

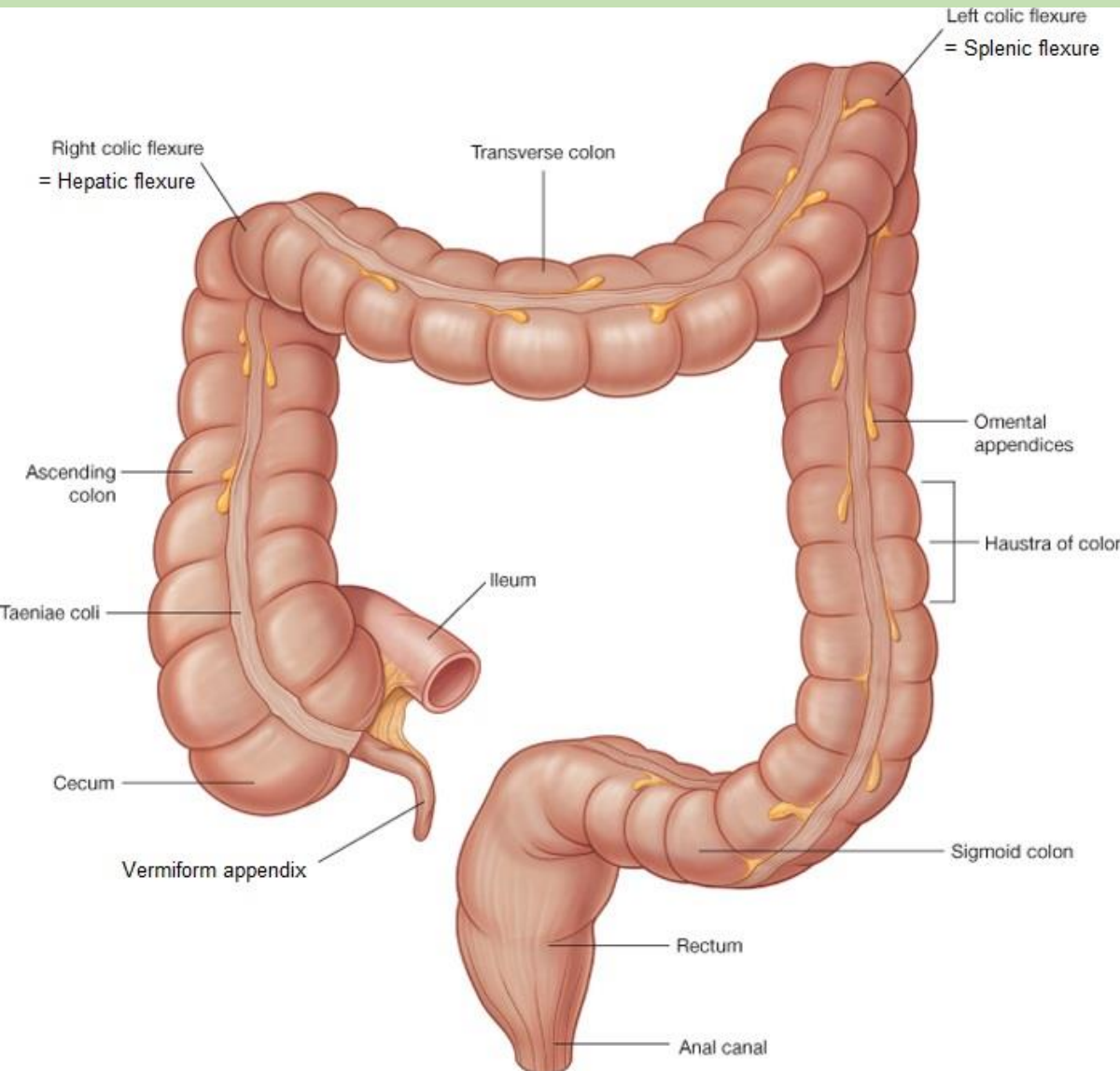


Large intestine and peritoneal recesses  
on the posterior abdominal wall.

Sándor Katz M.D., Ph.D.



# Anatomical divisions of the large intestine (1,5 m long in adults)



- Cecum with the vermiform appendix
- Ascending colon
- Transverse colon
- Descending colon
- Sigmoid colon
- Rectum

Transverse  
colon

Right colic  
(hepatic)  
flexure, deep

Ascending  
colon

Cecum

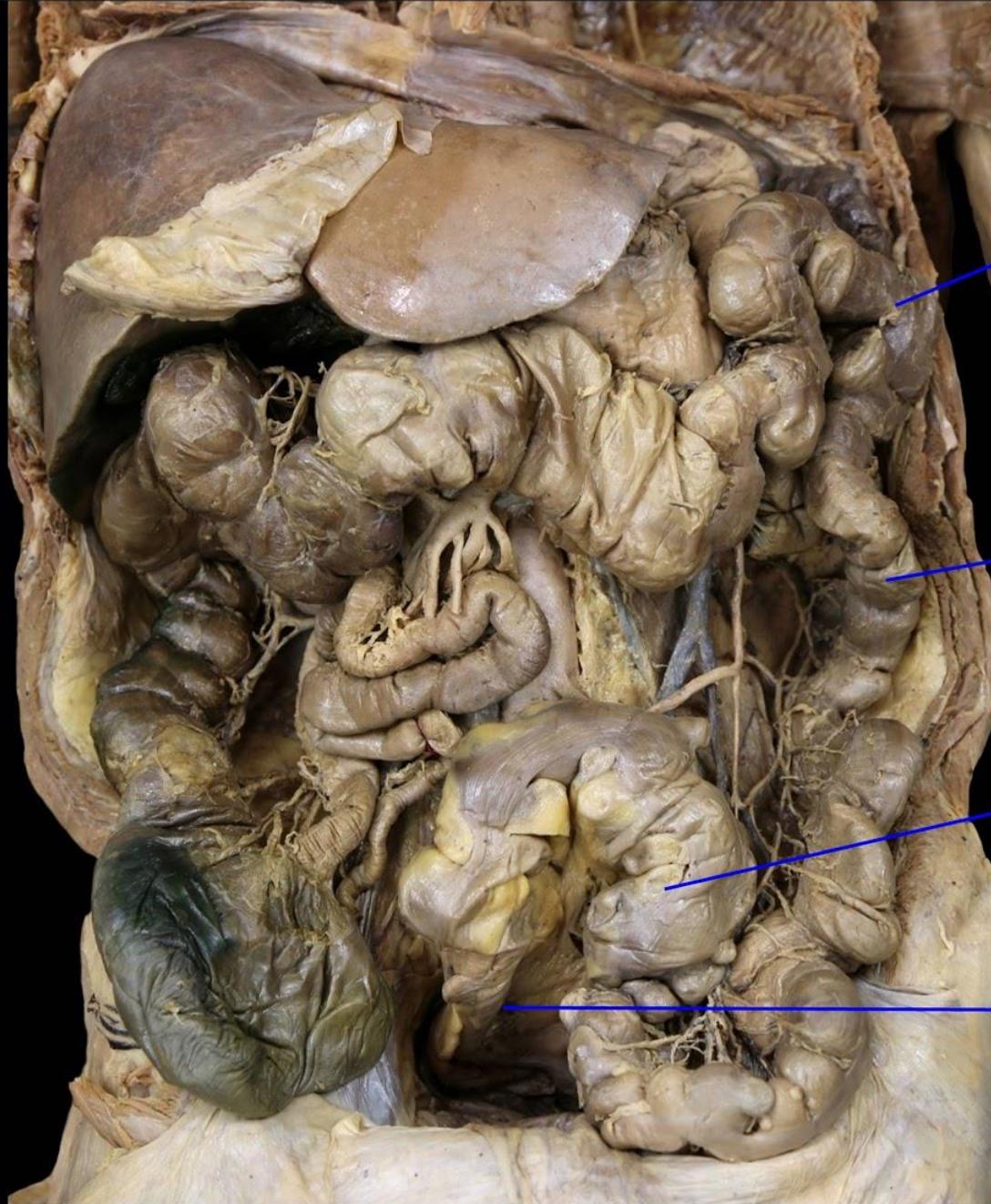


Abdominal cavity, anterior

BlueLink

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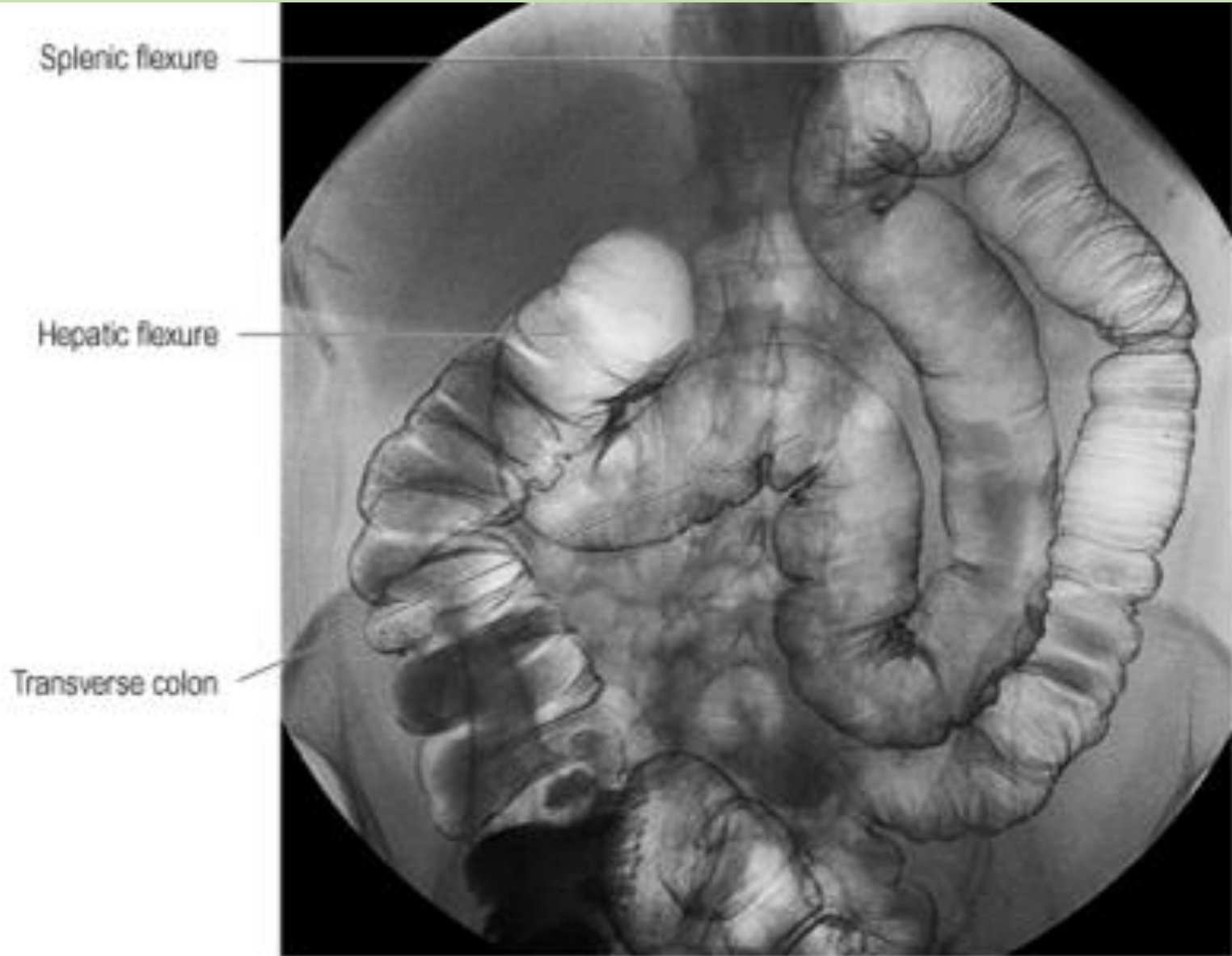


Left colic  
(splenic)  
flexure

Descending  
colon

Sigmoid  
colon

Rectum

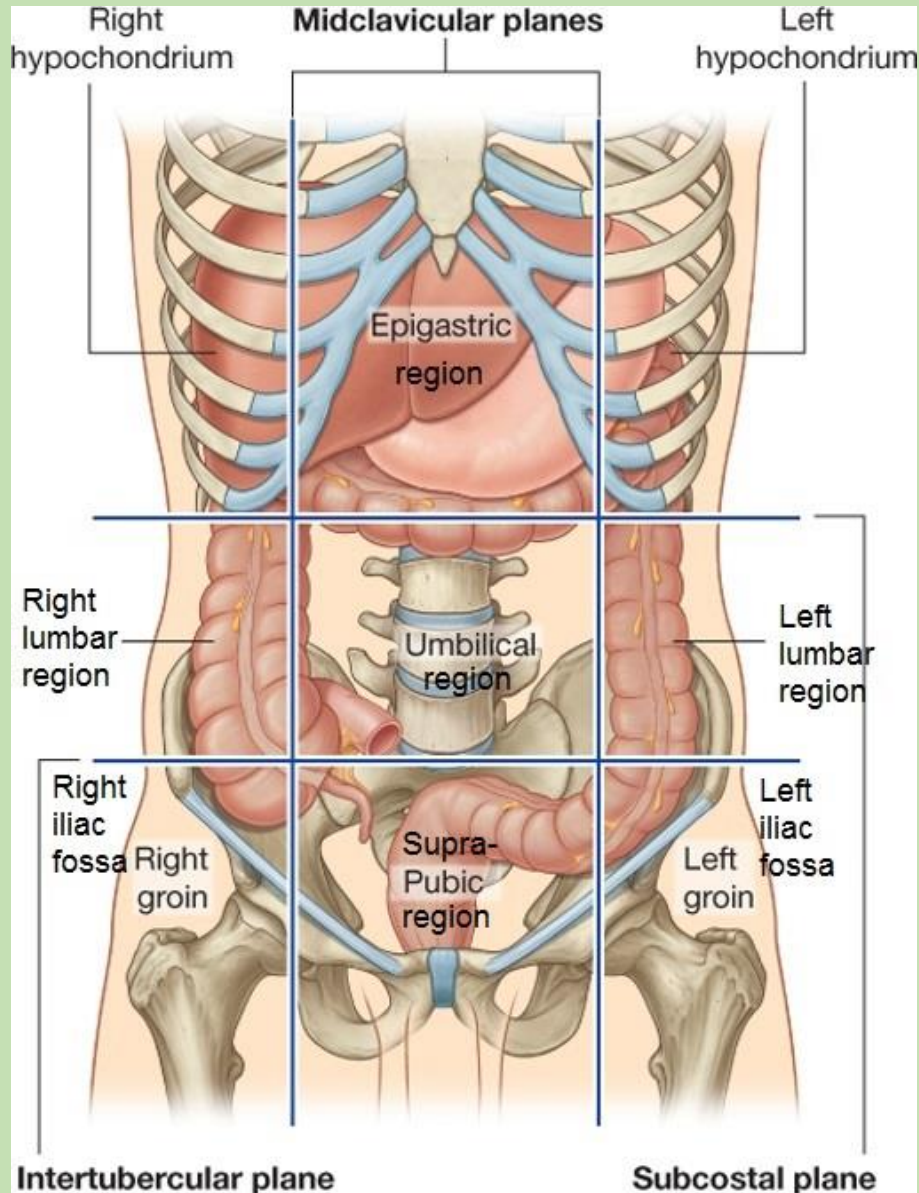


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Appearance of the abdominal colon on double contrast barium enema



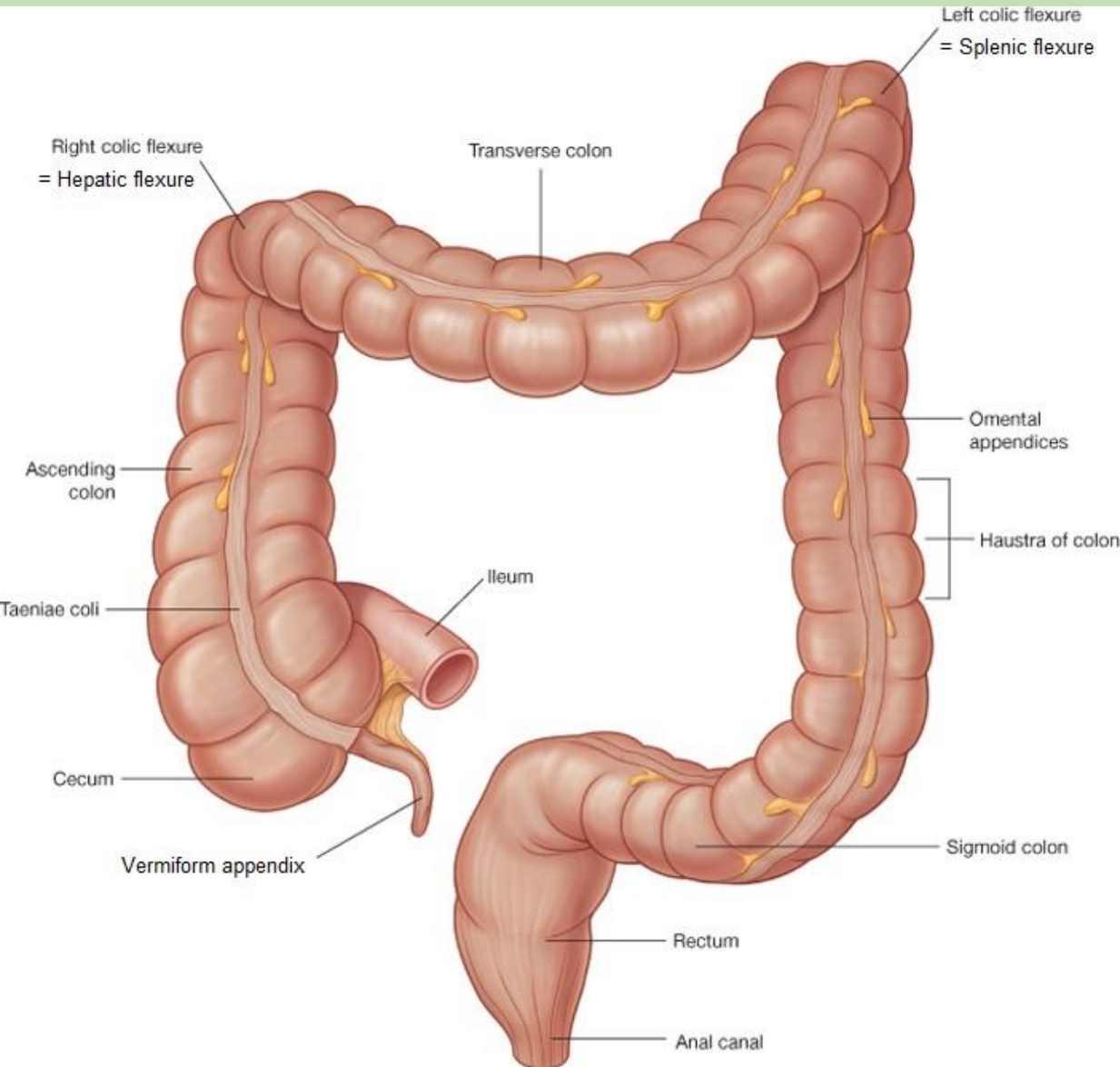
# Location of the large intestine



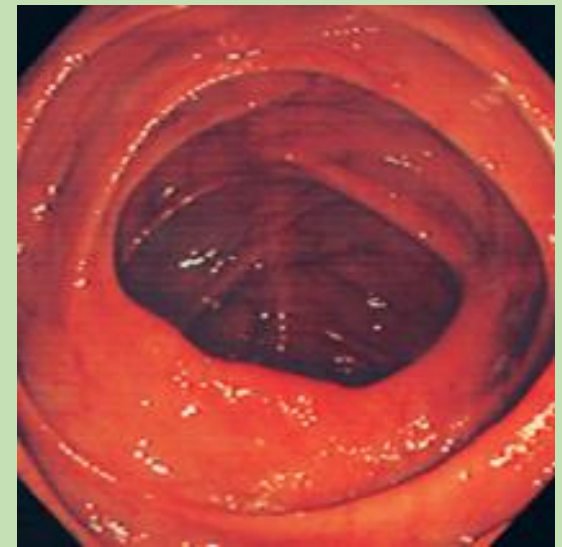
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# Distinctive morphological features

