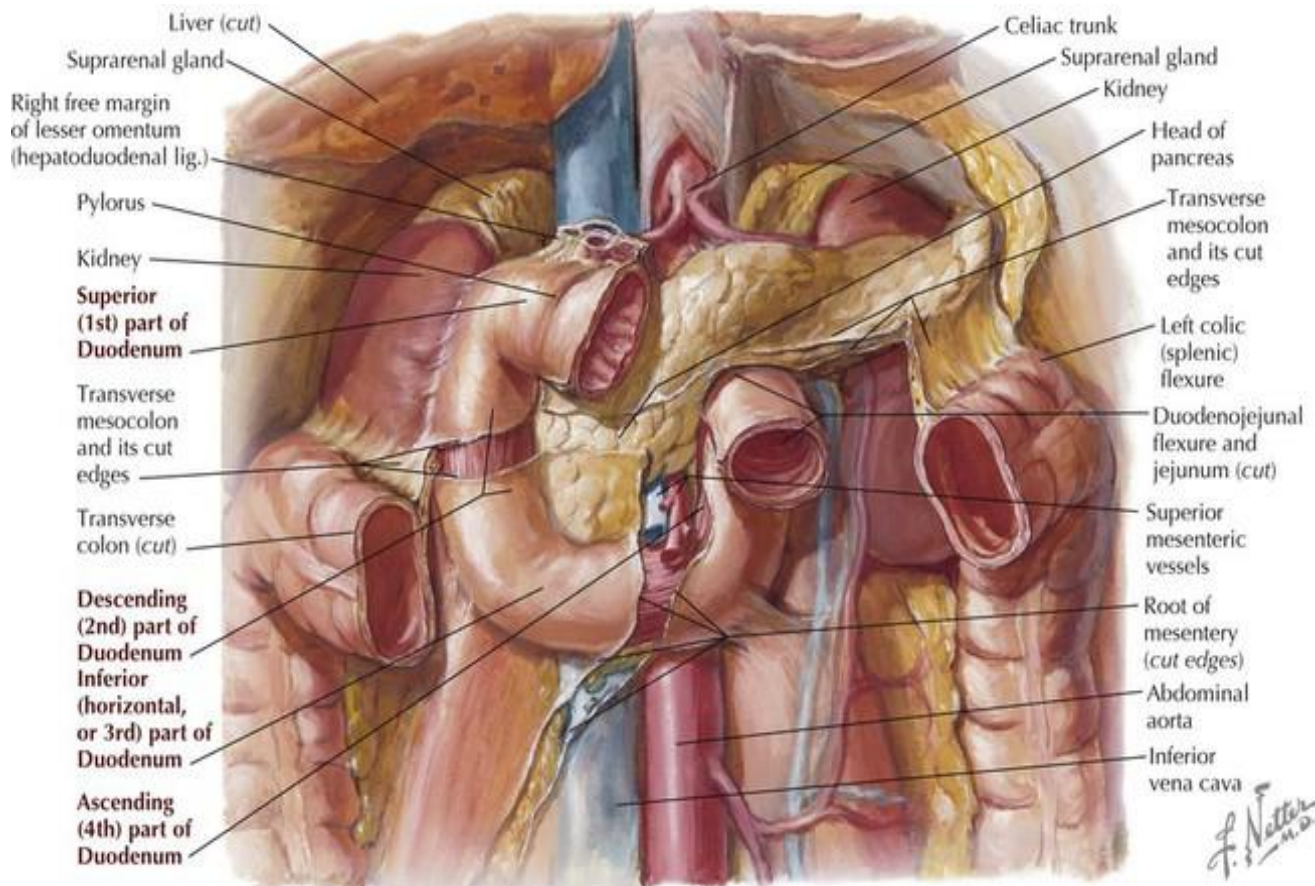




## Anatomy of colon

- **Posteriorly:**

1. Second part of the duodenum.
2. Head of the pancreas.
3. Duodenojejunal flexure and coils of jejunum.
4. Left kidney.



- ★ **Arterial supply:**

1. **Right 1/3** is supplied by the ascending branch of right colic artery (branch from superior mesenteric artery).
2. **Middle 1/3** is supplied by the middle colic artery (branch from the superior mesenteric artery).

3. **Left 1/3** is supplied by the ascending branch of superior left colic artery (branch from the inferior mesenteric artery).

★ **Venous drainage:**

- It follows the arterial supply to drain into the superior and inferior mesenteric veins (portal circulation).

### **Descending Colon**

★ **Position:**

- It lies in the left hypochondrium, left lumbar and left iliac regions.
- It extends down from the left colic flexure to the inlet of lesser pelvis where it becomes continuous with the pelvic colon.

★ **Length:** It is about 25-30 cm long.

★ **Peritoneal covering:** (like those of ascending colon)

- It is covered by peritoneum anteriorly and on both sides.
- Peritoneal left paracolic gutters are found along its medial and lateral sides, which reach down to the pelvic cavity.

