Gastro-intestinal Module

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Blood Supply of the GIT

Major Organs of the Digestive Tract

Oral Cavity (Mouth)

Ingestion, mechanical processing with accessory organs (teeth and tongue), moistening, mixing with salivary secretions

Pharynx

Muscular propulsion of materials into the esophagus

Esophagus

Transport of materials to the stomach

Stomach

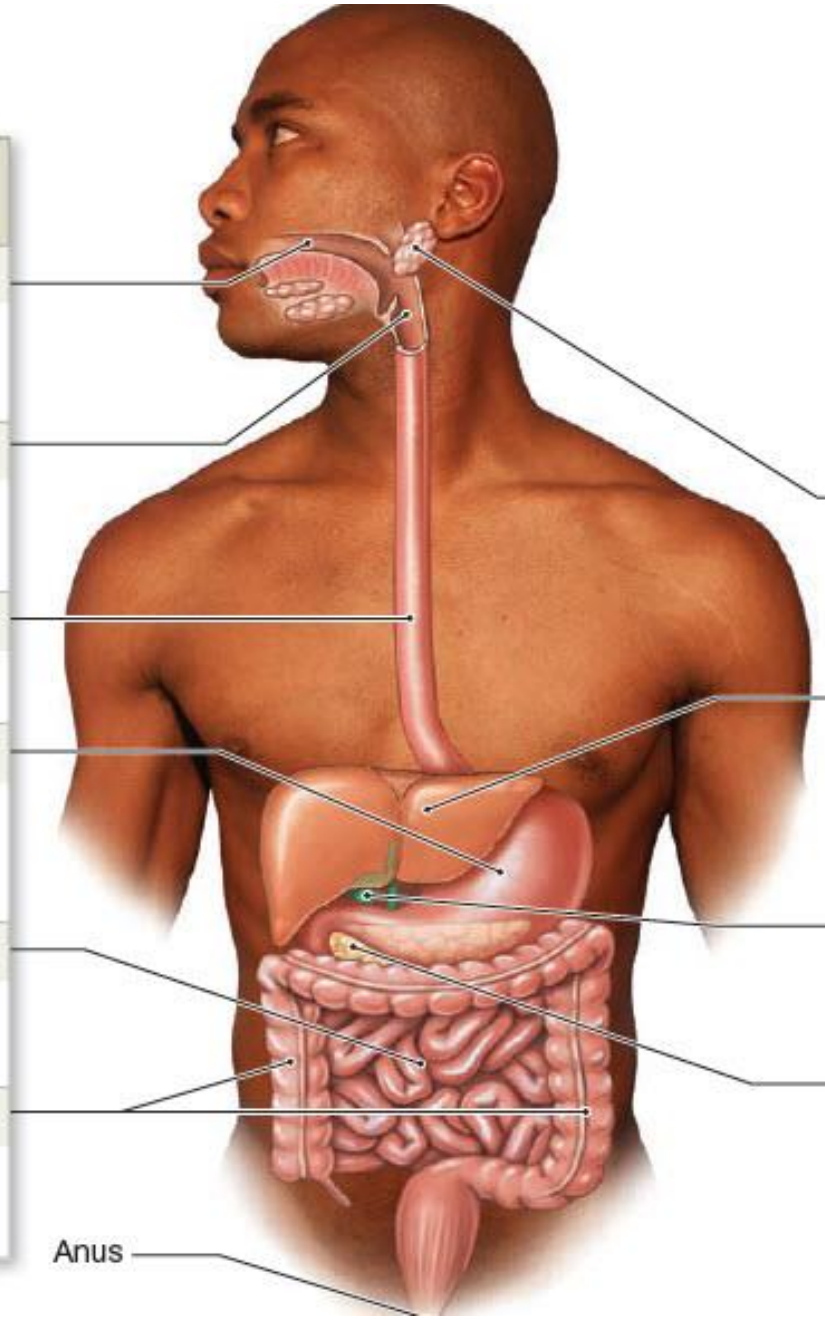
Chemical breakdown of materials by acid and enzymes; mechanical processing through muscular contractions

Small Intestine

Enzymatic digestion and absorption of water, organic substrates, vitamins, and ions

Large Intestine

Dehydration and compaction of indigestible materials in preparation for elimination



Accessory Organs of the Digestive System

Teeth

Mechanical processing by chewing (mastication)

Tongue

Assists mechanical processing with teeth, sensory analysis

Salivary Glands

Secretion of lubricating fluid containing enzymes that break down carbohydrates

Liver

Secretion of bile (important for lipid digestion), storage of nutrients, many other vital functions

Gallbladder

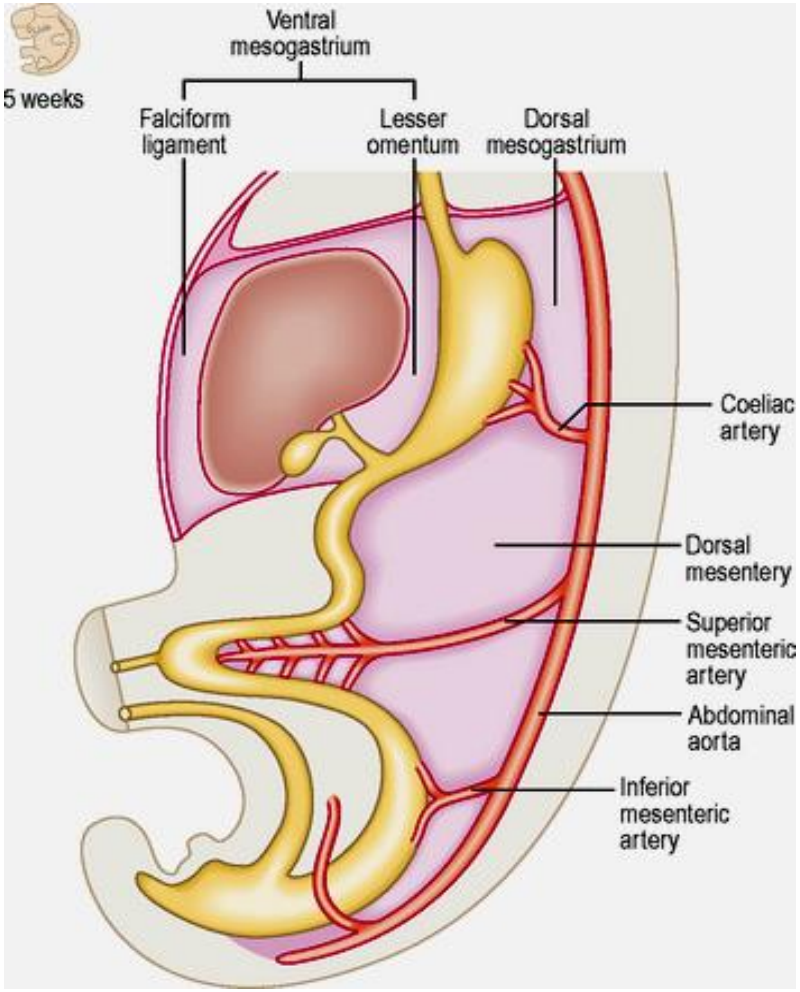
Storage and concentration of bile

Pancreas

Exocrine cells secrete buffers and digestive enzymes; endocrine cells secrete hormones

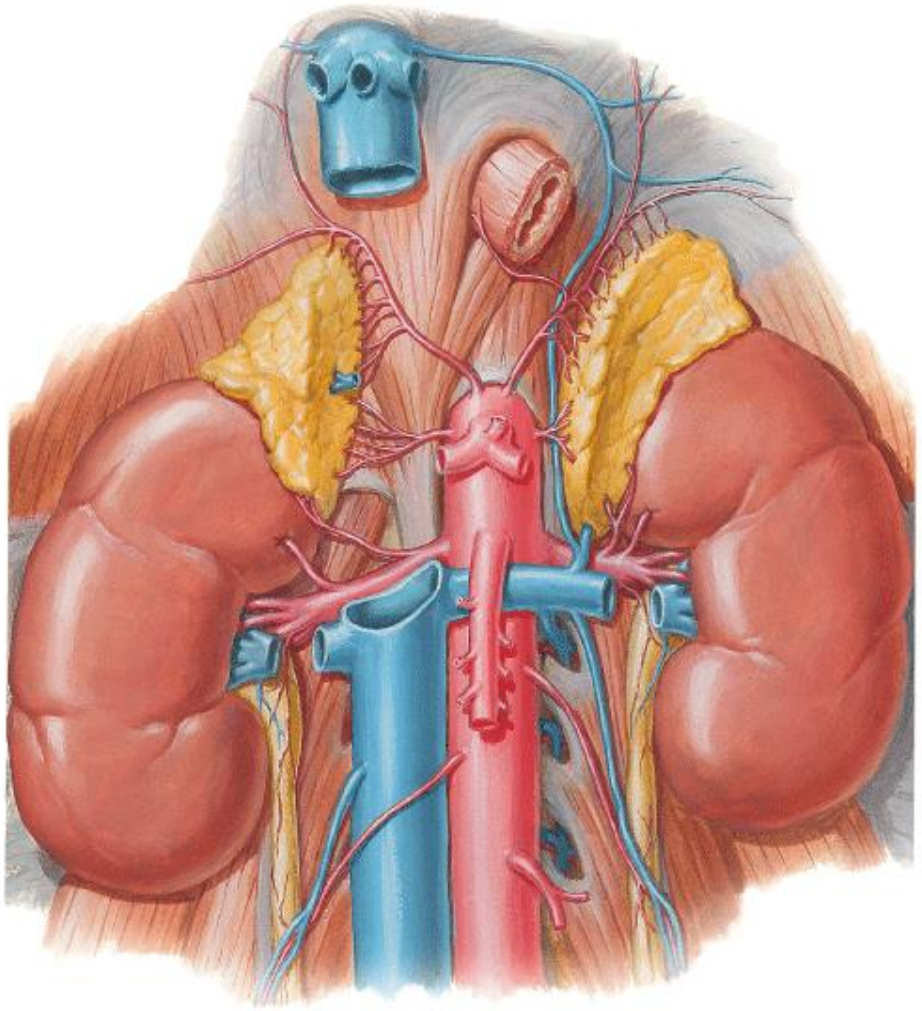
Basic Concept

- **Fore Gut**
  - Celiac Trunk
- **Mid Gut**
  - Superior Mesenteric Artery
- **Hind Gut**
  - Inferior Mesenteric Artery



Abdominal Aorta

- It begins at the aortic hiatus of the diaphragm, anterior to the lower border of vertebra T12.
- It descends to the level of vertebra L4 it is slightly to the left of midline.
- The terminal branches of the abdominal aorta are the two ***common iliac arteries***.



Branches of Abdominal Aorta

- **Visceral Branches**

1. Celiac (1).
2. Superior Mesenteric (1).
3. Inferior Mesenteric (1).
4. Middle Suprarenals (2).
5. Renal arteries (2).
6. Gonadal arteries (2)

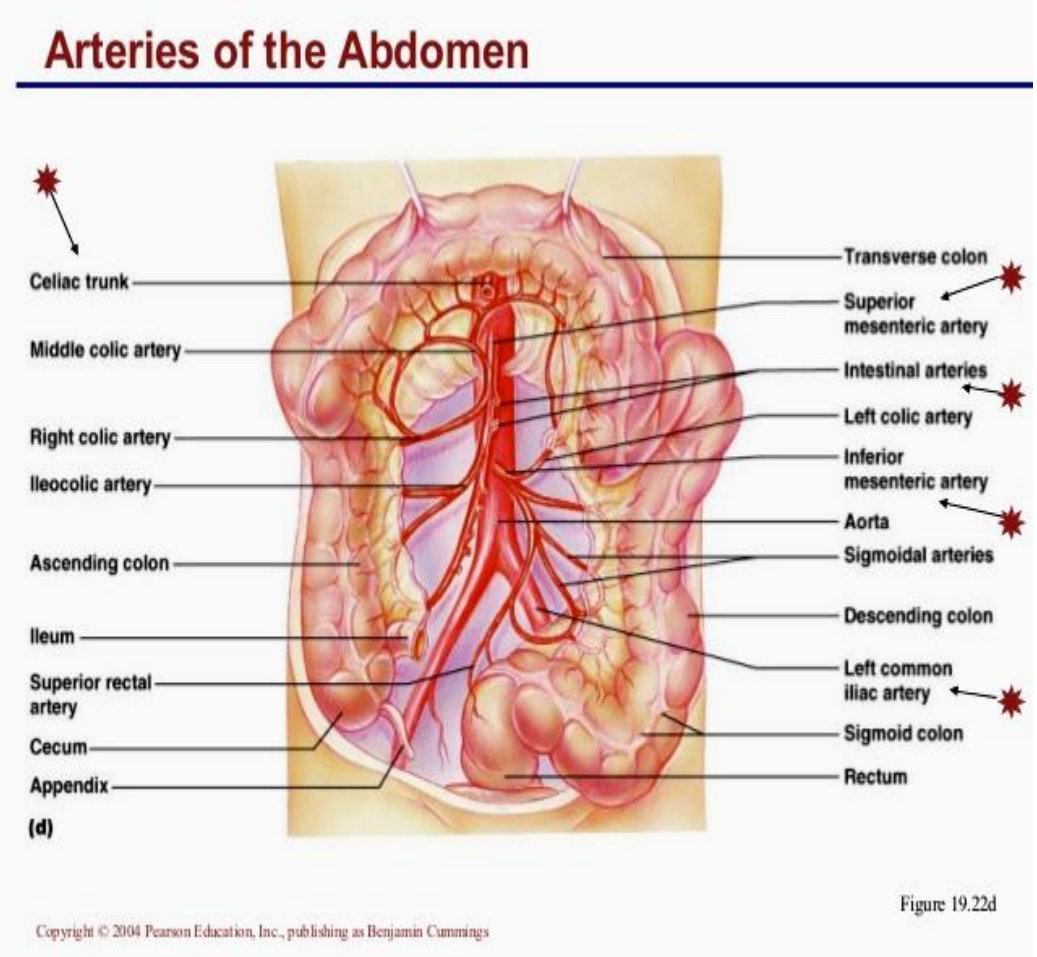
- **Parietal Branches**

1. Inferior Phrenics (2).
2. Lumbar arteries
3. Middle Sacral (1).

Anterior Branches of The Abdominal Aorta

1. Celiac Artery.
2. Superior Mesenteric Artery.
3. Inferior Mesenteric Artery.

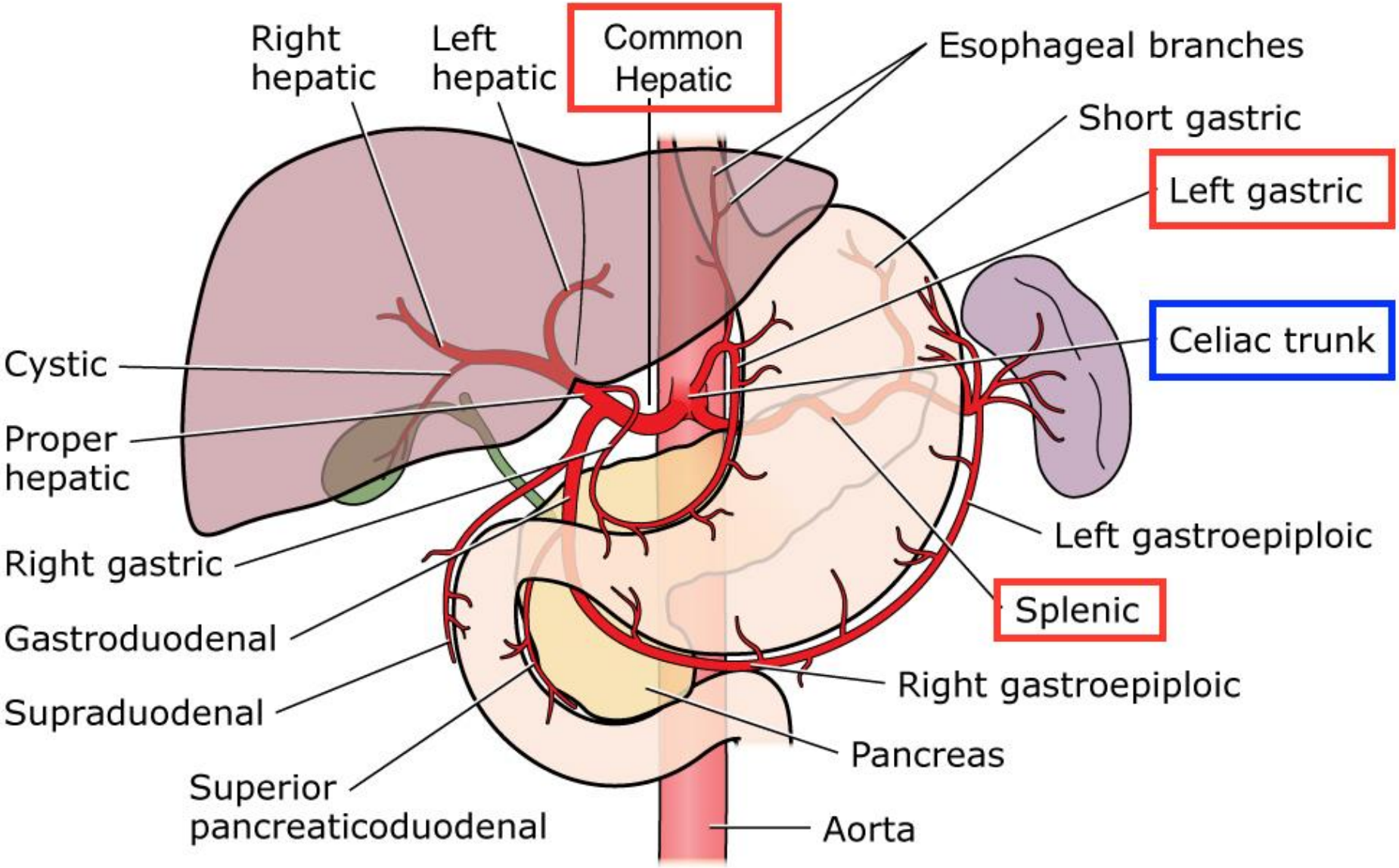
- The three anterior branches supply the gastrointestinal viscera.



Celiac Trunk

- It arises from the abdominal aorta immediately below the aortic hiatus of the diaphragm anterior to the upper part of vertebra L1.

- It divides into the:
  - ***Left gastric artery,***
  - ***Splenic artery,***
  - ***Common hepatic artery***.


Right hepatic
Left hepatic
Common Hepatic
Esophageal branches
Short gastric
Left gastric
Celiac trunk
Cystic
Proper hepatic
Right gastric
Gastroduodenal
Supraduodenal
Superior pancreaticoduodenal
Left gastroepiploic
Splenic
Right gastroepiploic
Pancreas
Aorta