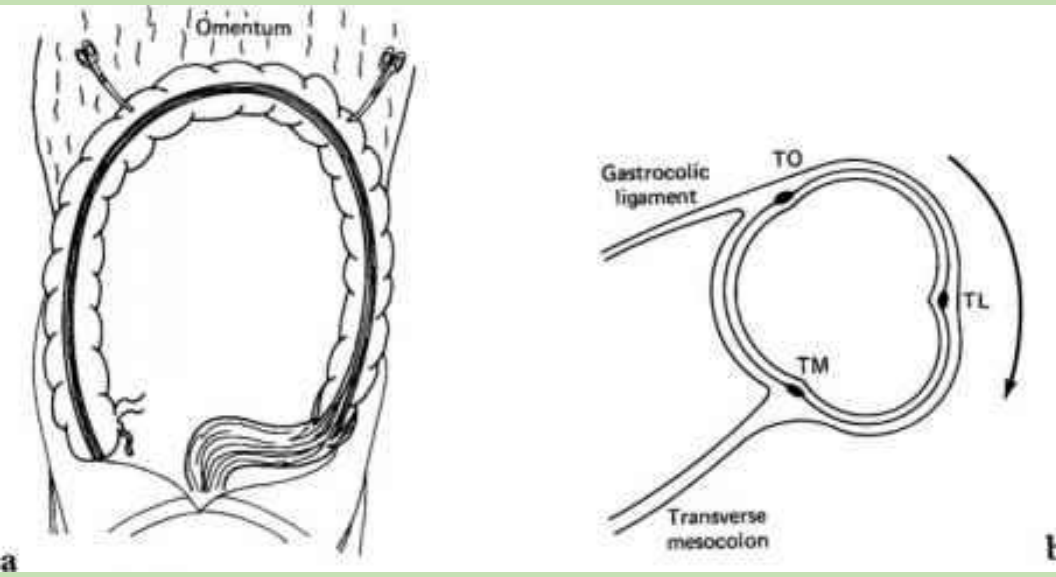


- **Epiploic appendices** (fat-filled protrusions of the peritoneum)
- **Haustrae** (saccular wall protrusions)
- **Semilunar folds** (only internally)



# Distinctive morphological features

- **Teniae coli** (three longitudinal bands, they not present in the vermiform appendix and rectum)

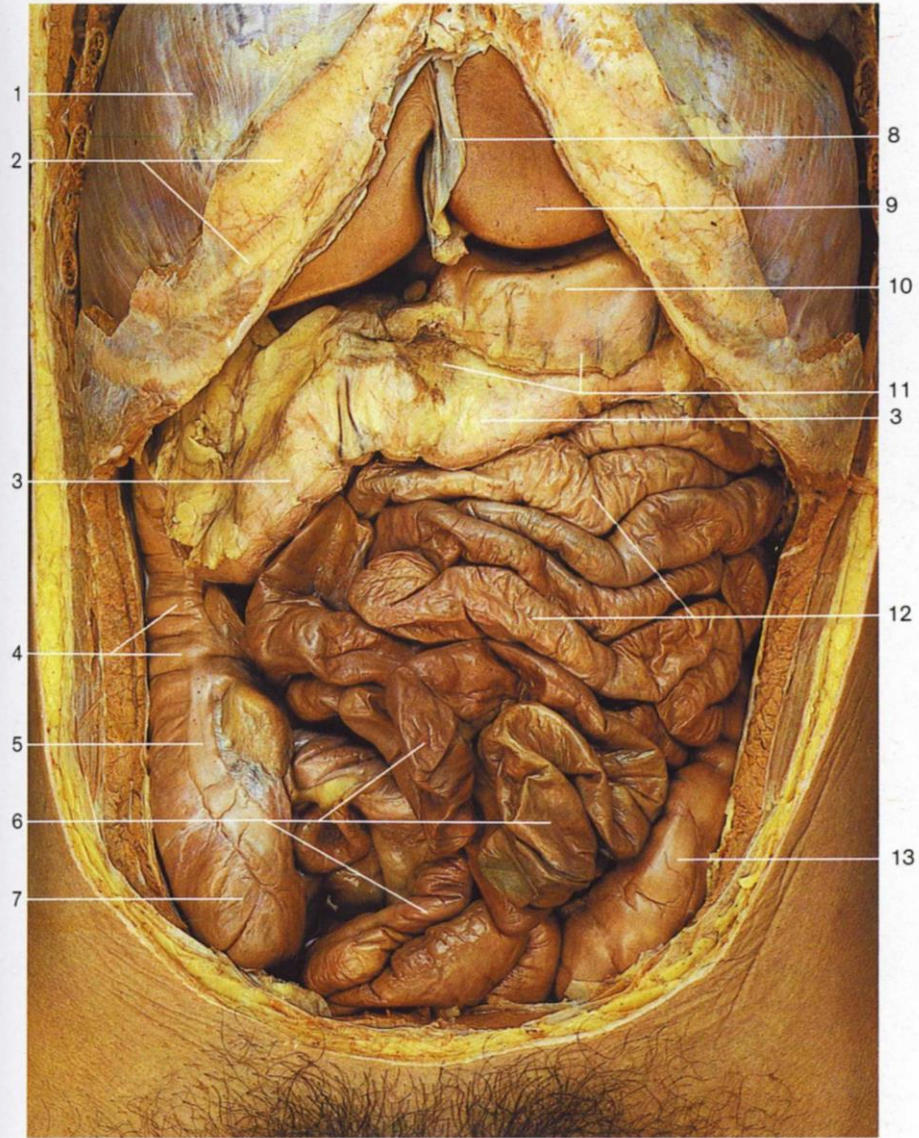
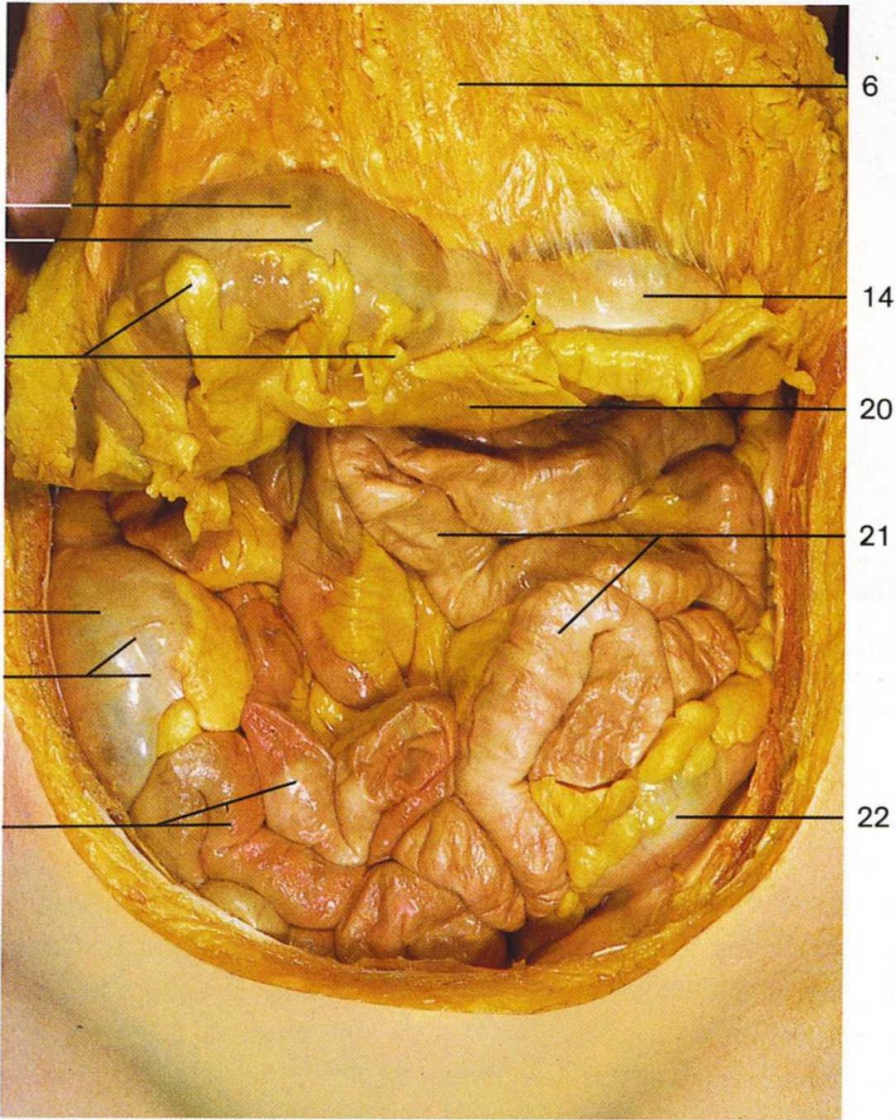


1. **Free tenia (TL)**
2. **Mesocolic tenia (TM)**
3. **Omental tenia (TO)**



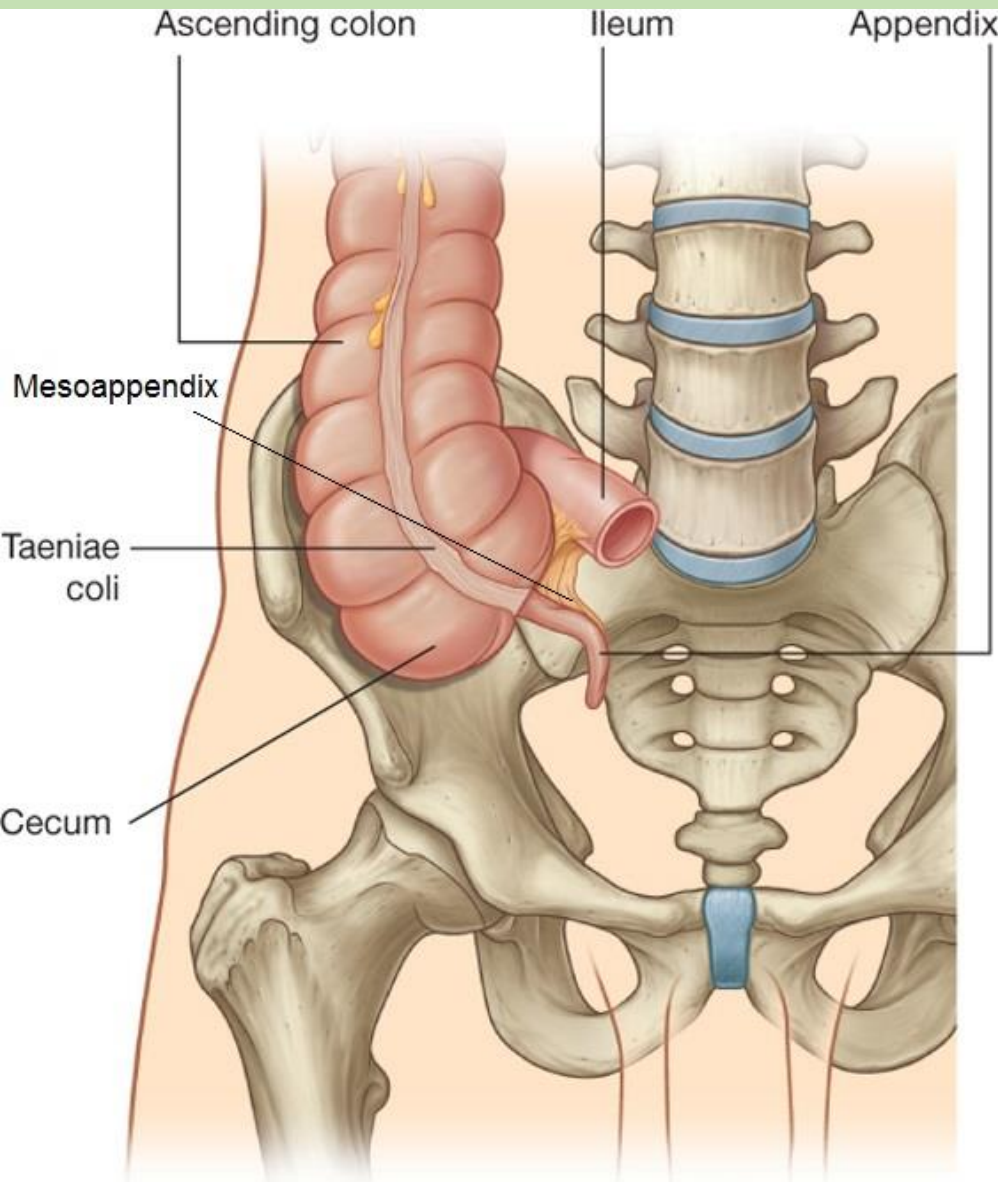


# Large intestine *in situ*



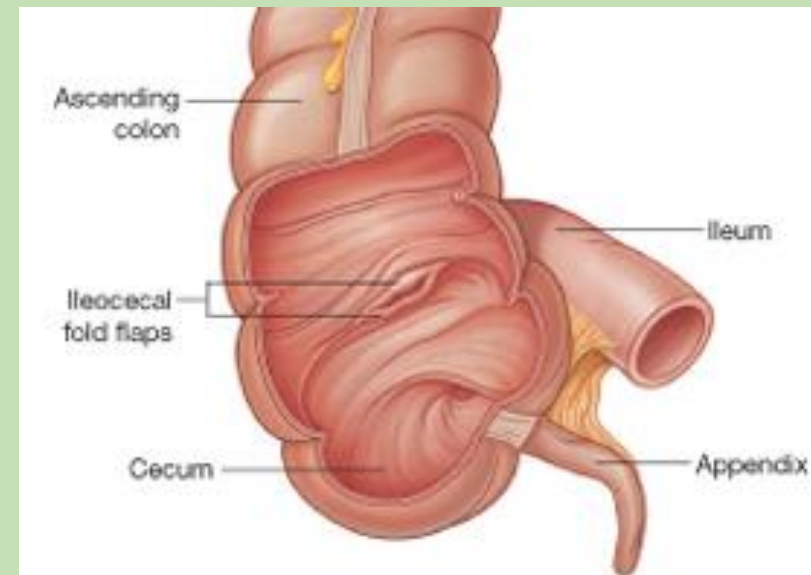


# Cecum and vermiform appendix



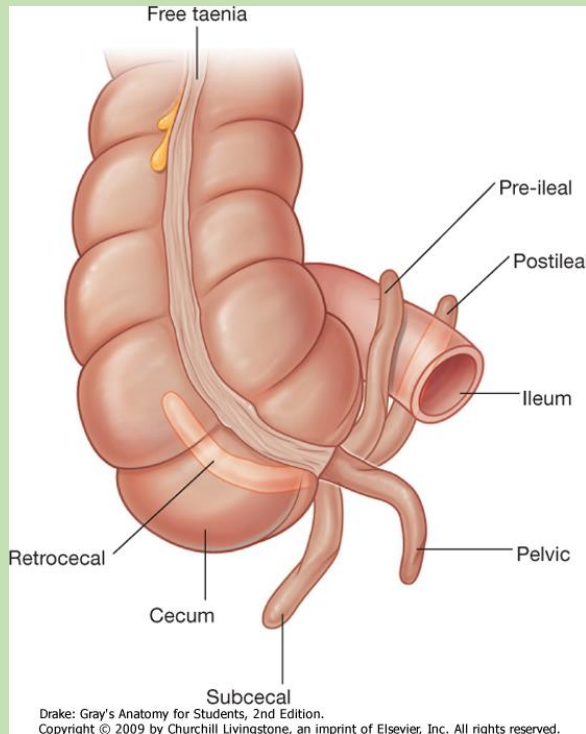
Both are ***intraperitoneal***. (Sometimes cecum covered by peritoneum incompletely.)

**Ileocecal valve** = Bauhin's valve prevents reflux of chyme from cecum to the ileum. (The ileal valvular surfaces are covered with villi and have the structure of small intestinal mucosa.)





# Vermiform appendix

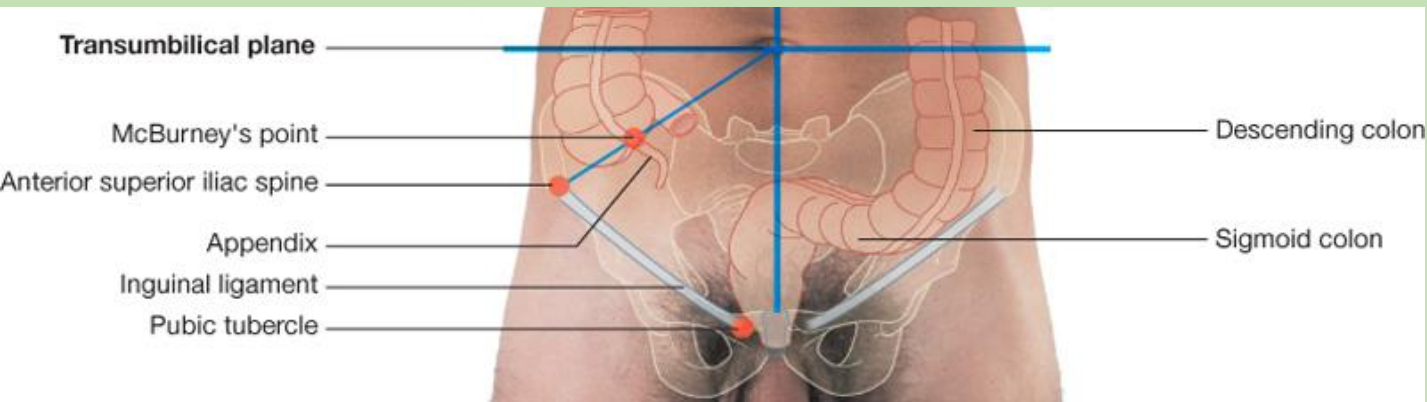


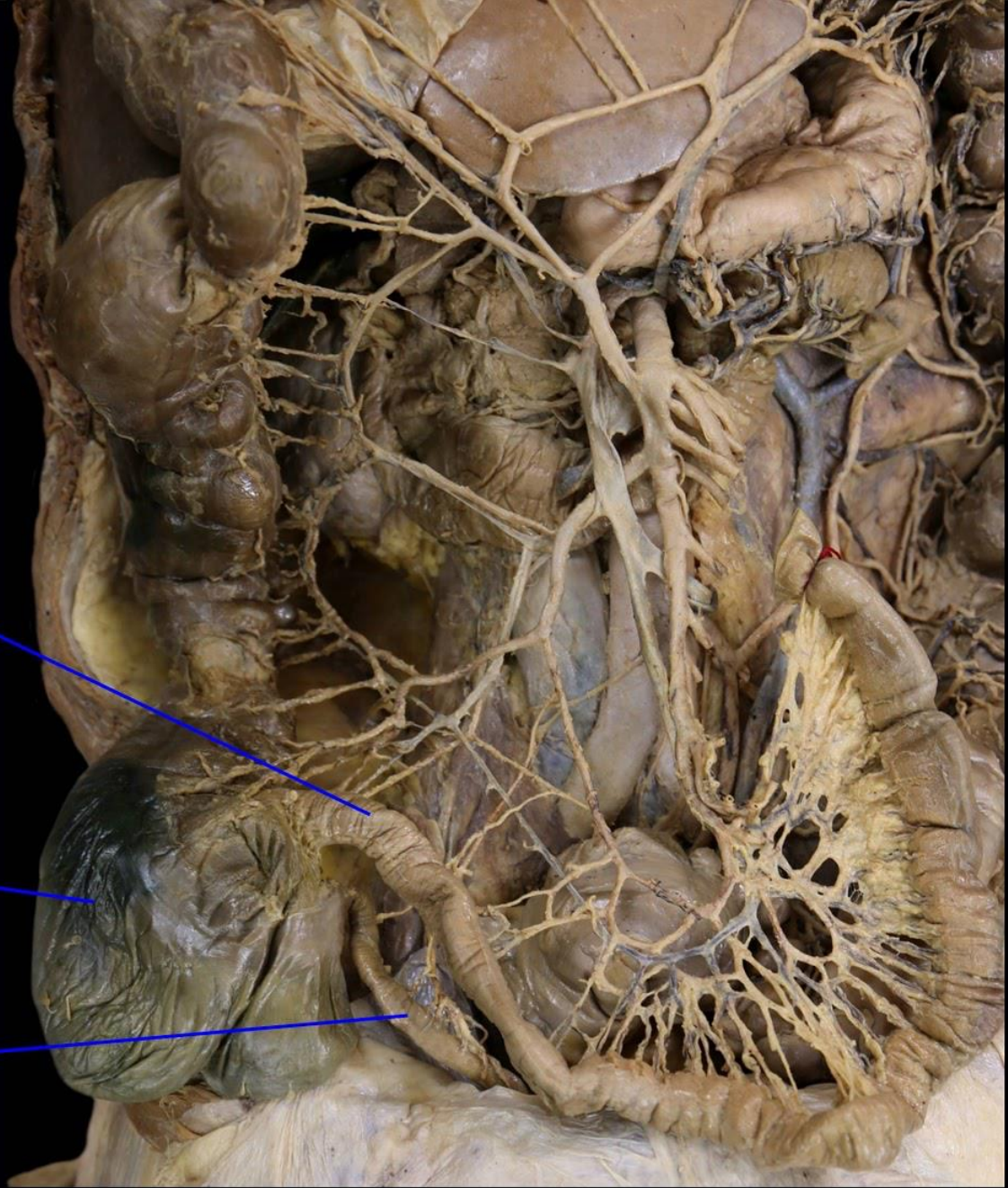
The major positions of the appendix seen in clinical practice are retrocecal and retrocolic.

It varies from 2-20 cm in length: the appendix is often relatively longer in children and may atrophy and shorten after mid-adult life.

**McBurney's point** (beginning of the appendix) situates on a line connecting the umbilicus to the right anterior superior iliac spine between the lateral and middle third.

**(Lanz's point** (end of the appendix) situates on a line connecting anterior superior iliac spines between the right and middle third.)