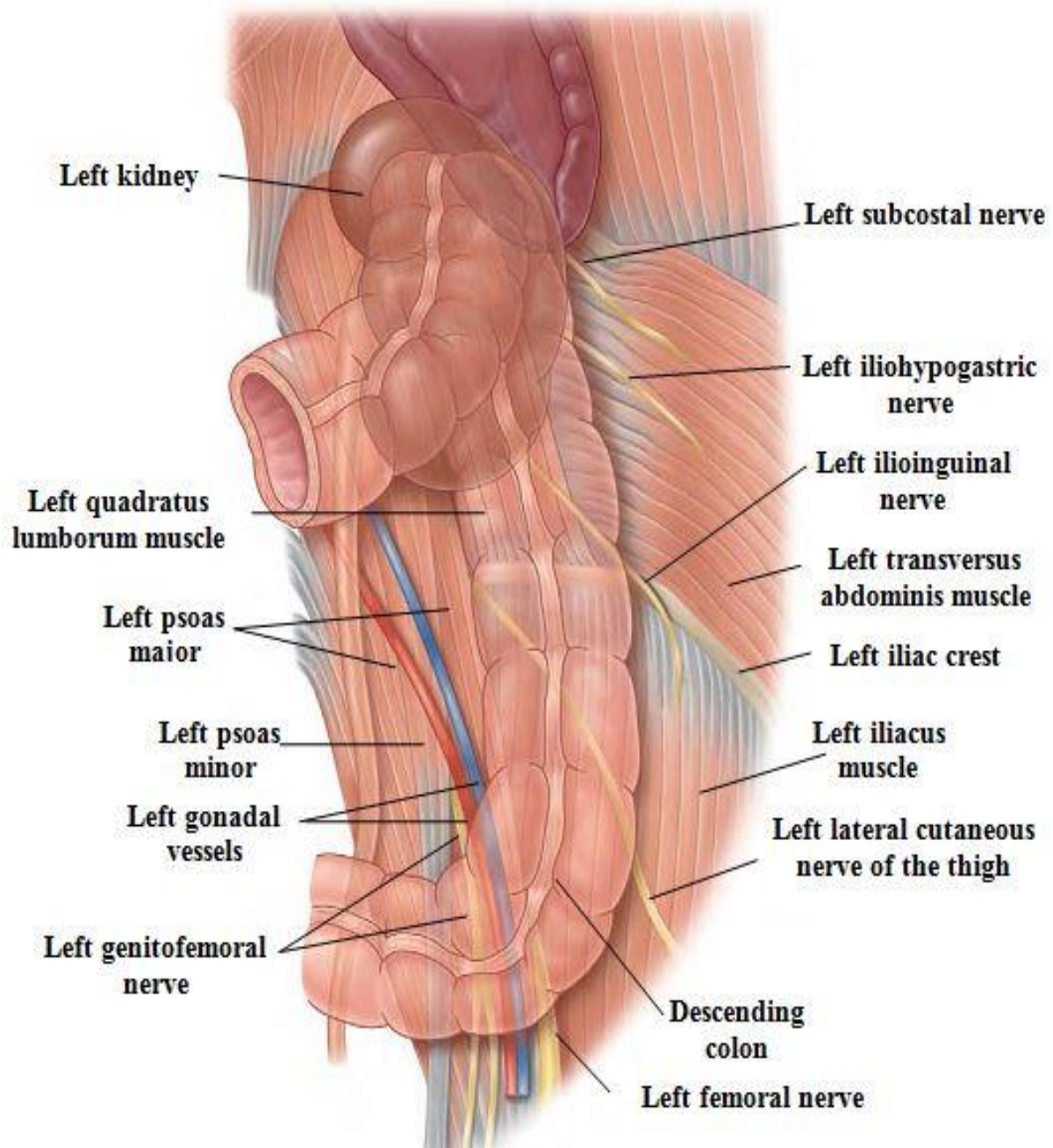
★ **Relations:**

- **Anteriorly:** (like those of ascending colon)
  1. Anterior abdominal wall.
  2. Loops of small intestine.
  3. Greater omentum.
- **Posteriorly:** (like those of caecum & ascending colon)
  1. Left kidney.
  2. Muscles :
    - Left quadratus lumborum muscle.
    - Left transversus abdominis muscle.

## Anatomy of colon

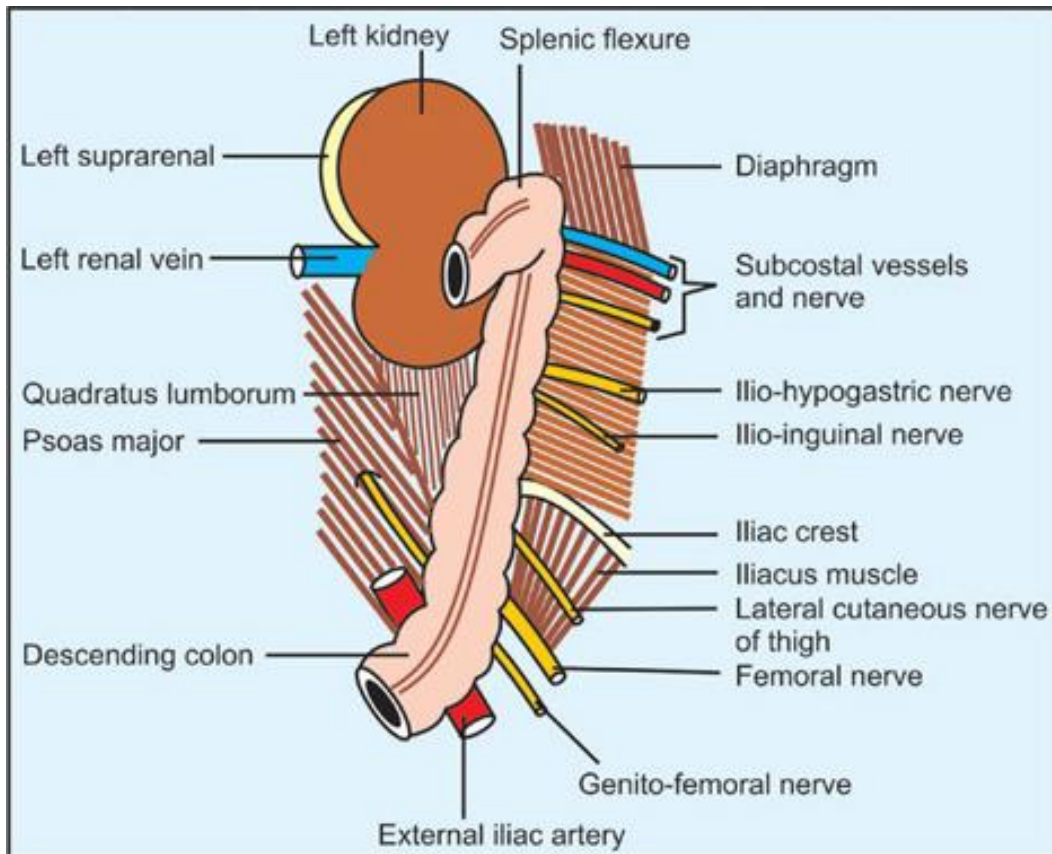
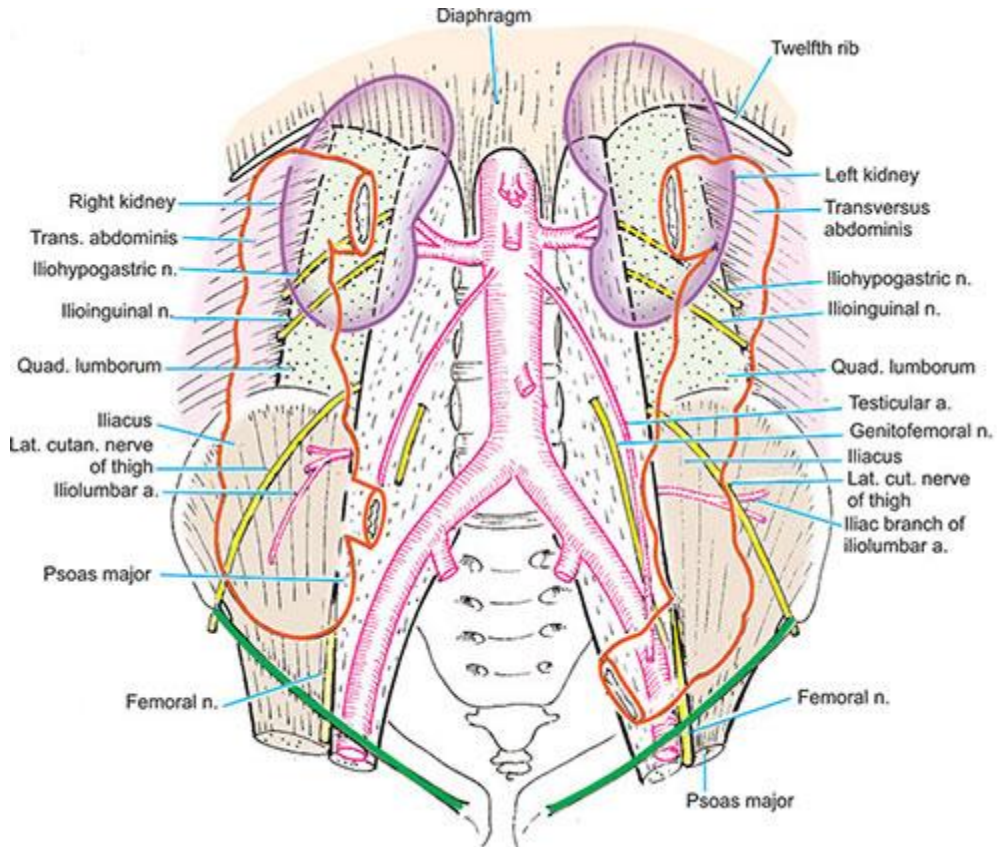
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- Left iliac crest.
- Left iliacus, left psoas major and psoas minor muscles.





