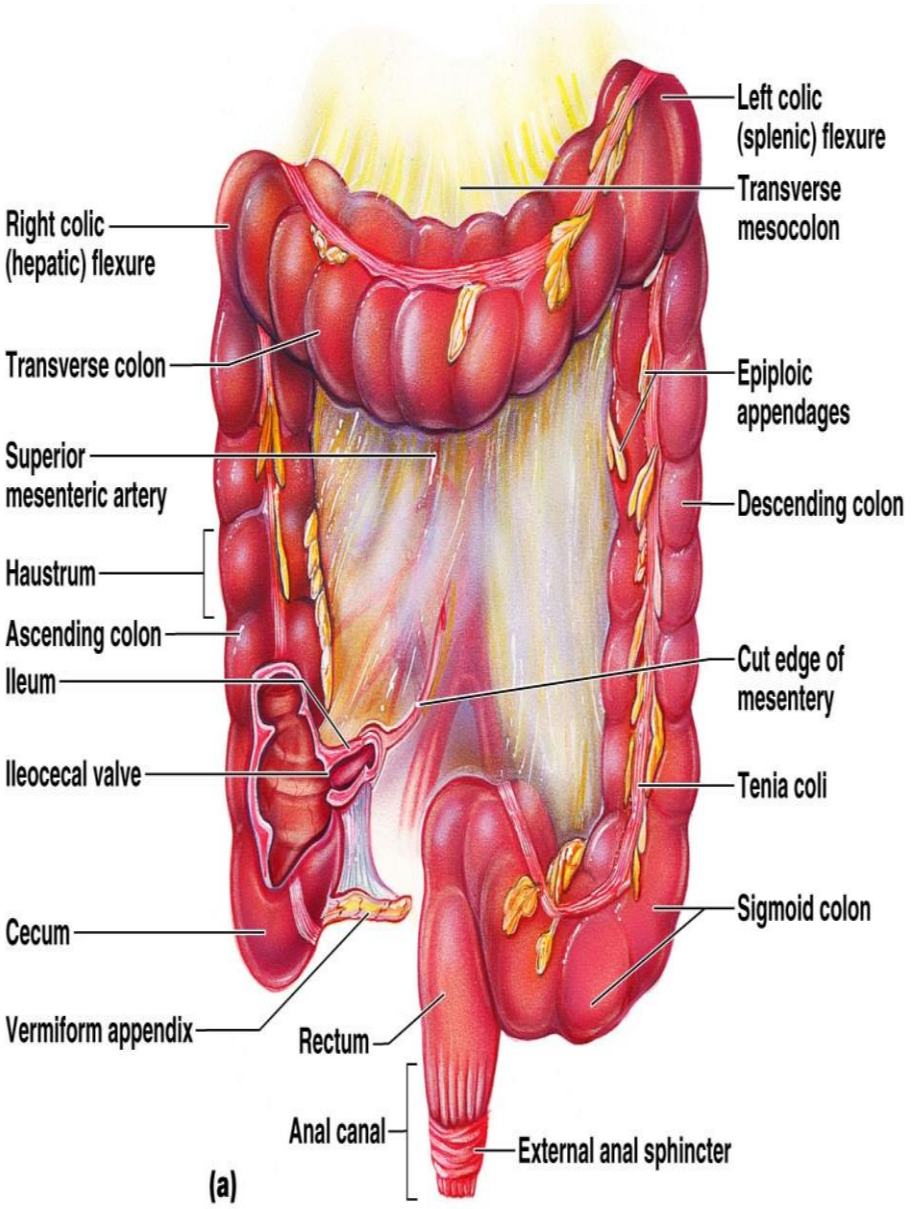
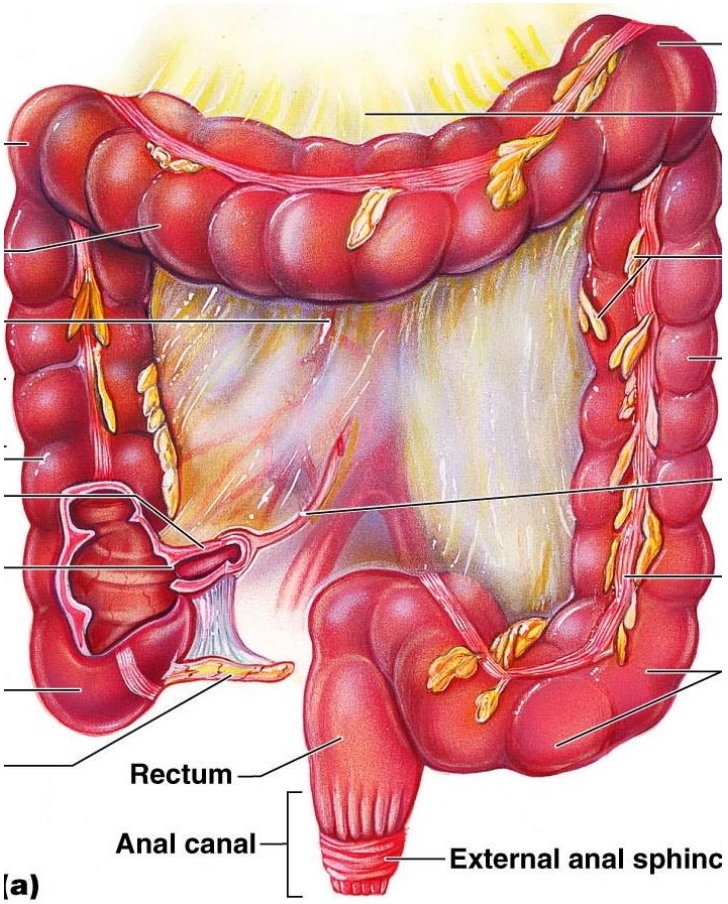
The Large Intestine

- Starts at the ileocecal junction.
- Ends at the anus.
- Approximately 1.5m long.
- Consists of
  - Cecum
  - Colon
  - Rectum
  - Anal canal
- The ascending, descending colon, and rectum are fixed to the posterior wall of abdominal cavity.
- The cecum and appendix are completely peritoneal