Ileum

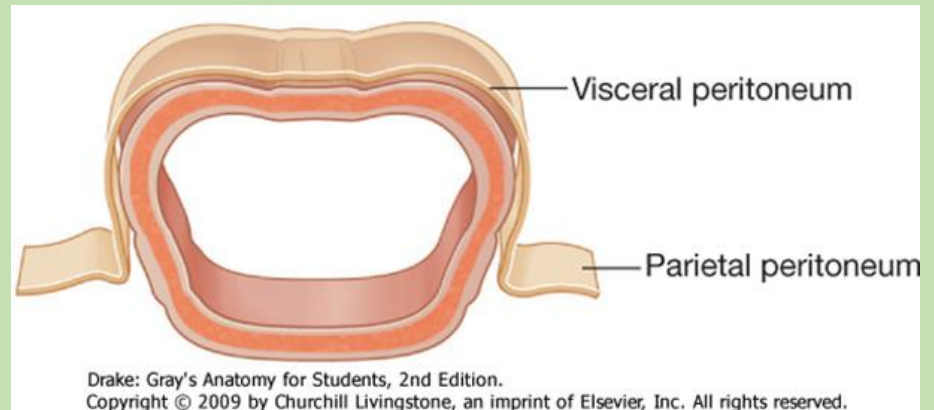
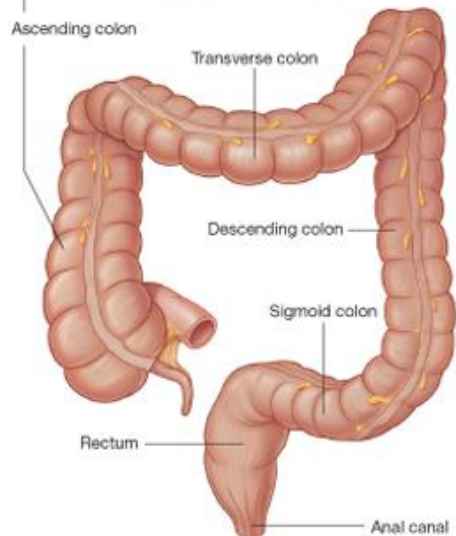
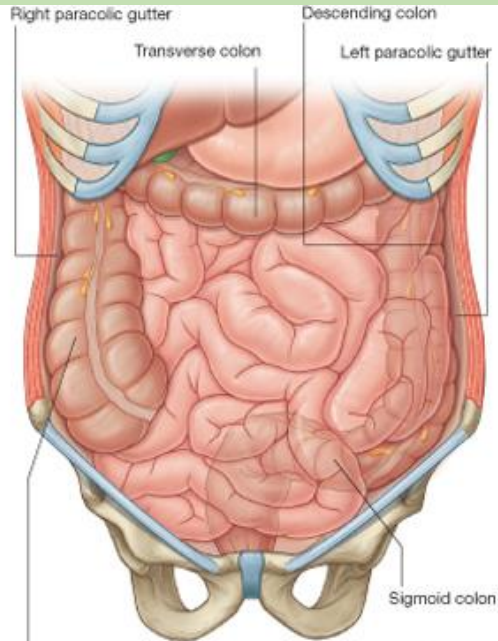
Cecum

Appendix

Cecum, anterior



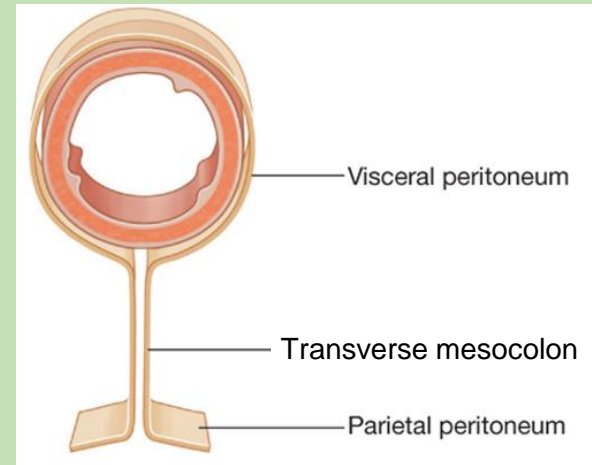
# Ascending colon



It is ***retroperitoneal (=semi-intraperitoneal)*** organ.

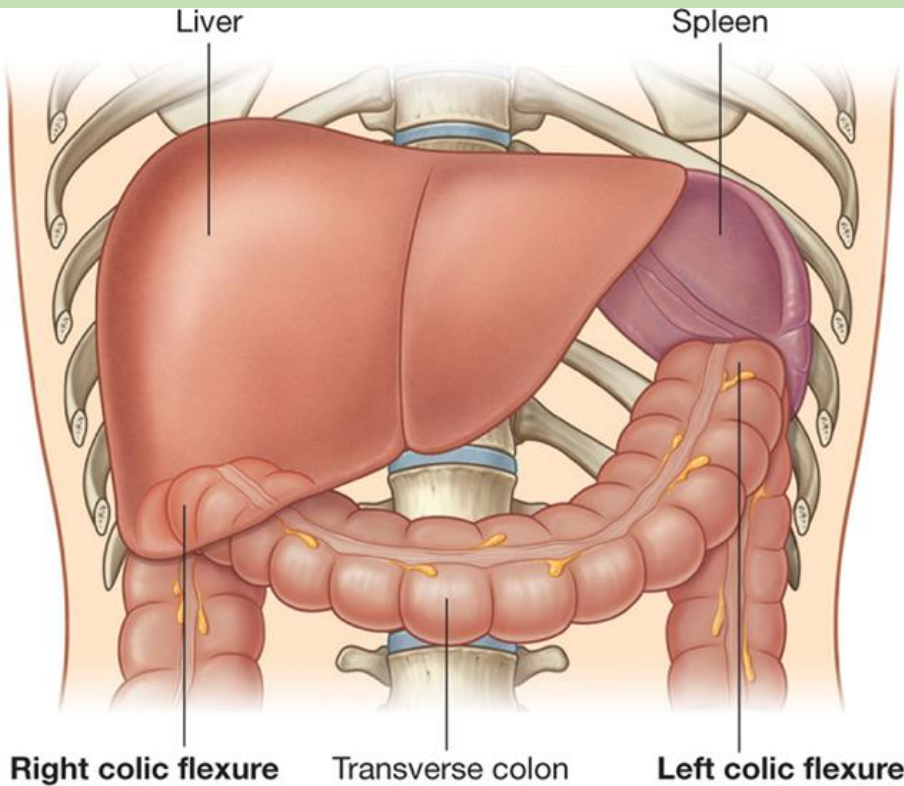
# Transverse colon

It is *intraperitoneal* organ and extends from the right colic flexure in the right lumbar region across into the left hypochondriac region, where it curves posteroinferiorly below the spleen as the left colic flexure. The transverse colon is usually attached to the greater curvature of the stomach by the *gastrocolic ligament*, which is in continuity with the greater omentum.



The **right colic/hepatic flexure** is anterior to the right kidney, posterior to the right lobe of the liver (forming the colic impression), posterolateral to the gallbladder, lateral to the descending part of the duodenum.

The **left colic/splenic flexure** is anterior to the pancreatic tail and also to the left kidney. Its peritoneal covering is often attached to the diaphragm at the level of 10th and 11th ribs by the *phrenicocolic ligament*. It lies more superiorly and posteriorly than the hepatic flexure and directly to the lower pole of spleen, forming the colic impression.



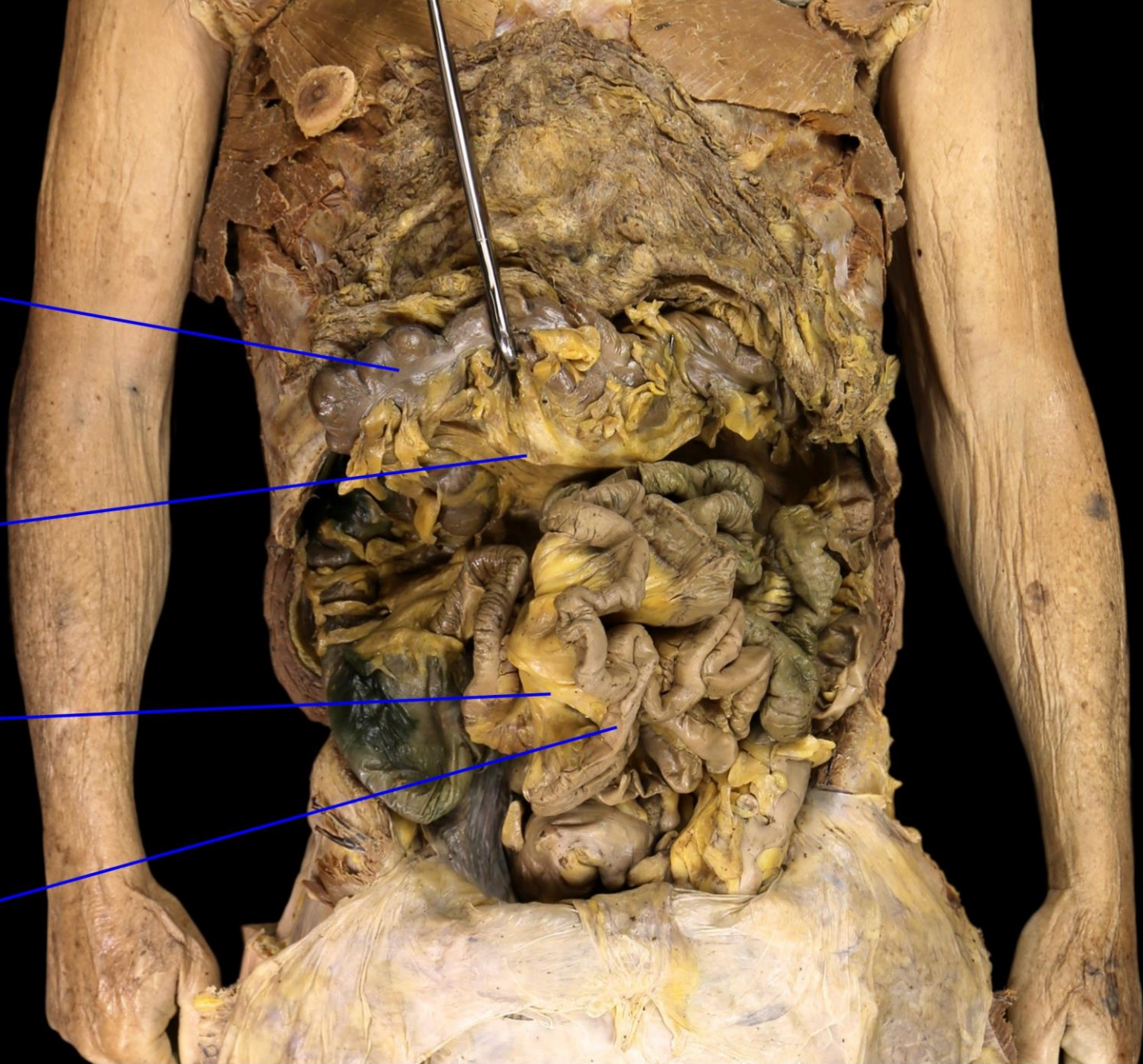


Transverse  
colon, reflected

Transverse  
mesocolon

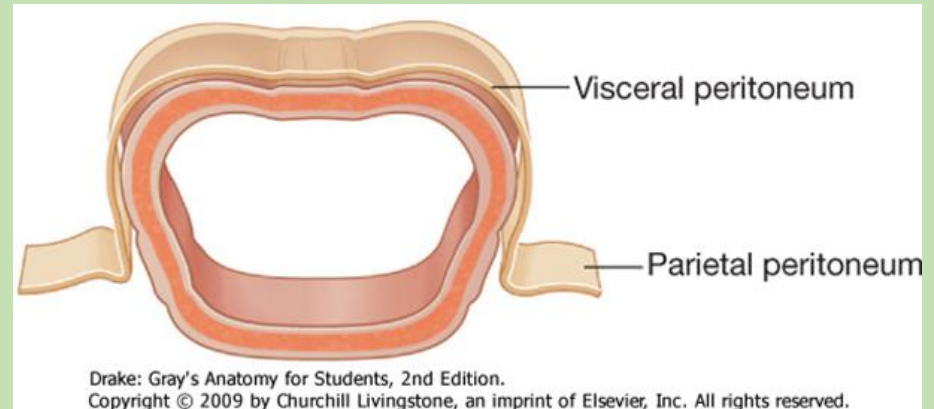
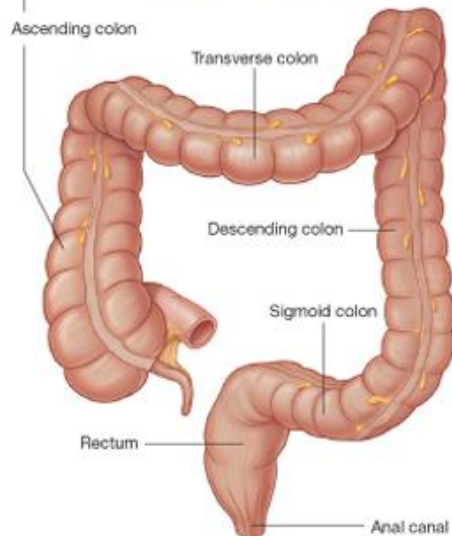
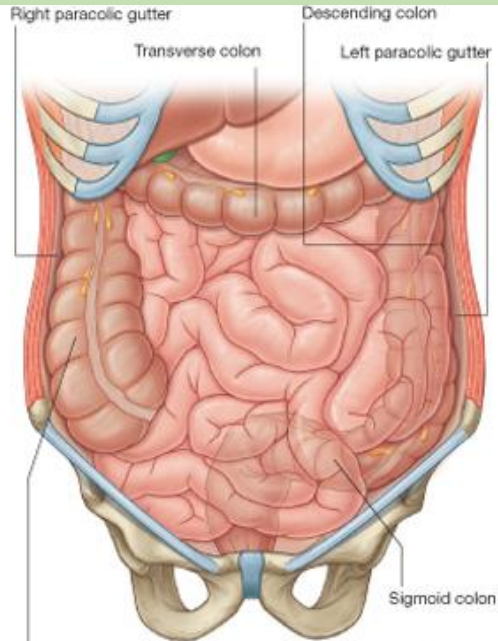
Mesentery

Small  
intestine



Abdominal cavity, anterior

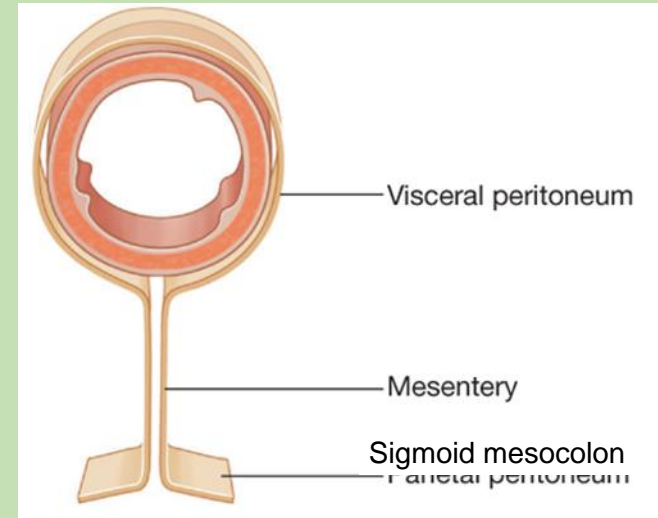
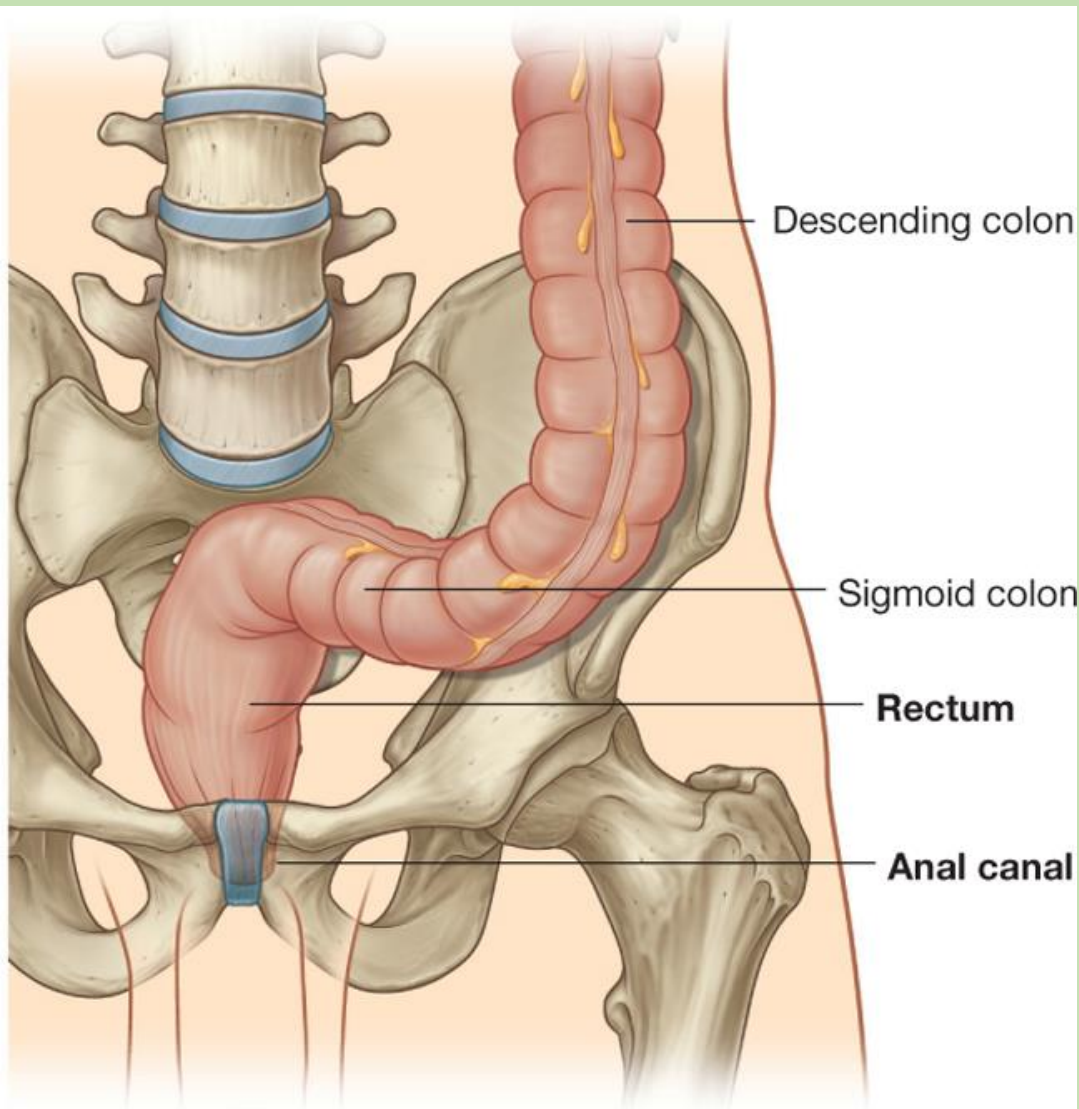
# Descending colon



It is ***retroperitoneal(=semi-intraperitoneal)*** organ.