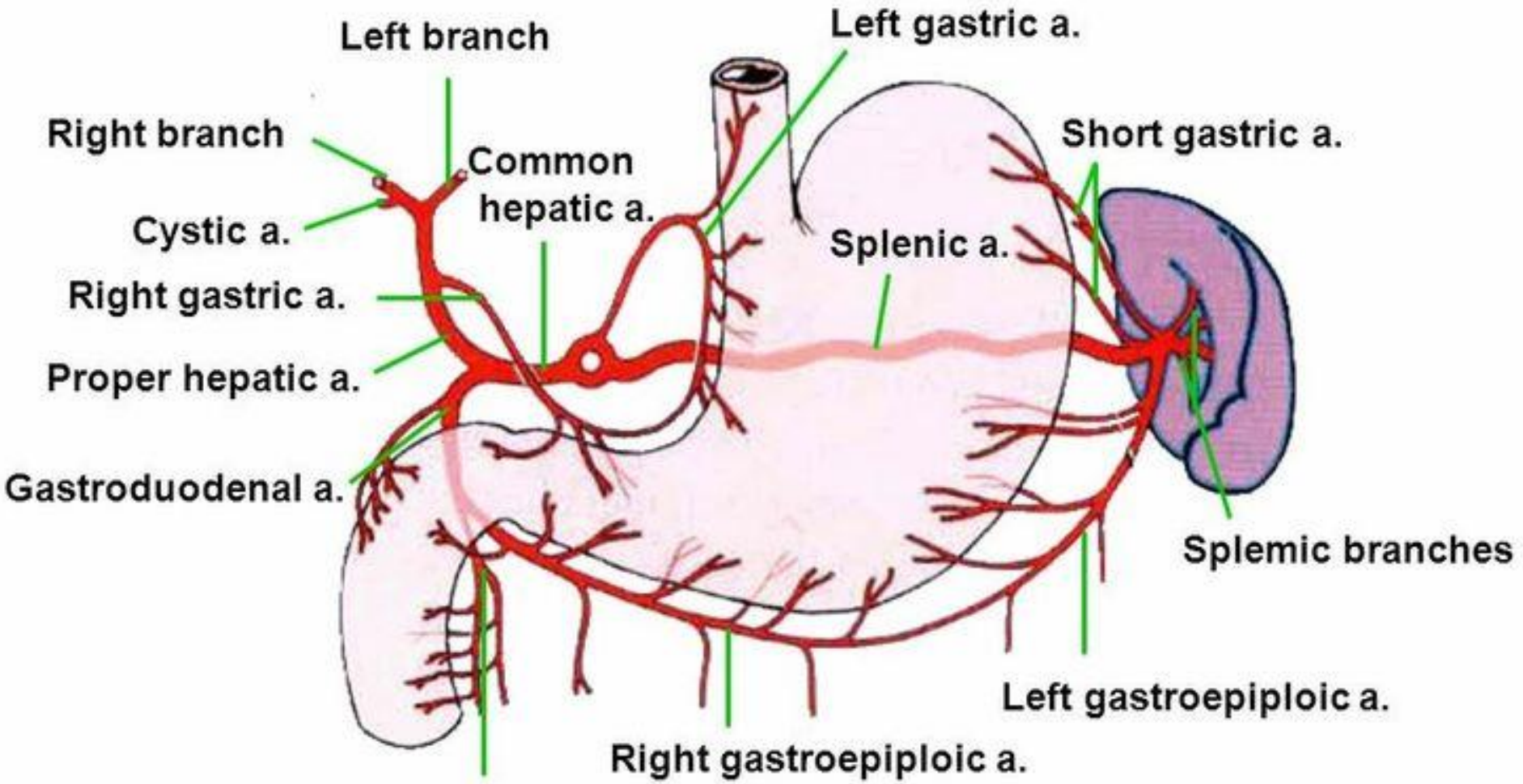
Celiac Trunk

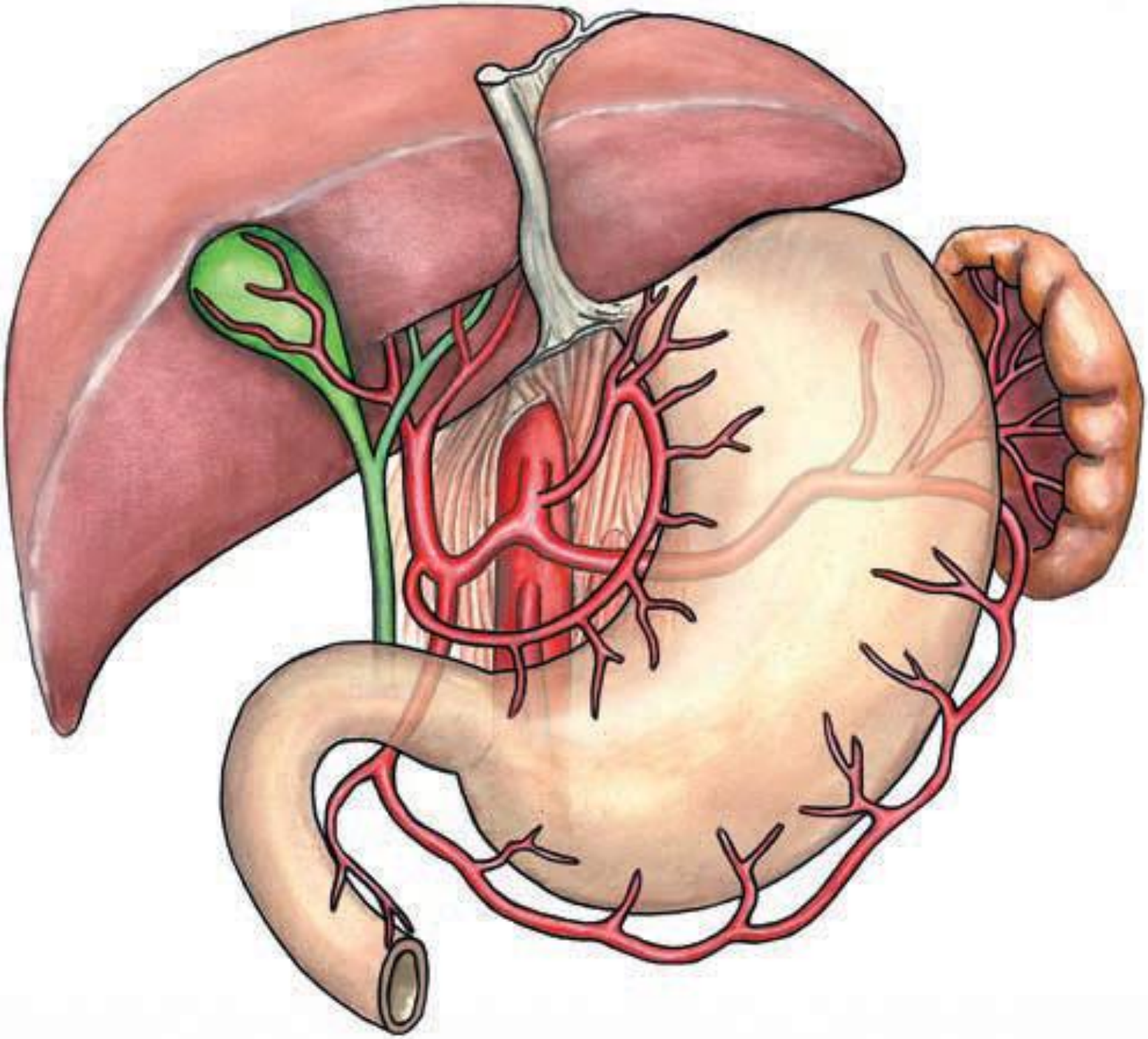
- **LEFT GASTRIC ARTERY: Lower part of esophagus and lesser curve of stomach**

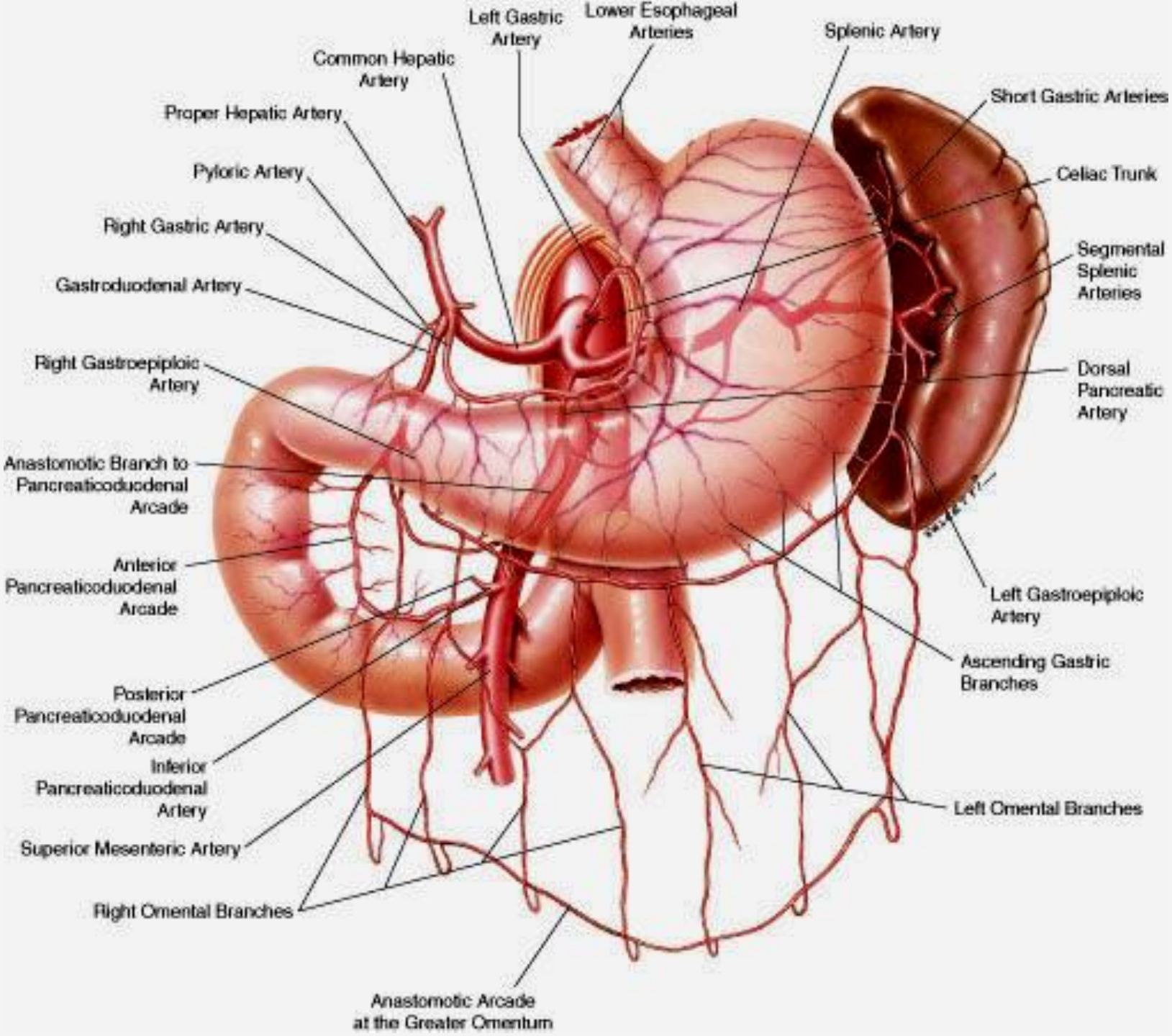
- **SPLENIC ARTERY**
  - **Short gastric vessels**
  - **Lt. gastroepiploic artery**

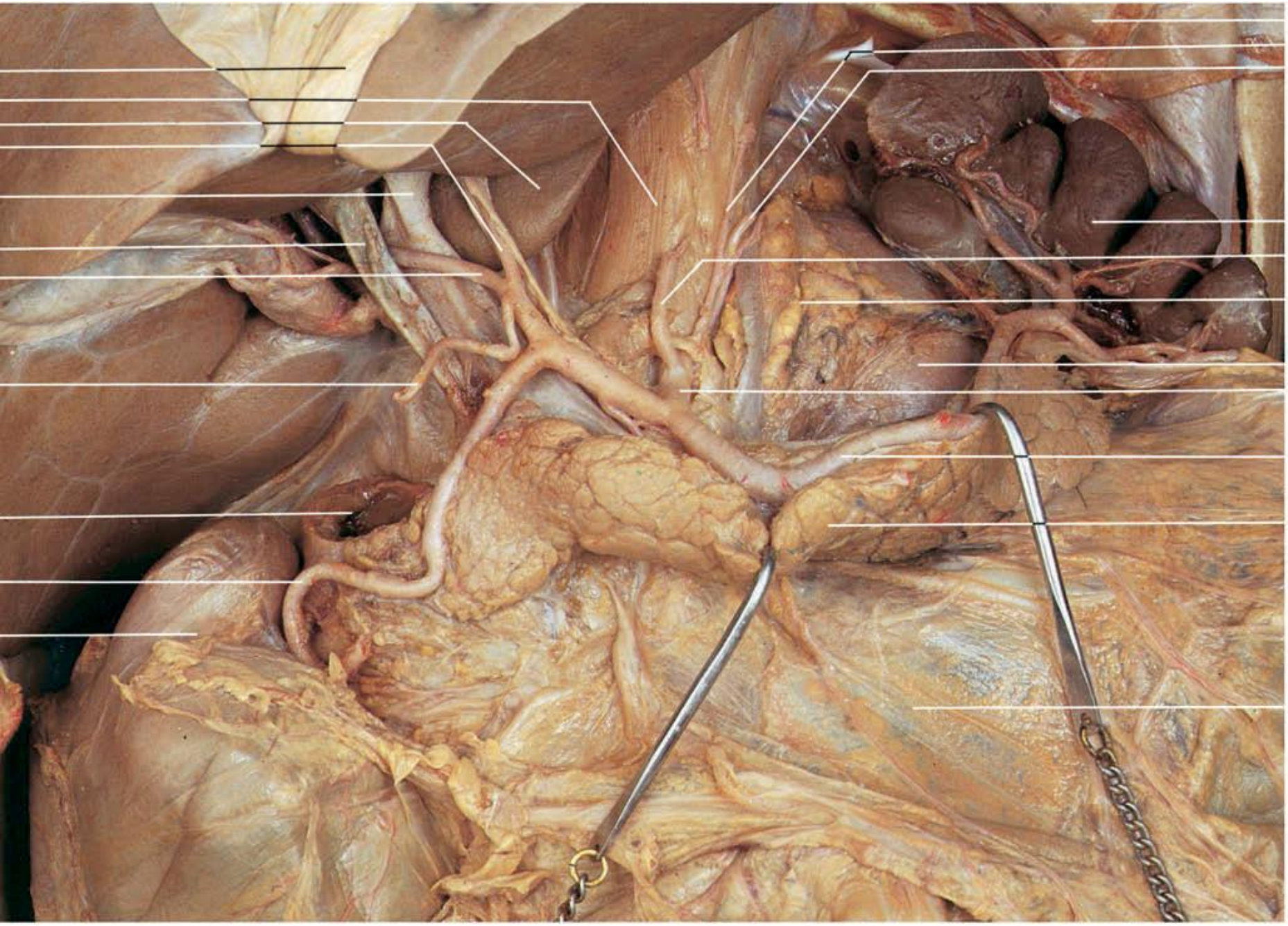
- **COMMON HEPATIC ARTERY**
  - **Hepatic artery proper**
    - **Left hepatic artery**
    - **Right hepatic artery**
  - **Gastroduodenal artery gives off Rt. Gastroepiploic (gastro-omental) artery and Superior pancreatoduodenal artery "*Supra-duodenal artery*"**

Celiac trunk






Left Gastric Artery
Lower Esophageal Arteries
Splenic Artery
Common Hepatic Artery
Short Gastric Arteries
Proper Hepatic Artery
Celiac Trunk
Pyloric Artery
Segmental Splenic Arteries
Right Gastric Artery
Gastroduodenal Artery
Dorsal Pancreatic Artery
Right Gastroepiploic Artery
Anastomotic Branch to Pancreaticoduodenal Arcade
Anterior Pancreaticoduodenal Arcade
Left Gastroepiploic Artery
Ascending Gastric Branches
Posterior Pancreaticoduodenal Arcade
Inferior Pancreaticoduodenal Artery
Left Omental Branches
Superior Mesenteric Artery
Right Omental Branches
Anastomotic Arcade at the Greater Omentum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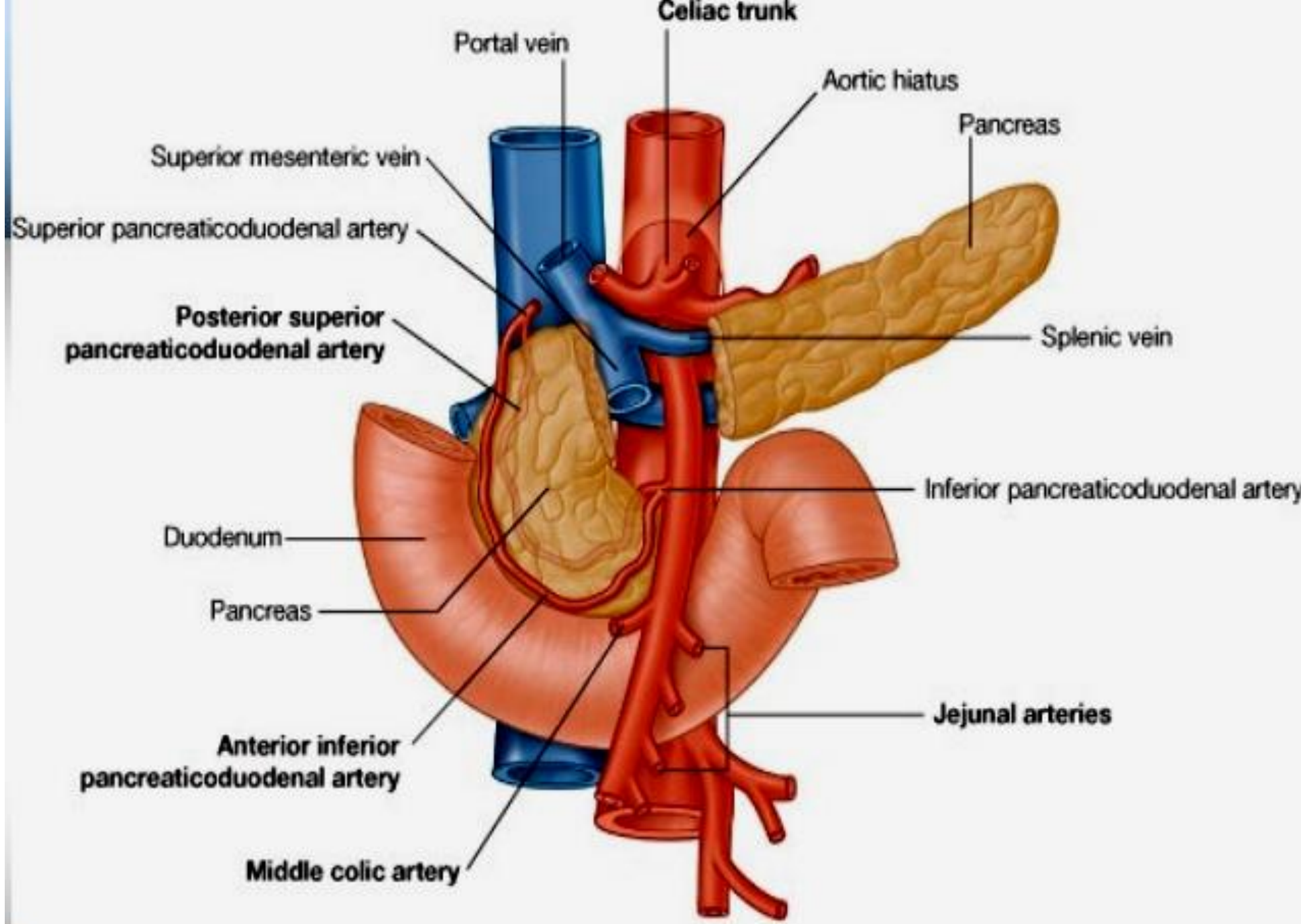
Superior Mesenteric Artery

- It arises from the abdominal aorta immediately 1cm below the celiac artery anterior to the lower part of vertebra L1.

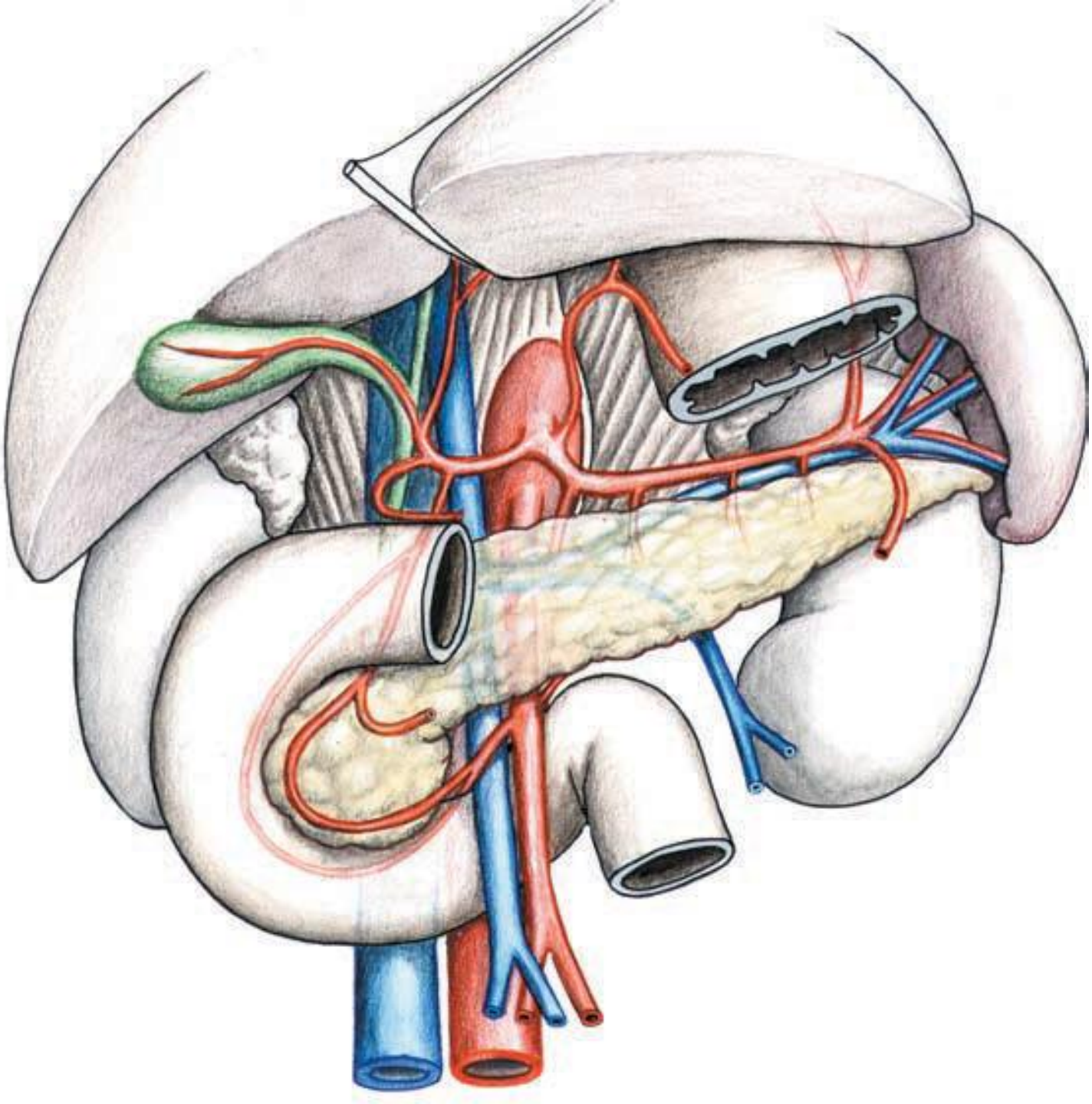
- It is crossed ***anterior*** by the ***splenic vein*** and the neck of pancreas.