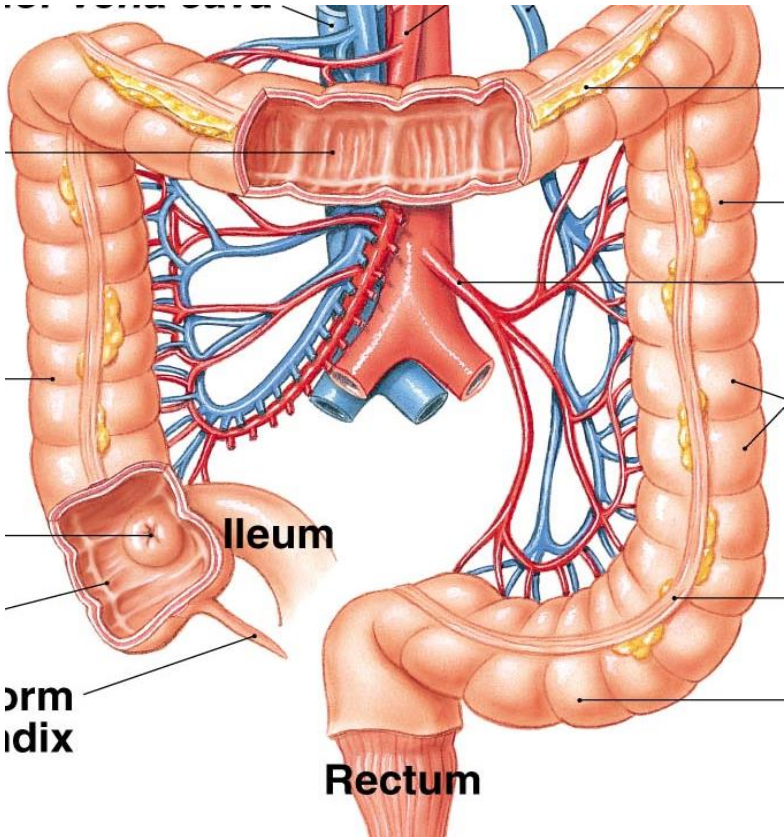
The Large Intestine (Intestinum Crassum)

- The teniae coli : are three bands of longitudinal muscle on the surface of the large intestine.
- Remember, the large intestine does not have a continuous layer of longitudinal muscle - instead, it has teniae coli.
- These three bands meet at the appendix, which is the terminal portion of the cecum.
- Appendices epiploicae :
  - Bodies of fat enclosed by peritoneum, hanging from the teniae



Structure of large intestine

- 4 layers
- Peritoneum – peritoneal layer – adventitia
- Longitudinal muscles modified into three bands called taeniae coli.
- These bands , surround the rectum completely and anal canal.
  The circular fibres of muscle are thickened to form the anal sphincter.
- Mucosa : contains mucous glands
  On the peritoneal surface fat containing peritoneal pouches called appendices epiploicae.

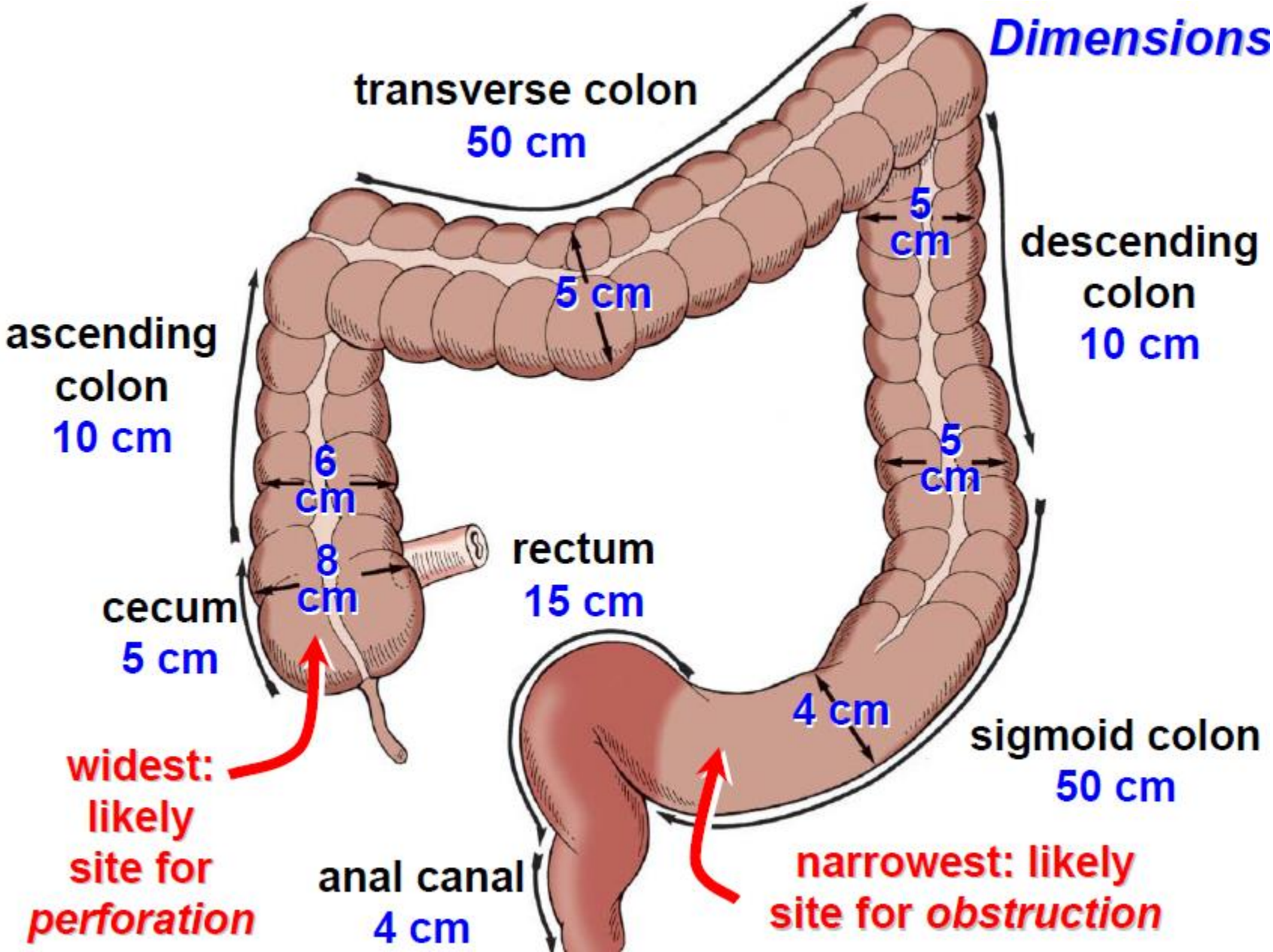


LARGE INTESTINE

PARTS:

1. Cecum
2. Appendix
3. Ascending colon
4. Transverse colon
5. Descending colon
6. Sigmoid (pelvic) colon
7. Rectum
8. Anal canal
9. N.B.: **Parts of large intestine in abdomen:** from 1 to 5

The Colon


Dimensions
transverse colon
50 cm
5 cm
5 cm
descending colon
10 cm
ascending colon
10 cm
6 cm
5 cm
8 cm
cecum
5 cm
rectum
15 cm
4 cm
sigmoid colon
50 cm
widest: likely site for perforation
anal canal
4 cm
narrowest: likely site for obstruction