# Sigmoid colon

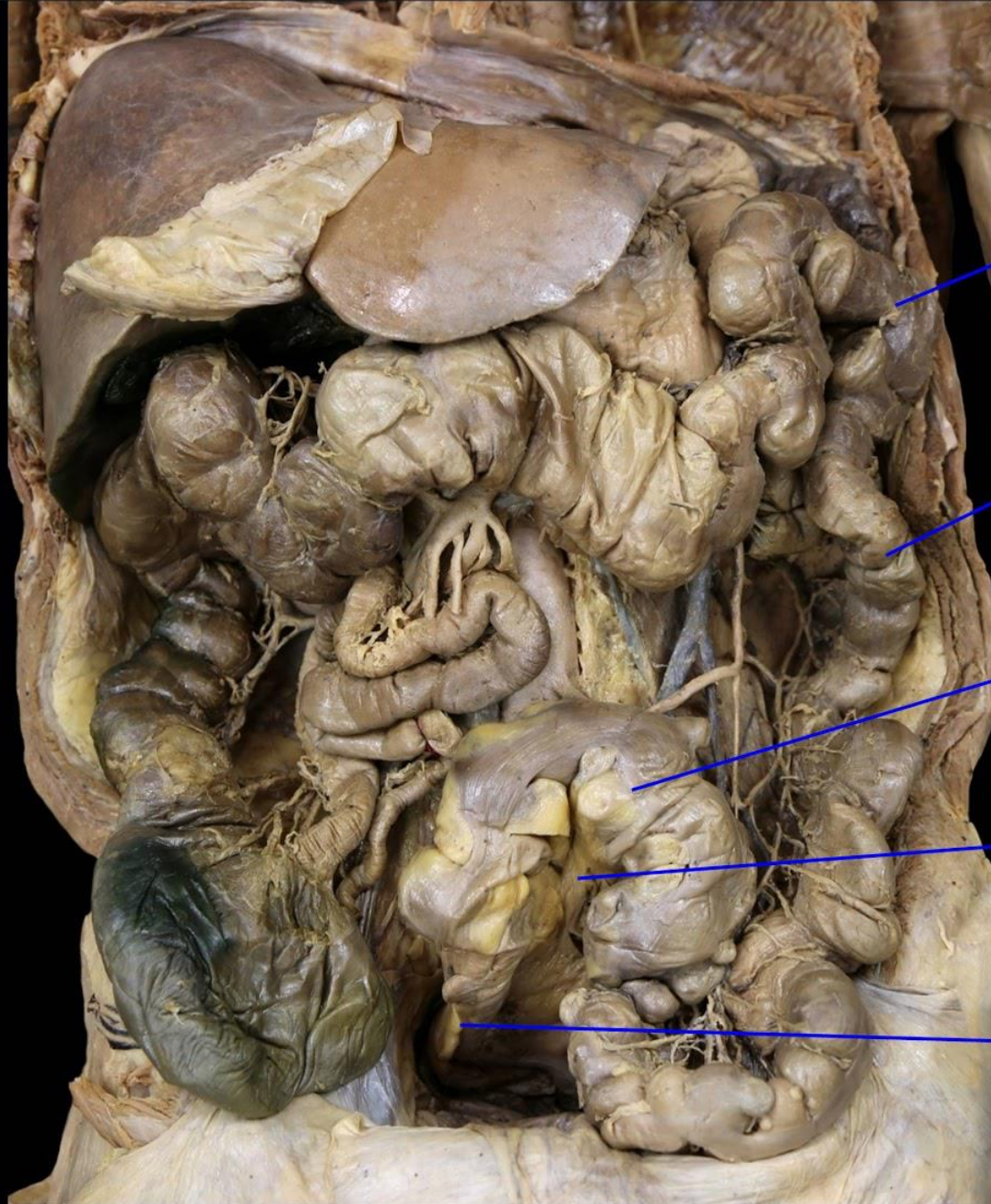


It is ***intraperitoneal*** organ.

The sigmoid loop is fixed at its junctions with the descending colon and rectum but quite mobile between them.

The sigmoid loop starts from the iliac fossa between the bladder and rectum in males, or uterus and rectum in females.

It ends at the level of S3 vertebra near to the pelvic wall.



Left colic  
(splenic)  
flexure

Descending  
colon

Sigmoid  
colon

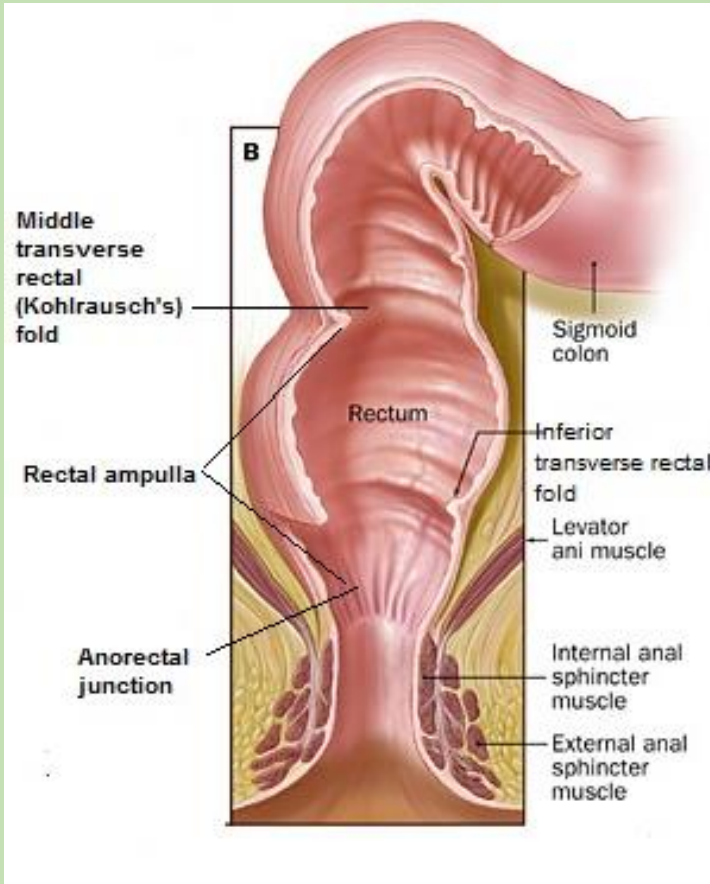
Sigmoid  
mesocolon

Rectum

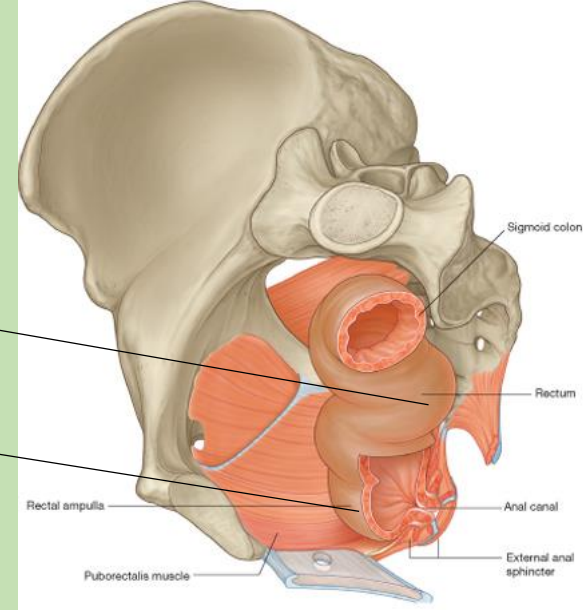
Abdominal cavity, anterior



# Rectum



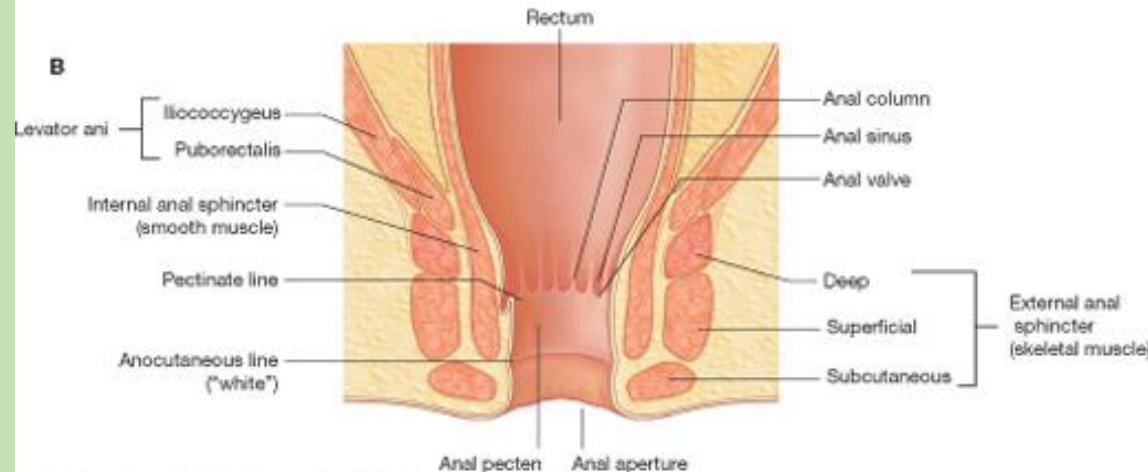
The rectum has a compound embryonic origin. Above the anorectal junction it is derived from endoderm. The anal canal, however develops from ectoderm.



Sacral flexure

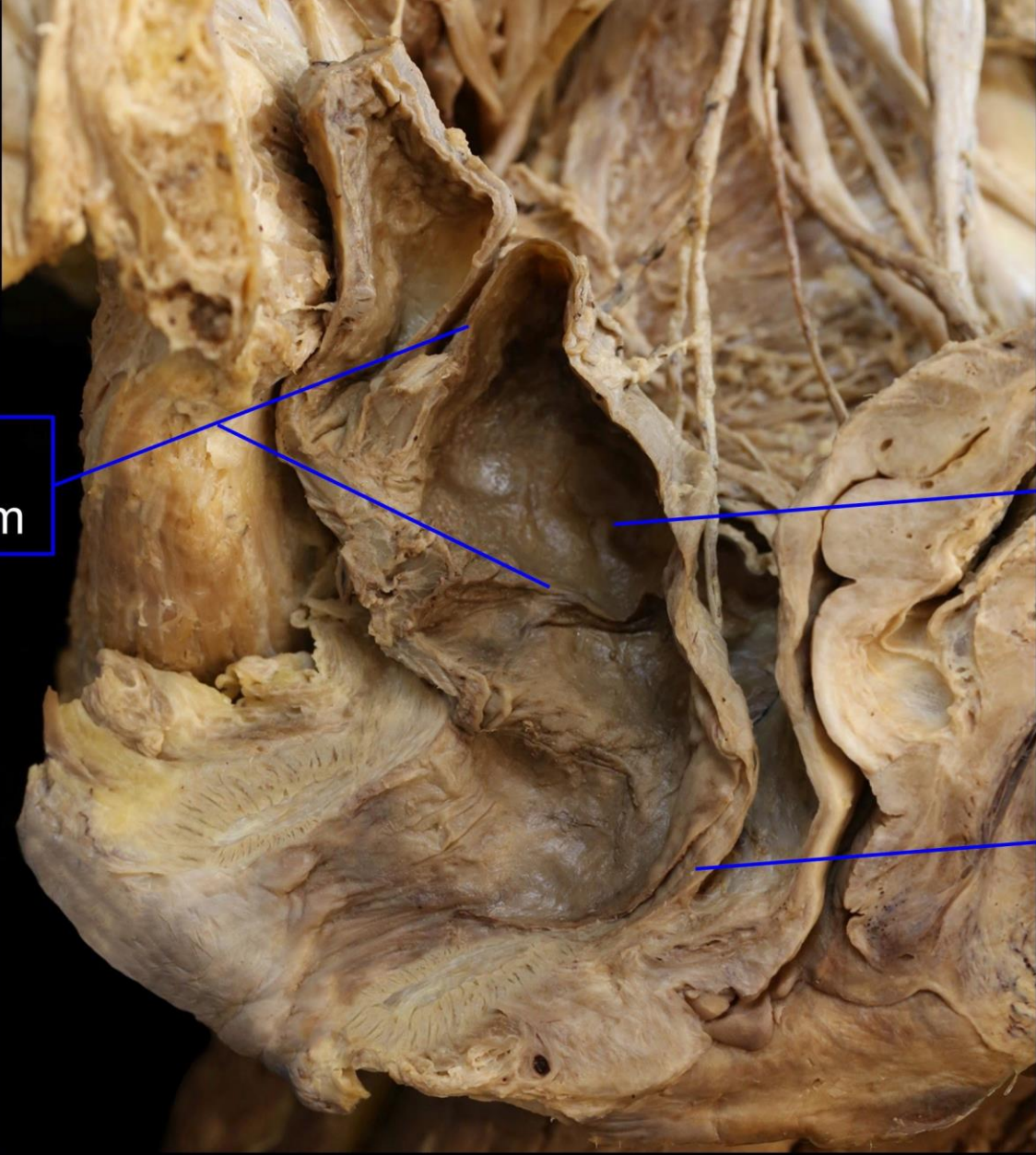
Perineal flexure

The **upper third** of rectum is *retroperitoneal* (=semi-intraperitoneal), the **lower third** is *infraperitoneal* and the **middle** shows the transition between the two peritoneal relationships.



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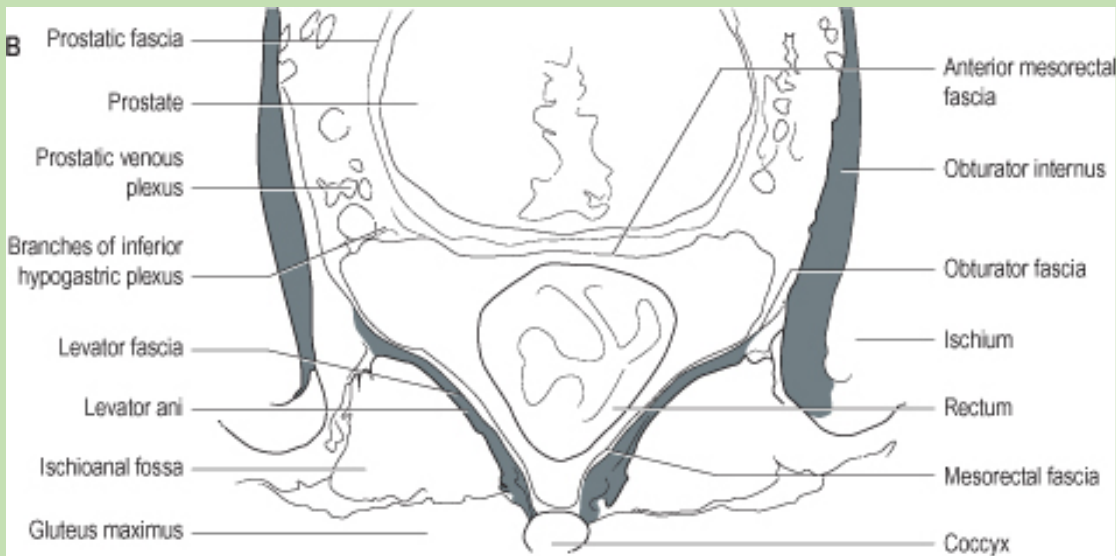
Transverse folds of rectum

Rectal ampulla

Longitudinal muscle of rectum



# Mesorectum



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The mesorectum (mesentery of the rectum) and its contents are intimately related to the rectum down to the level of levator ani muscle.

It contains the **superior rectal vessels** and their branches, **lymphatic vessels and nodes**, **inferior mesenteric plexus** and **loose connective tissue**. The mesorectum is enclosed by mesorectal fascia, a distinct covering derived from the visceral peritoneum.



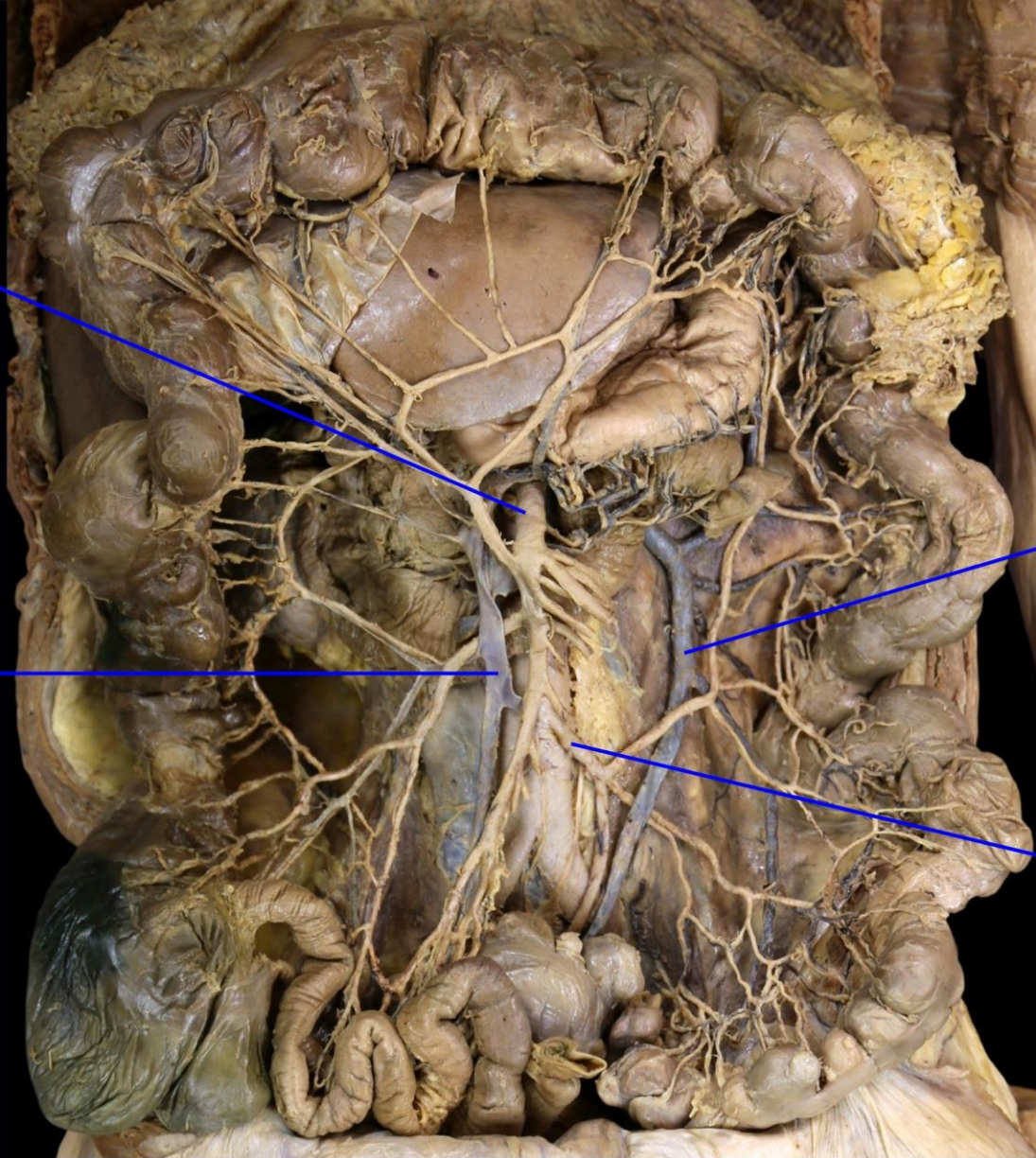
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Superior mesenteric a.

Superior mesenteric v.

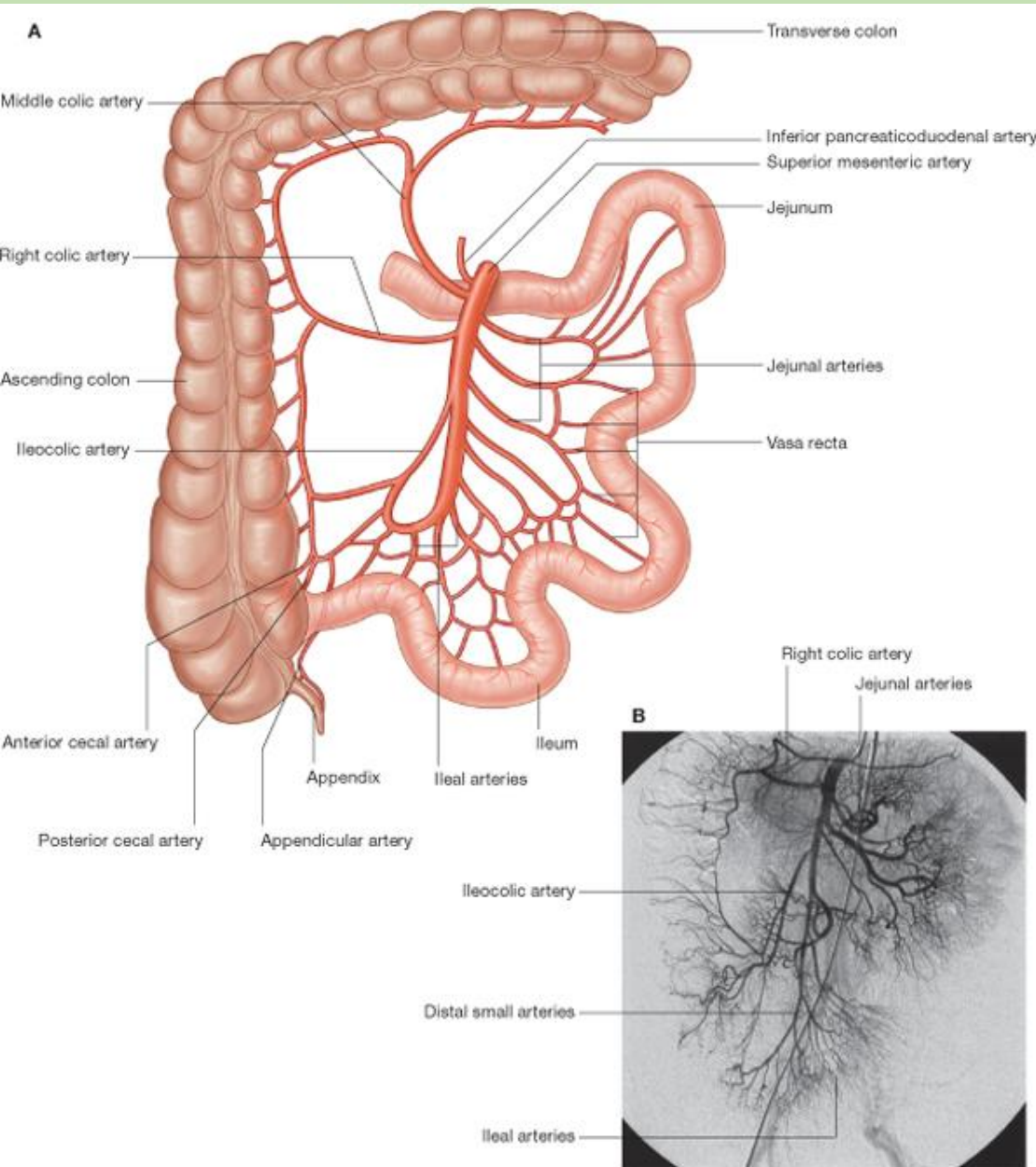
Inferior mesenteric v.