# Anatomy of colon





3. **Nerves and vessels:** separating the previous muscles from the colon .

- Left Subcostal nerve and vessels.
- Left iliohypogastric nerve.
- Left ilio-inguinal nerve.
- Left lateral cutaneous nerve of the thigh.
- Left femoral nerve.
- Left gonadal vessels.
- Left genitofemoral nerve.
- Left external iliac artery.

- **Medially:** coils of small intestine (mainly ileum).

★ **Arterial supply:** By the superior and inferior left colic branches of the inferior mesenteric artery.

★ **Venous drainage:** By superior and inferior left colic veins which drain into the inferior mesenteric vein (portal circulation).

### **Pelvic (Sigmoid) Colon**

★ **Position:**

- It **begins** at the left border of the inlet of lesser pelvis, as a continuation of the descending colon.
- It **ends** in the pelvic cavity opposite the 3<sup>rd</sup> sacral piece, at the recto-sigmoid junction by becoming continuous with the rectum.

★ **Shape and Length:**

- It is S-shaped.

## Anatomy of colon

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- It is 30-40 cm long.

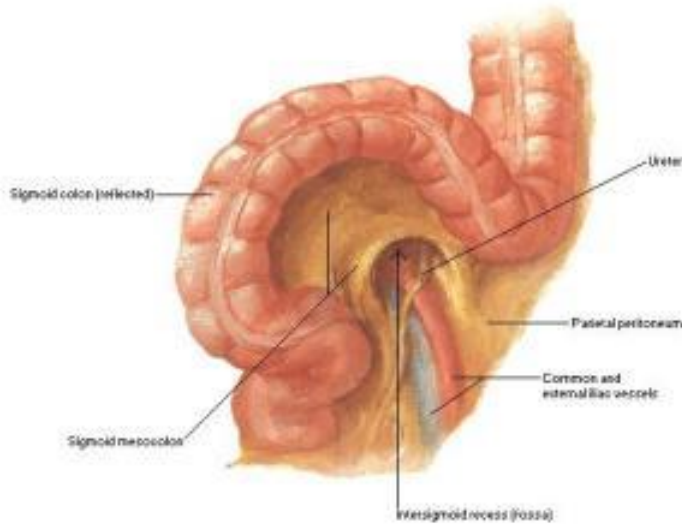
### ★ **Peritoneal covering:**

- It is completely covered by peritoneum.
- It has a triangular shaped mesentery, called pelvic (sigmoid) mesocolon.

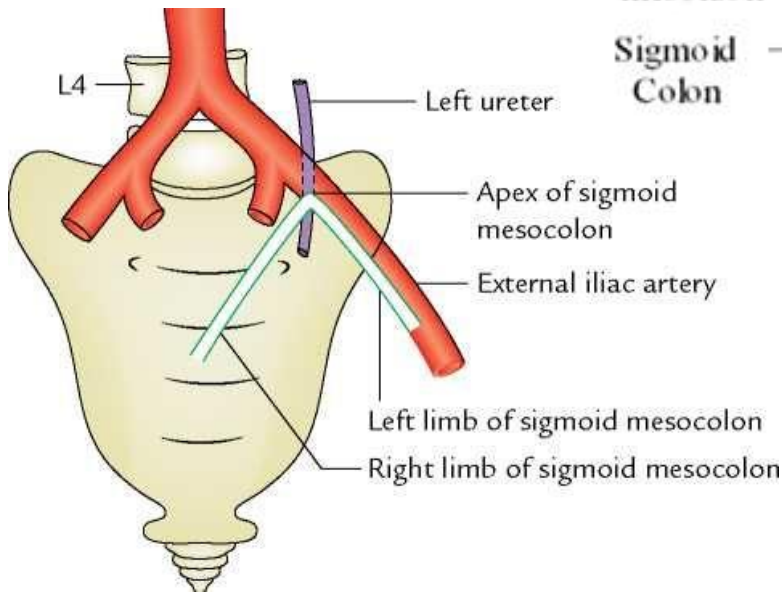
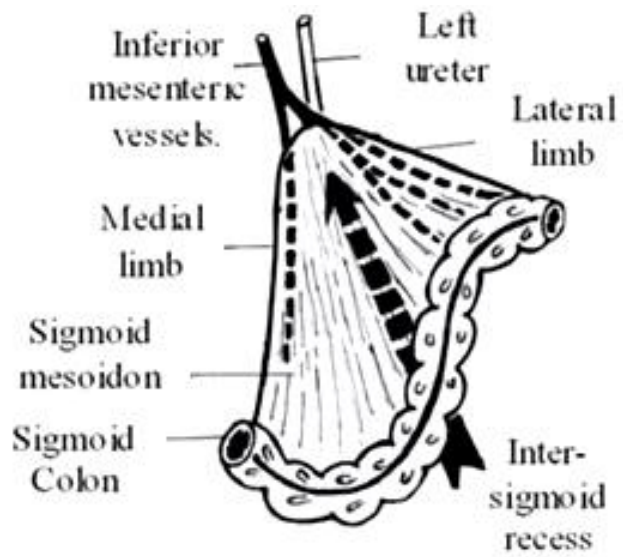
### • **Pelvic mesocolon:**