LARGE INTESTINE

CHARACTERISTICS:

1. **Teniae coli:** 3 longitudinal muscle bands
2. **Sacculations (haustrations):** teniae coli are shorter than large intestine
3. **Appendices epiploicae:** short peritoneal fold filled with fat

- N.B.: characteristics are present in all large intestine EXCEPT: **in rectum & anal canal**

LARGE INTESTINE

- **Embryological origin:**

1. **From midgut:** cecum, appendix, ascending colon, right 2/3 of transverse colon
2. **From hindgut:** left 1/3 of transverse colon, descending & sigmoid colon, rectum, upper half of anal canal

- **Peritoneal fold:**

1. **Appendix, transverse & sigmoid colon:** have mesentery
2. **Cecum:** completely covered by peritoneum, but has no mesentery
3. **Ascending & descending colon:** covered anteriorly & on the sides
4. **Rectum & anal canal:** discussed later

LARGE INTESTINE

- **Arterial supply:**

1. **Midgut:** colic branches of **superior mesenteric**
2. **Hindgut: inferior mesenteric**

- **Lymphatic drainage:**

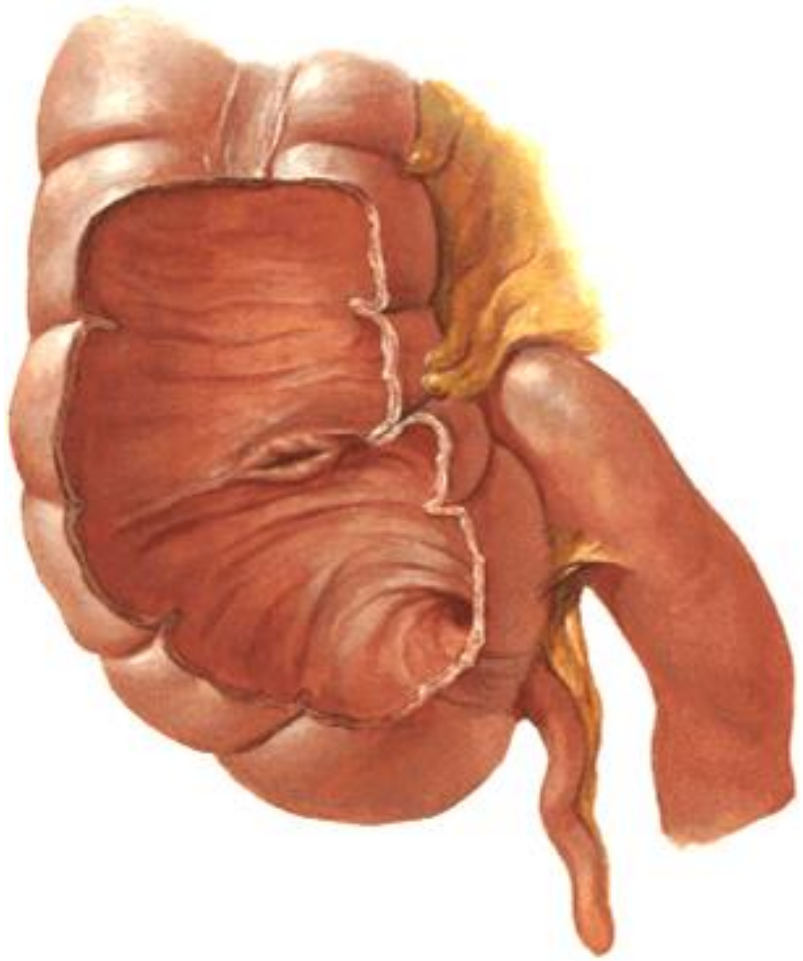
1. **Midgut: superior mesenteric** lymph nodes
2. **Hindgut: inferior mesenteric** lymph nodes

- **Nerve supply:**

1. **Superior mesenteric** plexus: sympathetic & parasympathetic (vagus)
2. **Inferior mesenteric** plexus: sympathetic & parasympathetic (pelvic splanchnic nerves)