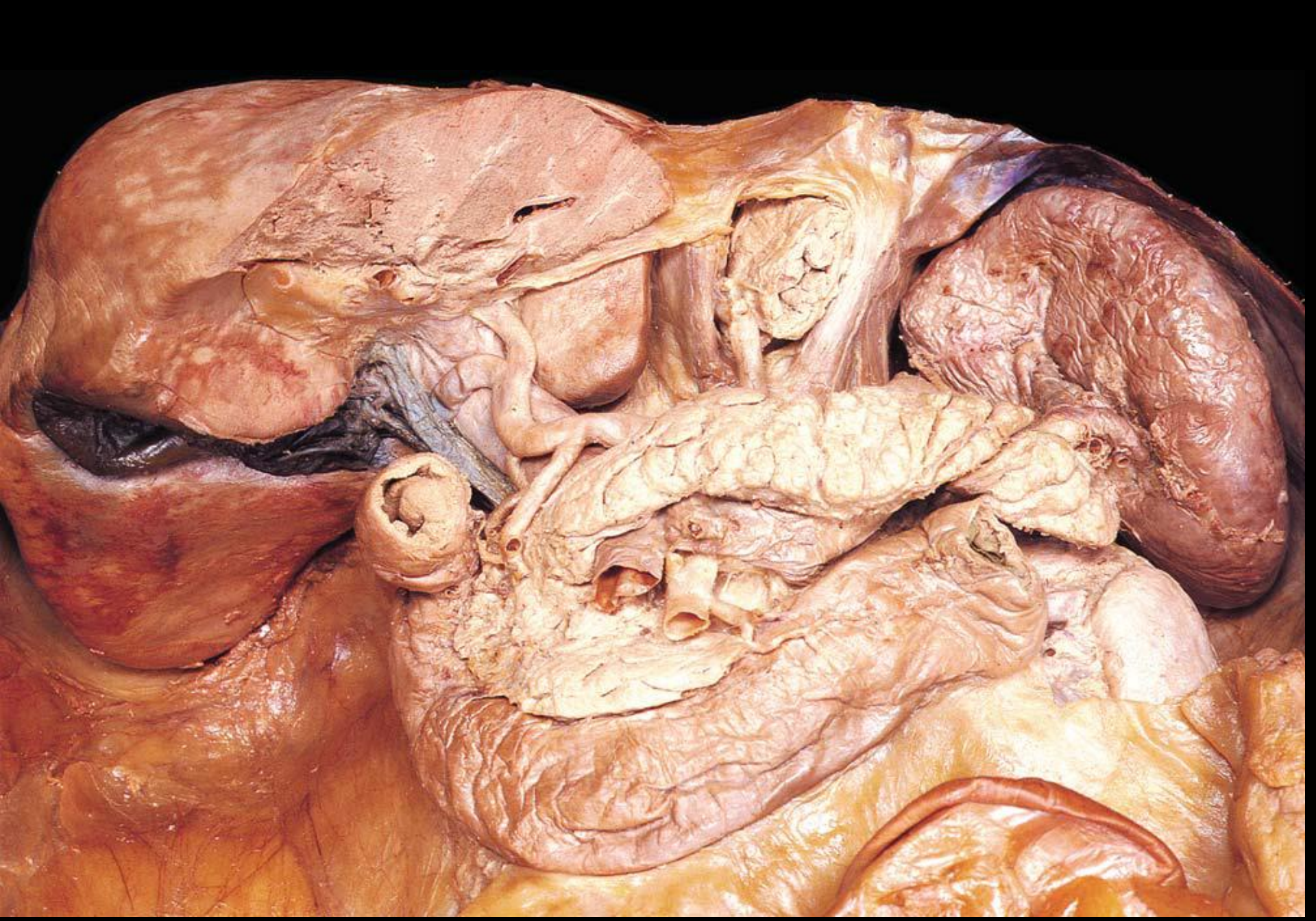
- ***Posterior*** to the artery are the ***left renal vein***, the ***UNCINATE process*** of the pancreas, and the ***3rd part*** of the ***duodenum***.

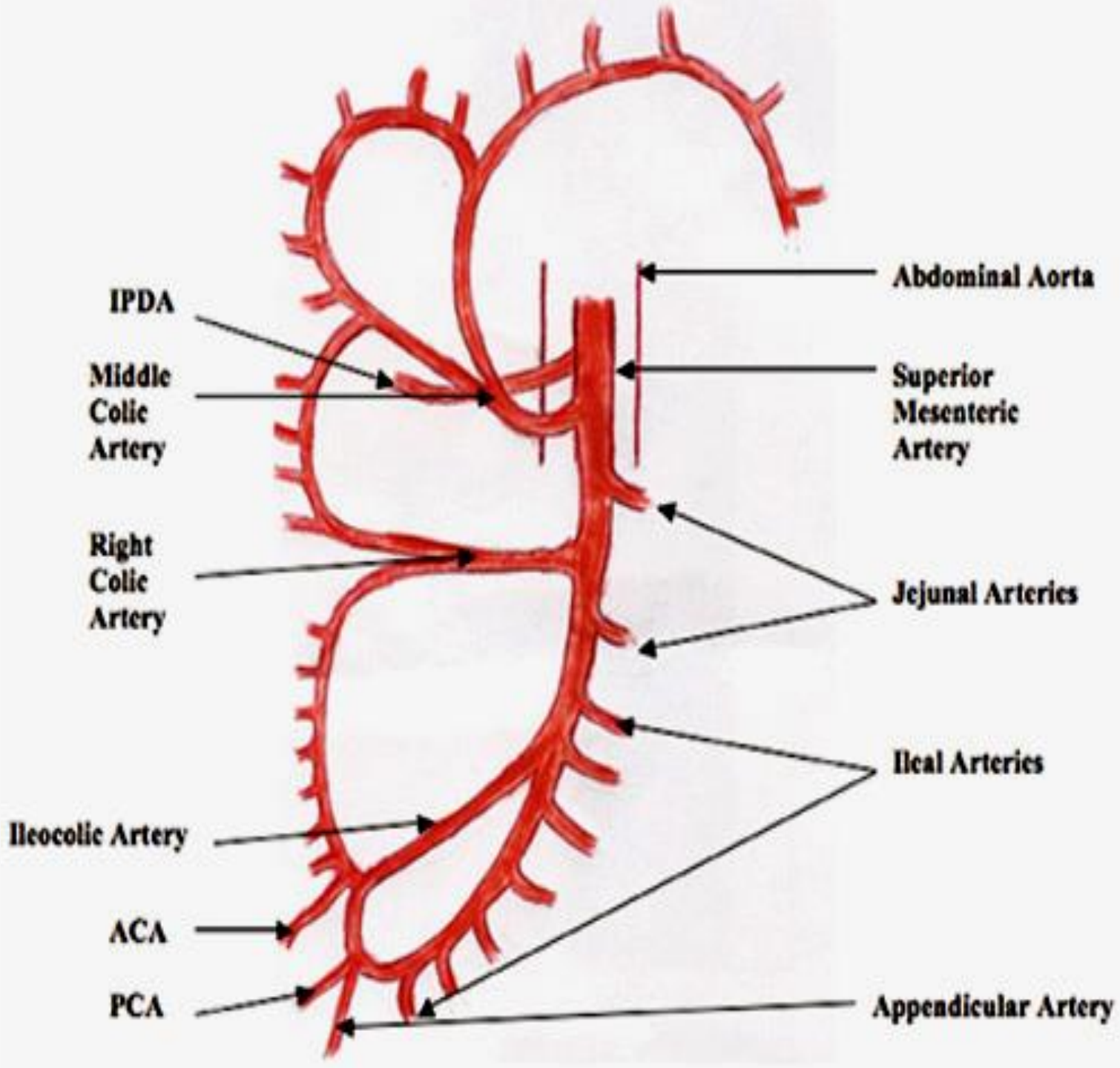


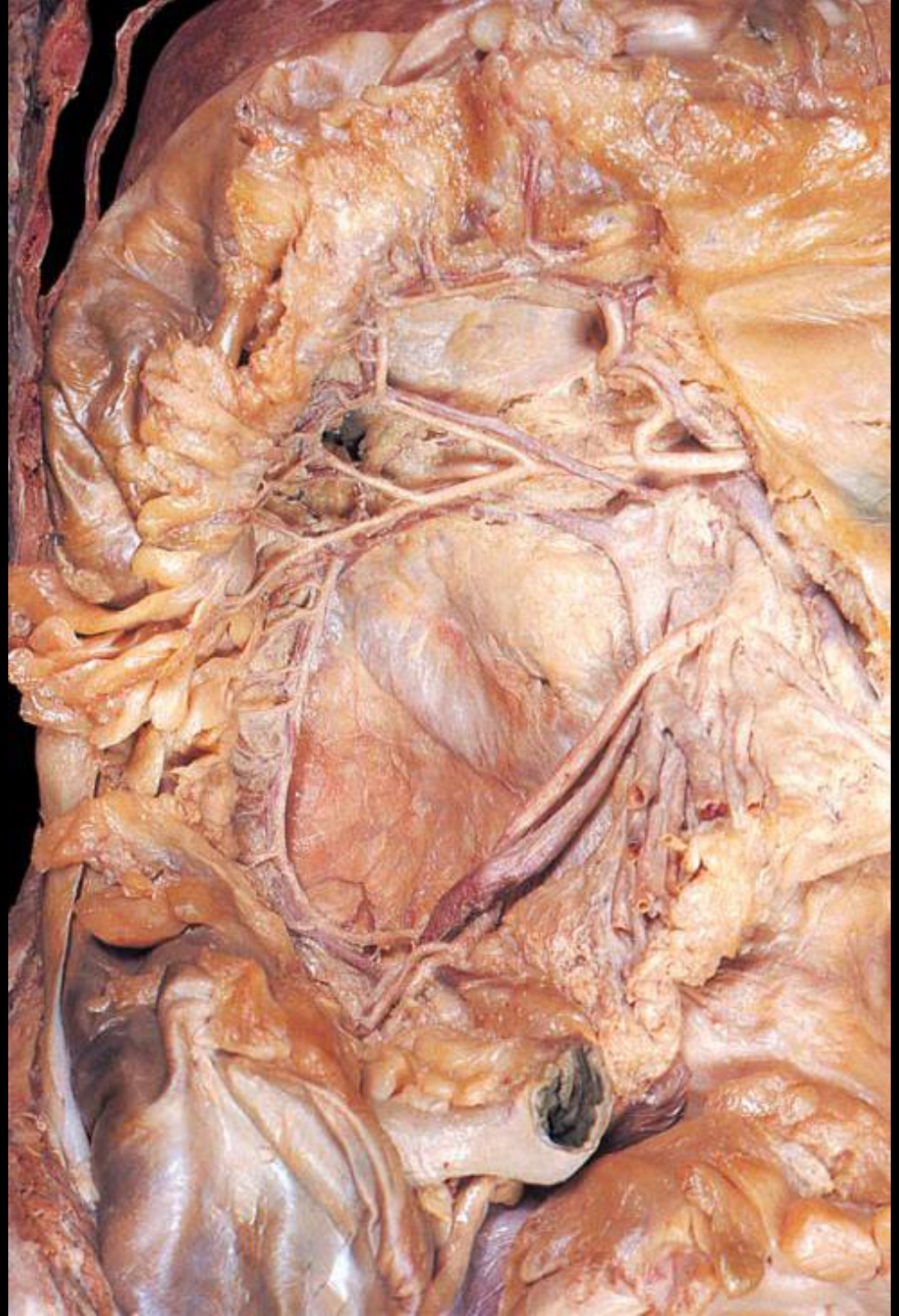
Superior Mesenteric Artery

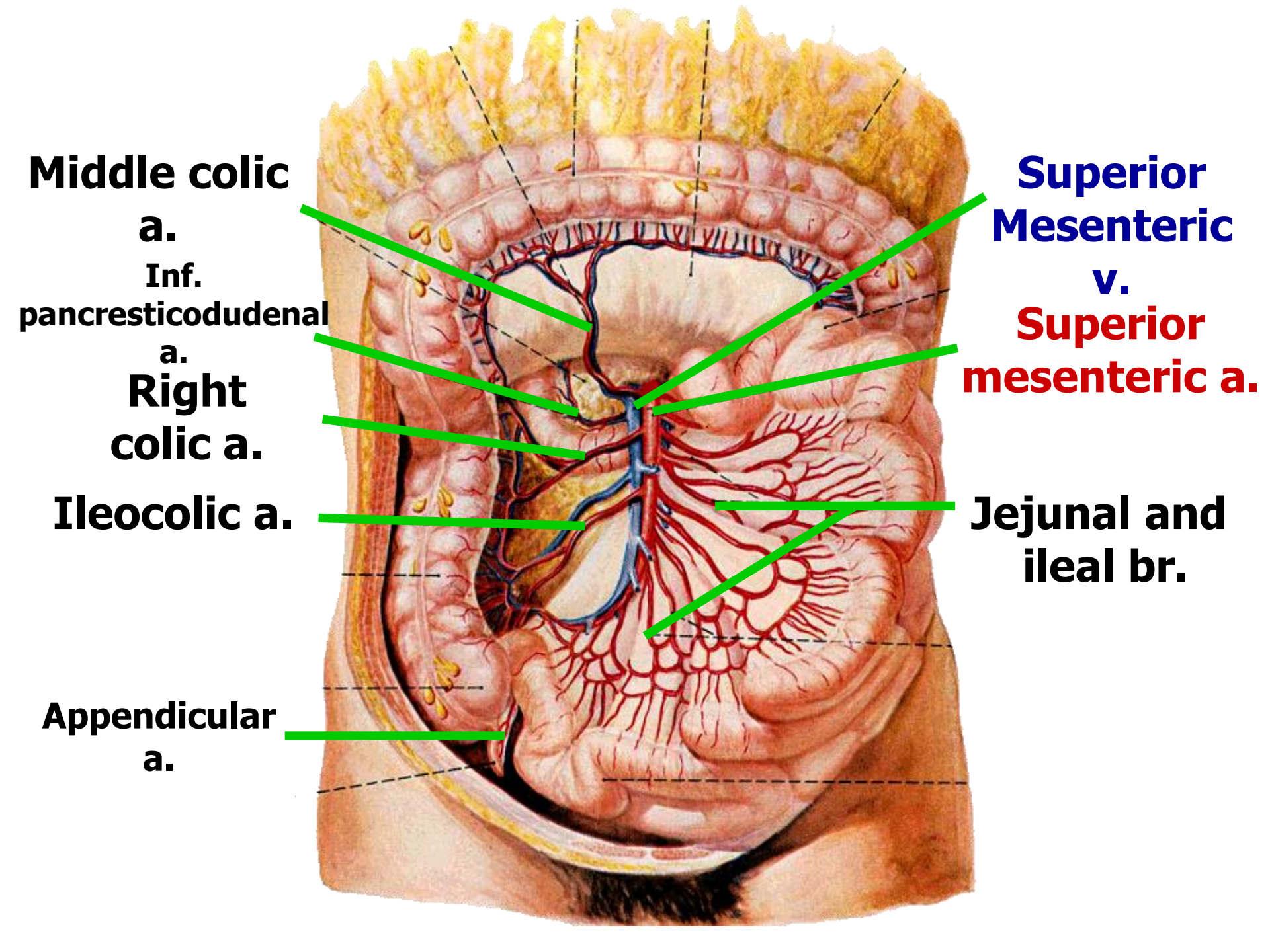
- Inferior pancreaticoduodenal artery
- Jejunal and ileal arteries
- Middle colic artery
- Right colic artery
- Ileocolic artery (Gives off appendicular A.)

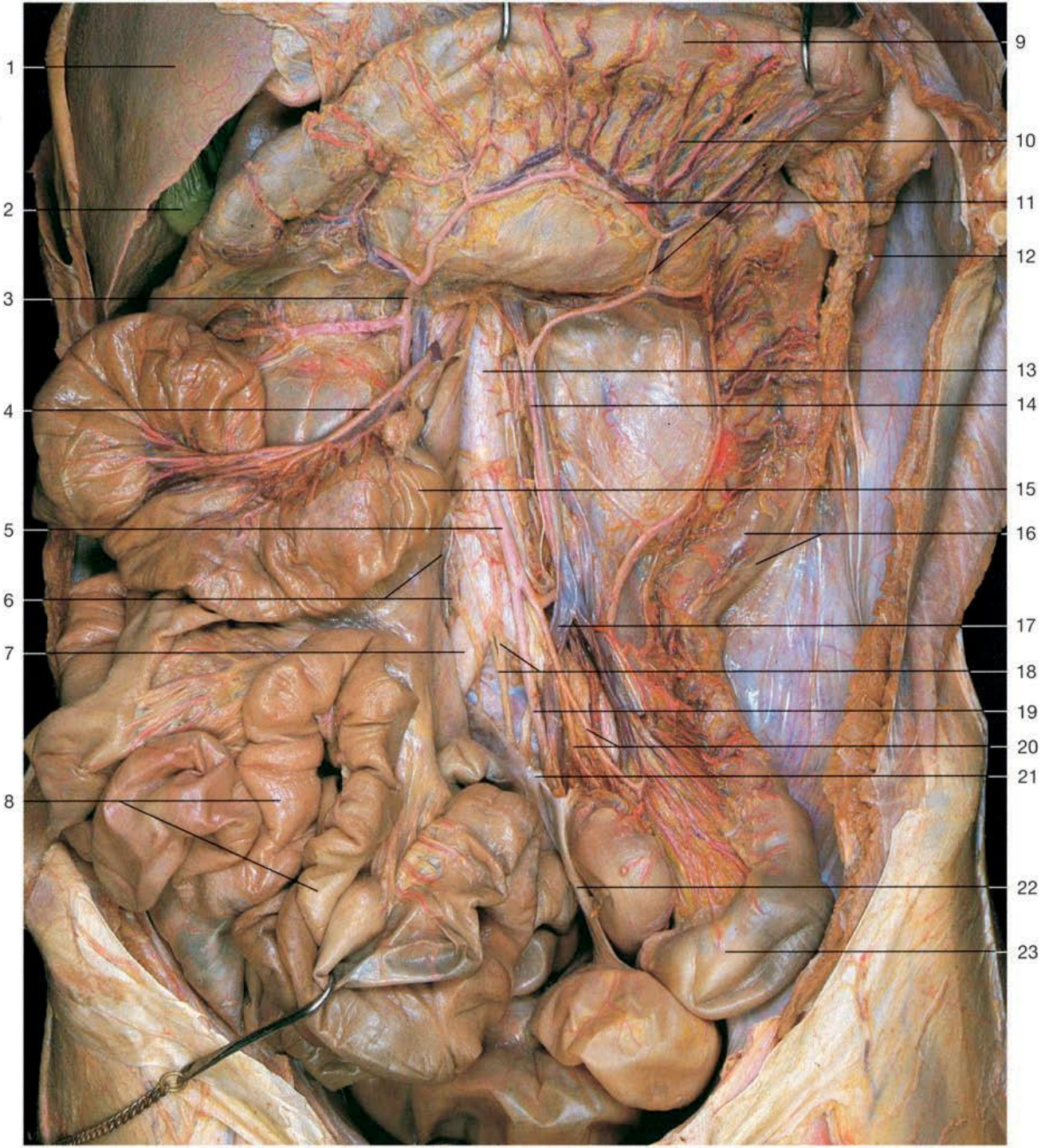





Abdominal Aorta
IPDA
Middle Colic Artery
Superior Mesenteric Artery
Right Colic Artery
Jejunal Arteries
Ileal Arteries
Ileocolic Artery
ACA
PCA
Appendicular Artery