- It is a peritoneal fold formed of two layers attaching the pelvic colon to the posterior wall of the pelvis.
- It has a free border containing the sigmoid colon .
- It has an **attached border or root** formed of two limbs:
  - ♣ **Lateral limb:** attached to **left external iliac** vessels along a line starting two inches above the inguinal ligament and ascending upwards to the point of bifurcation of the left common iliac artery.
  - ♣ **Medial limb:** descends from the **apex till the 3<sup>rd</sup> sacral piece**. It is attached to the front of the sacrum.
  - ♣ The **apex crosses** in front of the **left ureter** at the **bifurcation** of left common iliac artery.
- An **intersigmoid recess** is found deep to the apex of the mesocolon.
- **Contents:**
  1. Sigmoid (pelvic) colon in the **free border**.
  2. Sigmoid vessels in the **lateral limb**.
  3. Superior rectal vessels in the **medial limb**.
  4. Autonomic fibers.
  5. Extraperitoneal fatty tissue, lymph vessels and lymph nodes.

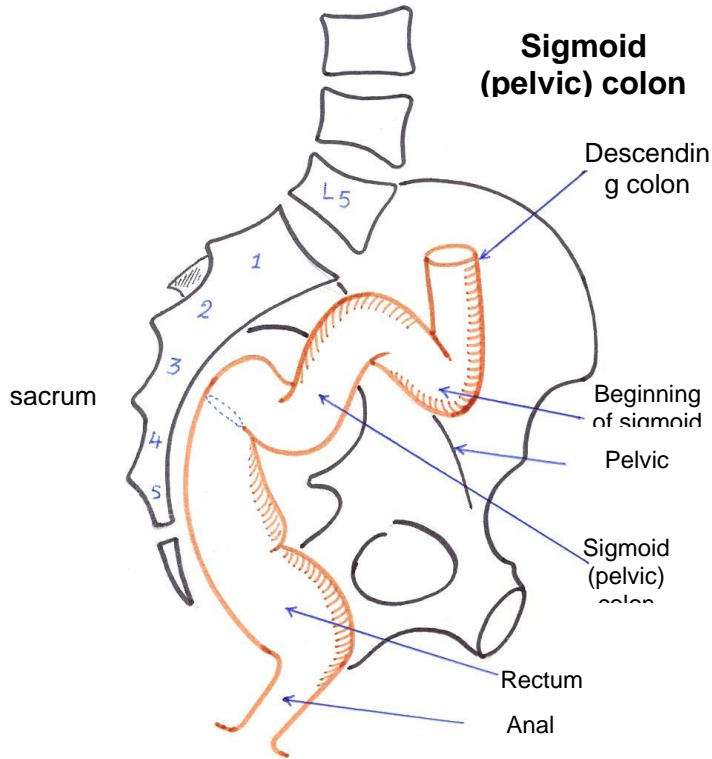
## Mesenteric Relations of Intestines Sigmoid Colon Reflected



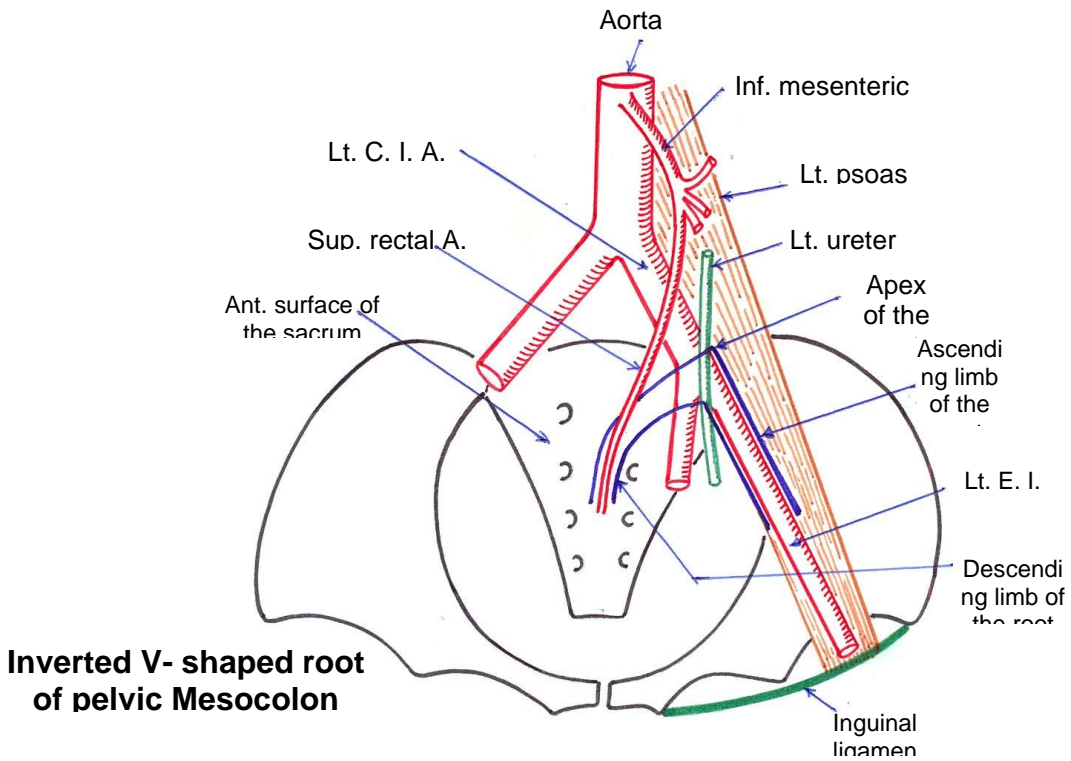
## Sigmoid mesocolon and intersigmoid recess