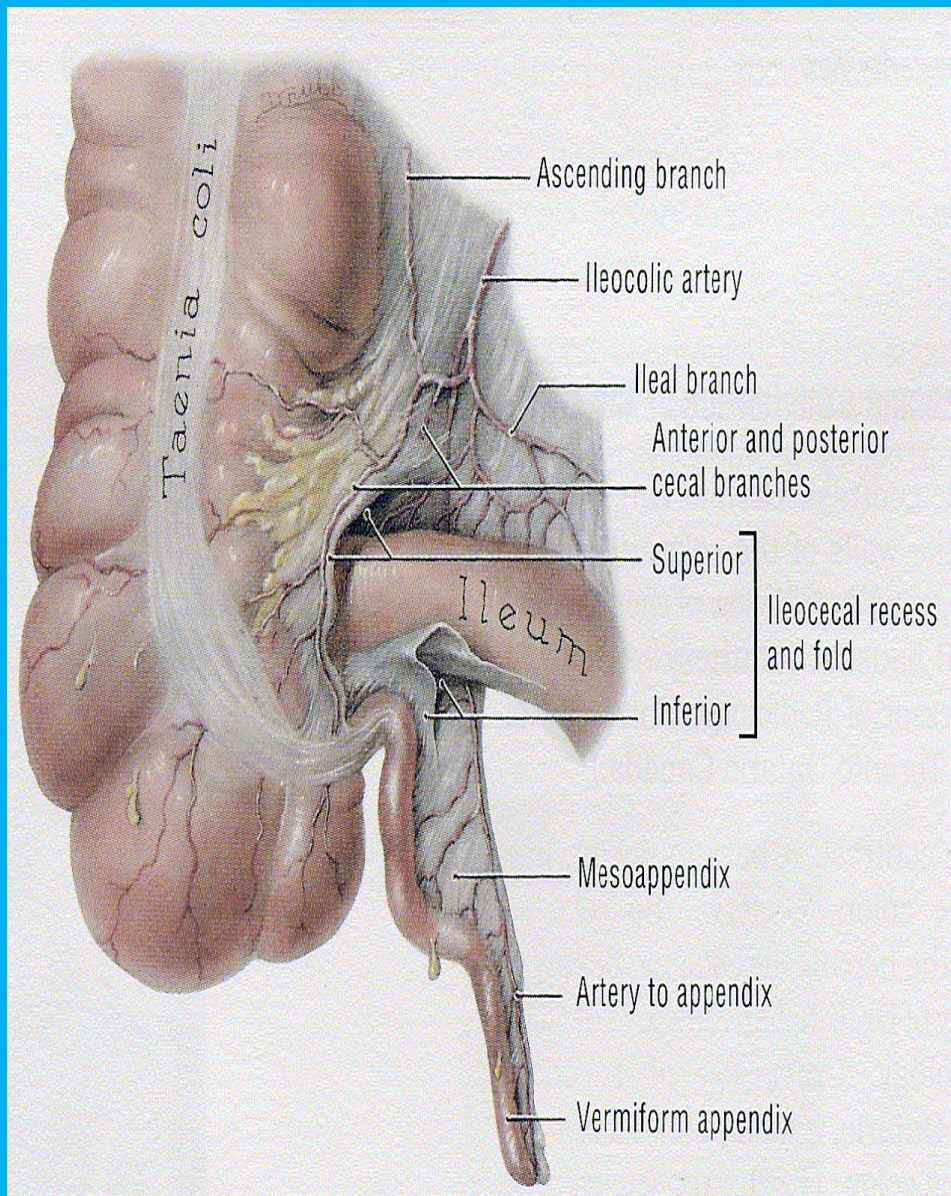
Gross Anatomy of Large Intestine

- **Caecum**
  - Dilated portion
  - Blind end inferiorly
  - Continuous superiorly as the ascending colon
  - The terminal ileum opens into the large intestine just below the junction of the caecum and ascending colon
  - The opening is guarded by **ileocaecal valve.**
  - The blind end has appendix attached to it .

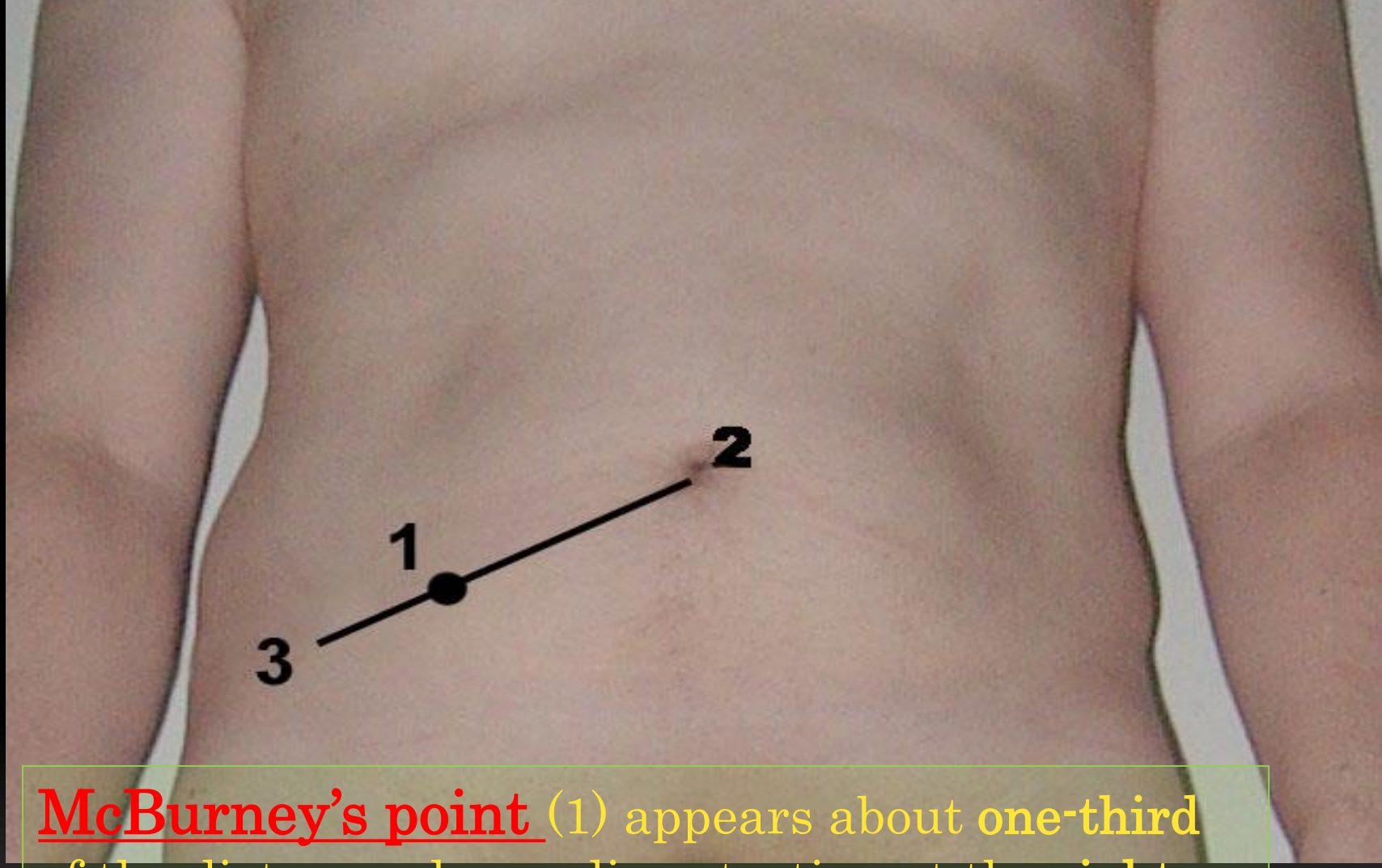


APPENDIX

- Appendix is a blind intestinal diverticulum (6–10 cm) in length arises from the postero medial aspect of the caecum inferior to the ileocaecal junction origin where it arises from the site at which the three taeniae coli collect
- . The appendix has short Mesentery (The Meso–appendix).