Inferior mesenteric a.



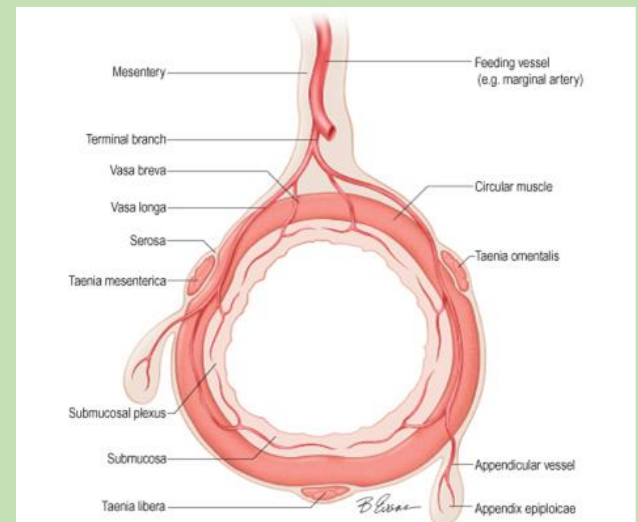


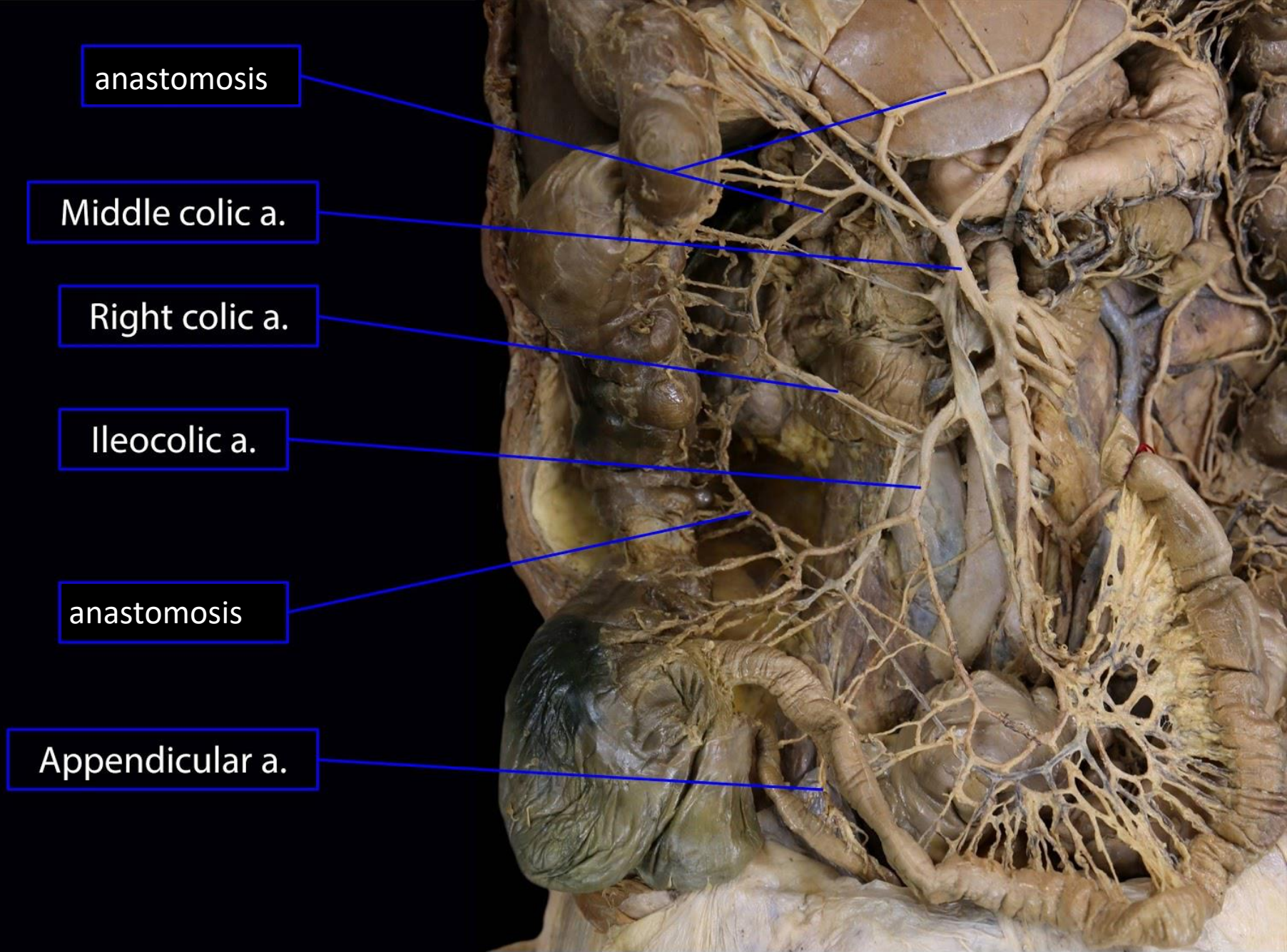
# Vasculature of the colon - arteries



## SUPERIOR MESENTERIC ARTERY (L1 vertebra):

- **Ileocolic artery's branches:** *appendicular artery* and *cecal arteries* for cecum, vermiform appendix and the beginning of the ascending colon.
- **Right colic artery:** for ascending colon.
- **Middle colic artery:** for transverse colon.





anastomosis

Middle colic a.

Right colic a.

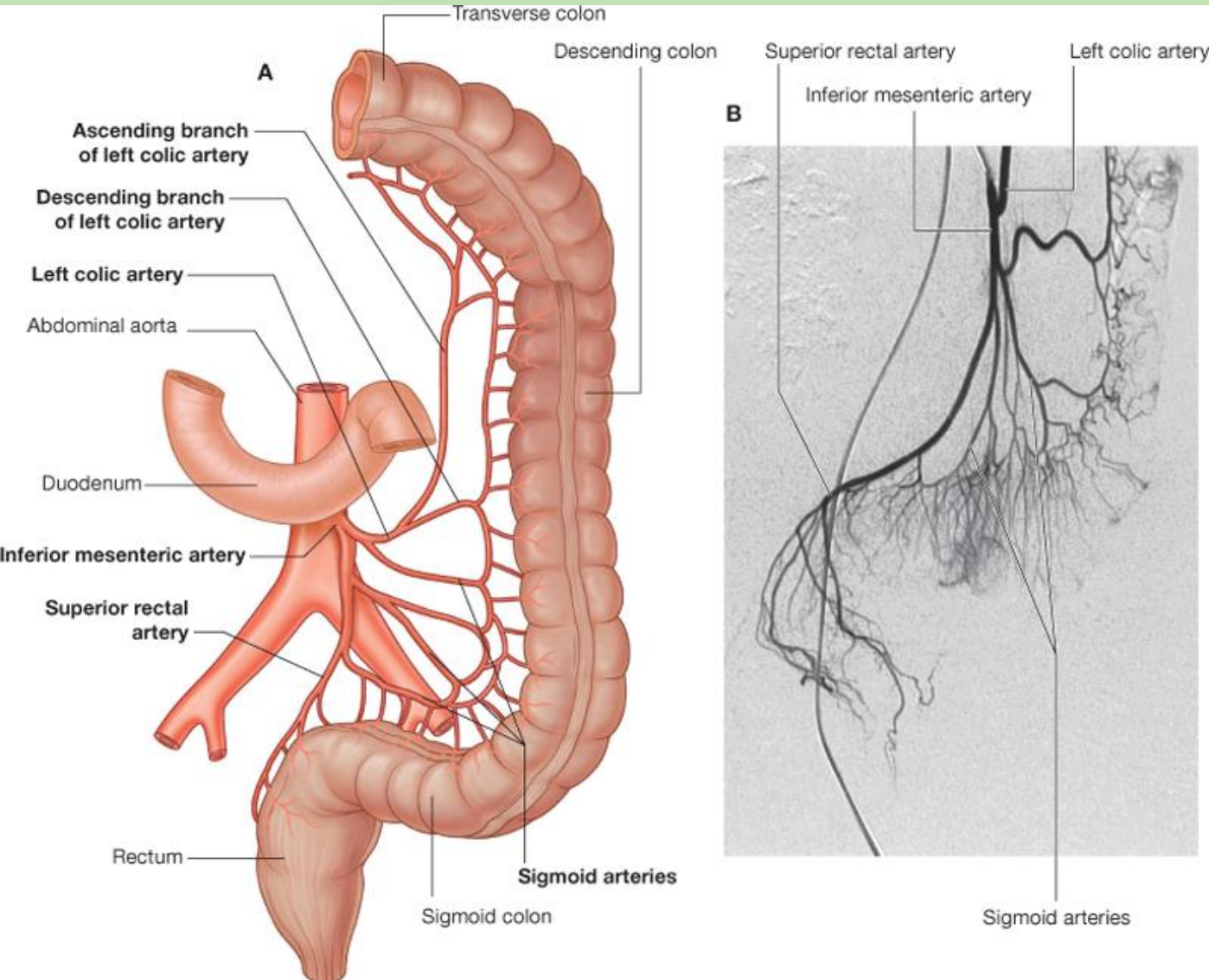
Ileocolic a.

anastomosis

Appendicular a.



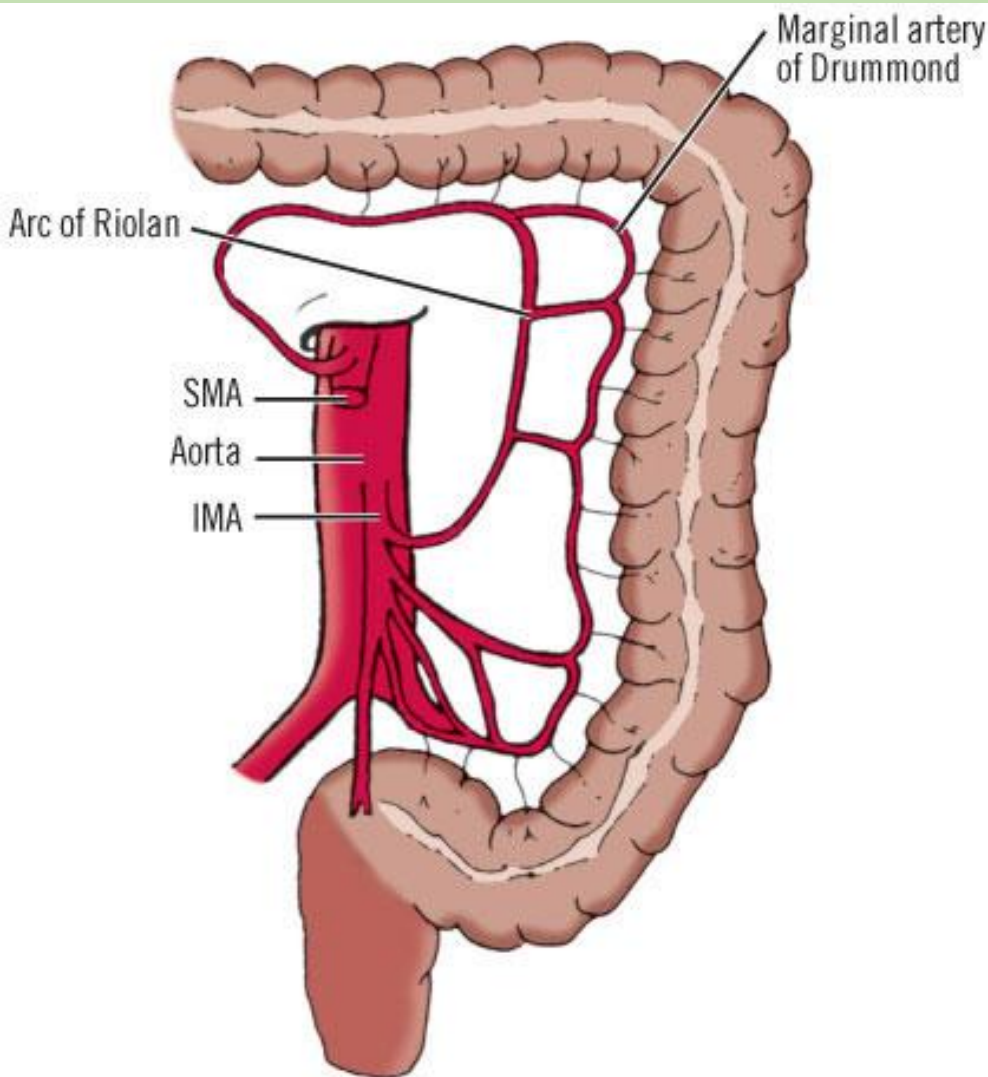
# Vasculature of the colon - arteries



## INFERIOR MESENTERIC ARTERY (L3 vertebra):

- **Left colic artery:** for transverse and descending colon.
- **Sigmoid arteries:** for sigmoid colon.
- **Superior rectal artery:** for upper third of the rectum.

# Vasculature of the colon – functionally important anastomoses



- **Arch of Riolan (=marginal artery):** anastomosis between the *middle colic* and *left colic arteries*, providing collateral circulation in case of occlusion of one of the arteries.
- **(Marginal artery of Drummond:** anastomosis between two arteries in one of the arcades close to the intestines.)
- **Sudek's critical point:** anastomosis between the last *sigmoid artery* and *superior rectal artery* at the rectosigmoid junction.



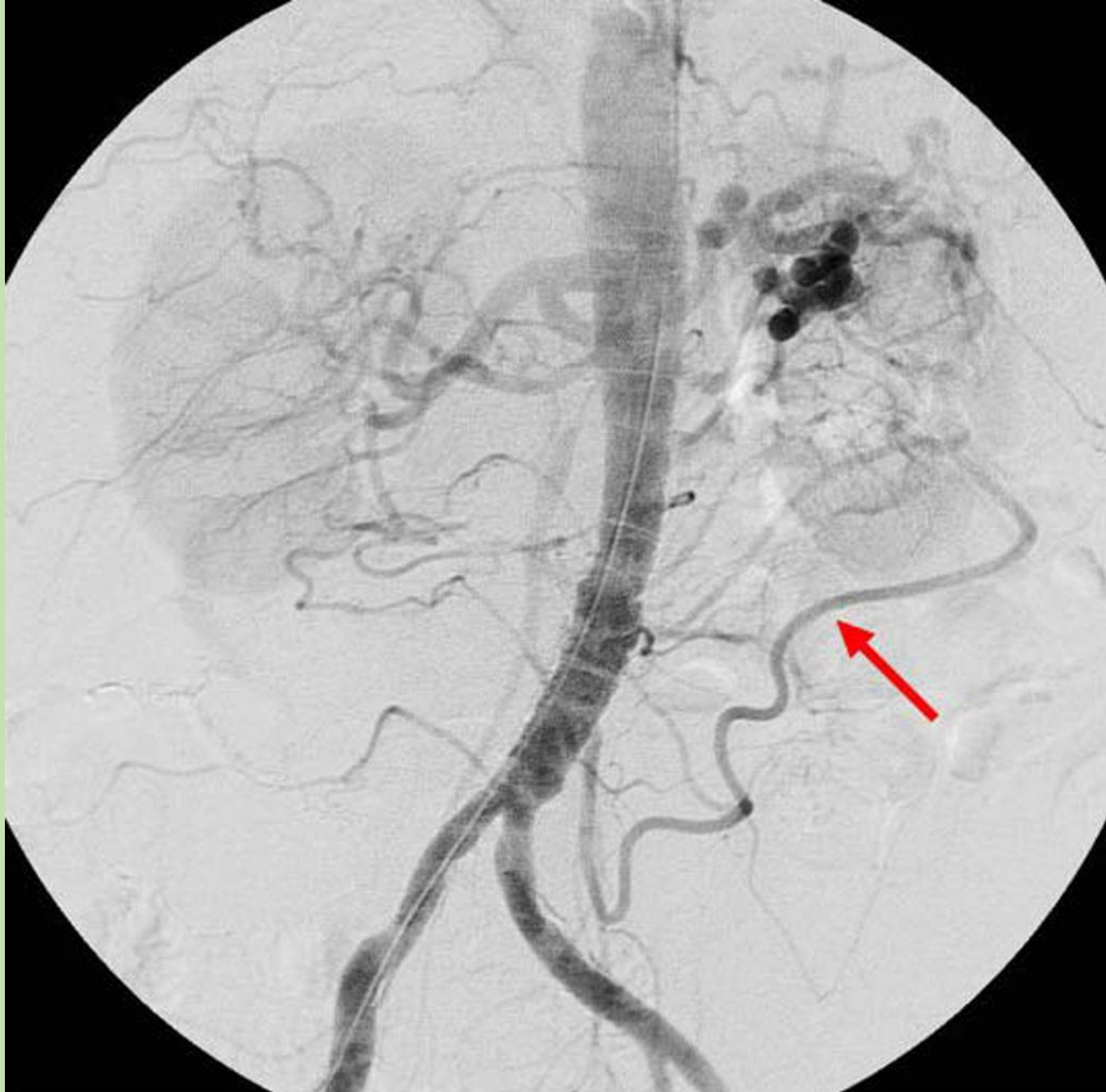


Inferior  
mesenteric a.

Left colic a.

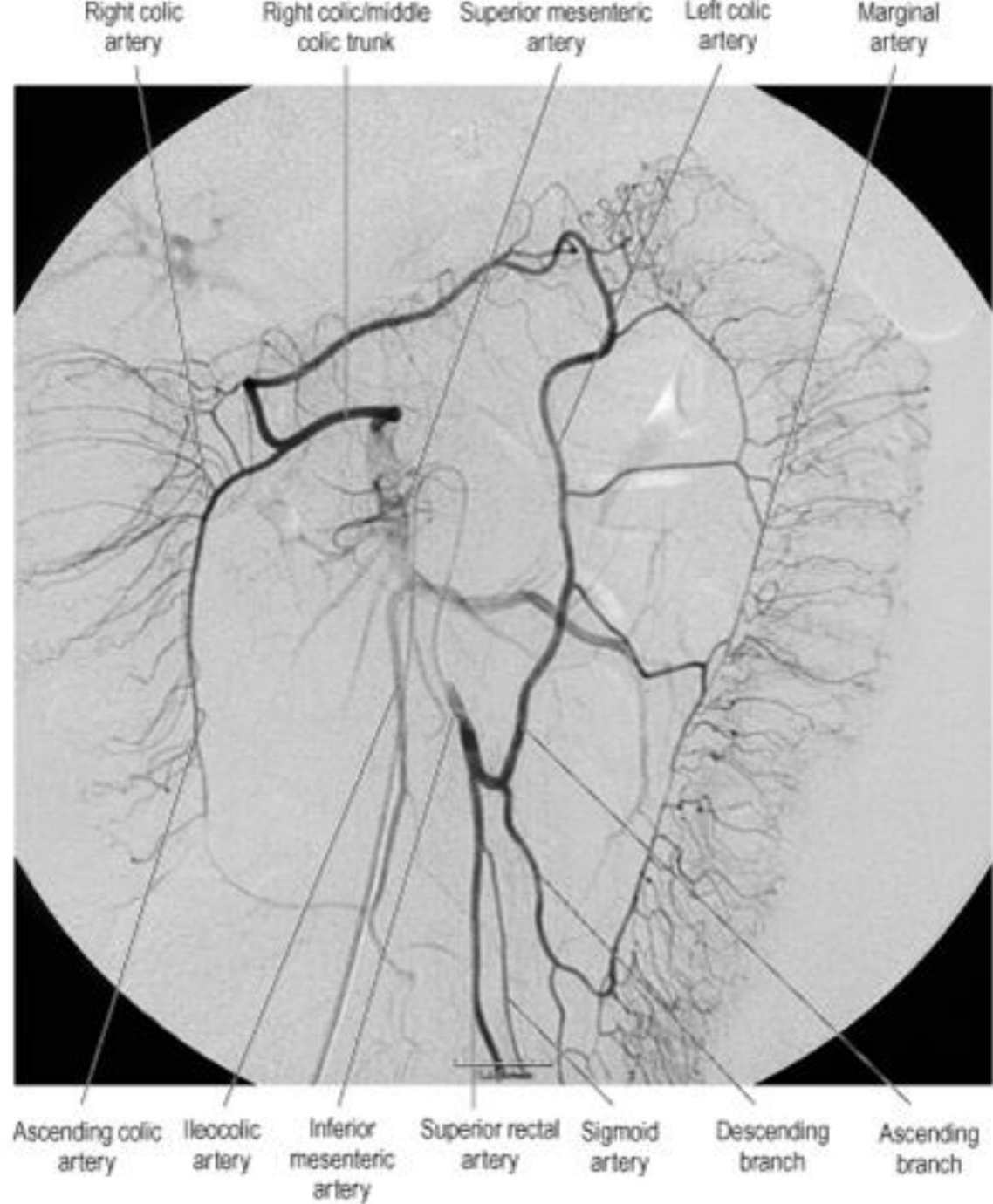
Sigmoid aa.