# Anatomy of colon

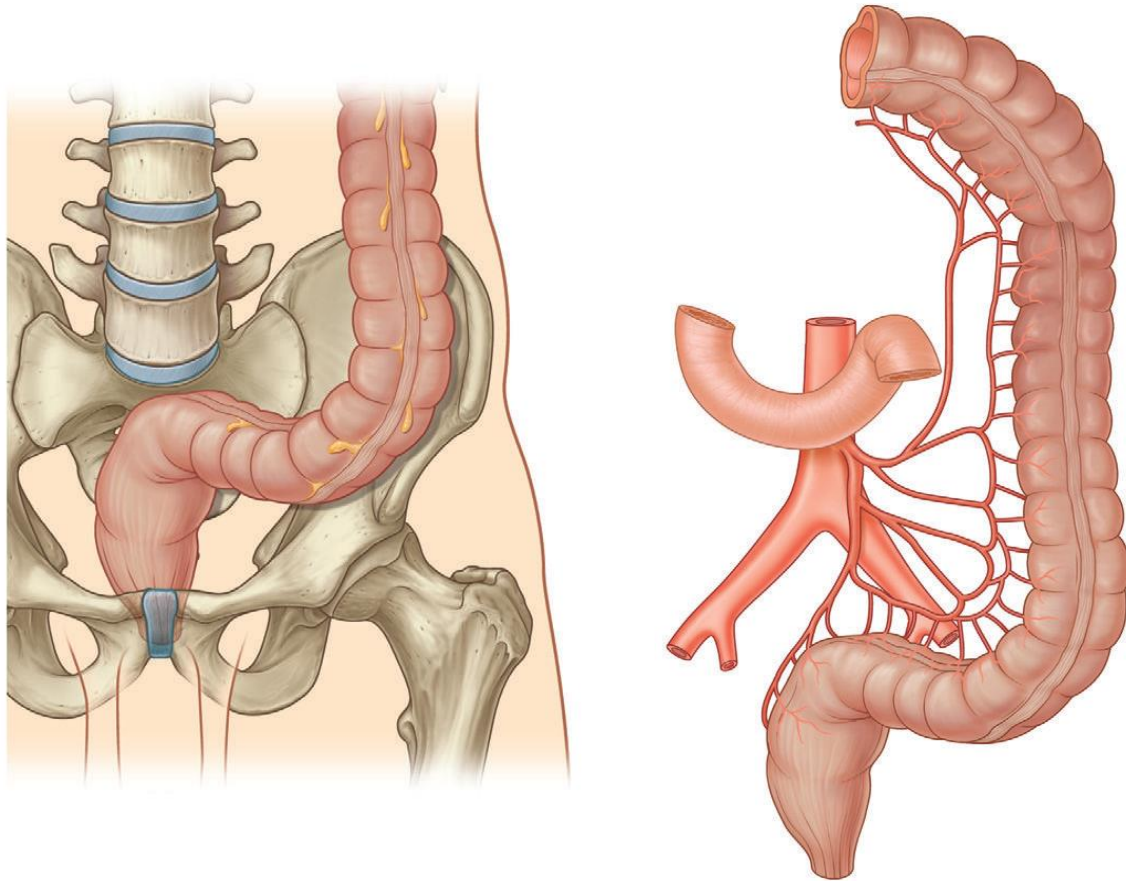


**Side view of pelvis**

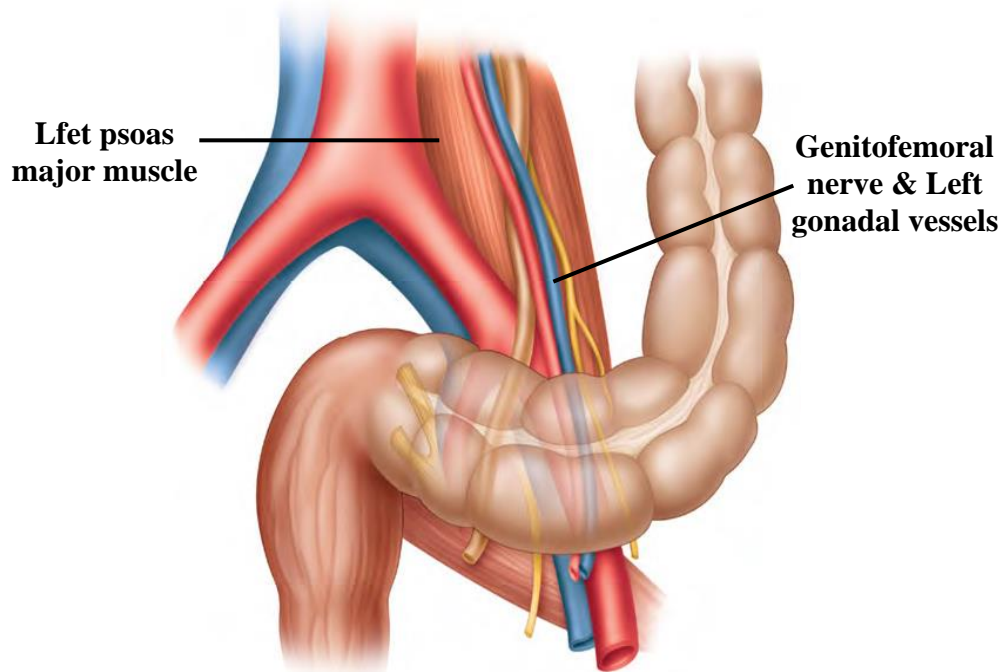


**Inverted V- shaped root of pelvic Mesocolon**





## Relations and arterial supply of the sigmoid colon



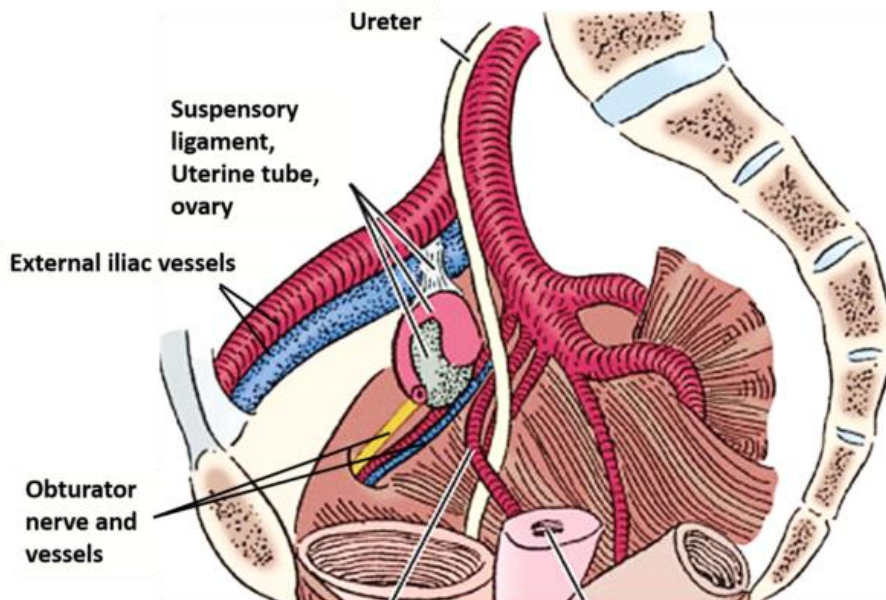
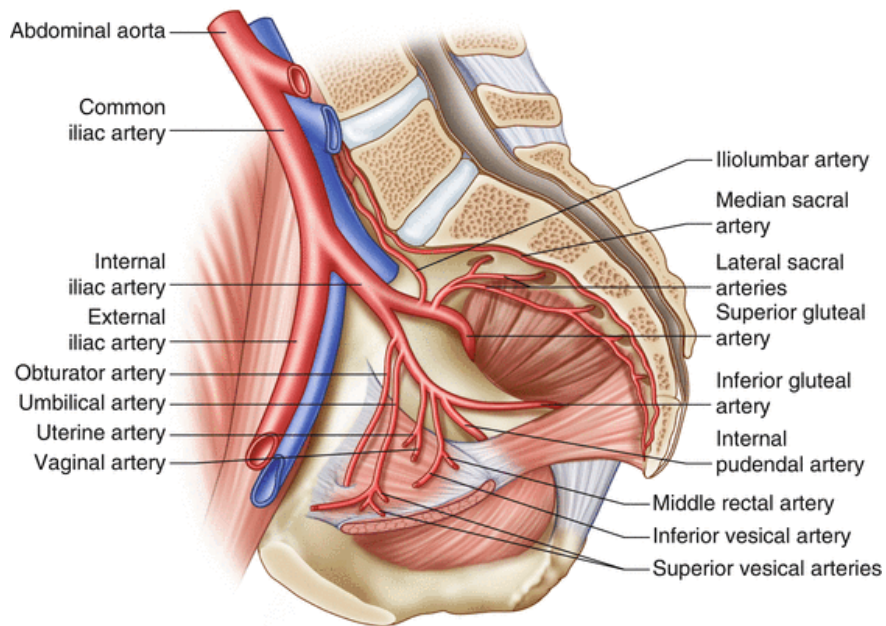
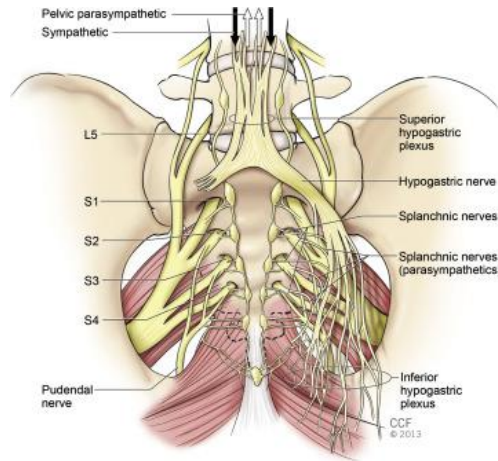
### ★ **Relations:**

- **Laterally:** Left wall of the lesser pelvis separated from the sigmoid colon by the followings:
  1. External iliac vessels.
  2. Obturator nerve and vessels.
  3. Left ovary (in female) or left vas deferens (in male).



- **Above and medially:** Coils of ileum.
- **Posteriorly:**
  1. Left internal iliac vessels.
  2. Left ureter.
  3. Sacral plexus.
  4. Left piriformis muscle.
- **Below:**
  1. Urinary bladder in both sexes.
  2. Uterus in female.