Middle colic a.
Inf. pancresticodudenal a.
Right colic a.
Ileocolic a.
Appendicular a.
Superior Mesenteric v.
Superior mesenteric a.
Jejunal and ileal br.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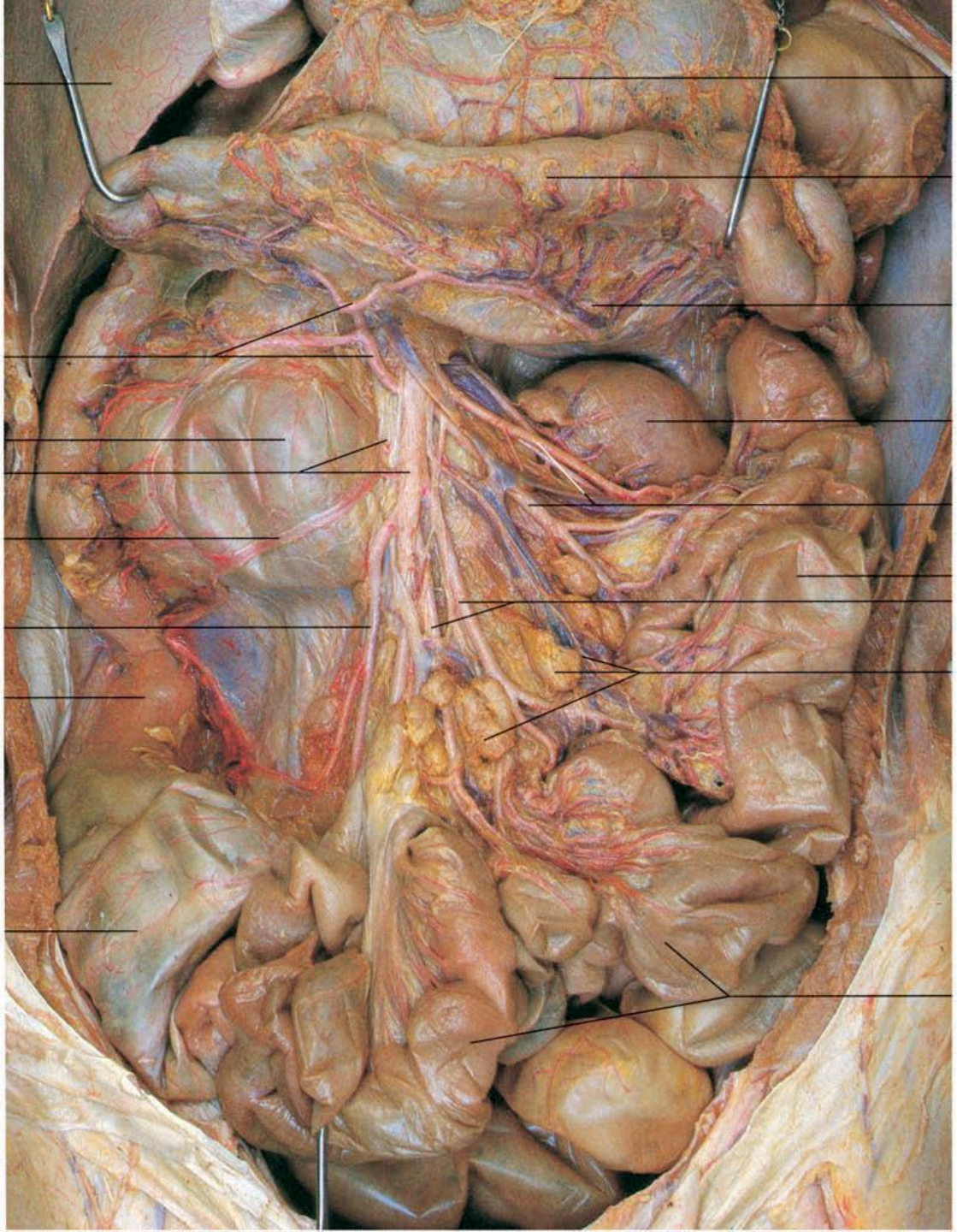
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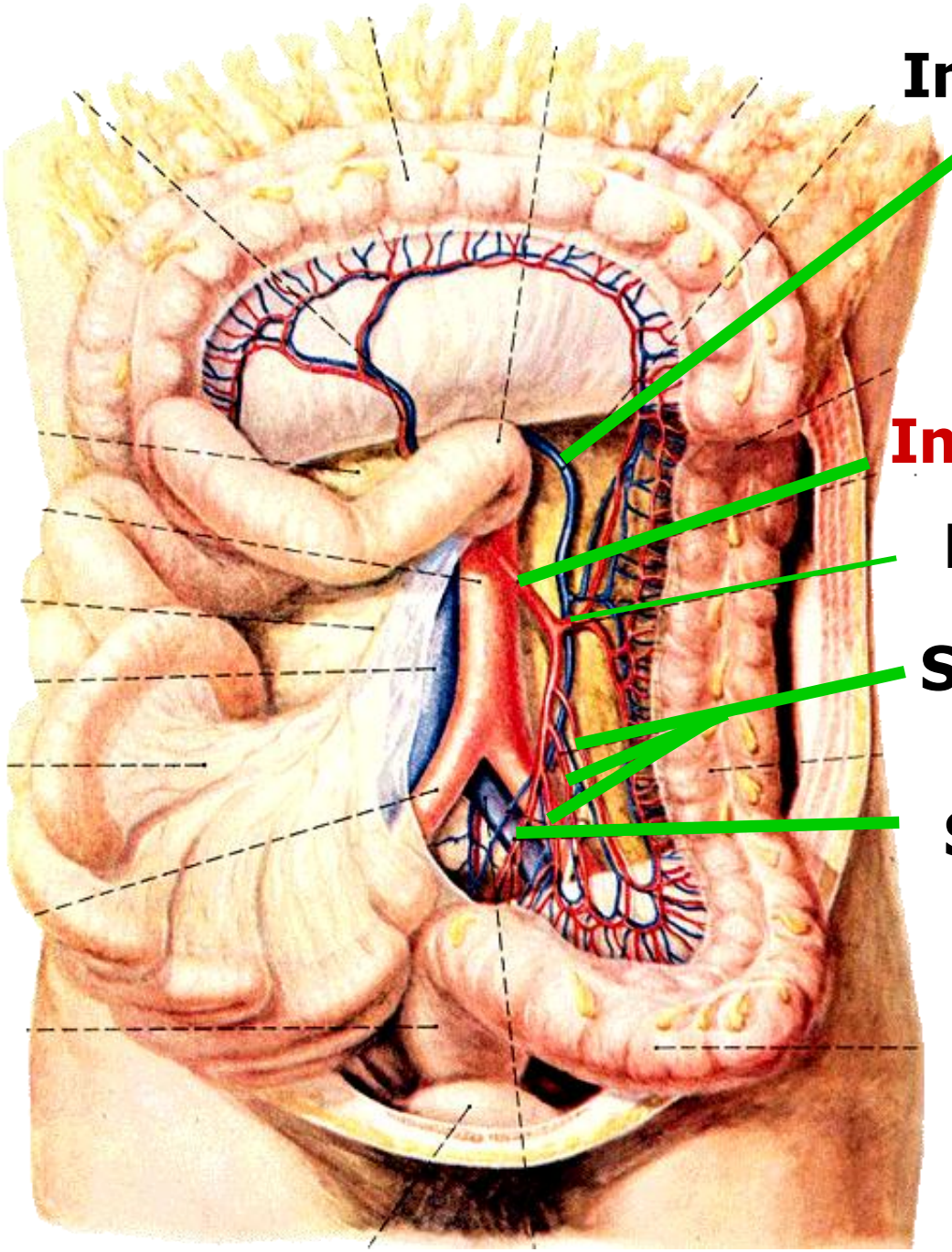
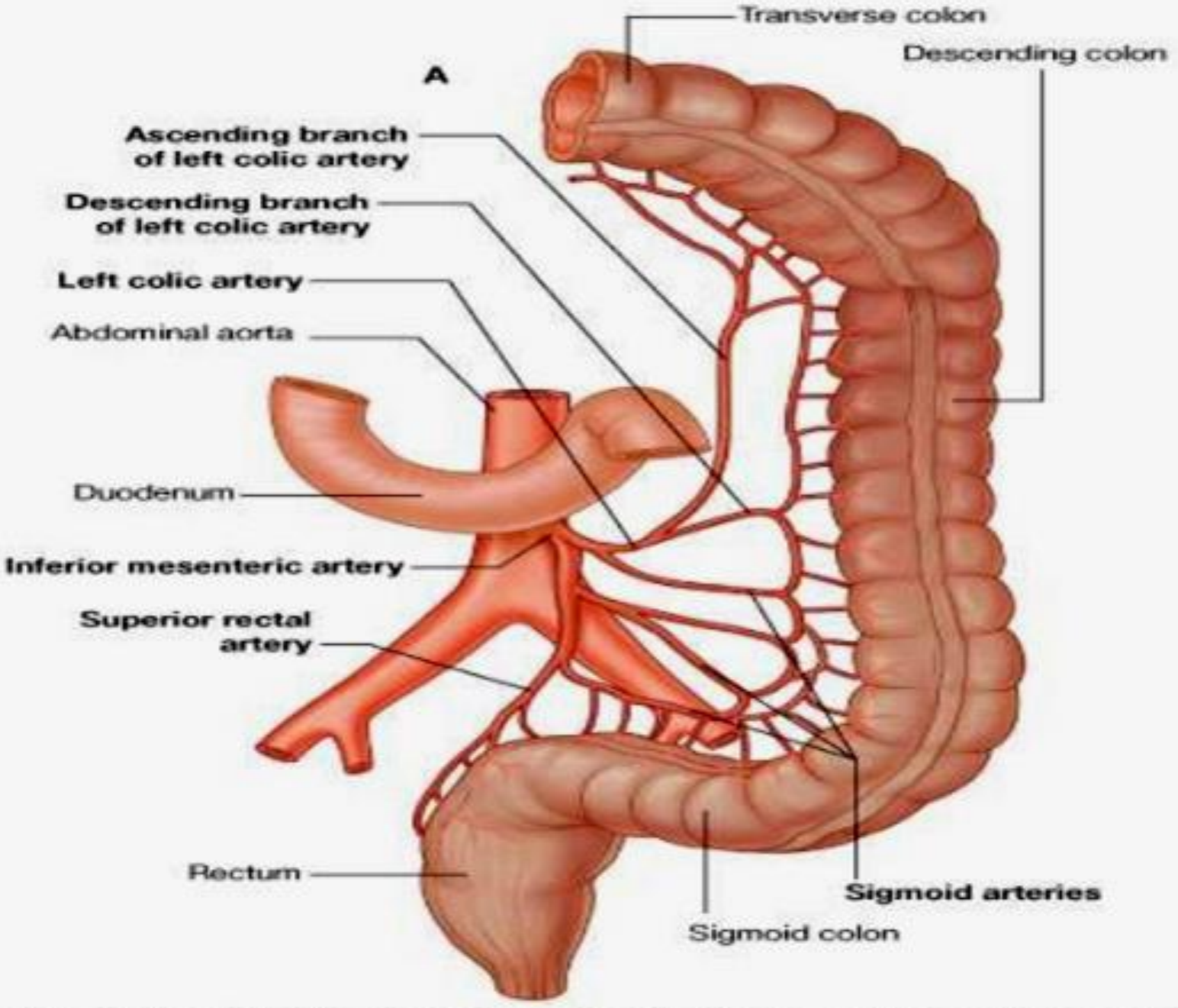
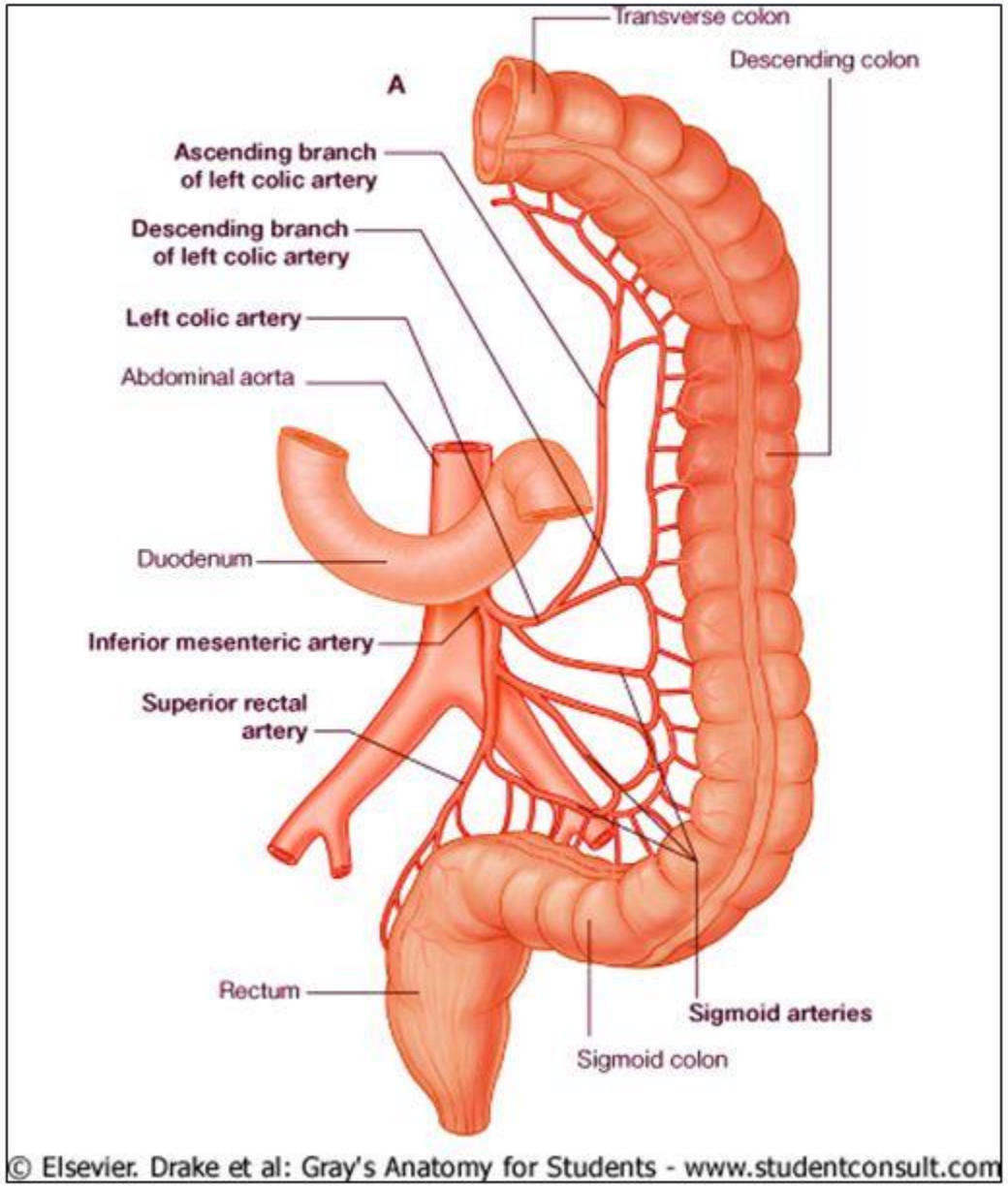
Inferior Mesenteric Artery

- It is the smallest of the three anterior branches of the abdominal aorta and arises anterior to the body of vertebra L3.
- Initially, the inferior mesenteric artery descends anteriorly to the aorta and then passes to the left as it continues inferiorly.
- After passing across the left common iliac artery it becomes ***Superior Rectal artery***


Inferior mesenteric v.
Inferior mesenteric a.
Left colic a.
Sigmoid a.
Superior rectal a.



Inferior mesenteric artery



Branches:

1. **Left colic artery**
2. **Several sigmoid arteries**
3. **Superior rectal artery**

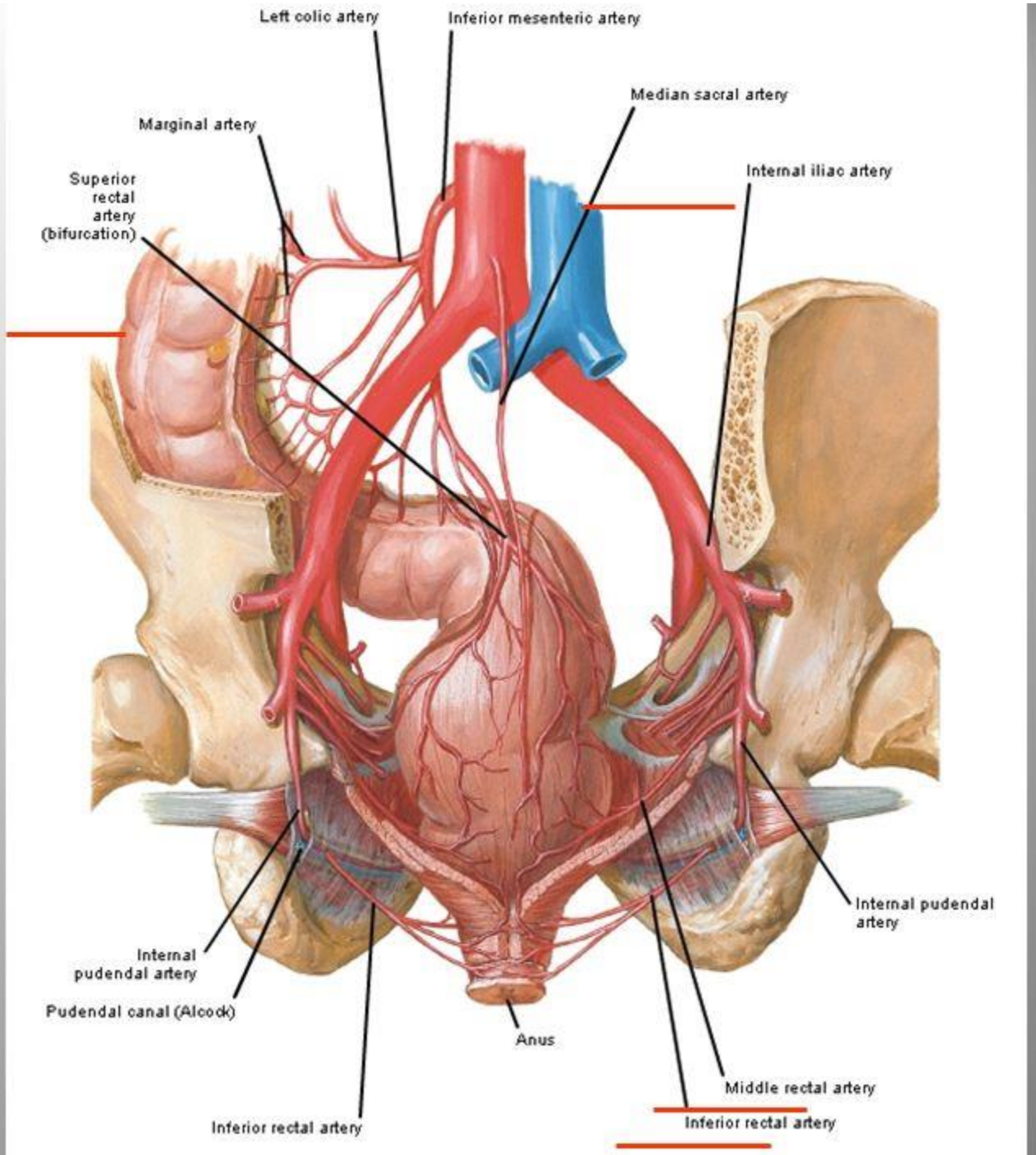
Arterial supply of the rectum and anal canal

median sacral artery

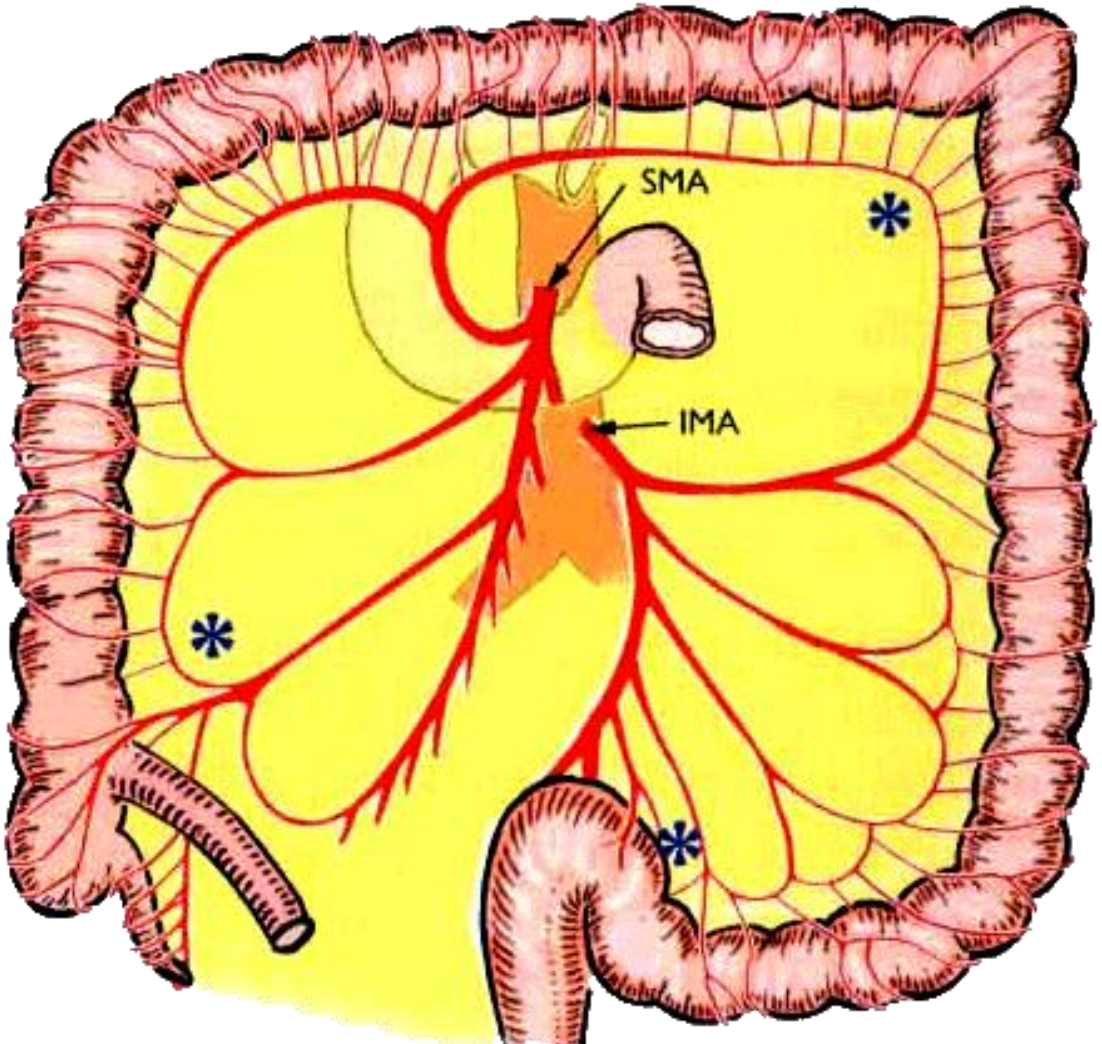
superior rectal artery (inferior mesenteric)

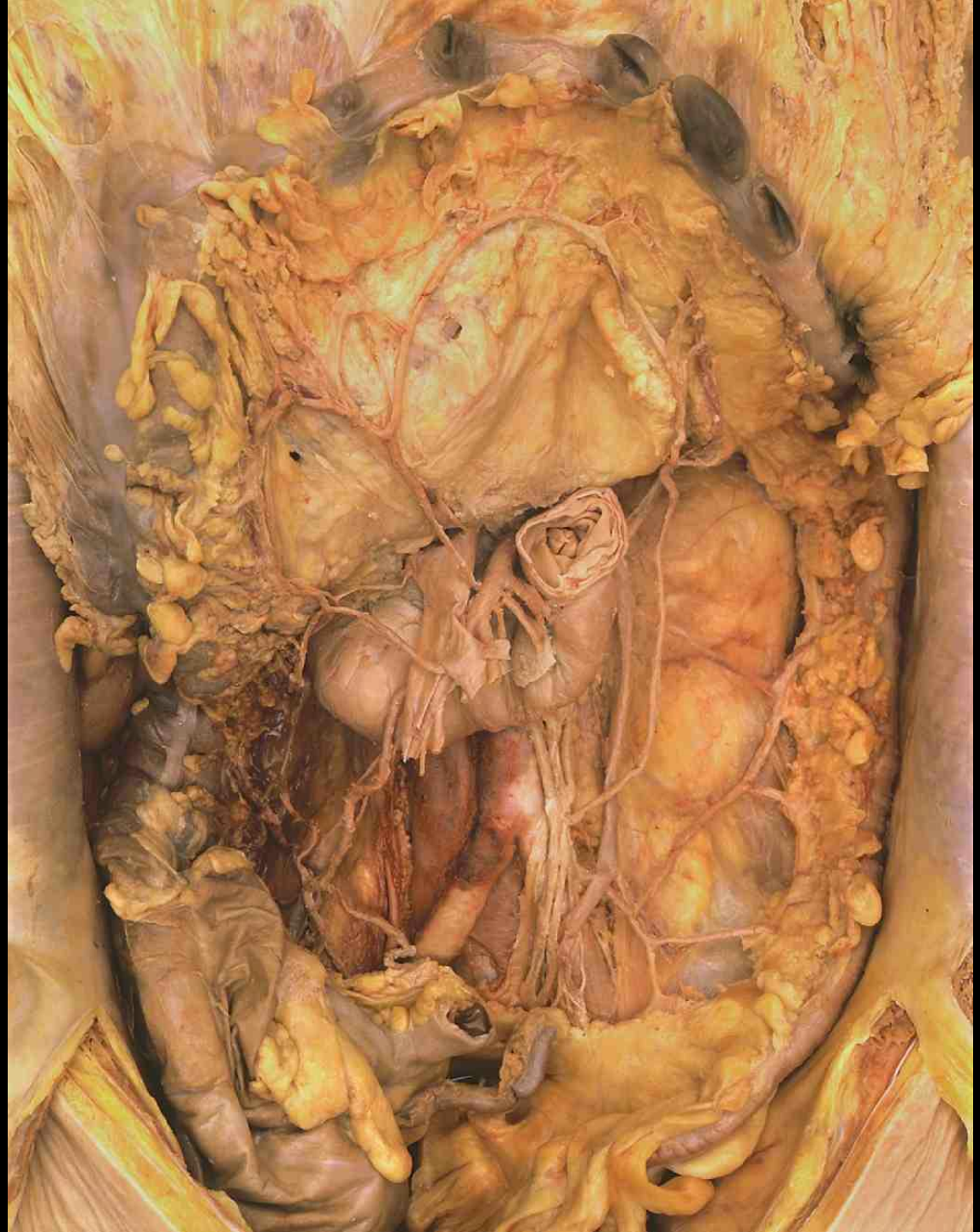
middle rectal artery (internal iliac)