MCBURNEY'S POINT

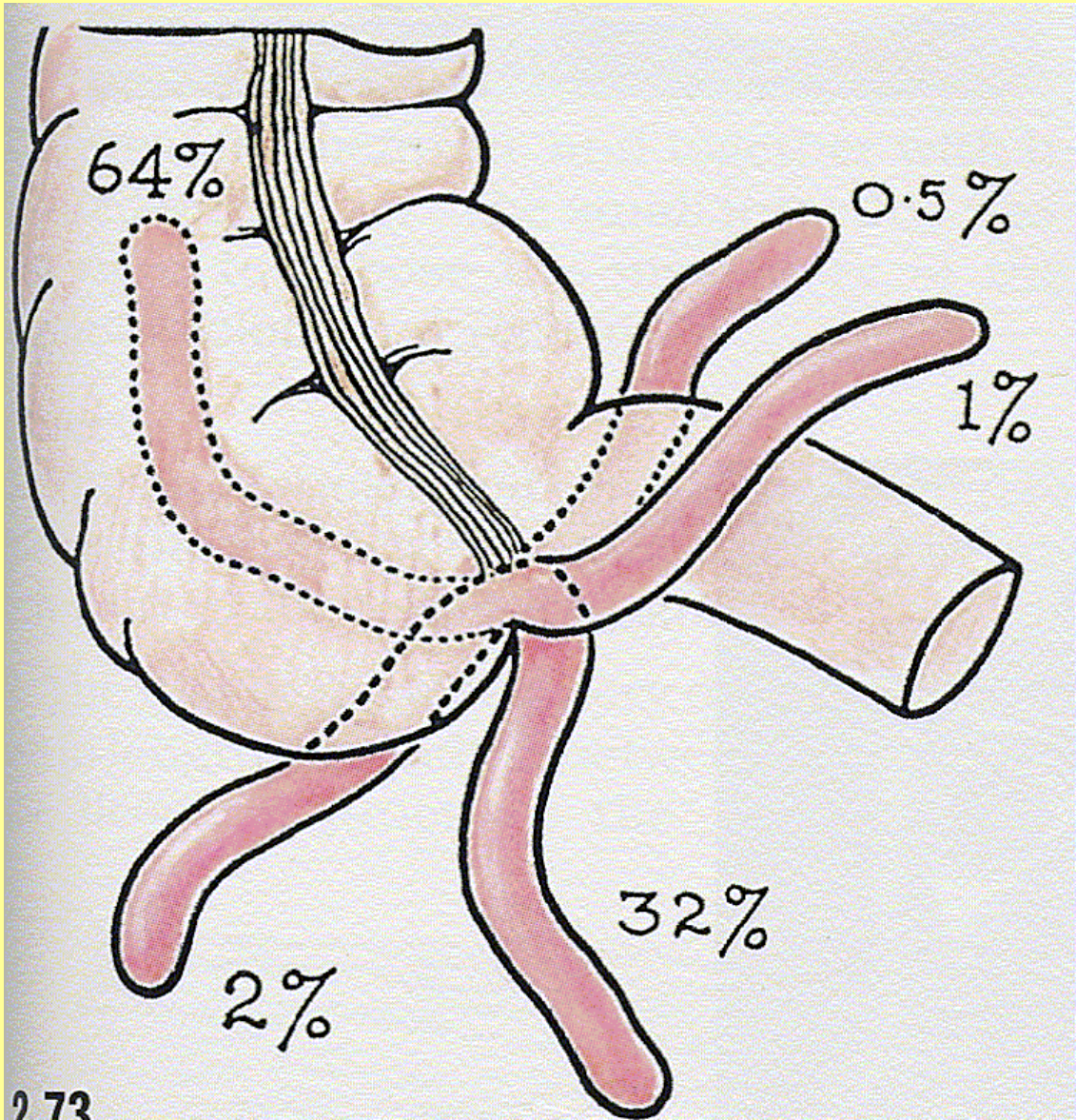


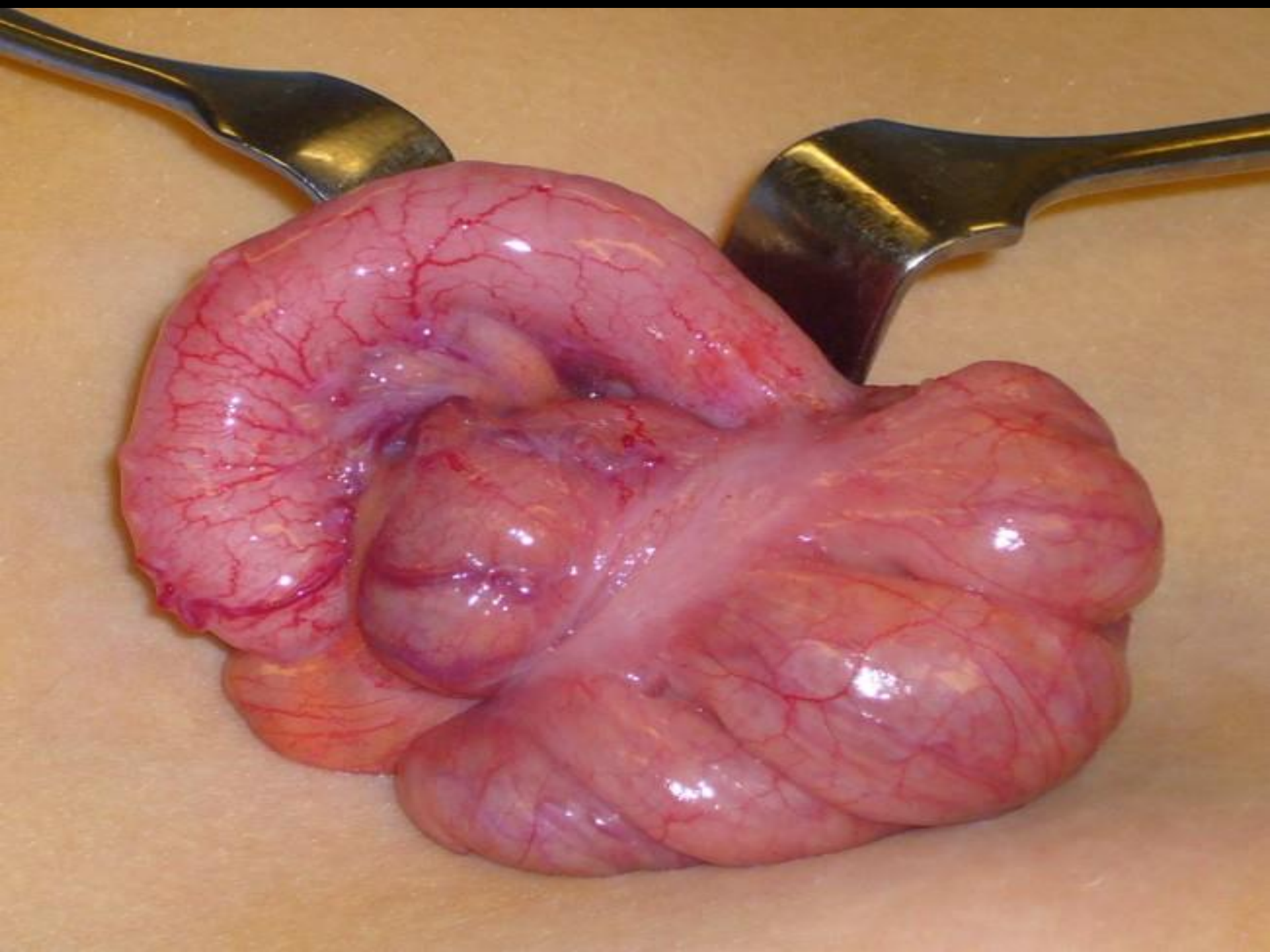
McBurney's point (1) appears about **one-third** of the distance along a line starting at the **right ASIS** (3) and ending at the **umbilicus** (2.