Superior  
rectal a.



Arch of Riolan, Case courtesy of Dr Donna D'Souza,  
Radiopaedia.org, rID: 36156



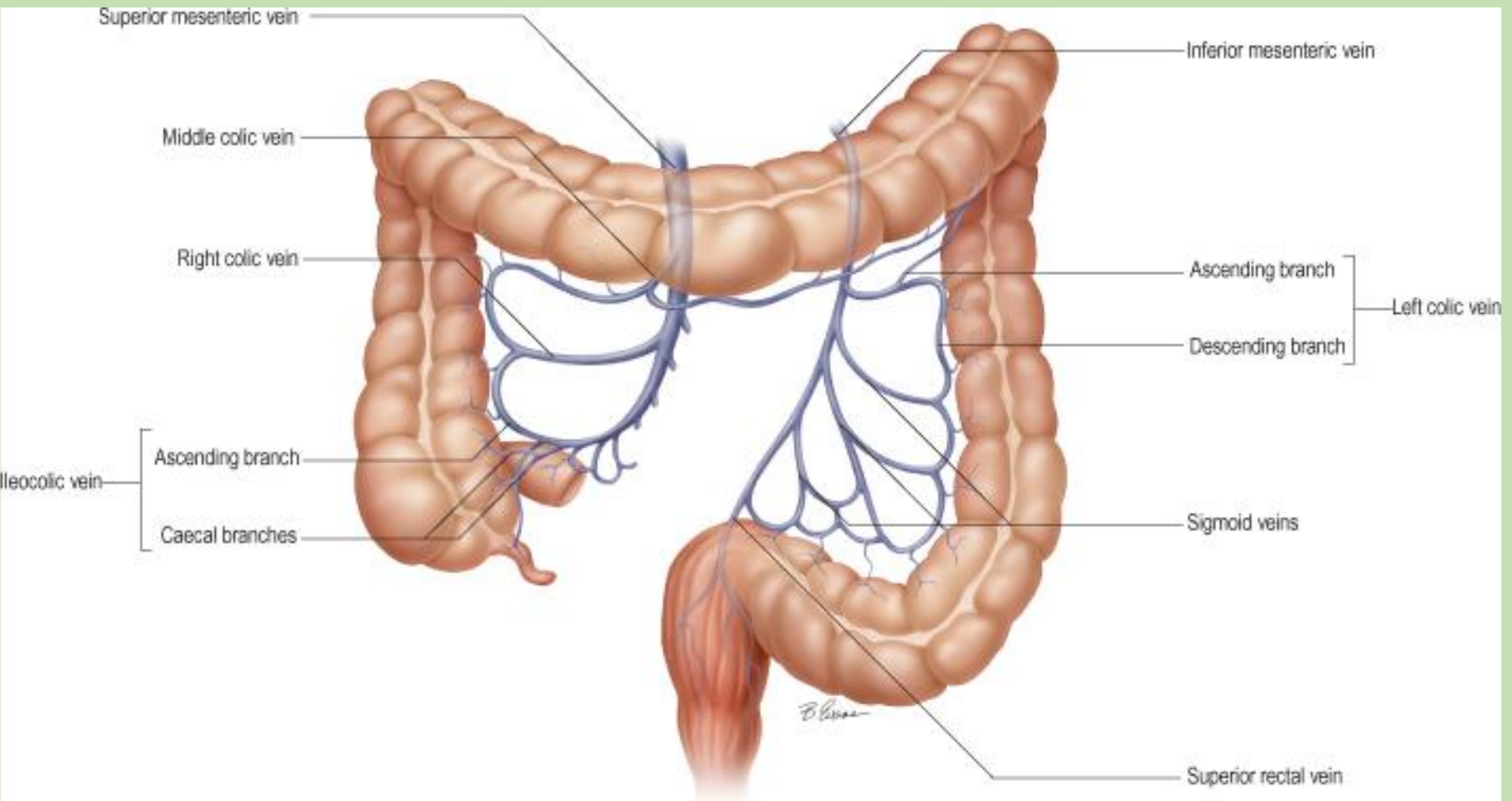


# Vasculature of the colon - veins

The veins correspond to the arteries.

**Ileocolic, right and middle colic veins:** drain into the hepatic portal vein via superior mesenteric vein.

**Left colic, sigmoid and superior rectal veins:** drain into the splenic vein via inferior mesenteric vein.



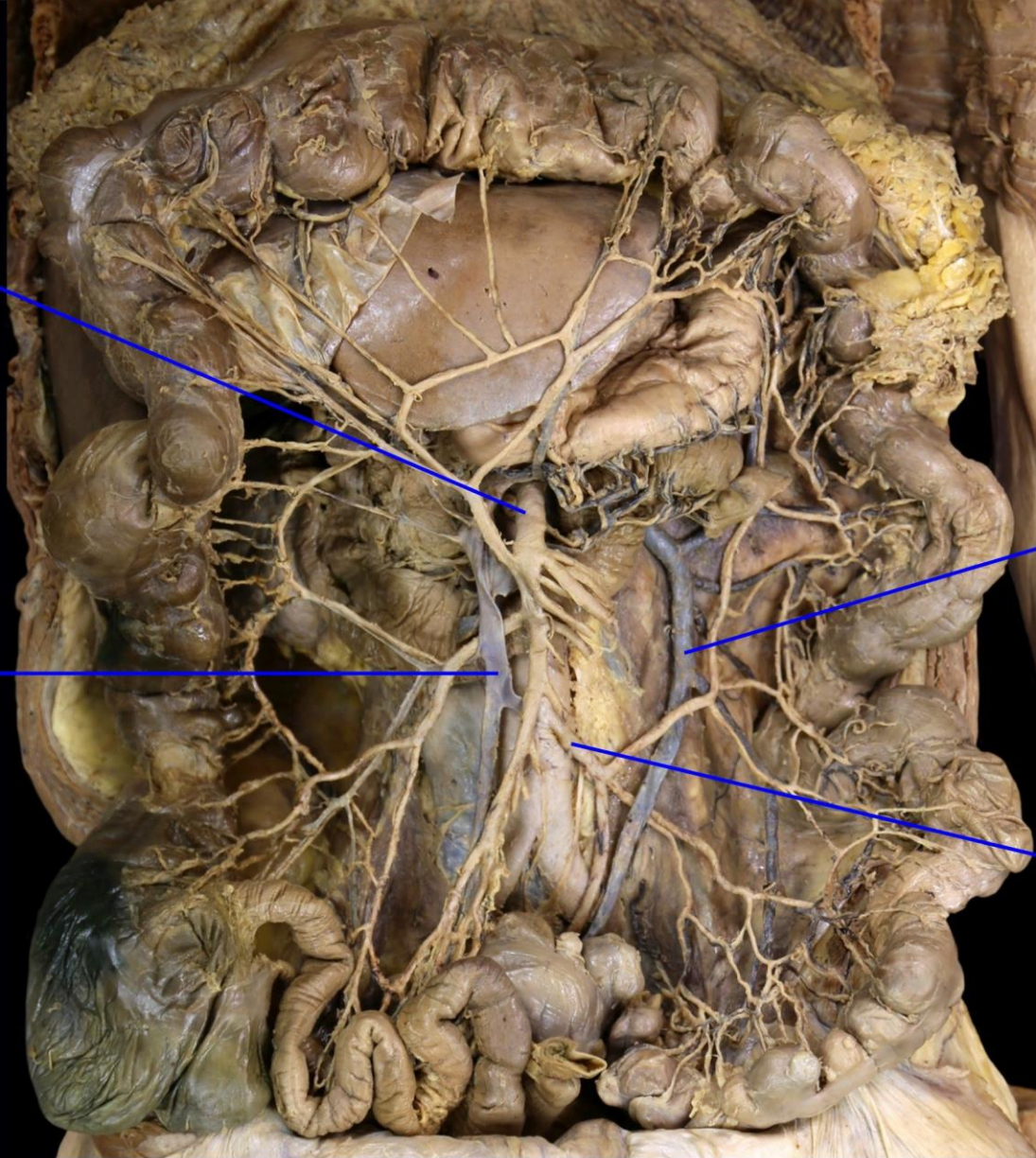


Superior mesenteric a.

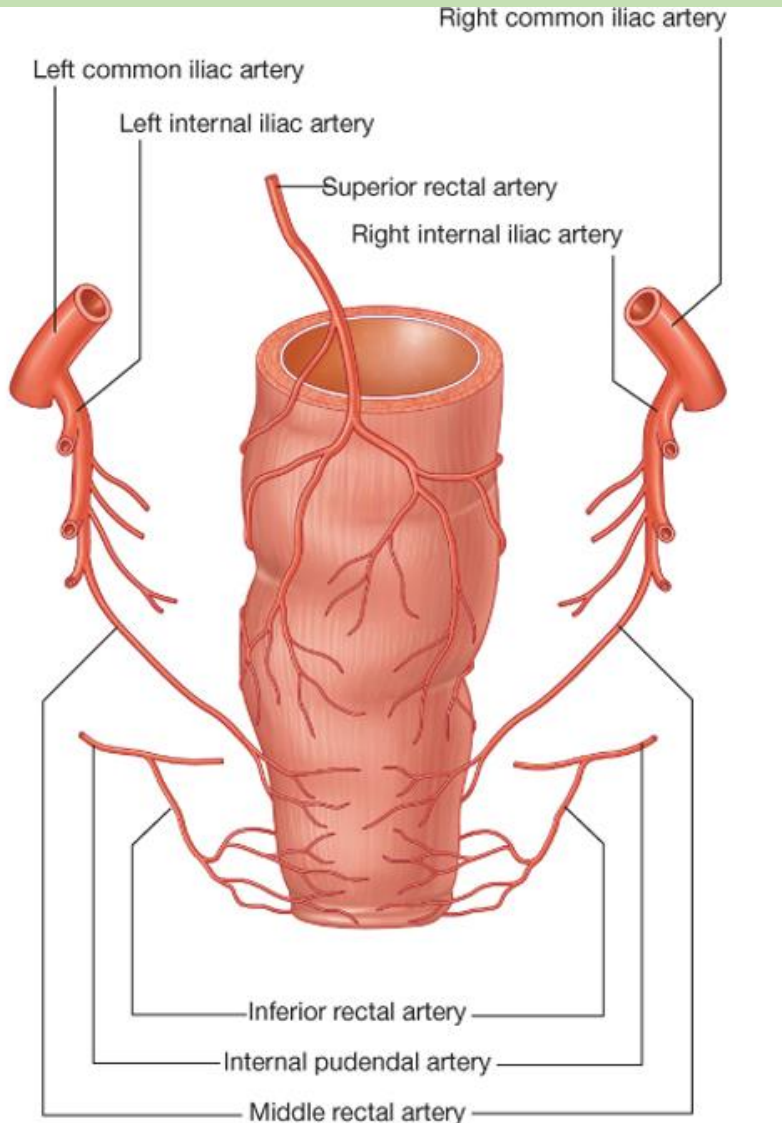
Superior mesenteric v.

Inferior mesenteric v.

Inferior mesenteric a.



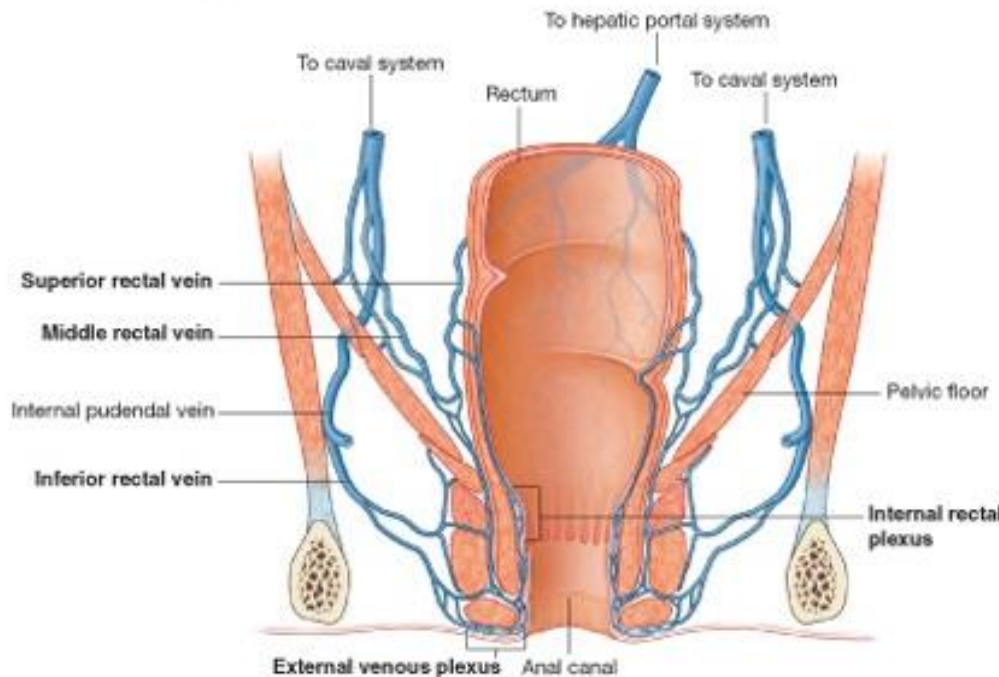
# Vasculature of the rectum - arteries



- **Superior rectal artery:** for upper third of the rectum. It arises from *inferior mesenteric artery*.
- **Middle rectal artery:** for middle third of the rectum. It originates from *internal iliac artery*.
- **Inferior rectal artery:** for inferior third of the rectum. It arises from internal iliac artery via *internal pudendal artery*.



# Vasculature of the rectum - veins



The veins correspond to the arteries.

- **Superior rectal vein:** drains into the *inferior mesenteric vein*.
- **Middle and inferior rectal veins:** drain into the *inferior vena cava* via iliac veins, bypassing the hepatic detoxification.

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# Lymphatic drainage

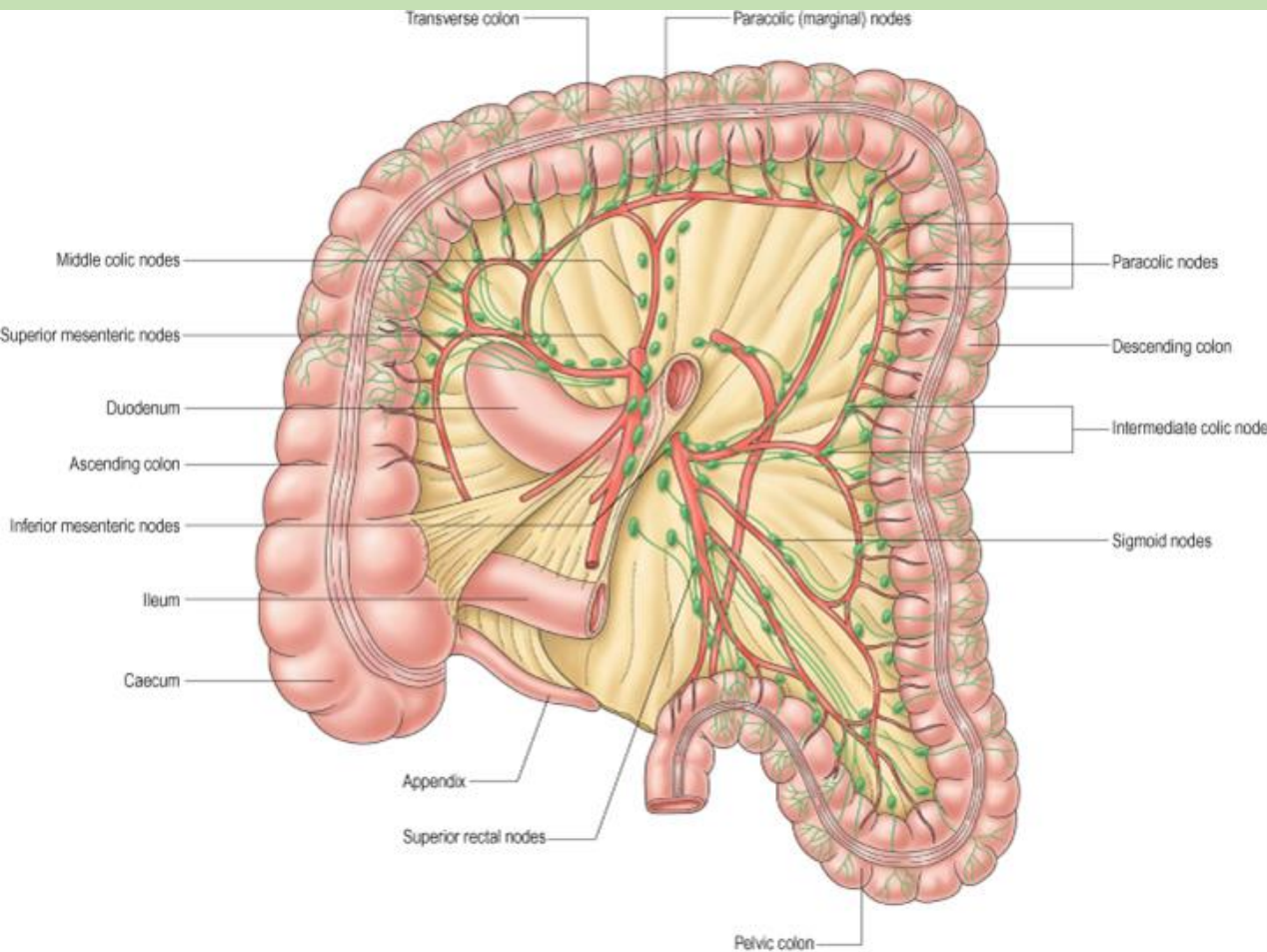
The colic lymphatic vessels are accompanying the arteries.

Lymph from *caecum, ascending and transverse colon* drained toward right and middle colic lymph nodes, then to the **superior mesenteric lymph nodes**.

Lymph from the *descending colon* drained toward left colic lymph nodes, then to the **inferior mesenteric lymph nodes**.

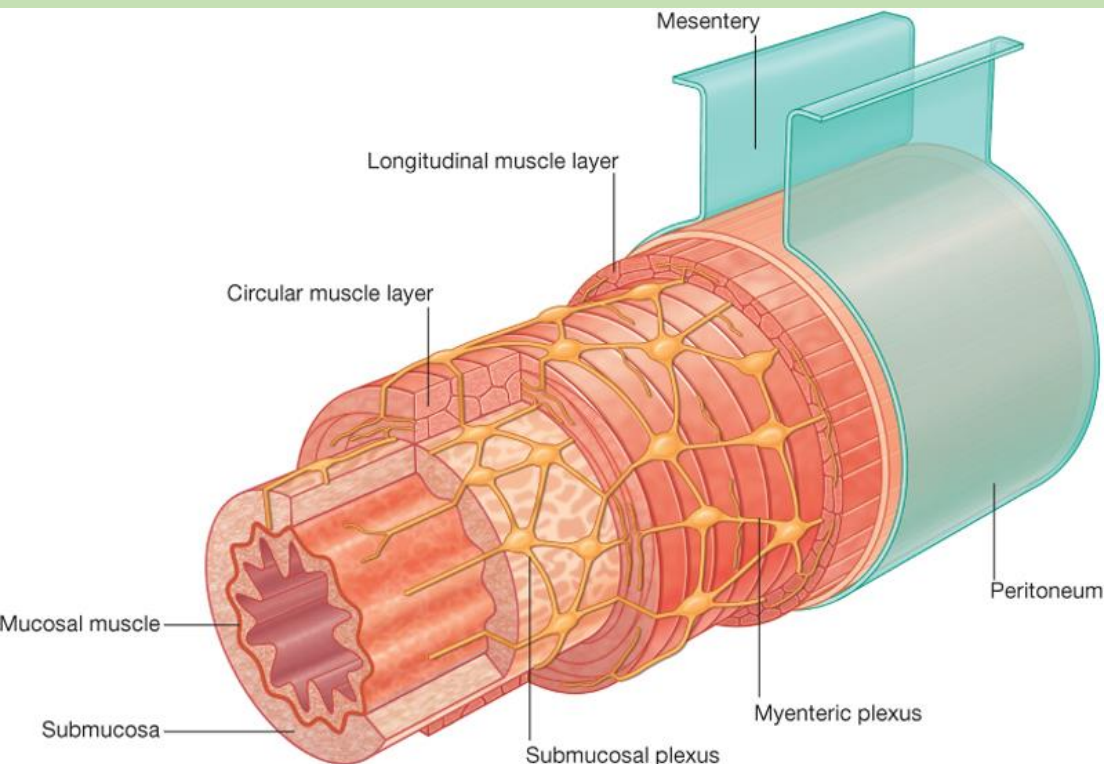
Lymph from the *sigmoid colon* drained toward the sigmoid lymph nodes, then to the **inferior mesenteric lymph nodes**.

Lymph from *upper third of the rectum* drained toward the **inferior mesenteric lymph nodes**, from *inferior two thirds* drained toward the **internal and external iliac lymph nodes**.