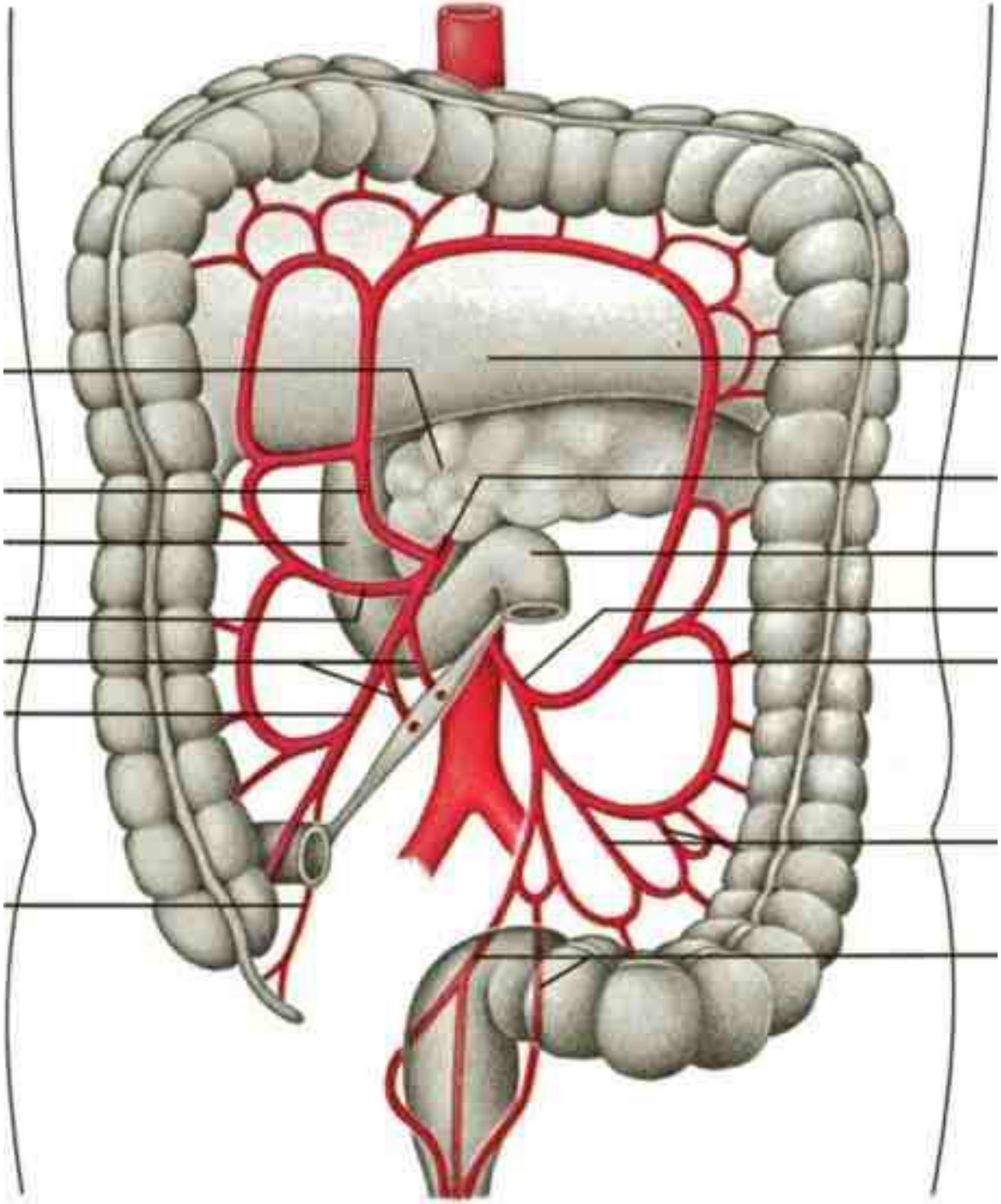
inferior rectal artery (internal pudendal)

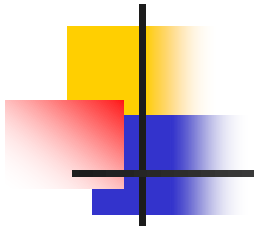


Colic Marginal Artery









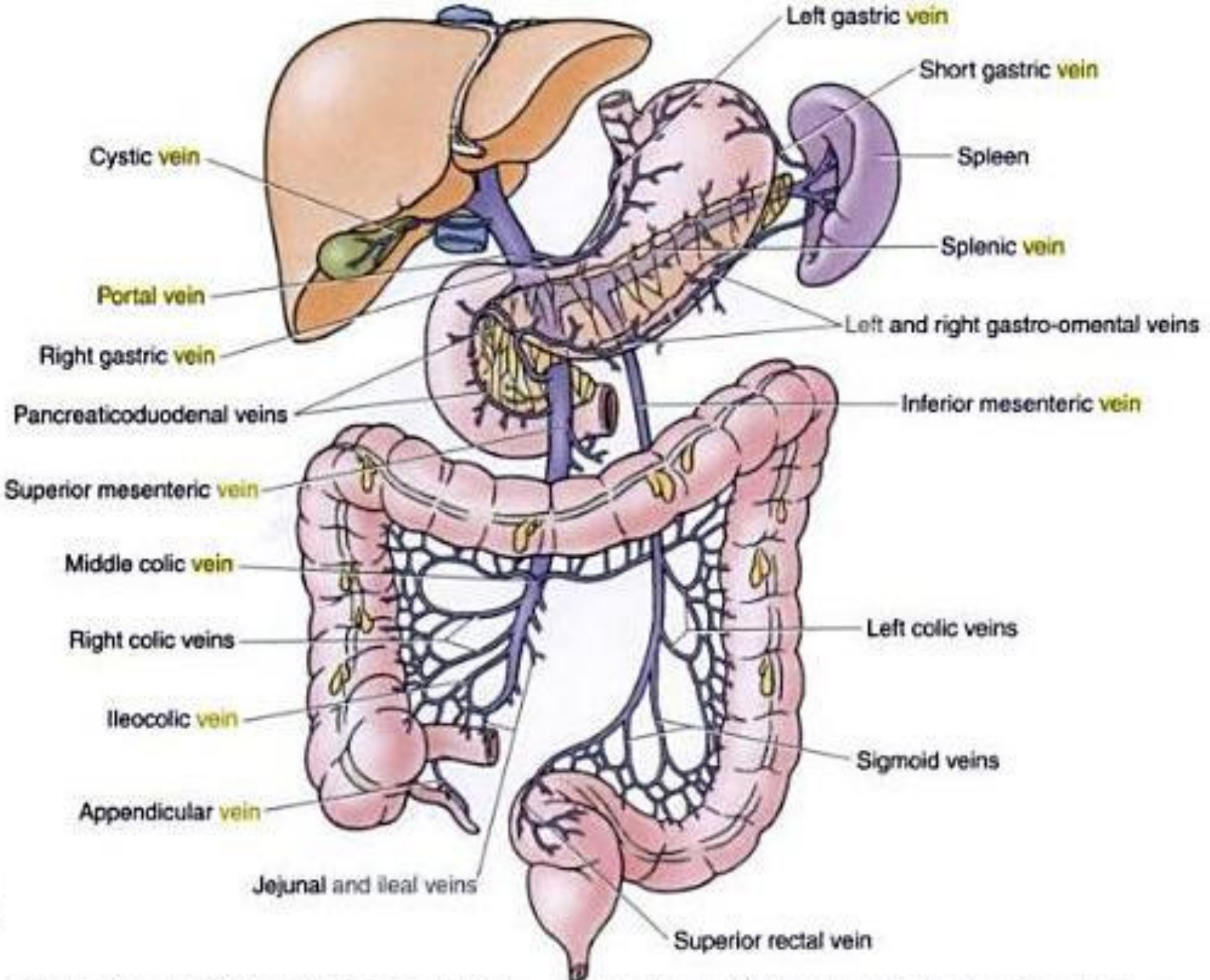
Venous Drainage of Gastrointestinal Tract

Venous Drainage of Gastrointestinal Tract

1. ***Veins of portal venous system***
2. ***Systemic veins***

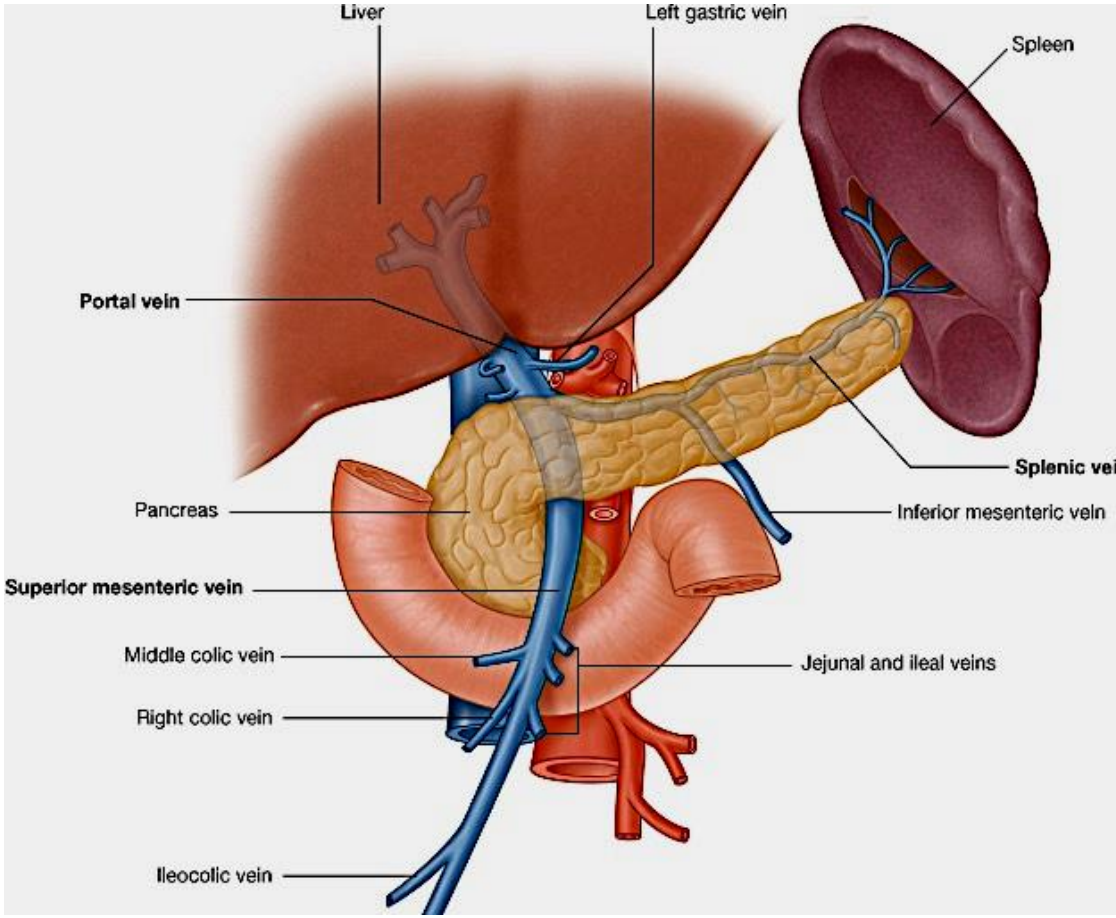
- Blood from GIT enter the liver via portal vein and leave the liver via hepatic veins to enter the inferior vena cava

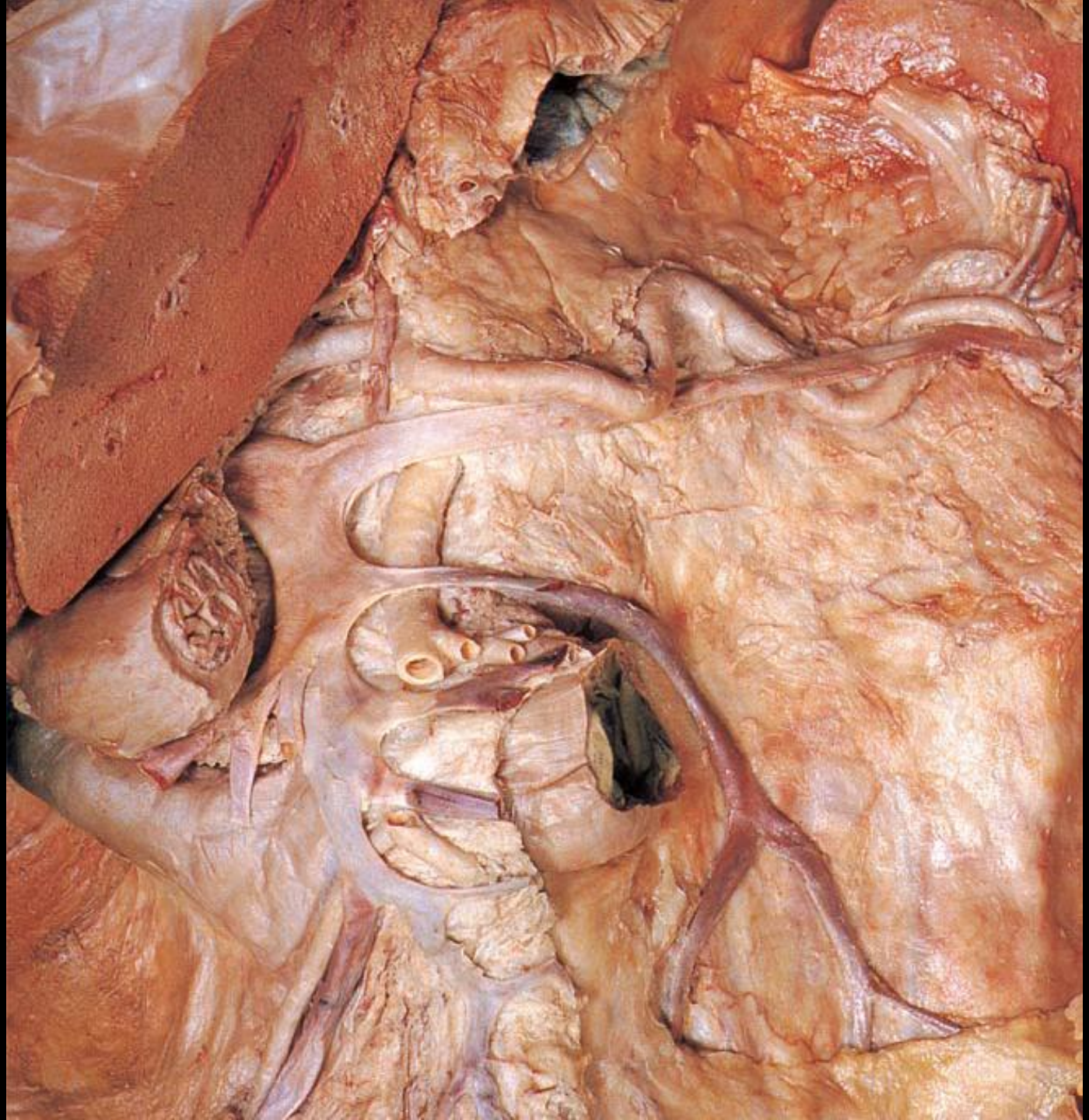
- Venous drainage of the abdominal part of the gastrointestinal tract, spleen, pancreas and gallbladder except for the inferior part of the anal canal, is through the ***portal system of veins***.


Left gastric vein
Short gastric vein
Cystic vein
Spleen
Splenic vein
Portal vein
Left and right gastro-omental veins
Right gastric vein
Pancreaticoduodenal veins
Inferior mesenteric vein
Superior mesenteric vein
Middle colic vein
Left colic veins
Right colic veins
Ileocolic vein
Sigmoid veins
Appendicular vein
Jejunal and ileal veins
Superior rectal vein

Portal Vein

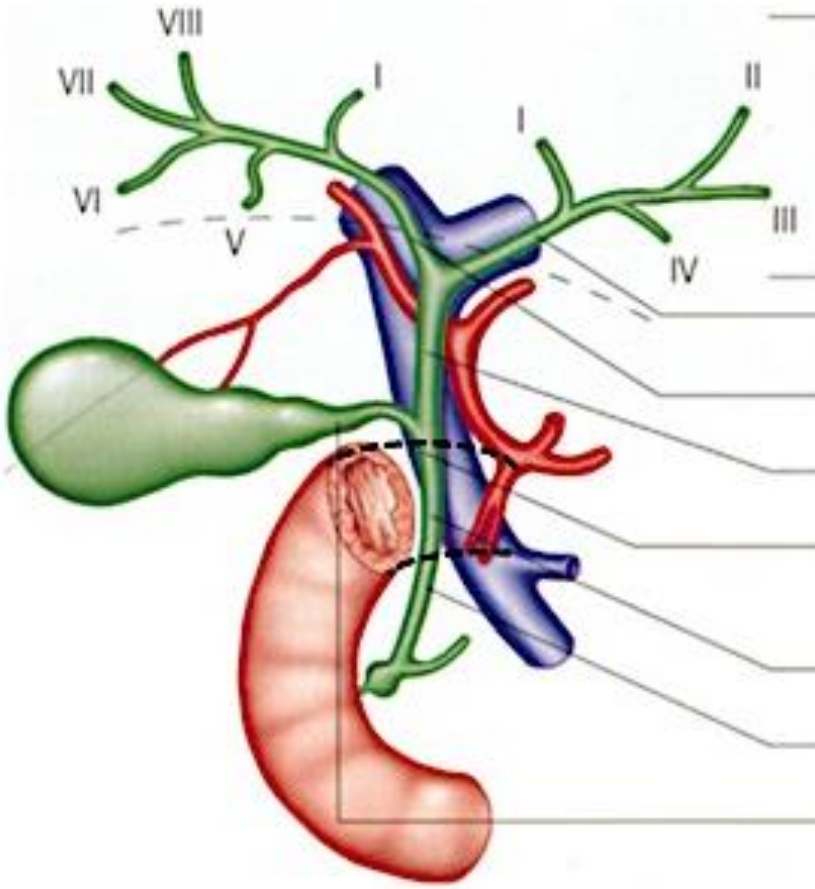
- It is formed by the union of the **splenic vein** and the **superior mesenteric vein** posterior to the neck of the pancreas at the level of vertebra L2.