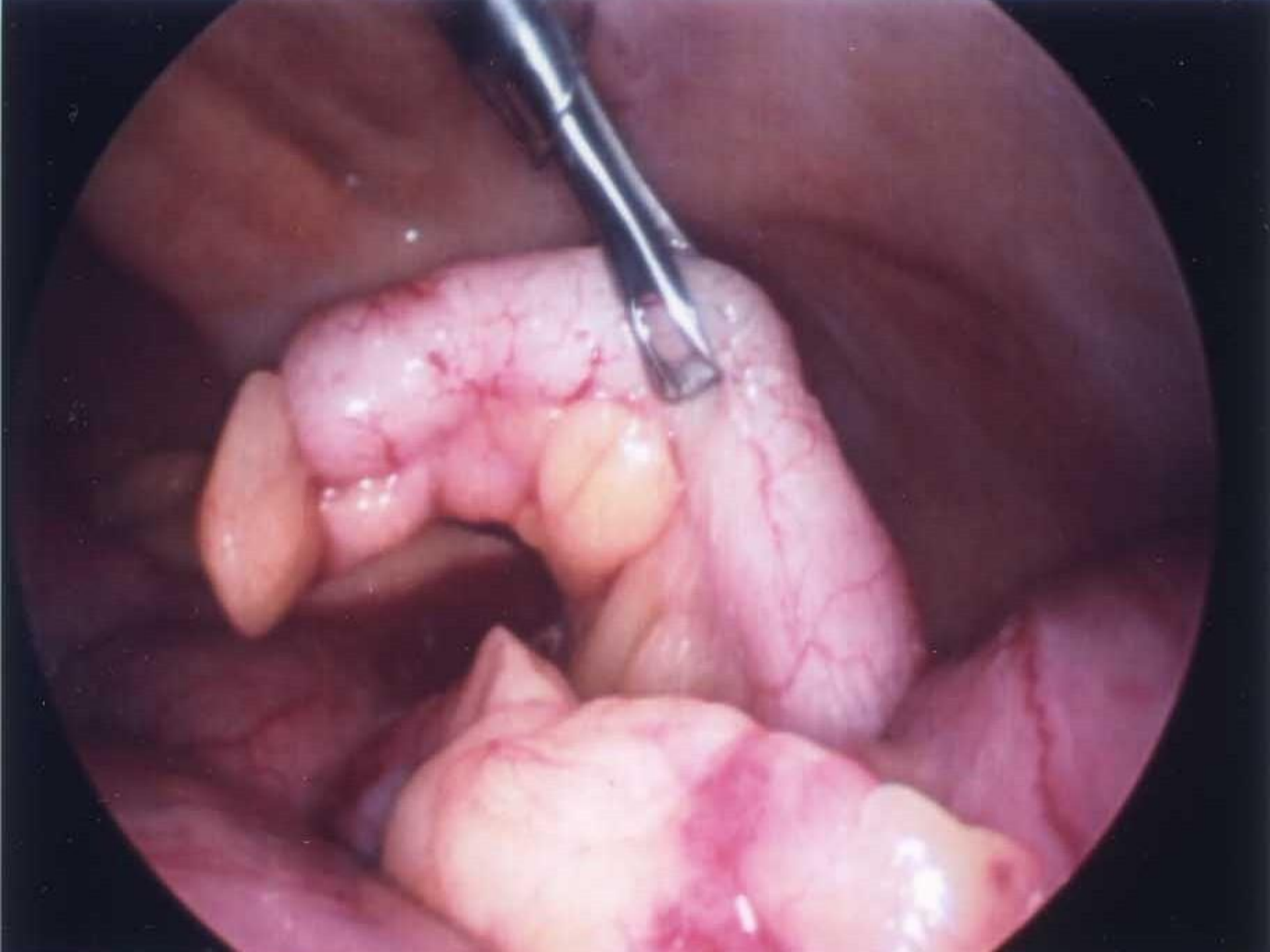
APPENDIX

- **Positions: (from most to least common)**

1. **Retrocecal**: most common position
2. Pelvic
3. Subcecal
4. Preilieal
5. Postileal