# Innervation of the large intestine



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## **Parasympathetic innervation:**

***vagi nerves*** innervate colon to the splenic flexure (Cannon-Böhm's point). For descending, sigmoid colon and rectum ***parasympathetic fibers*** provide innervation ***from S3-5*** segments .

The parasympathetic colic supply is secretomotor to the colic glands and motor to the colic musculature.

**Sympathetic innervation:** from T6-11 ganglia via the ***greater and lesser splanchnic nerves via superior and inferior mesenteric plexuses.***

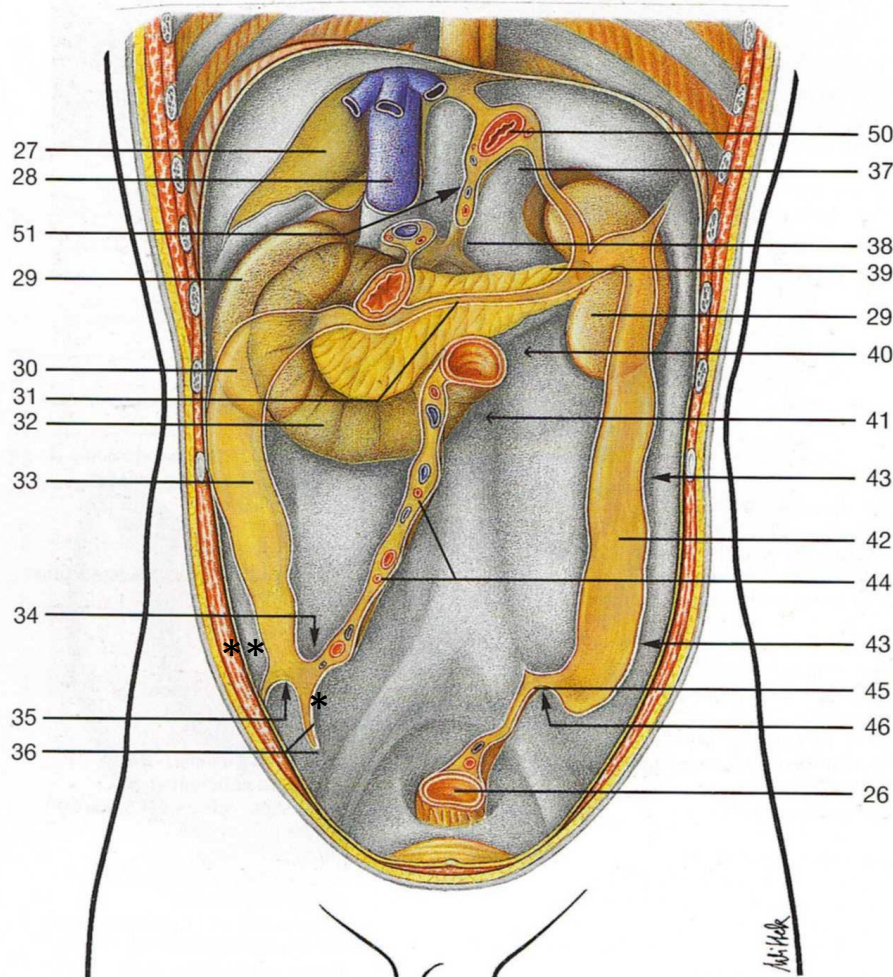
The colic sympathetic nerves are vasoconstrictor to the colic vasculature and inhibitory to colic musculature.

## **Enteric nervous system:**

***Meissner's plexus***

***Auerbach's plexus***

# Peritoneal recesses on the posterior abdominal wall



The peritoneal recesses are located between organs or between organ and peritoneum covered body wall. The intestinal loops may become entrapped in these recesses = *internal herniation*.

30: attachment of the right colic flexure

31: root of the transverse mesocolon

32: duodenum

34: superior ileocecal recess

\* : inferior ileocecal recess

35: retrocecal recess

\*\* : right paracolic gutter/groove

43: left paracolic gutter/groove

46: intersigmoid recess

51: epiploic foramen



# Histology of the colon

NOTE: The colon represents neither Kerckring's folds nor intestinal villi.

**Epithelium mucosae:** simple columnar (enterocytes), numerous goblet cells

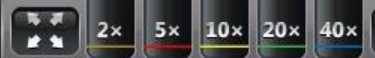
**Lamina propria:** highly cellular loose connective tissue, crypts of Lieberkühn

**Lamina muscularis mucosae:** smooth muscle: inner circular, outer longitudinal

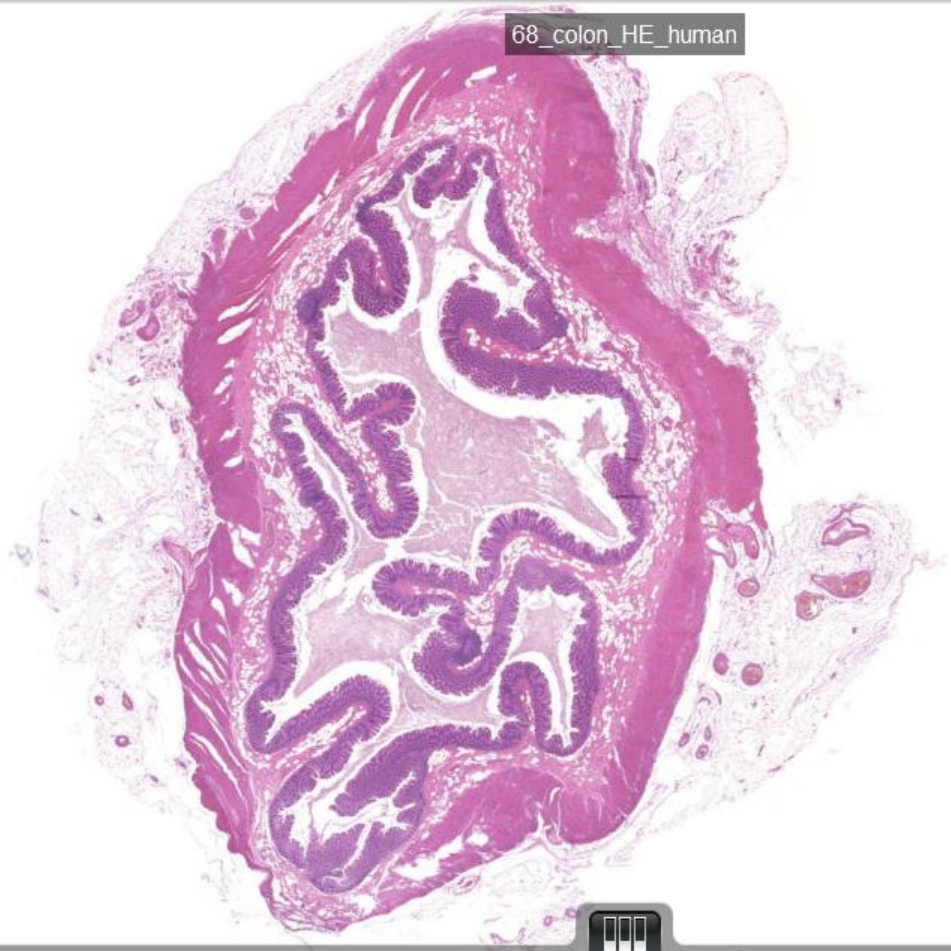
**Tunica submucosa:** loose connective tissue, Meissner's plexuses

**Muscularis externa:** smooth muscle: inner circular, outer longitudinal, Auerbach's plexuses

**Tunica serosa/adventitia**

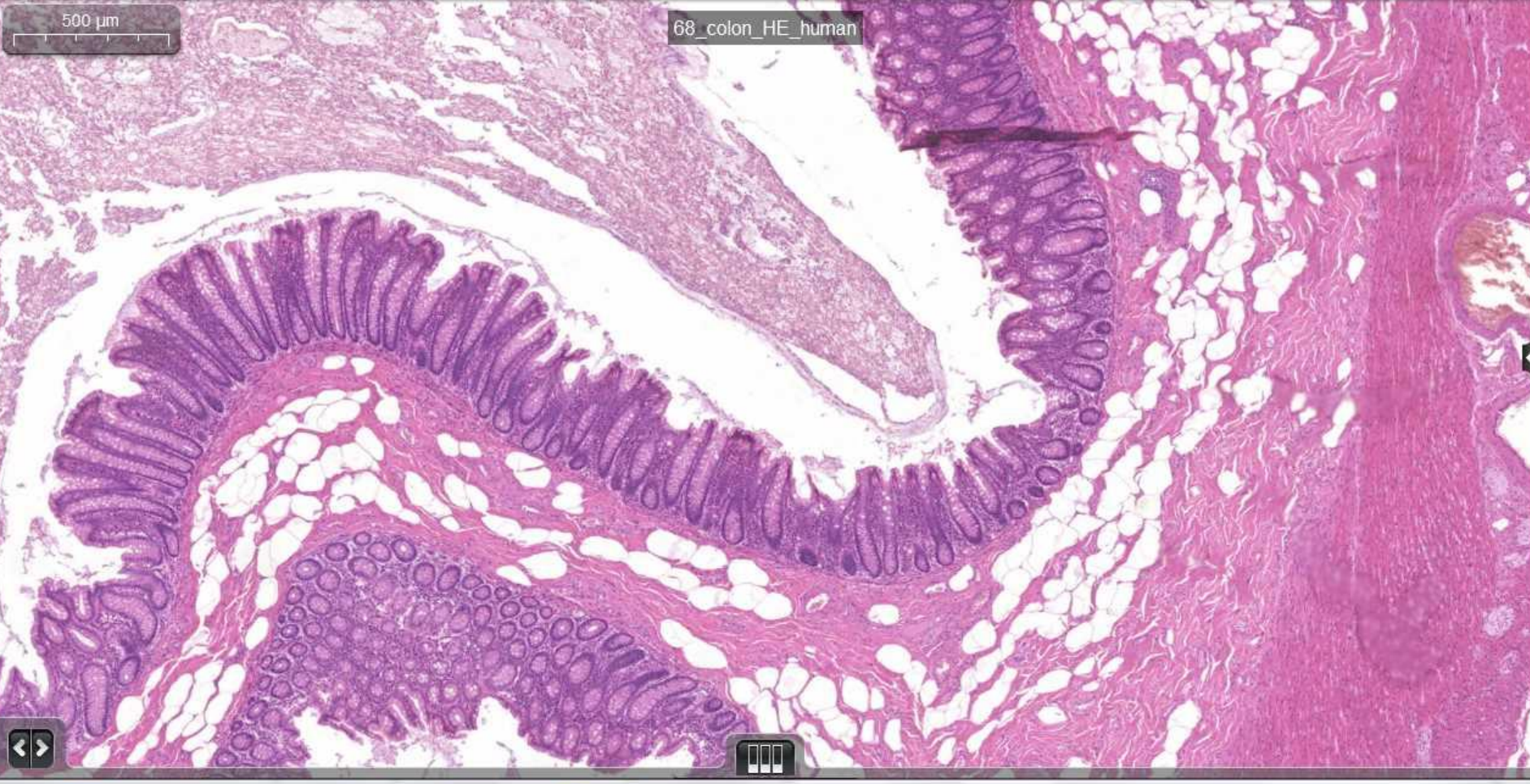


68\_colon\_HE\_human





Navigation toolbar with icons for home, search, zoom (2x, 5x, 10x, 20x, 40x, 1:1), and a search input field containing '2.6x'. Other icons include a list, a hand, a camera, and a 3D HISTECH logo.



500  $\mu$ m

68\_colon\_HE\_human



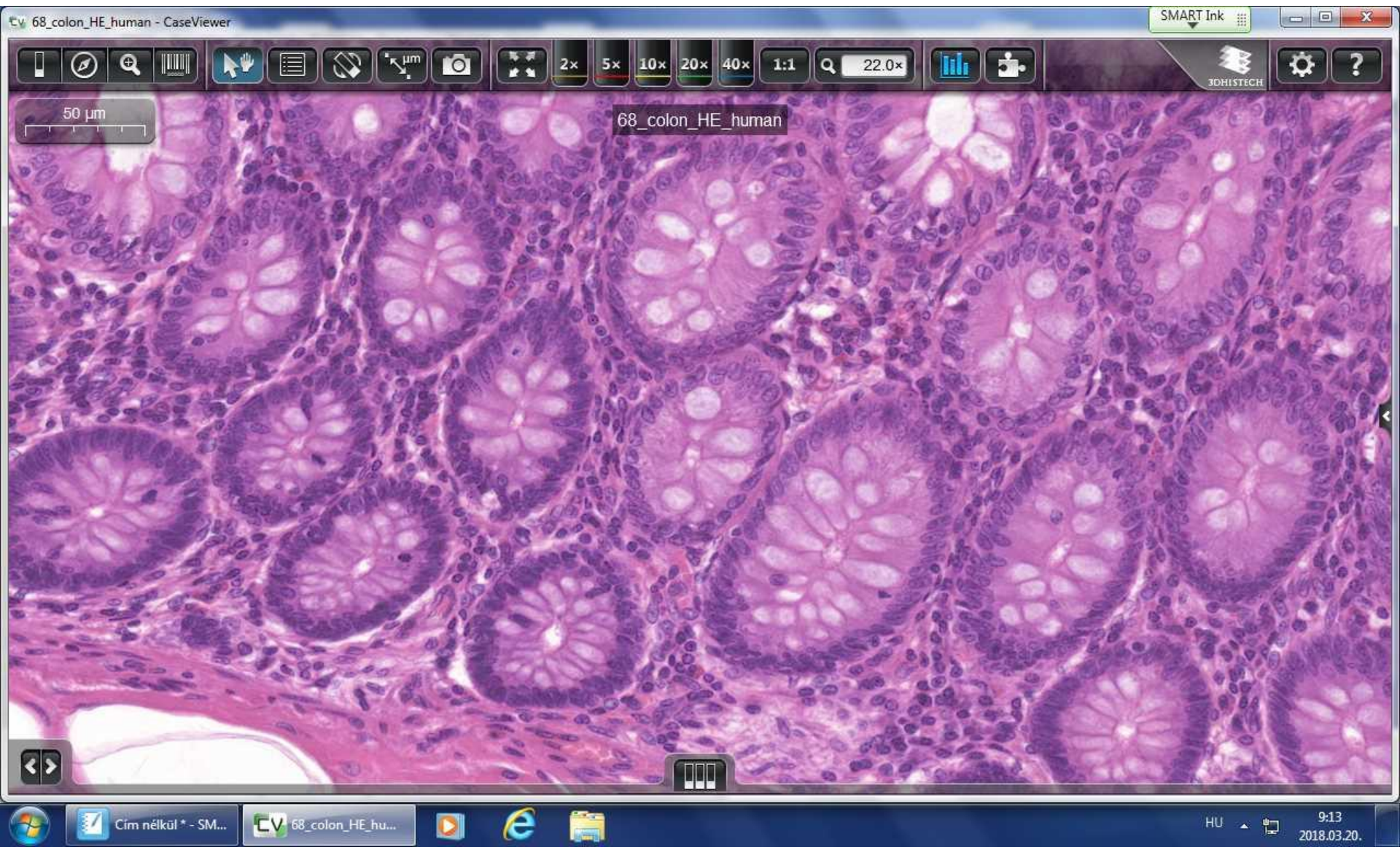


100  $\mu$ m

68\_colon\_HE\_human





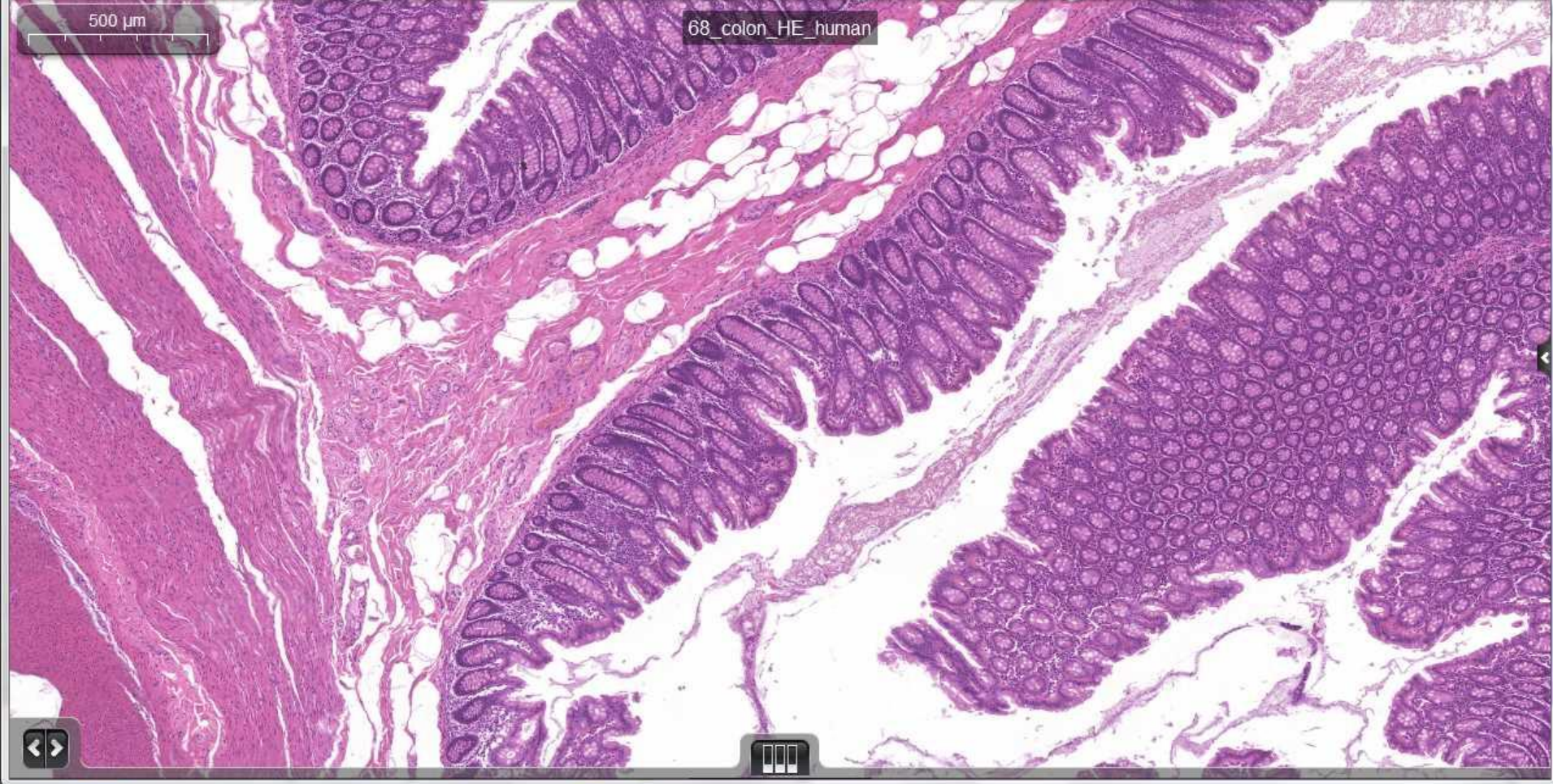




Navigation toolbar with icons for: Home, Back, Forward, Search, Scale (2x, 5x, 10x, 20x, 40x, 1:1), Zoom (3.0x), and other utility icons.