# Anatomy of colon

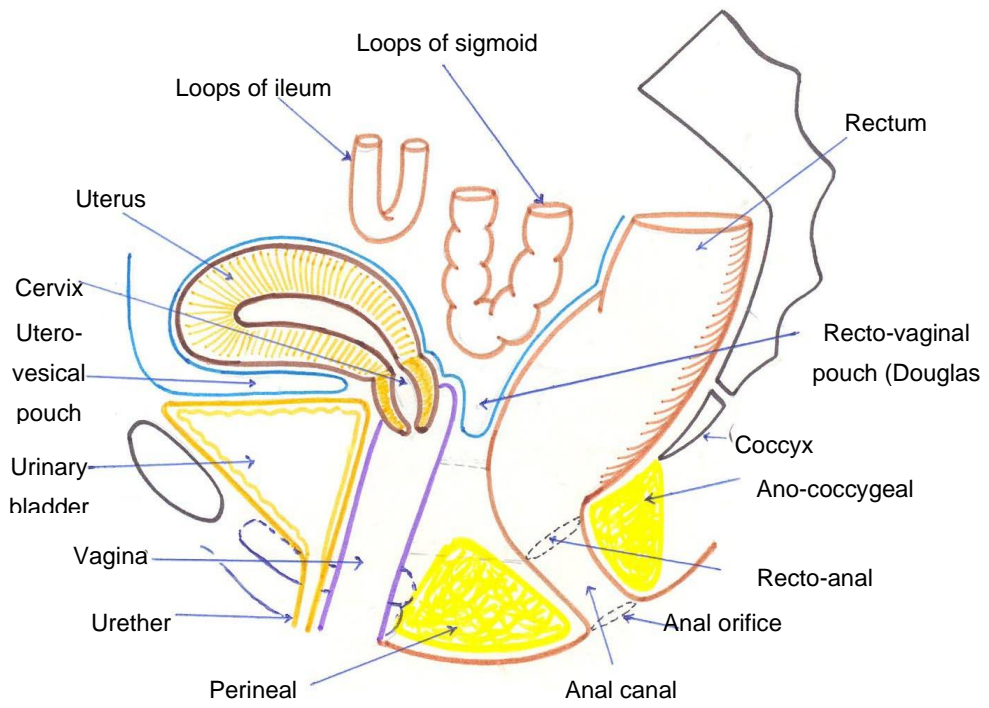
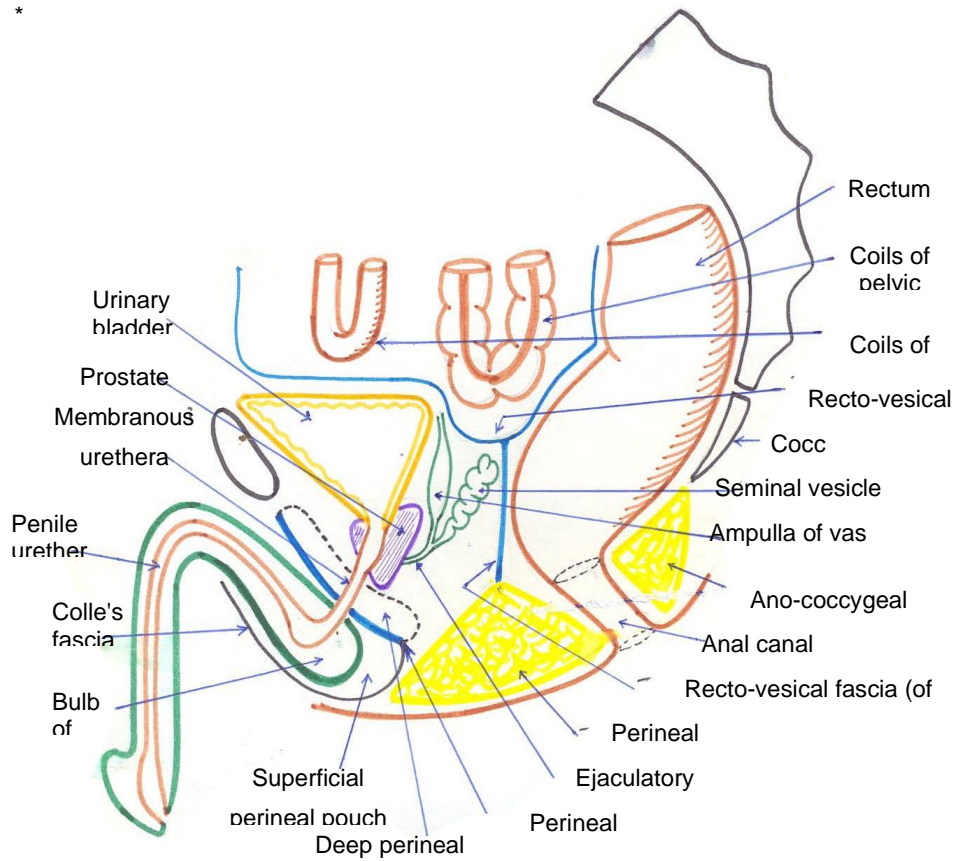




# Anatomy of colon

## Sagittal section in Male Pelvis:

\*



## Sagittal section in Female Pelvis:

\*



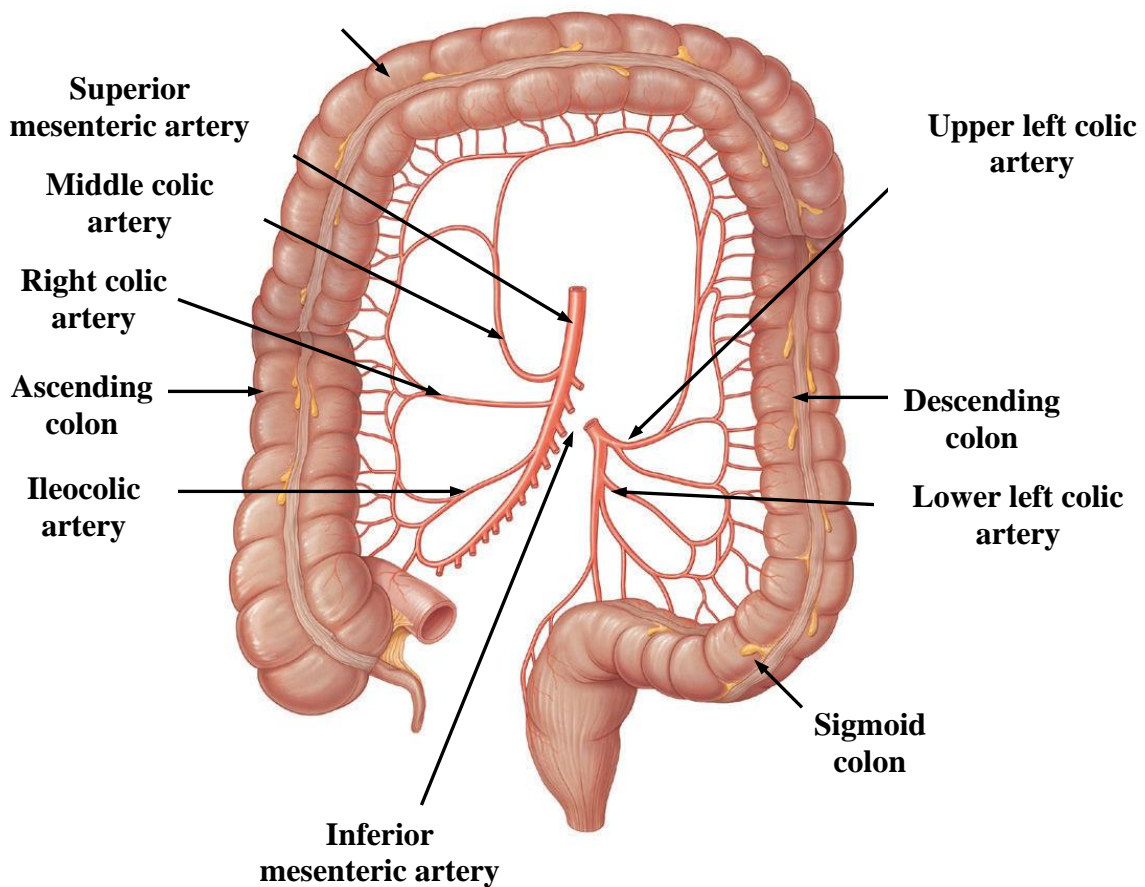
- ★ **Arterial supply:** Sigmoid branches of the inferior left colic arteries .
- ★ **Venous drainage:** It follows the arterial supply to drain into the inferior mesenteric veins (portal circulation).