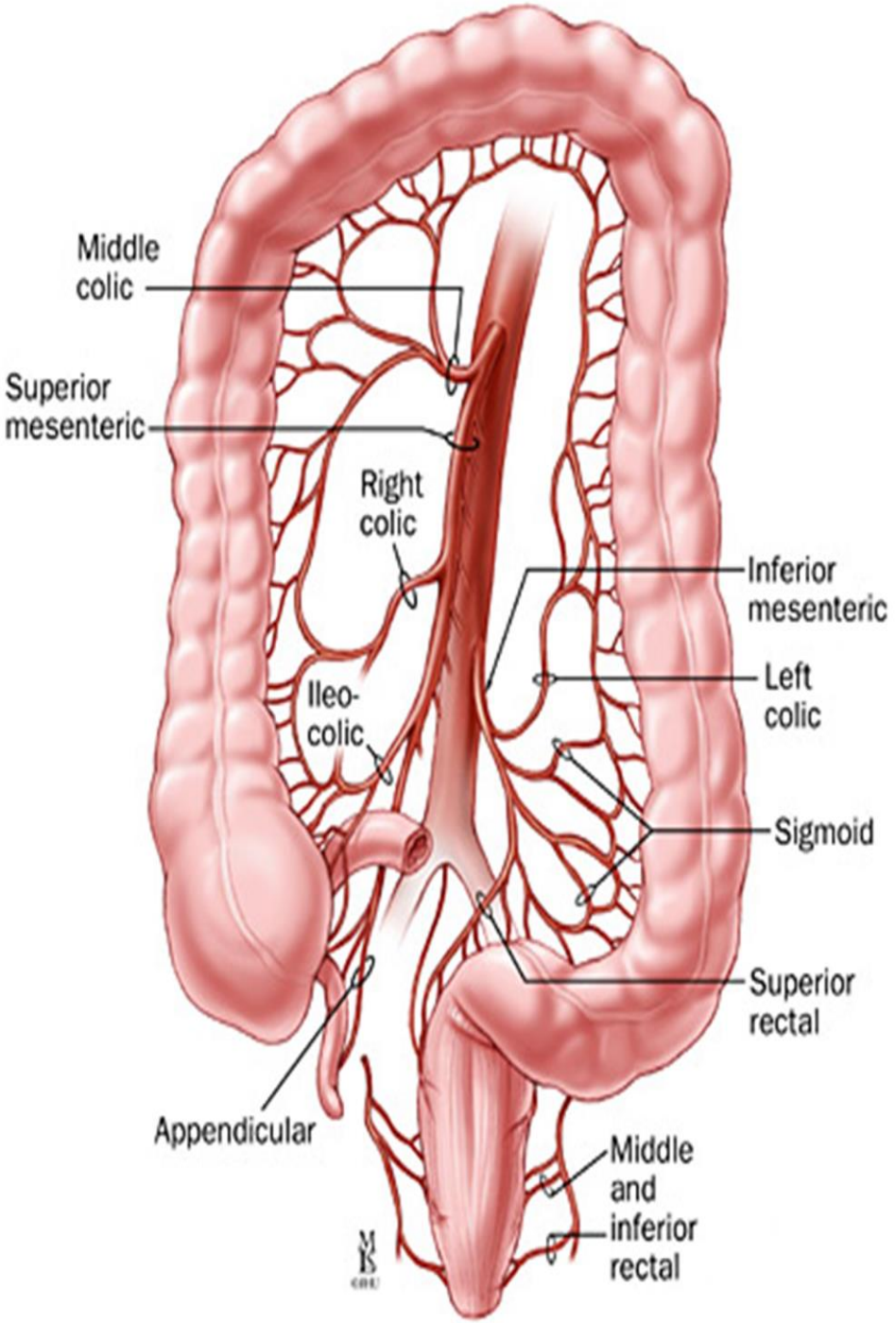




- The blood supply : by the appendicular artery ,which arises from the ileocolic artery ,which arises from the superior mesenteric artery ,drain by ileocolic vein.

☒ The lymphatic : pass to the LN in the mesoappendix and to the ileocolic LN along the ileocolic artery than to SM LN.

Nerve : The sympathetic nerve fibres originate in the lower,thoracic part of the spinal cord and the parasympathetic nerve fibres,from the vagus nerve.



Gross Anatomy of Large Intestine

Ascending colon

- Passes upwards from caecum to the level of the liver – turns to the left – **hepatic flexure** – becomes

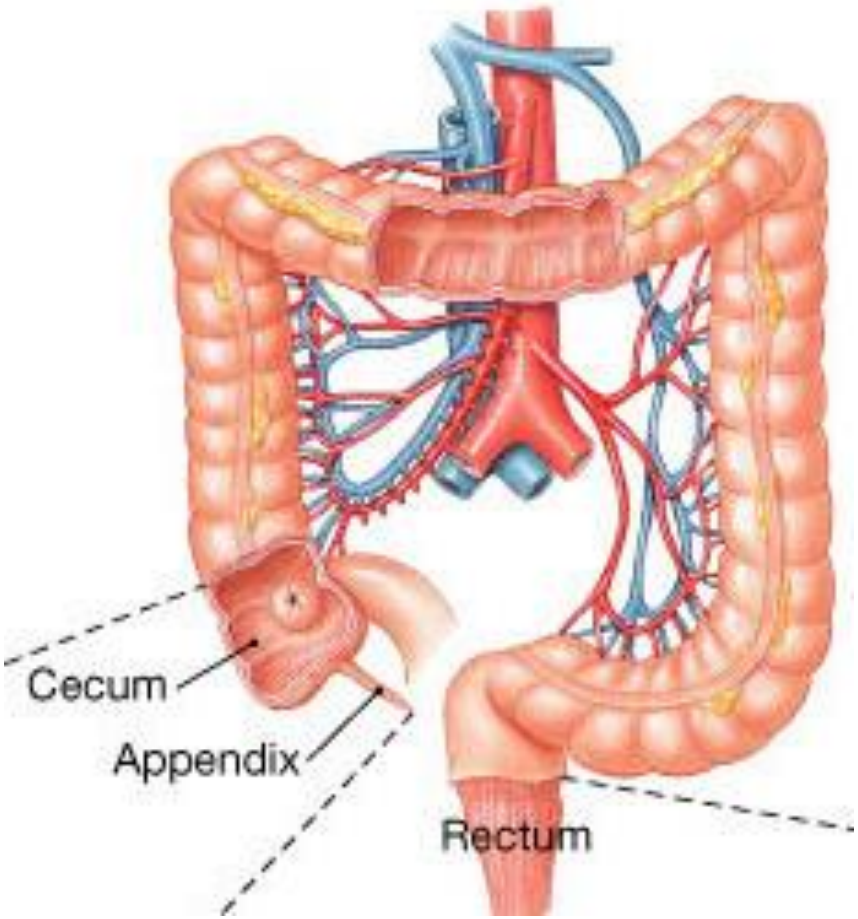
Transverse colon

- A loop curved downwards across the abdomen upto spleen – turns downwards – **splenic flexure** – becomes

Descending colon

- Passes down from splenic flexure situated on the left side of the abdomen.