500 μm

68\_colon\_HE\_human

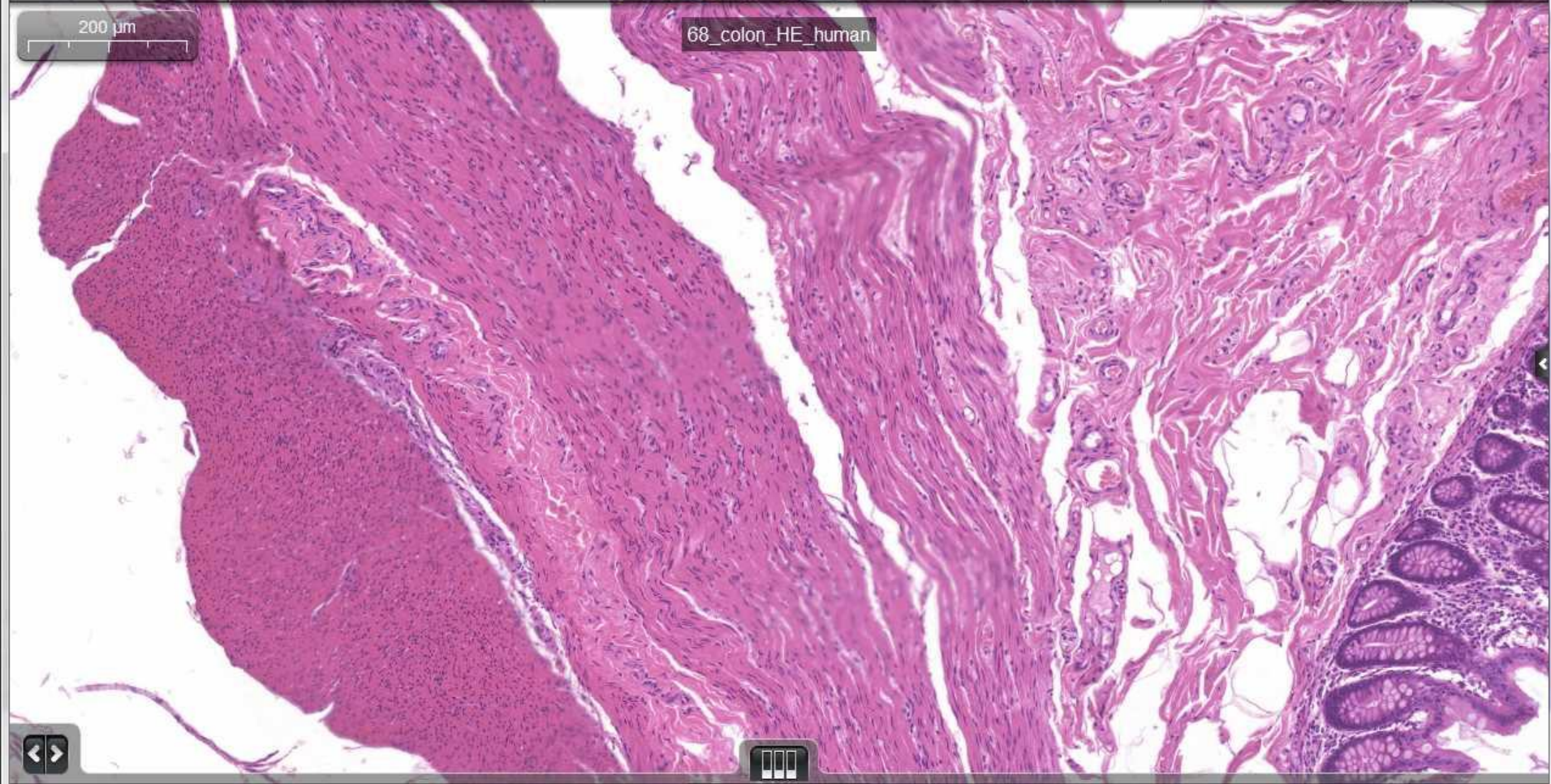




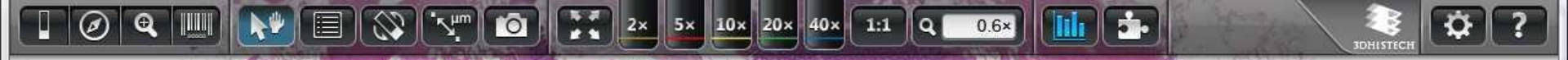
Navigation toolbar with icons for home, search, zoom (2x, 5x, 10x, 20x, 40x), 1:1, search (6.5x), and other controls. Includes a '3DHISTECH' logo and a help icon.

200 μm

68\_colon\_HE\_human







2000  $\mu$ m

68\_colon\_HE\_human



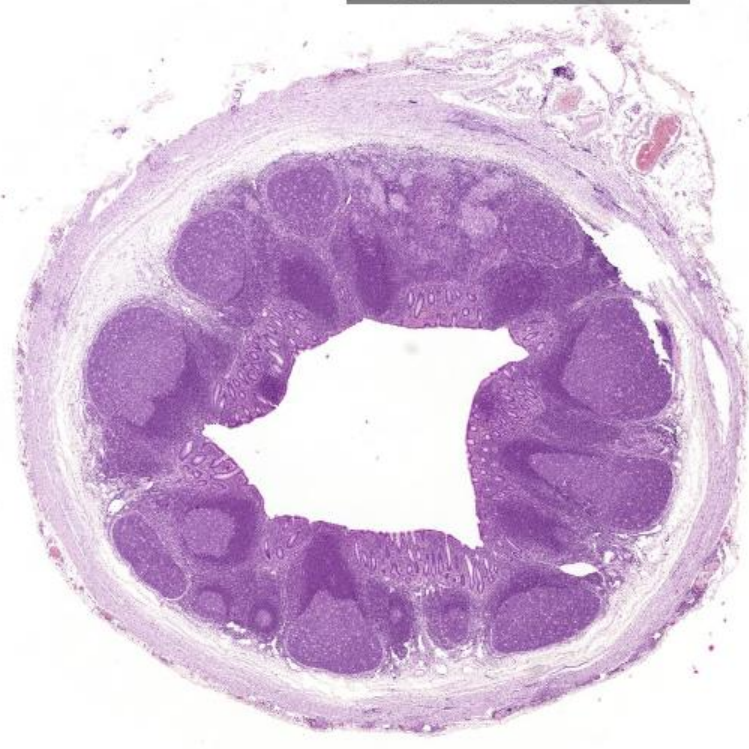


2000 μm

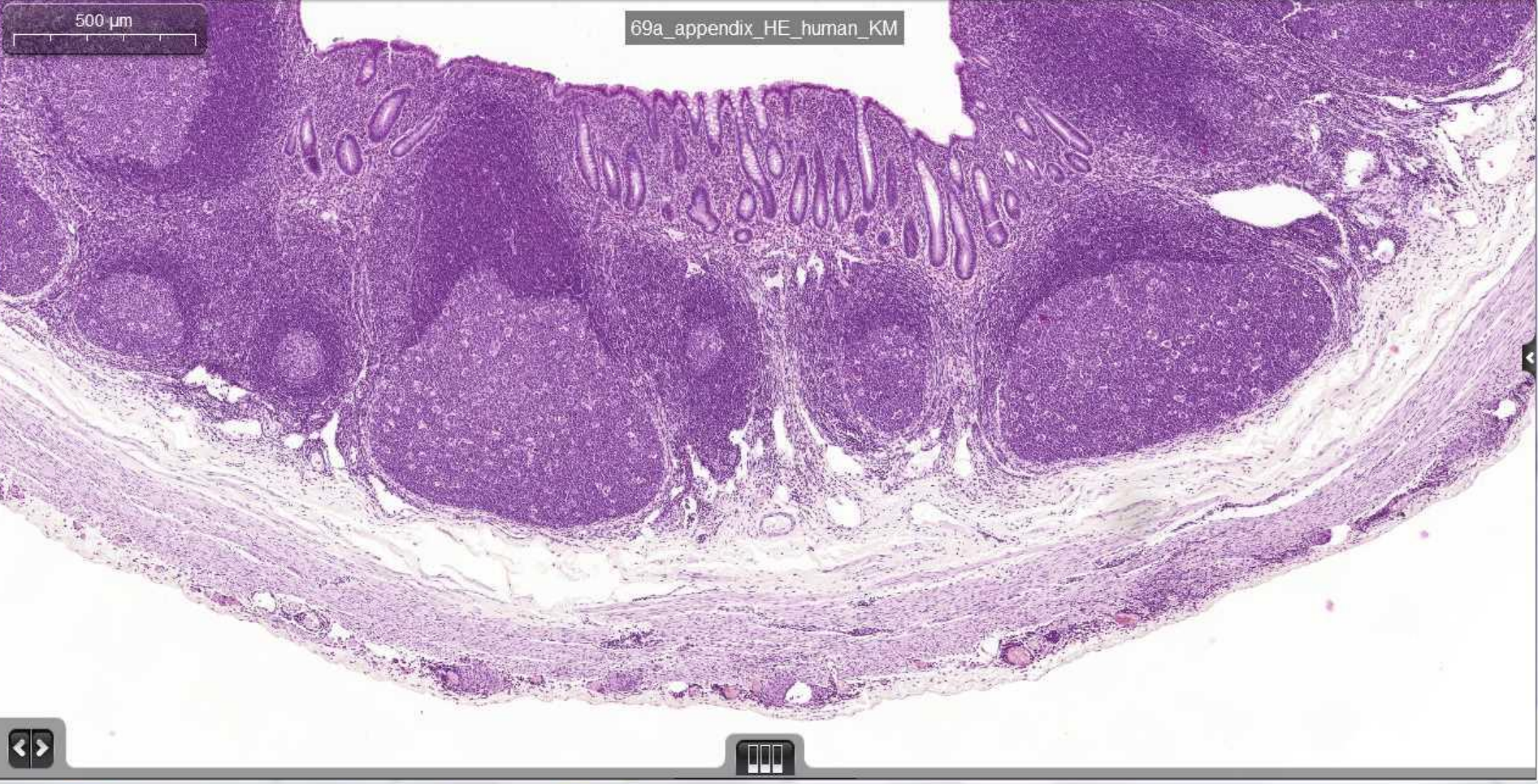
69a\_appendix\_HE\_human\_KM

2x 5x 10x 20x 40x 1:1 0.8x

3DHISTECH





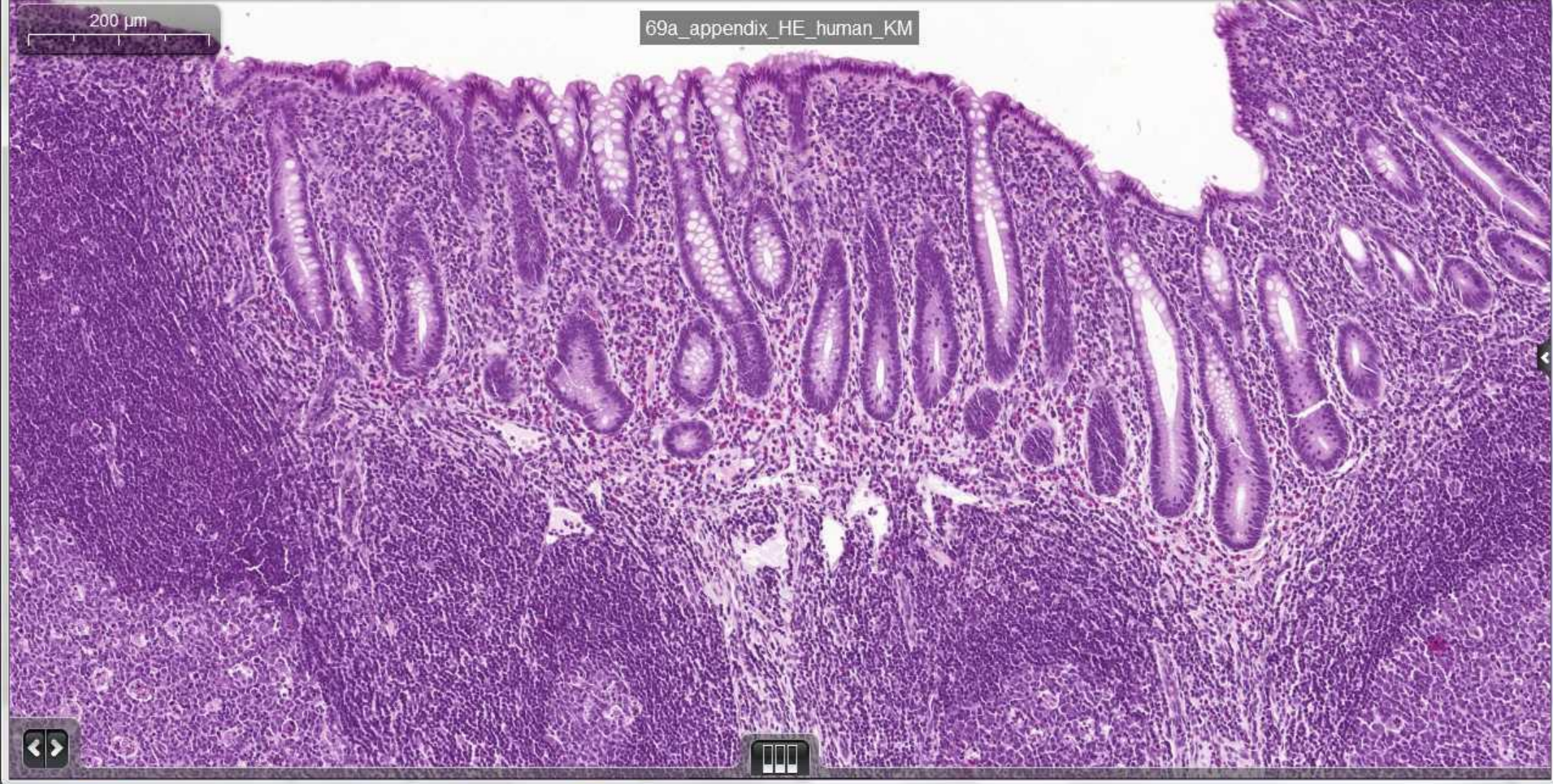






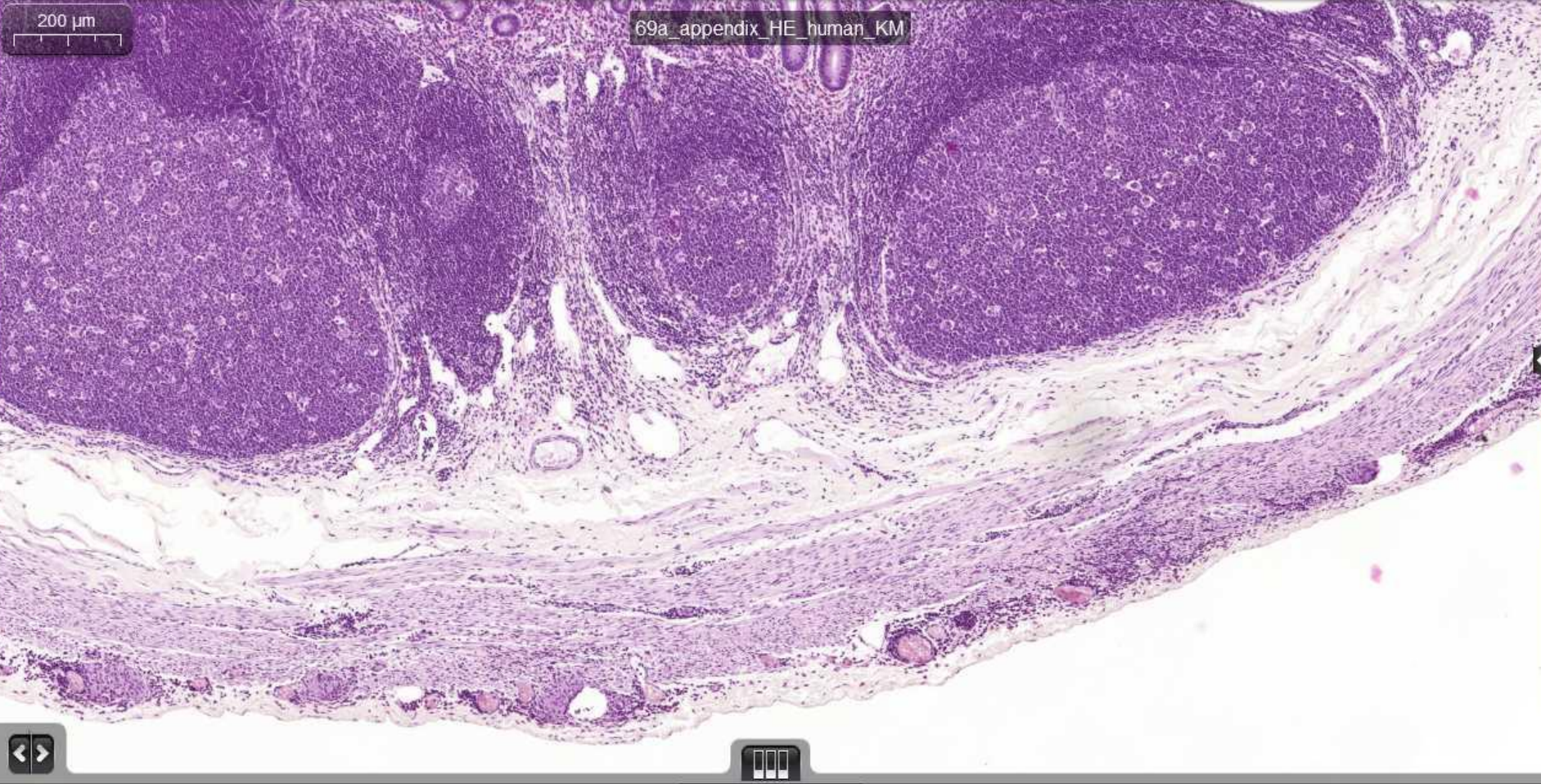
200  $\mu$ m

69a\_appendix\_HE\_human\_KM

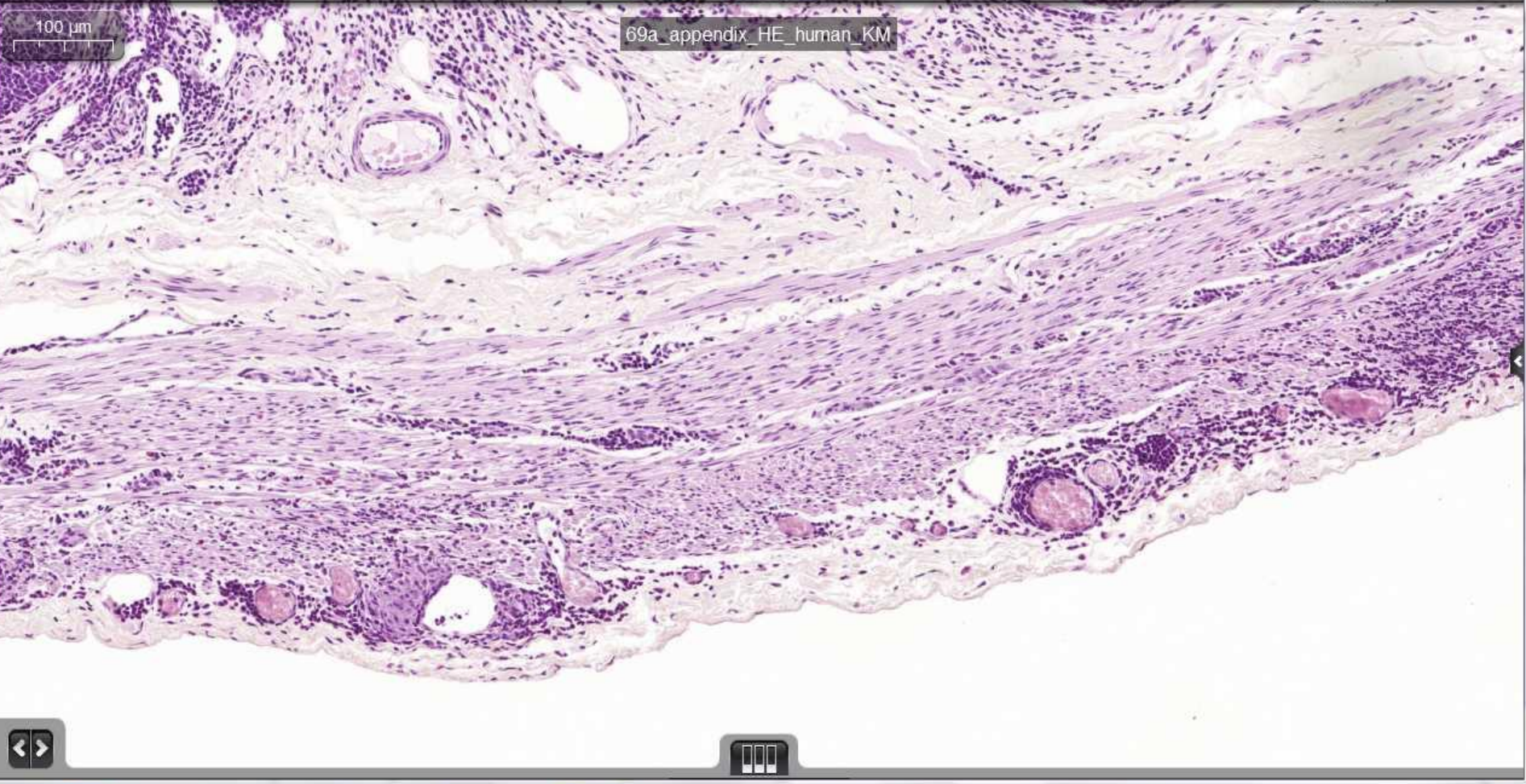




Navigation toolbar with icons for home, back, forward, search, and various zoom levels (2x, 5x, 10x, 20x, 40x, 1:1, 4.4x). Includes a 'SMART InK' logo and a help icon.







# Appendicitis

An acute inflammatory process of the **appendix related to obstruction** (faecolith, undigested food, or enlarged lymphoid tissue). Peak incidence between ages 5-15, but can occur at any age.



Case courtesy of Dr Andrew Dixon,  
Radiopaedia.org, rID: 9644



Case courtesy of Dr Maulik S Patel,  
Radiopaedia.org, rID: 12822



# Ulcerative colitis (UC)

An *idiopathic* inflammatory bowel disease, which *always involves the rectum* and extends proximally. Causes *inflammation and ulcers*. Major incidence between 15-25 years.

The main symptom of active disease is bloody diarrhoea, often with urgency and tenesmus.

Surgical removal of the colon and rectum cures the UC.



Case courtesy of Dr Andrew Ryan,  
Radiopaedia.org, rID: 16115

# Thank you for your attention.

References: Drake: Gray's Anatomy for Students, 2nd ed.

Standring: Gray's Anatomy, 39th ed.

[radiopaedia.org](http://radiopaedia.org)

[BlueLink.com](http://BlueLink.com)

Thieme Atlas of Anatomy, Neck and Internal Organs