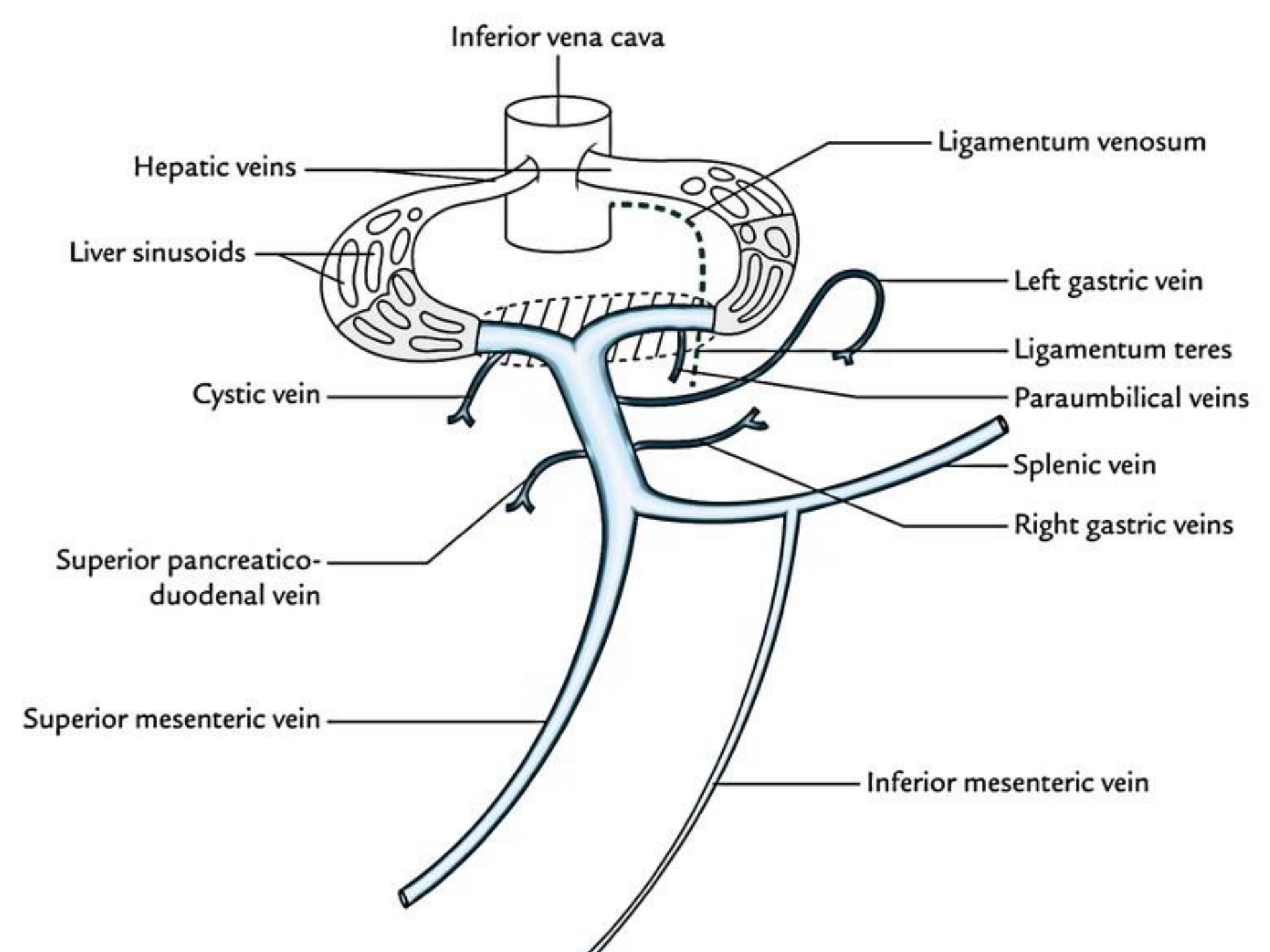
Course: Extrahepatic part

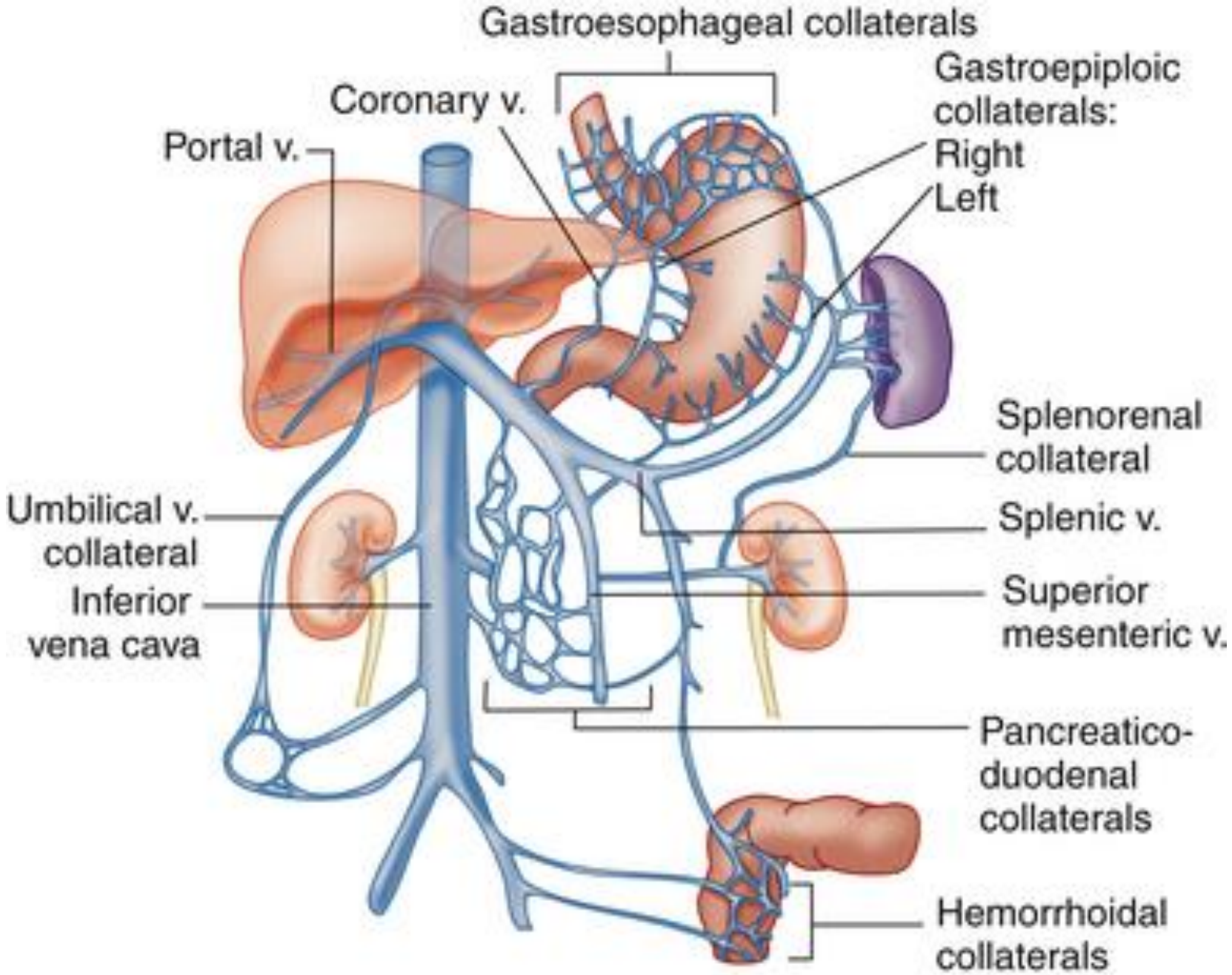
- Passes upwards & Rt, behind neck of pancreas & 1st part of duodenum
- Enters Rt. free margin of lesser omentum in front of epiploic foramen with BD & HA
- Reaches porta hepatis & divides into Rt & Lt branches.



Tributaries to The Portal Vein

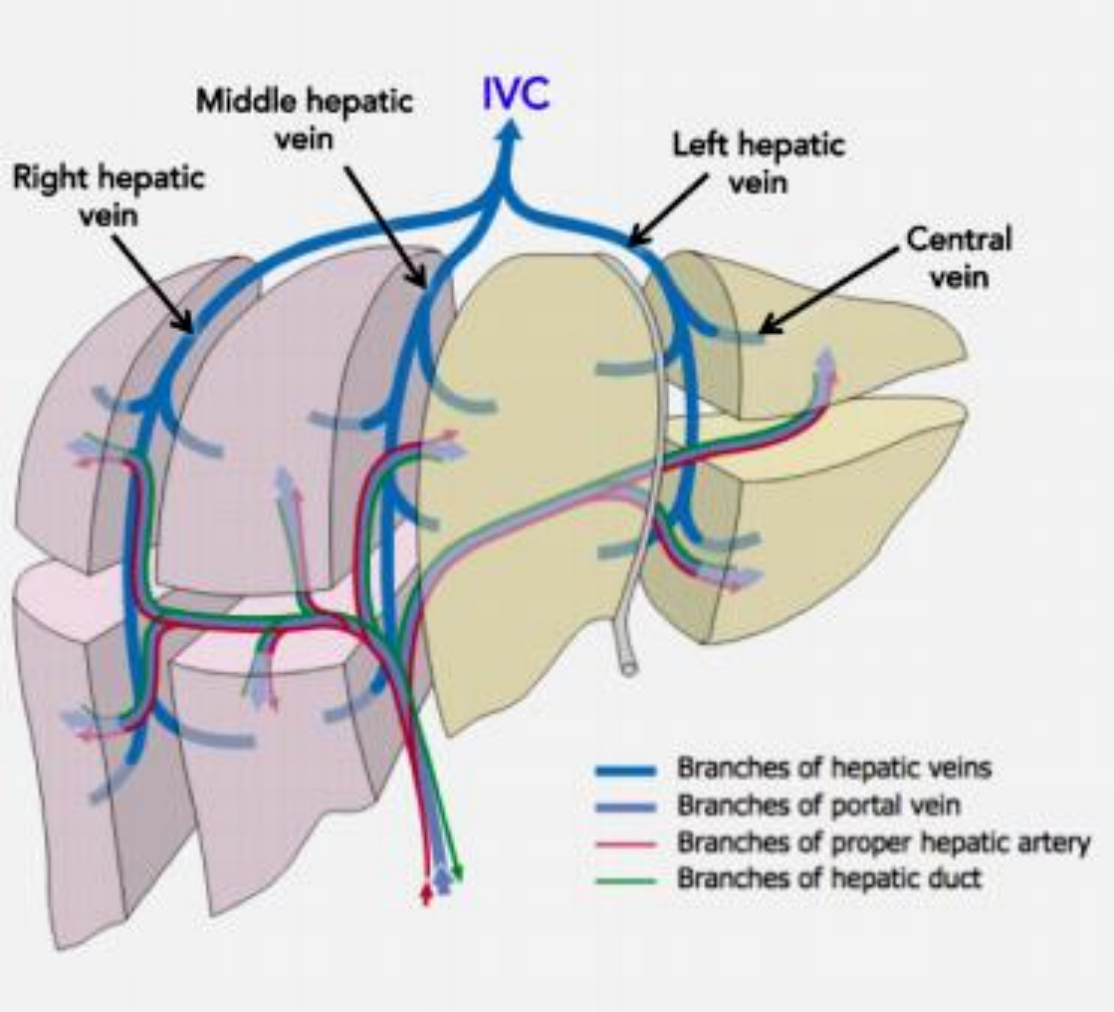
- **Right** and **left gastric veins** draining the lesser curvature of the stomach and abdominal oesophagus
- **Cystic veins** from the gallbladder
- The **para-umbilical veins** are associated with the obliterated umbilical vein and connect to veins on the anterior abdominal wall.

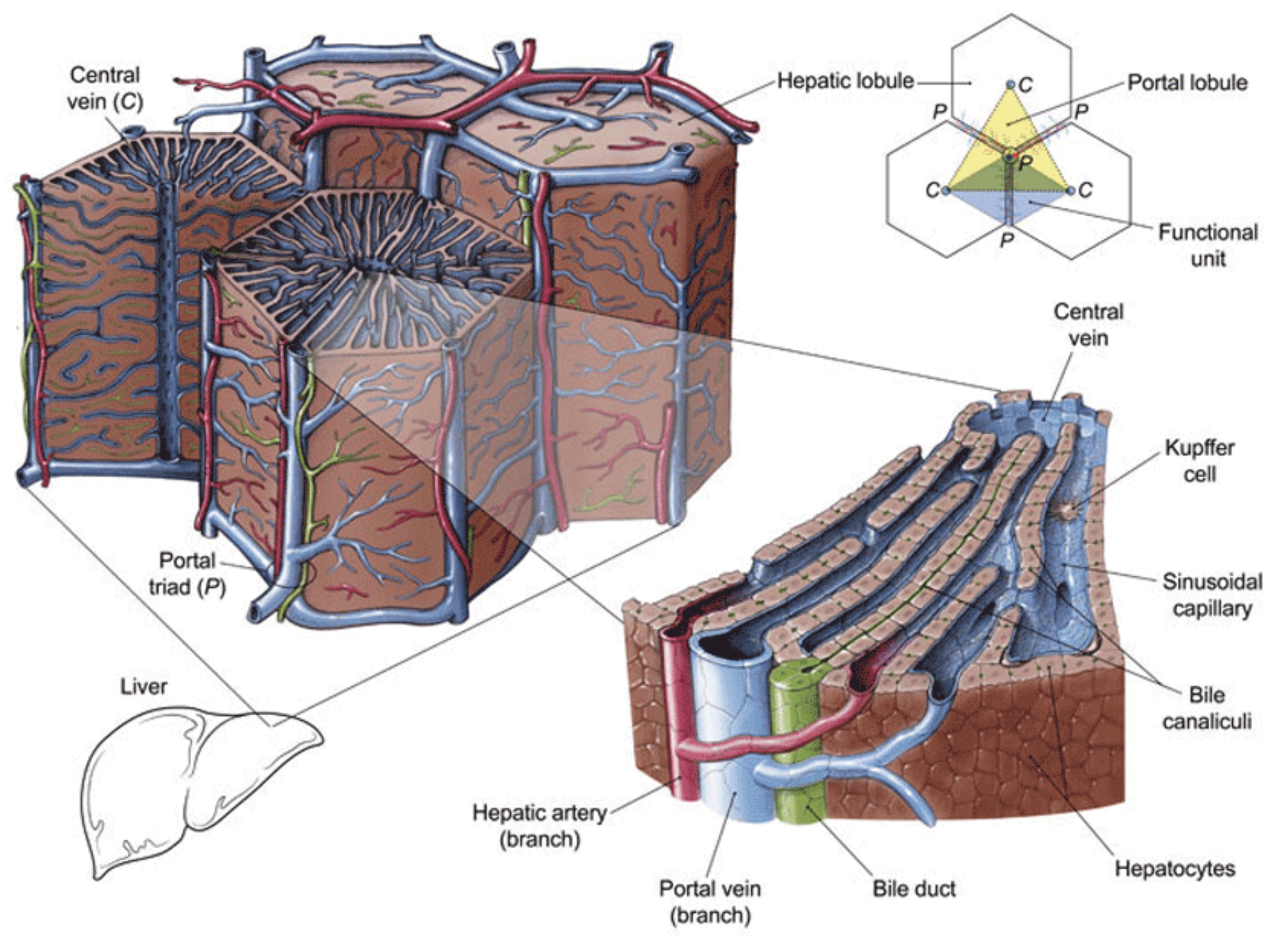

Inferior vena cava
Hepatic veins
Ligamentum venosum
Liver sinusoids
Left gastric vein
Ligamentum teres
Cystic vein
Paraumbilical veins
Splenic vein
Right gastric veins
Superior pancreatico-
duodenal vein
Superior mesenteric vein
Inferior mesenteric vein


Gastroesophageal collaterals
Coronary v.
Gastroepiploic collaterals:
Right
Left
Portal v.
Splenorenal collateral
Umbilical v. collateral
Splenic v.
Inferior vena cava
Superior mesenteric v.
Pancreatico-duodenal collaterals
Hemorrhoidal collaterals

Portal Vein

- It divides into **right** and **left branches**, which enter the liver parenchyma.




Central vein (C)
Hepatic lobule
Portal lobule
C
P
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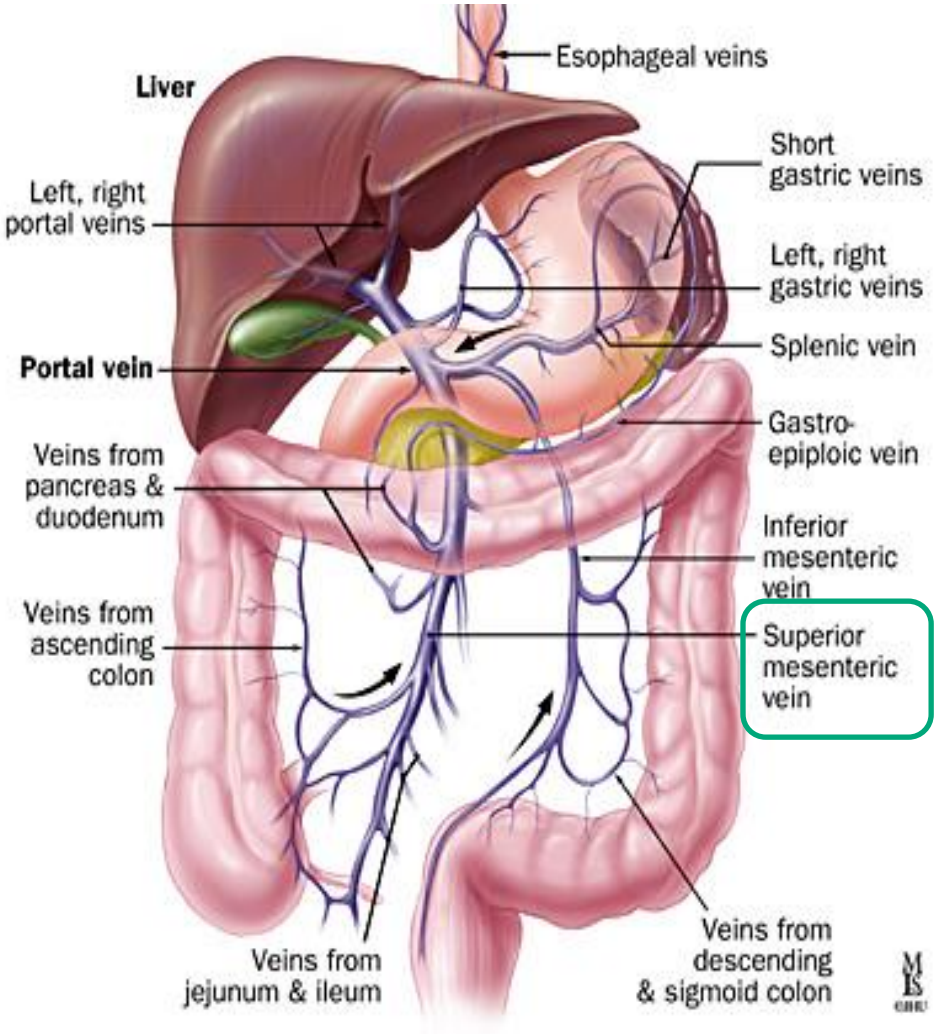
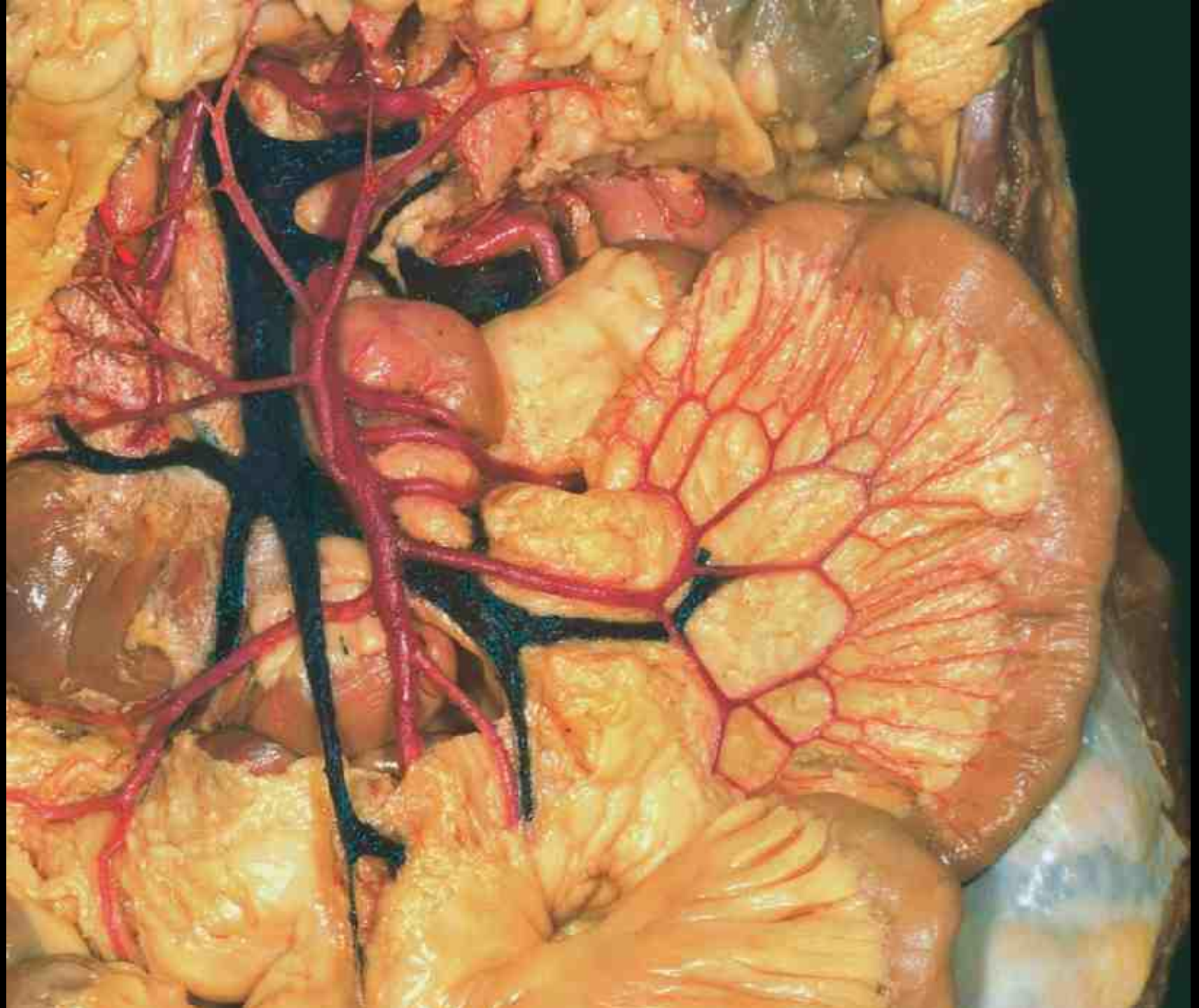
P
C
C
P
Functional unit
Central vein
Kupffer cell
Portal triad (P)
Sinusoidal capillary
Liver
Bile canaliculi
Hepatic artery (branch)
Hepatocytes
Portal vein (branch)
Bile duct

Superior Mesenteric Vein

- It drains blood from the small intestine, cecum, ascending colon, and transverse colon.
- It begins in the RIF as veins draining the terminal ileum, cecum, and appendix.
- It ascends in the mesentery to the right of the superior mesenteric artery.