### **Vessels and Nerves of Large Intestine**

- ★ **From ileocaecal valve to right 2/3 of transverse colon:**(part of the colon derived from the midgut)
  - **Arterial supply is derived from superior mesenteric artery:**
    1. Ileocolic artery.
    2. Right colic artery.
    3. Middle colic artery.
  - **Venous drainage** through ileocolic , right colic and middle colic to superior mesenteric vein.
  - **Sympathetic** supply from **superior mesenteric plexus.**
  - **Parasympathetic** supply is **vagus.**
- ★ **From left 1/3 of transverse colon to upper 1/2 of anal canal:** ( part of the colon derived from the hindgut)
  - **Arterial supply is derived from inferior mesenteric artery:**
    1. Superior left colic artery.
    2. Inferior left colic arteries (sigmoid arteries).
    3. Superior rectal vessels.
  - **Venous drainage** through superior and inferior left colic & superior rectal veins to inferior mesenteric vein.
  - **Sympathetic** supply from **inferior mesenteric plexus.**
  - **Parasympathetic** supply is **pelvic splanchnic nerves(S<sub>2,3,4</sub>).**

★ **The marginal artery of Drummond** connects all colic arteries as it lies in the concavity of the colon.

- It is an important collateral channel between the superior and inferior mesenteric arteries.
- It gives straight branches (**vasa recta**) which pass directly to the colon.
- **Applied Anatomy:** The marginal artery has a great surgical importance as it can maintain the viability of a long segment of the colon after division of a major colic branch. This allows colon bypass operation to be feasible.

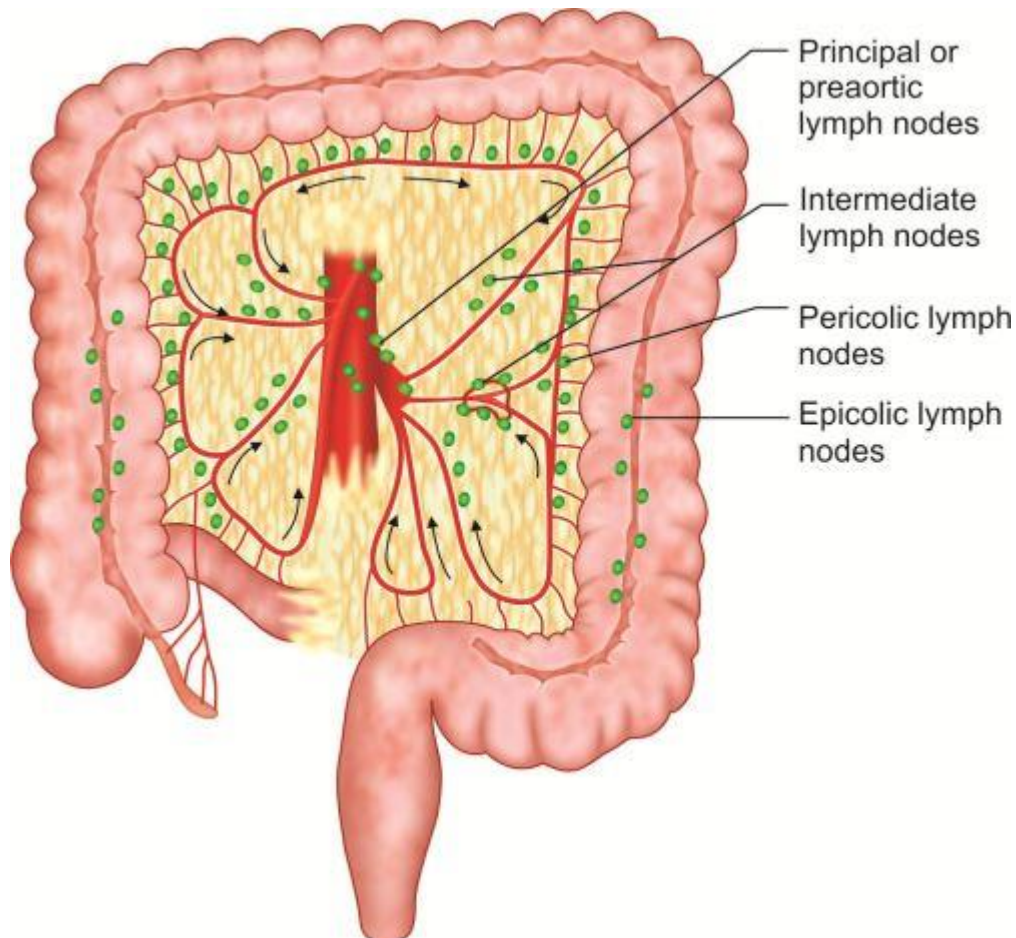


**The marginal artery of the colon**

## Lymphatic Drainage of Colon

★ Lymph vessels from the colon follow the arterial supply to drain into the following lymph node groups, in sequence:

1. **Epicolic nodes:** on the bowel wall.
2. **Paracolic nodes:** between the marginal artery and the bowel.
3. **Intermediate nodes:** on the main vessels along the colic arteries.
4. **Central nodes:** alongside the superior and inferior mesenteric vessels.



### ★ **Applied anatomy:**

- 1) Sigmoidoscope** is used to examine the interior of the sigmoid colon and biopsies of lesions may be taken through it.
- 2) Colonoscope** is used to examine the interior of the the whole colon and biopsies of lesions may be taken through it.
- 3) Direct spread** of cancer colon occurs according the relation of the the part affected .
- 4) Blood spread of cancer right side of colon** (along superior mesenteric vein) to right lobe of liver .
- 5) Blood spread of cancer left side of colon** (along inferior mesenteric vein) to left lobe of liver .
- 6) Lymphatic spread of cancer colon** (mention lymphatic spread).
- 7) Sigmoid colon** is the site of **storage of faeces** .
- 8) Prolonged storage of faeces** with absorption of water → hard faeces and constipation.
- 9) The sigmoid colon** is the **narrowest area** in the colon and contains hard faeces → easily obstructed by cancer → large intestinal obstruction .
- 10) The caecum is the widest area** of large intestine and contain fluid contents → in cancer caecum intestinal obstruction is rare.



## Anatomy of colon

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