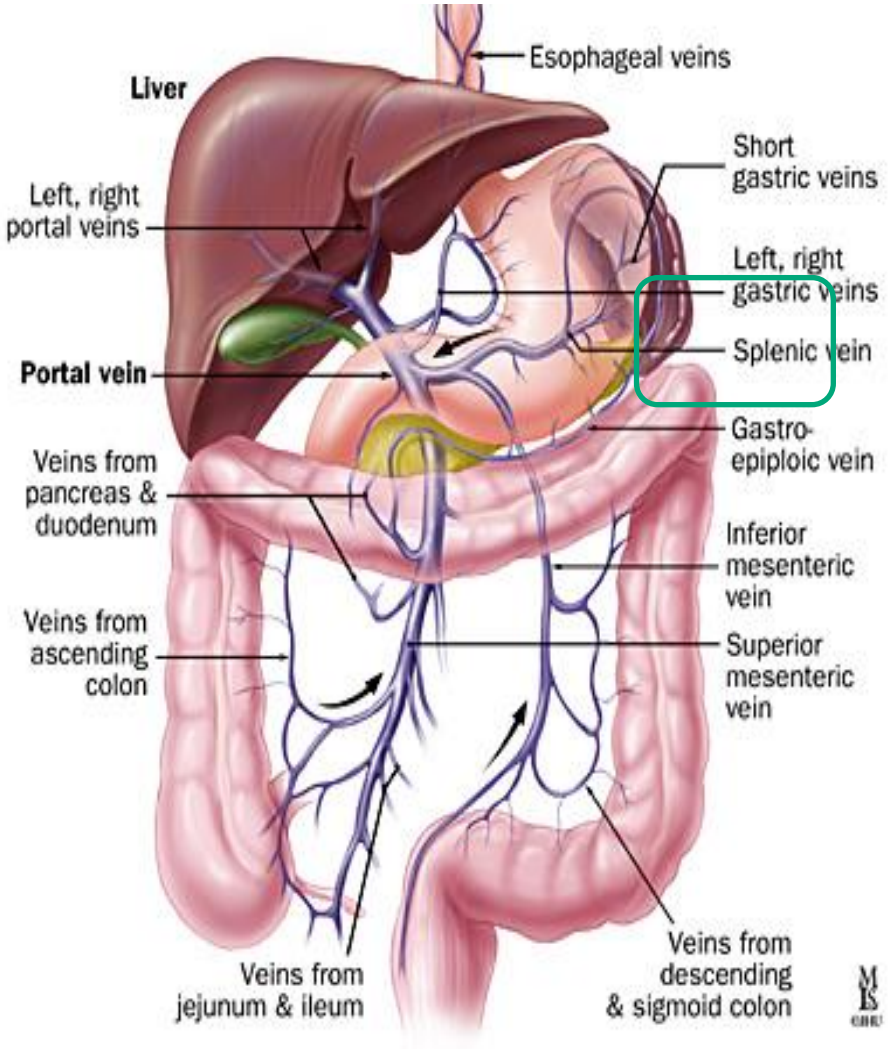


Tributaries to The SMV

- **Right gastro-epiploic vein**, draining the right part of the greater curvature of the stomach
- **Inferior pancreaticoduodenal vein**
- **Superior pancreaticoduodenal vein**
- **Veins from jejunum, ileum, middle colic vein (drains the transverse colon), right colic vein (drains the ascending colon) and ileocolic vein**

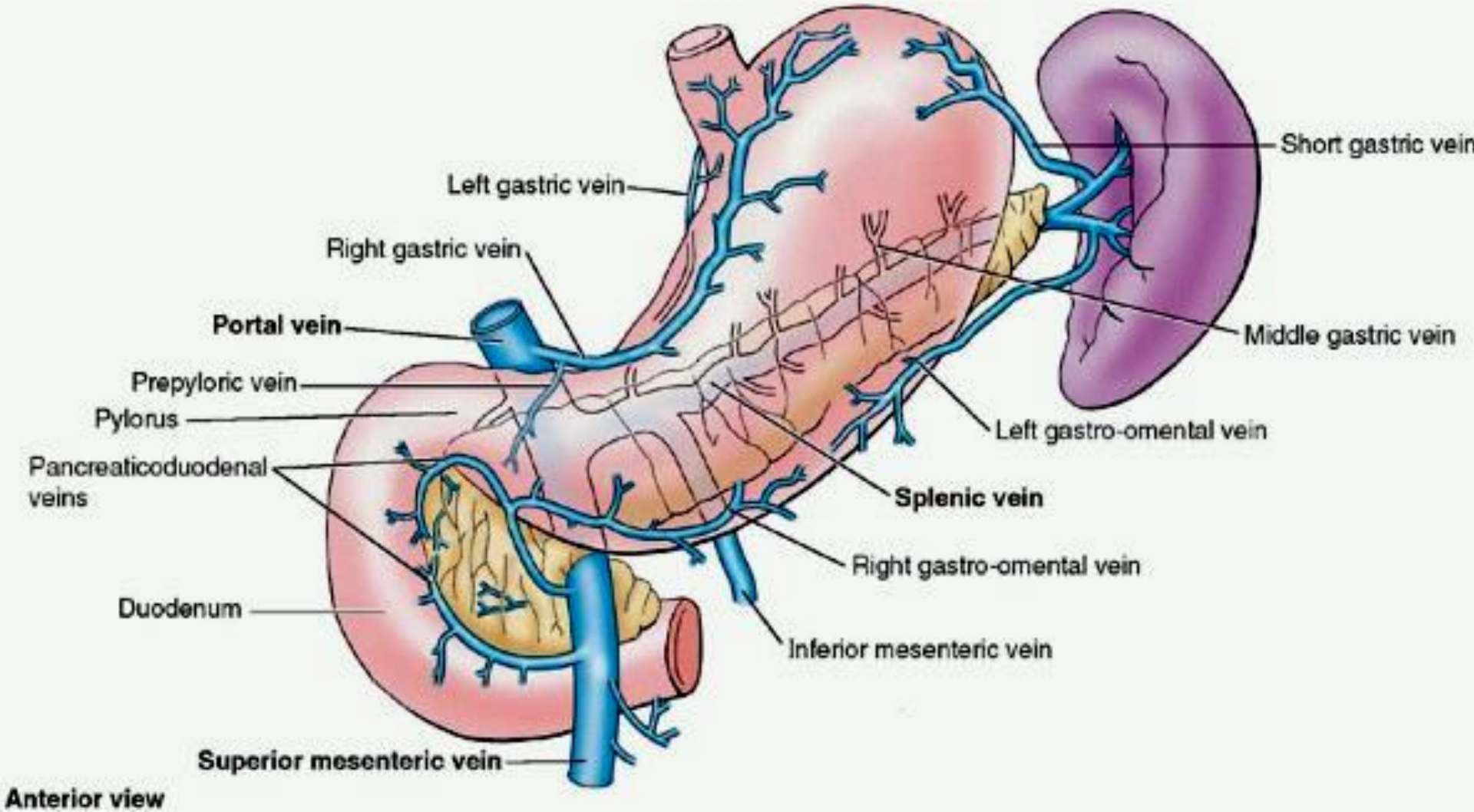
Inferior Mesenteric Vein

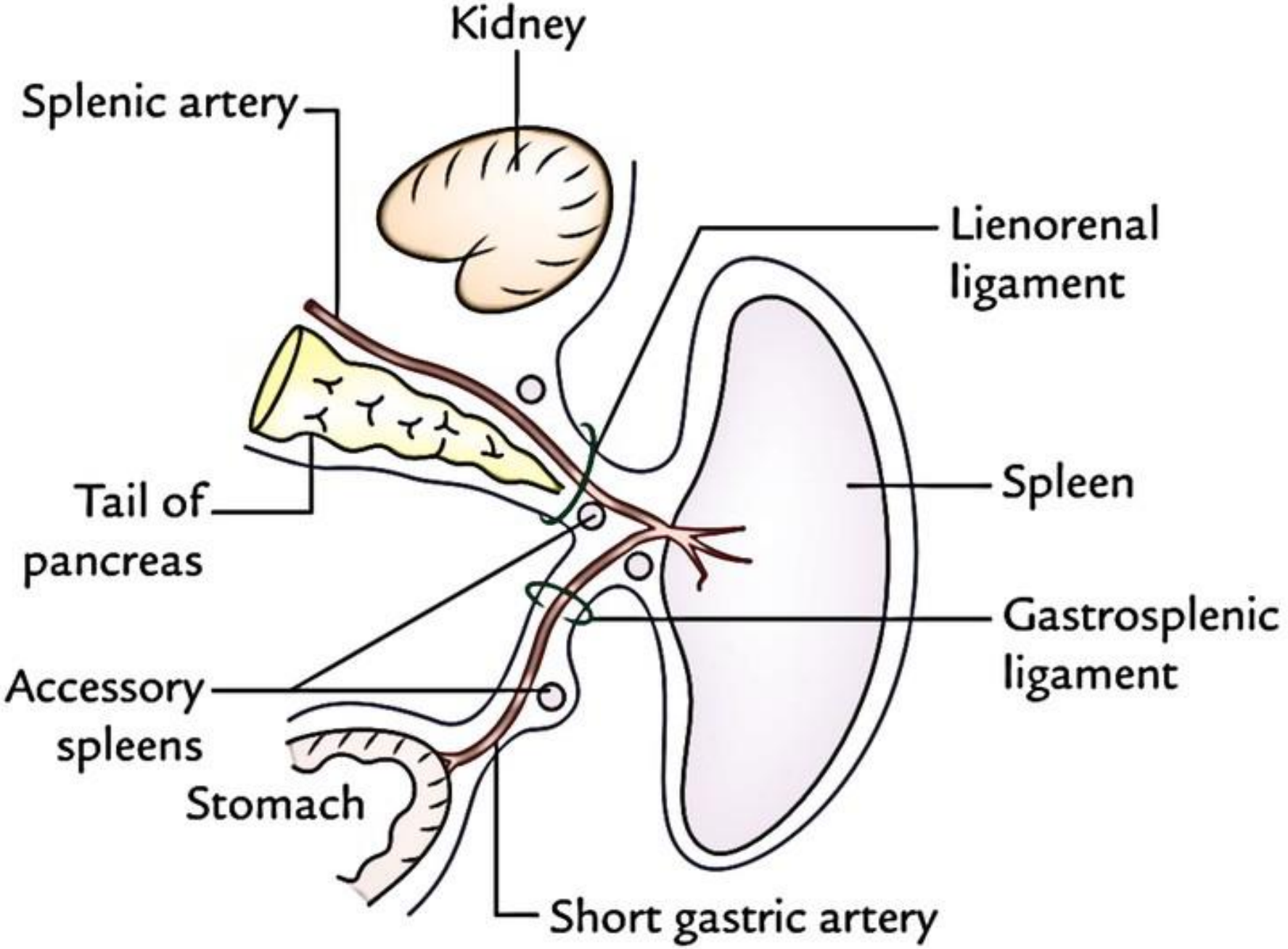
- It drains blood from the rectum, sigmoid colon, descending colon, and splenic flexure.
- It begins as the **superior rectal vein** and ascends, receiving tributaries from the **sigmoid veins** and the **left colic vein**.
- It joins the splenic vein posterior to the body of the pancreas



Splenic Vein

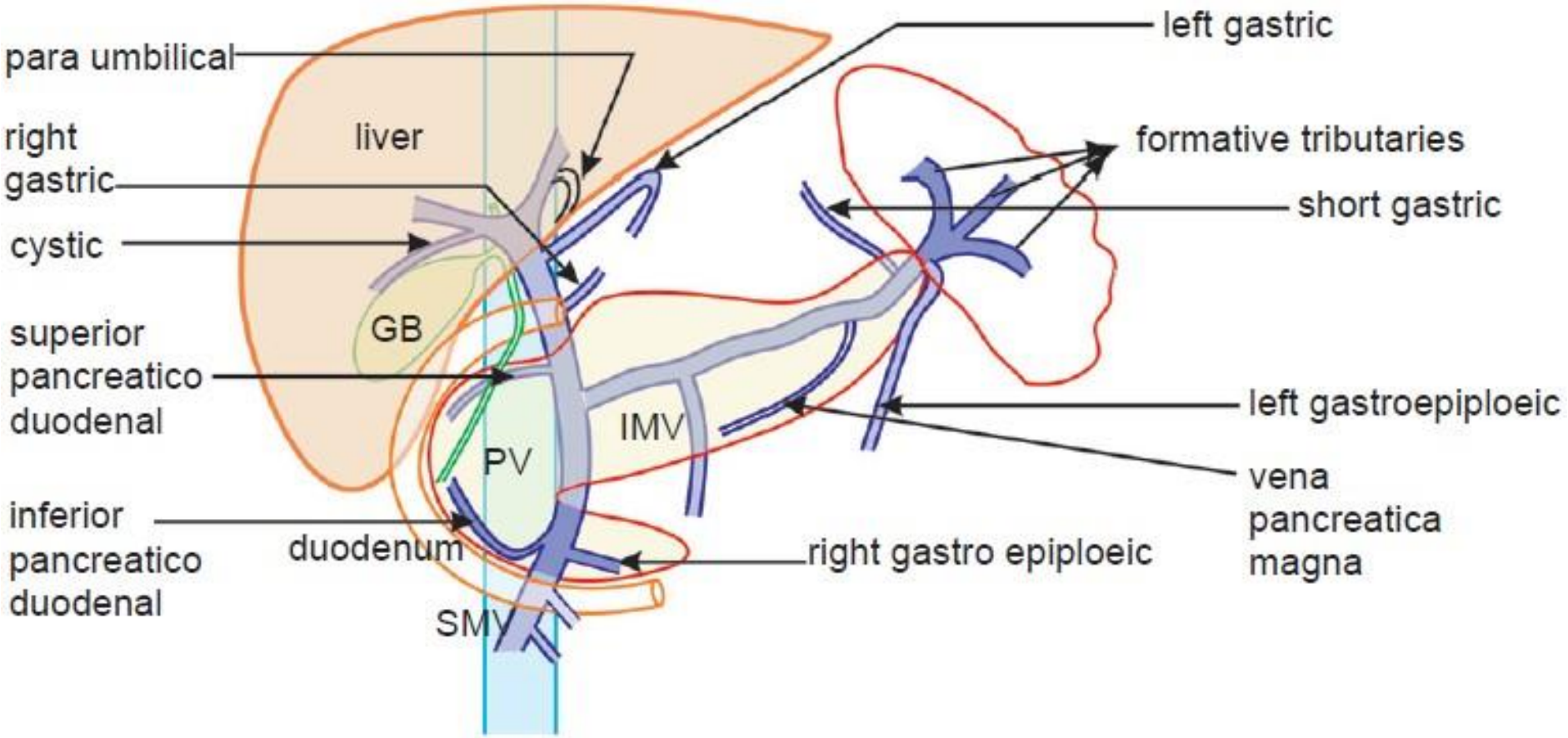
- It is formed from numerous smaller vessels leaving the hilum of the spleen.
- It passes to the right, passing through the lienorenal ligament with the splenic artery and the tail of pancreas.
- It crosses the posterior abdominal wall and unite with IMV.


Short gastric vein
Left gastric vein
Right gastric vein
Portal vein
Middle gastric vein
Prepyloric vein
Pylorus
Left gastro-omental vein
Pancreaticoduodenal veins
Splenic vein
Right gastro-omental vein
Duodenum
Inferior mesenteric vein
Superior mesenteric vein
Anterior view


Kidney
Splenic artery
Lienorenal ligament
Tail of pancreas
Spleen
Gastrosplenic ligament
Accessory spleens
Stomach
Short gastric artery

Tributaries to The Splenic Vein

1. **Short gastric veins** from the fundus and left part of the greater curvature of the stomach
2. **Left gastro-epiploic vein** from the greater curvature of the stomach
3. **Pancreatic veins** draining the body and tail of pancreas
4. **Inferior mesenteric vein (IMV).**


para umbilical
right gastric
cystic
superior pancreatico duodenal
inferior pancreatico duodenal
liver
GB
PV
IMV
SMV
duodenum
left gastric
formative tributaries
short gastric
left gastroepiploeic
vena pancreatica magna
right gastro epiploeic

Porto-systemic Anastomosis

- The ***gastroesophageal junction*** around the cardia of the stomach-where the left gastric vein anastomosis with tributaries to the azygos system of veins of the caval system.

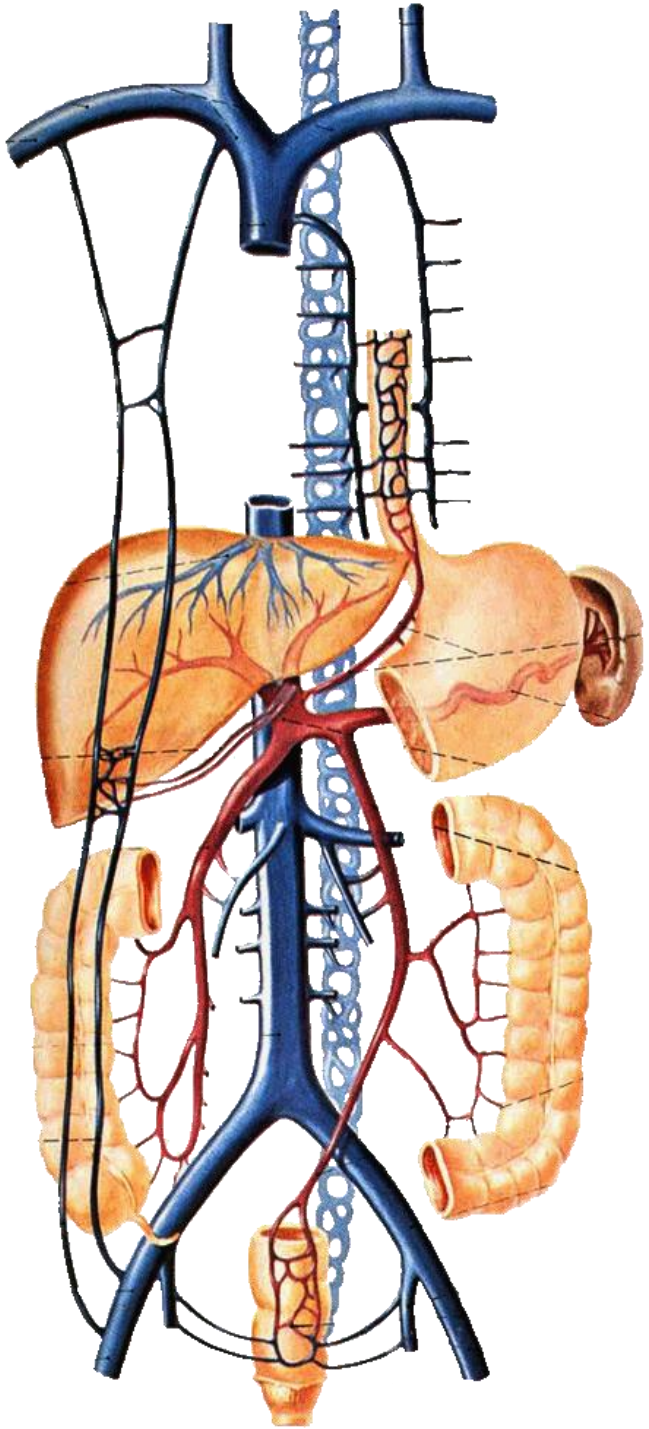
- The ***anal canal*** - the superior rectal vein of the portal system anastomoses with the middle and inferior rectal veins of the systemic venous system (***Internal Iliac Vein***).

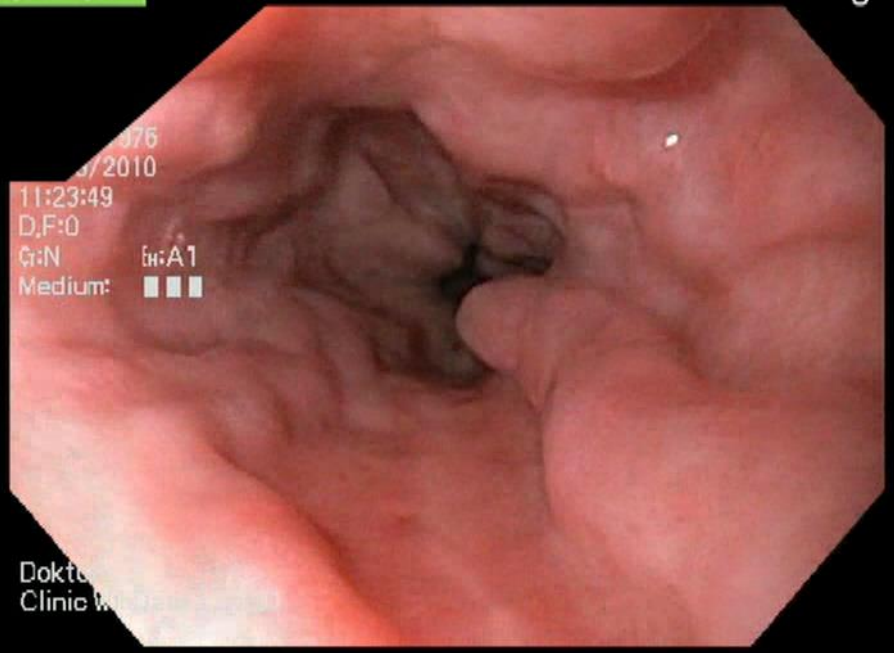
- The ***anterior abdominal wall*** around the umbilicus-the para-umbilical veins anastomose with veins on the anterior abdominal wall (***Caput Medusa***).

Porto-systemic Anastomosis

1. The Gastro-esophageal Junction

Hepatic portal vein → left gastric vein → **esophageal venous plexus** → esophageal vein → azygos vein → superior vena cava → ***Esophageal Varices***

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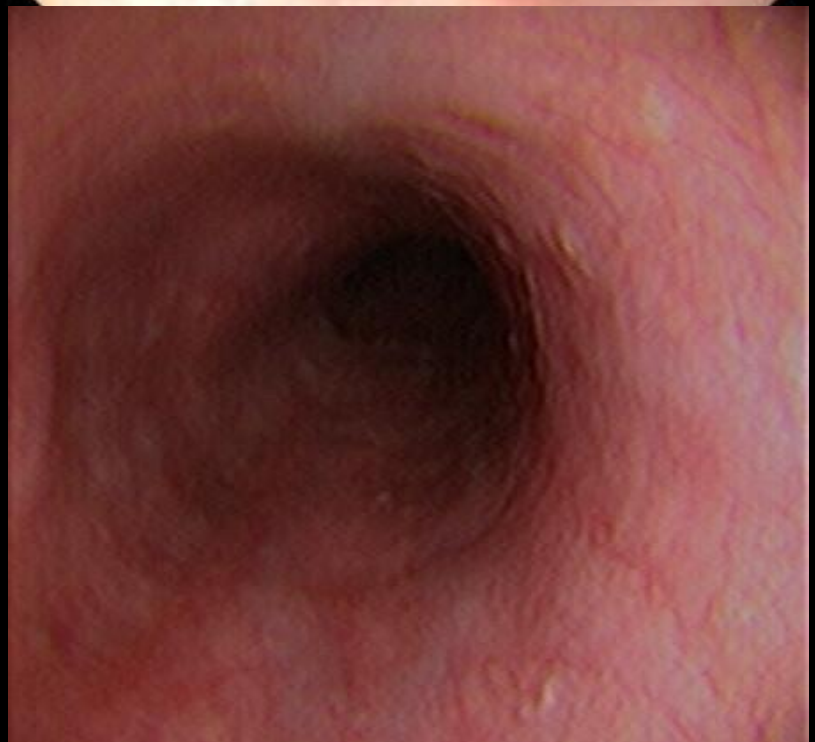
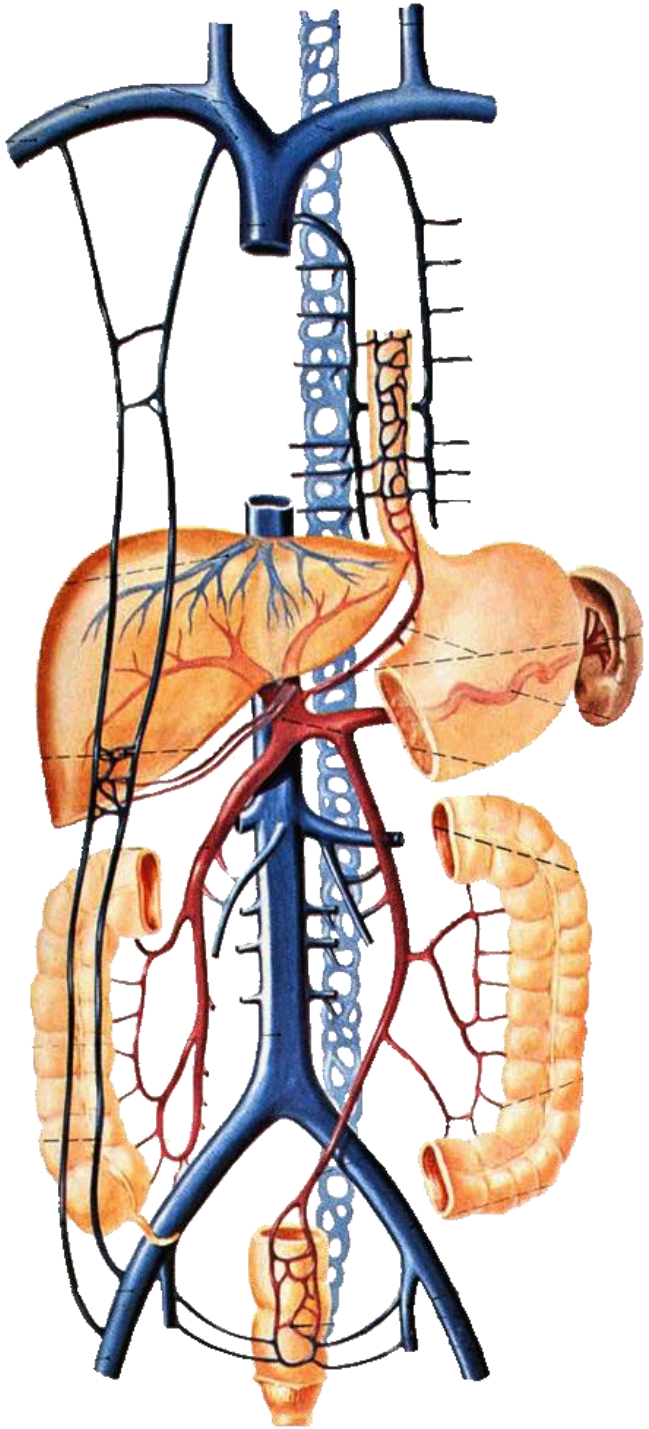


Porto-systemic Anastomosis

2. At Rectal Venous Plexus

Hepatic portal vein → splenic vein → inferior mesenteric vein → superior rectal vein → **rectal venous plexus** → inferior rectal and anal veins → internal iliac vein → inferior vena cava → ***Rectal Bleeding***

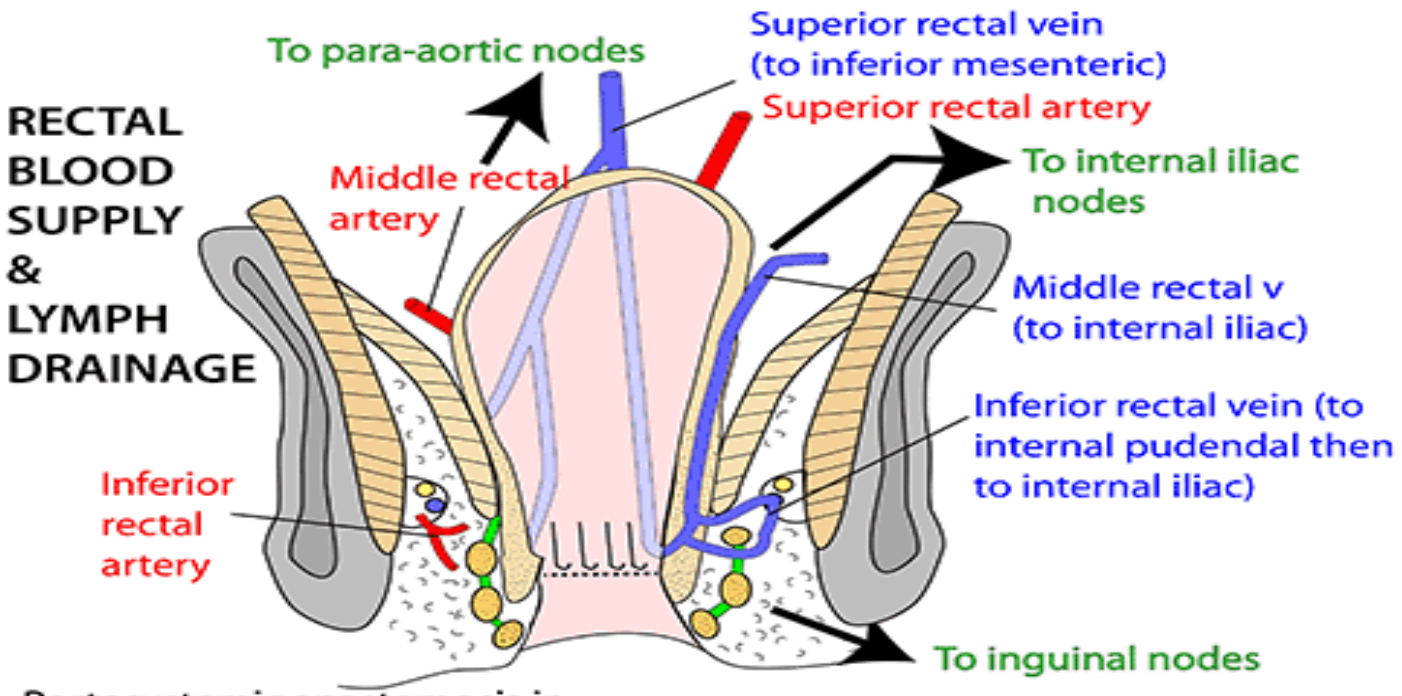


RECTUM - VESSELS/LYMPHATICS

Blood supply: Superior rectal artery from inferior mesenteric
Middle rectal artery from internal iliac.
Smaller inferior rectal artery from internal pudendal
Median sacral may contribute
All arteries supply all layers

Venous drainage: Superior rectal vein to inferior mesenteric which is portal. Middle rectal to internal iliac (systemic) Inferior rectal to internal pudendal to internal iliac (systemic). Portosystemic anastomosis in upper anal canal where internal & external venous plexuses meet.

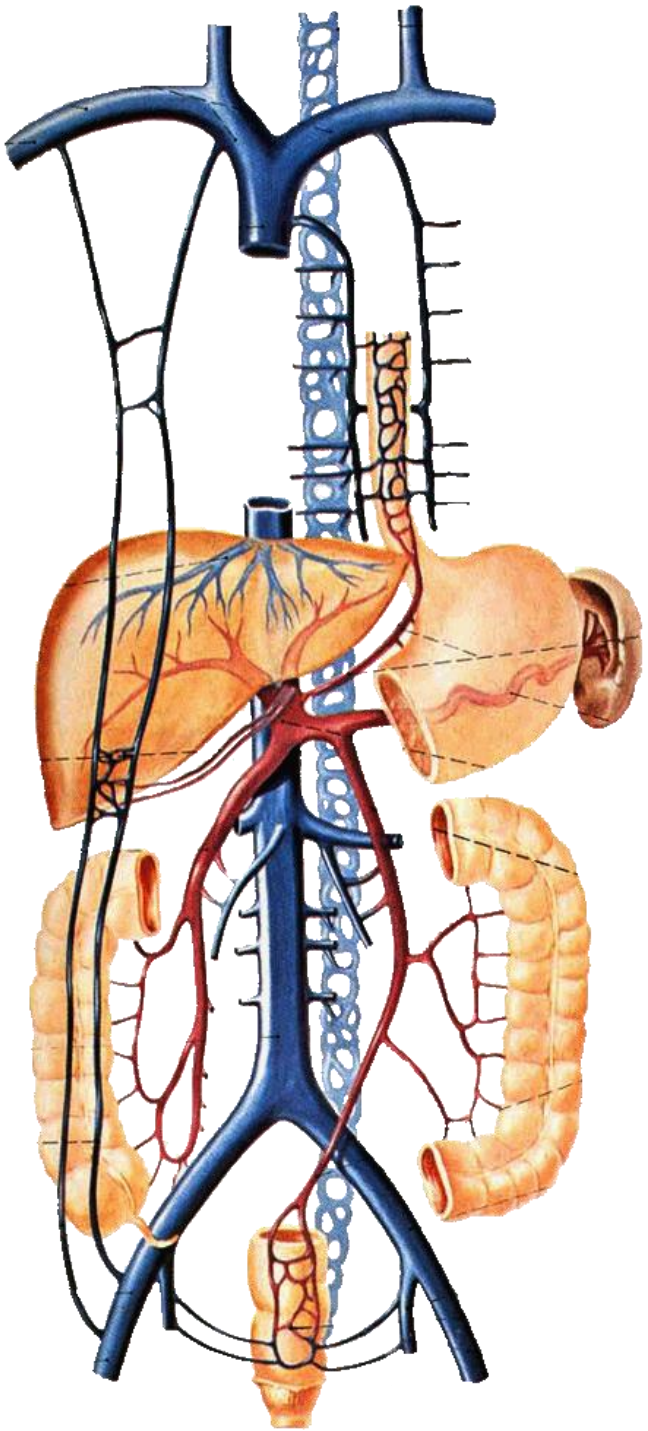
Lymphatics: Follow deep veins and arteries (black arrows below)

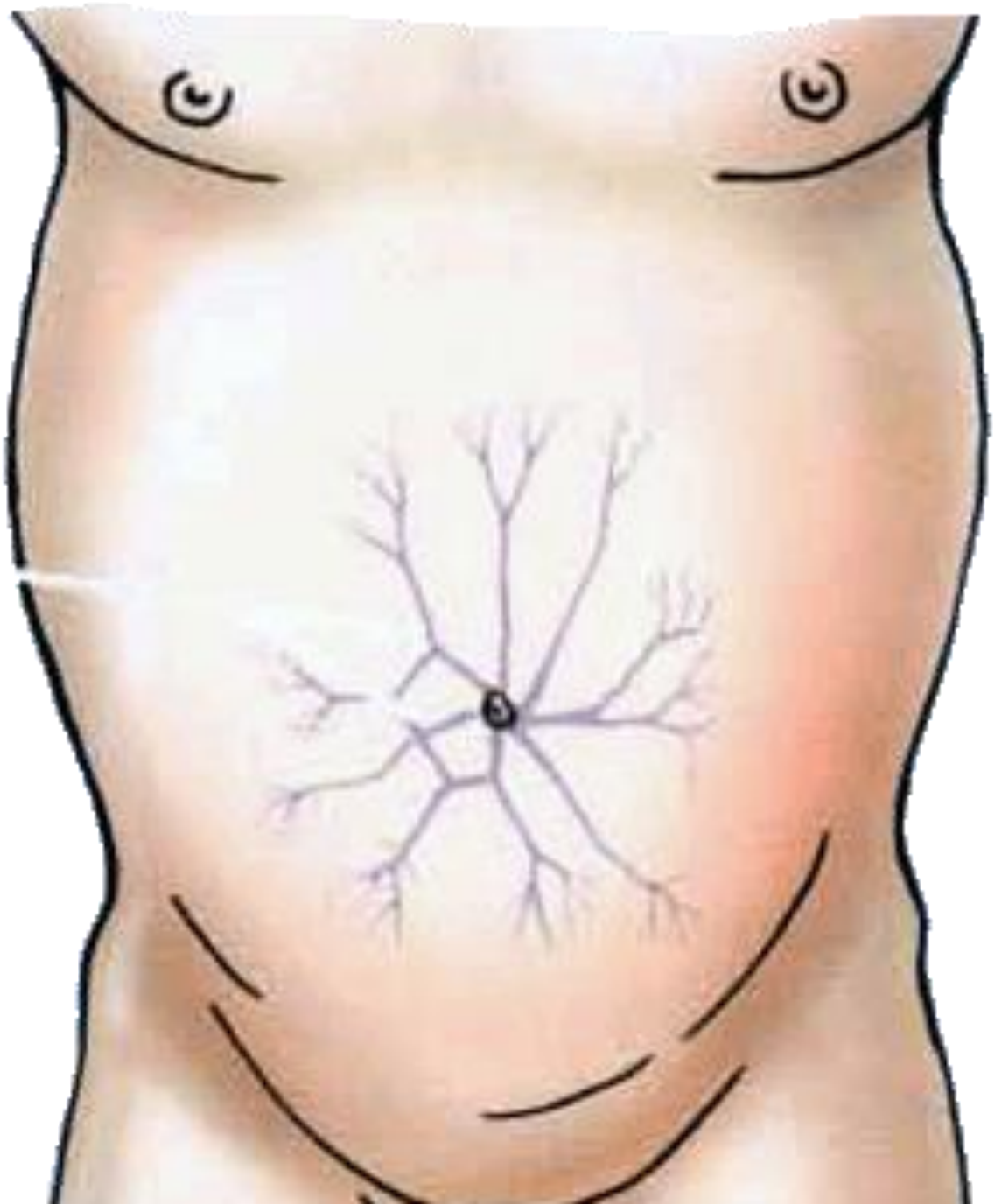


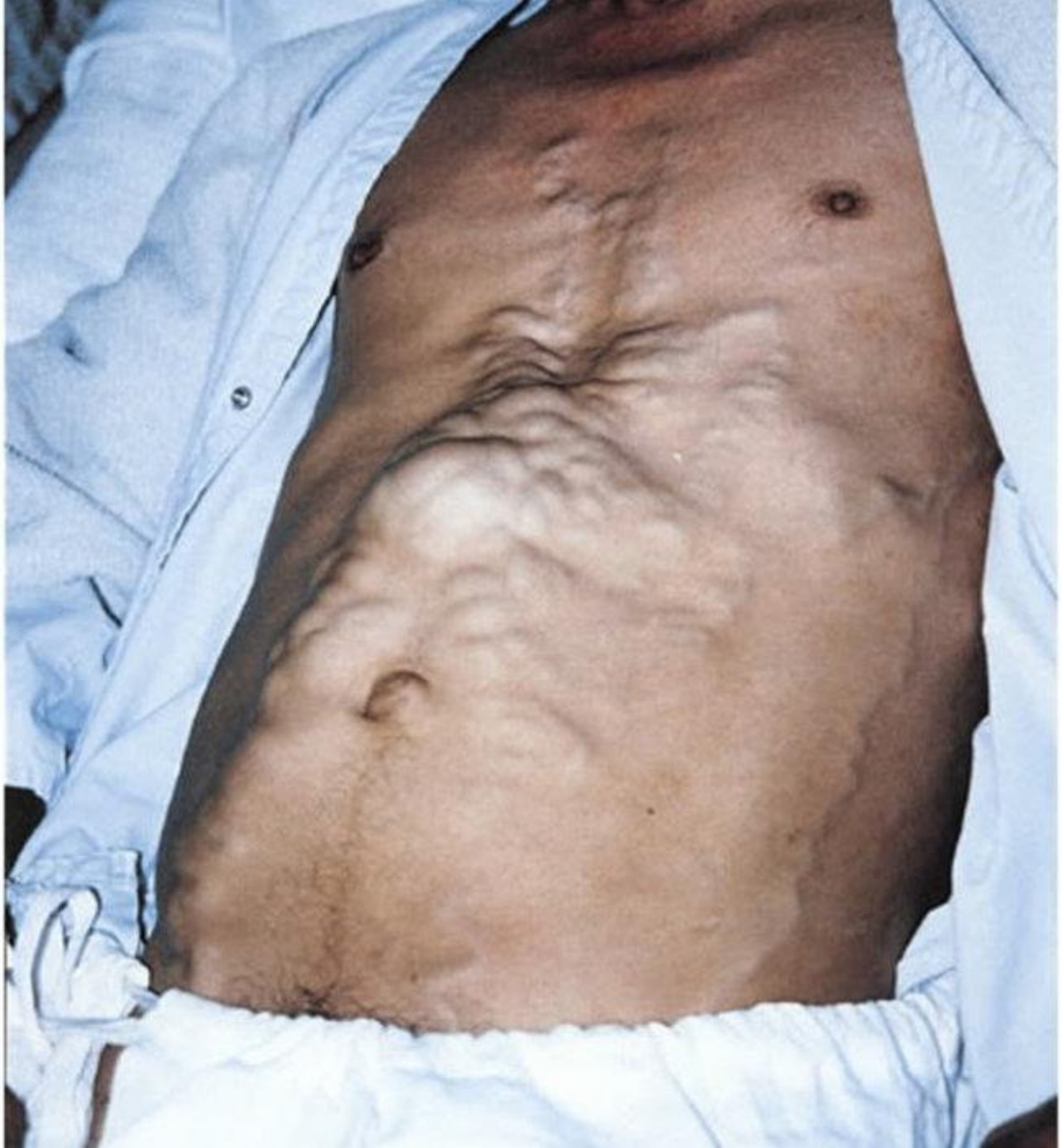
Porto-systemic Anastomosis

3. At periumbilical venous plexus

Hepatic portal vein → paraumbilical vein → **periumbilical venous plexus** → thoraco-epigastric and superior epigastric vein → superior vena cava superficial epigastric and inferior epigastric veins → inferior vena cava → ***Caput Medusa***



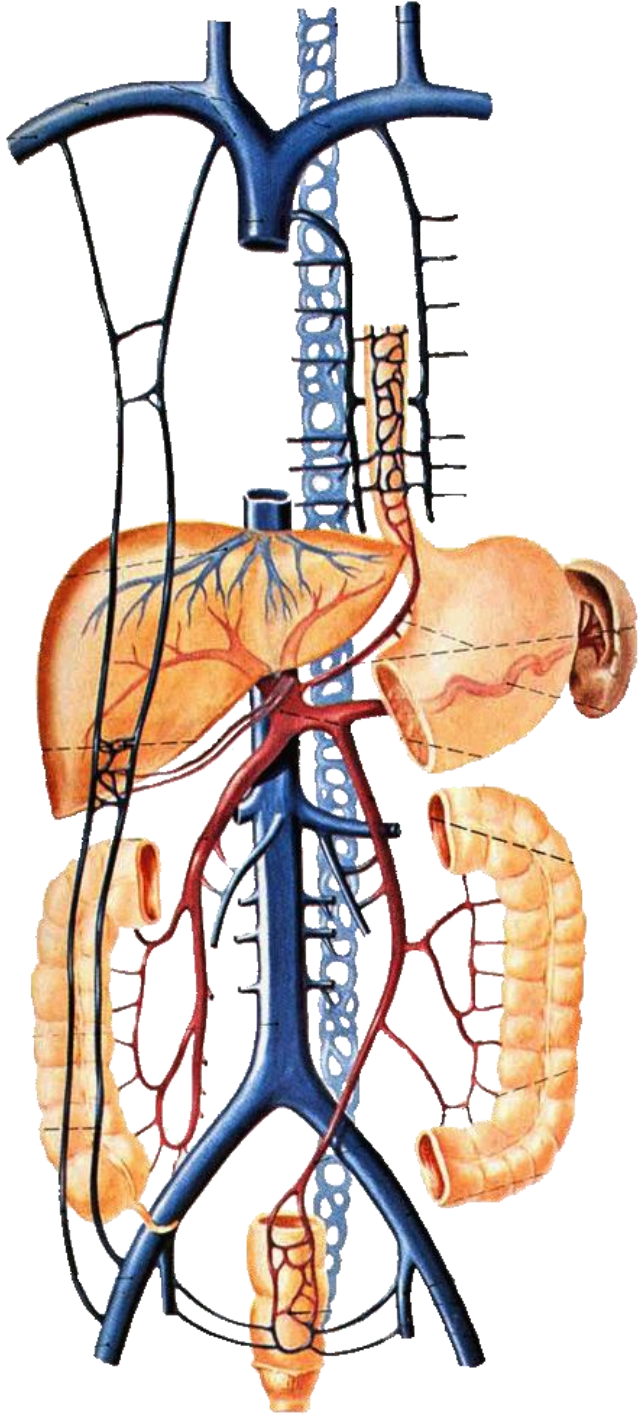




Porto-systemic Anastomosis

4. Portal-retroperitoneal anastomosis

Between the retroperitoneal branches of the colic veins and the lumbar veins, pancreaticoduodenal veins with the renal veins and the subcapsular veins of the liver with the phrenic veins twigs of colic veins (portal) anastomosing with systemic retroperitoneal veins



- For further inquiries ***PLZ*** feel free to contact at any time through email

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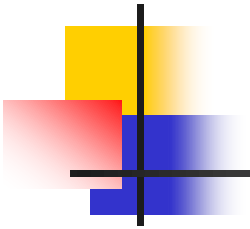
gamaltaha@med.asu.edu.eg



Thank You