- In the true pelvic cavity it is called **sigmoid** or **pelvic colon**



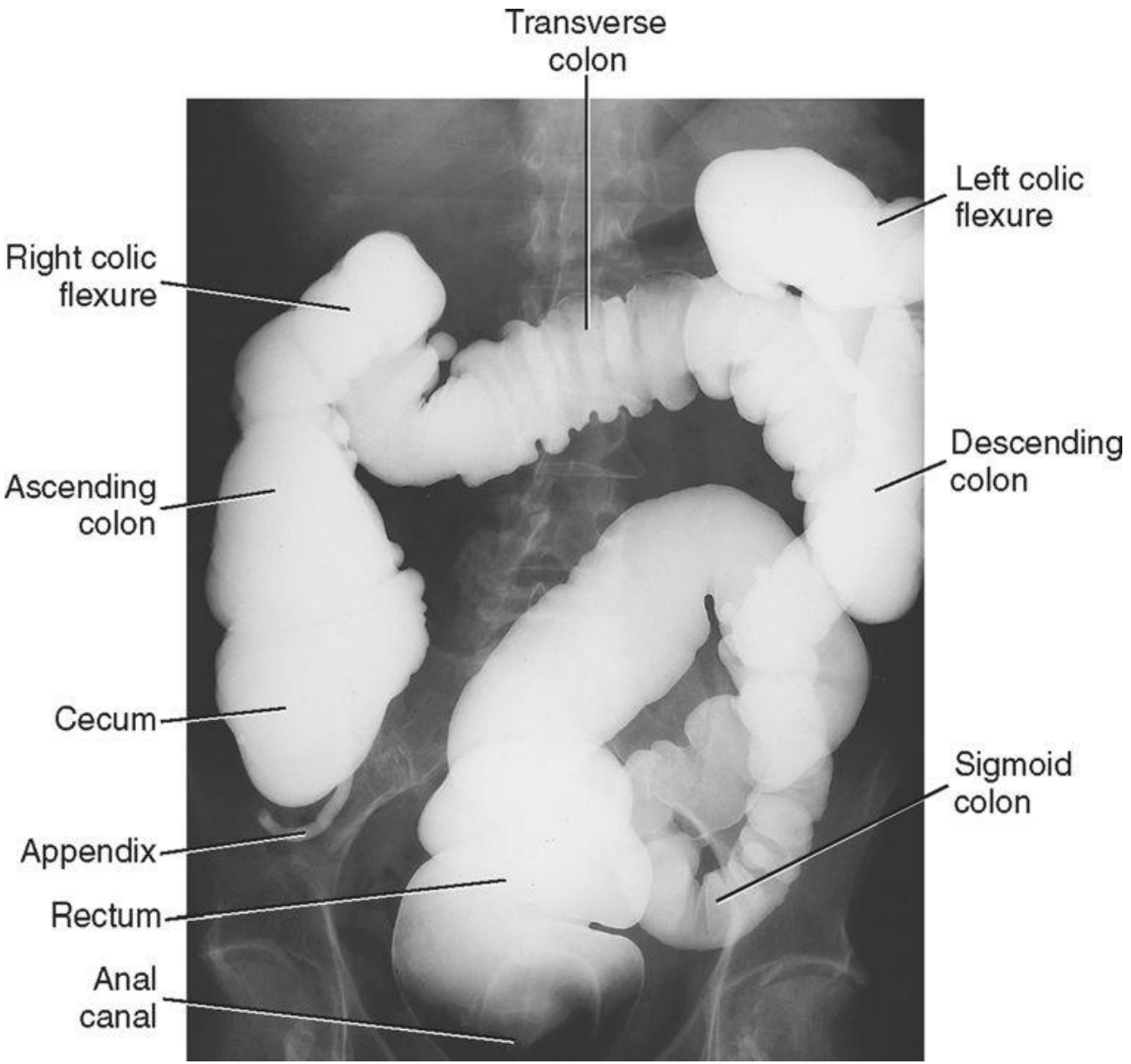
CECUM, ASCENDING & DESCENDING COLON

- **POSTERIOR RELATIONS:**
- **Cecum:** psoas major, genitofemoral nerve, iliacus, lateral cutaneous nerve of thigh, femoral nerve
- **Ascending colon:** iliacus, lateral cutaneous nerve of thigh, quadratus lumborum, ilioinguial nerve, iliohypogastric nerve, iliac crest, origin of transversus abdominis from lumbar fascia
- **Descending colon: relations of cecum + relations of ascending colon + left kidney**

RELATIONS OF TRANSVERSE COLON

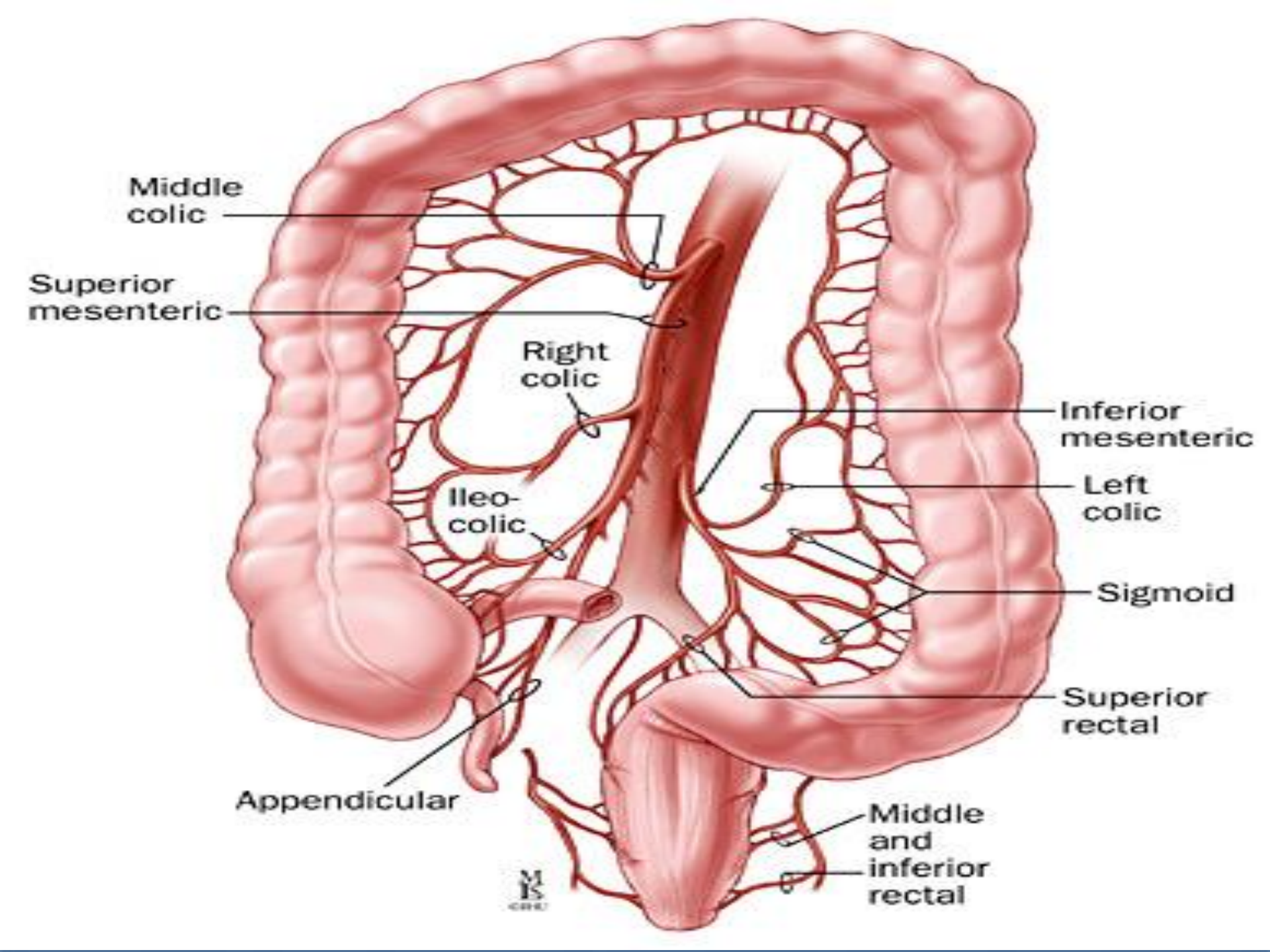
- **ANTERIOR:** greater omentum, anterior abdominal wall
- **POSTERIOR:** 2nd part of duodenum, head of pancreas, coils of small intestine
- **SUPERIOR:** liver, gall bladder, stomach
- **INFERIOR:** coils of small intestine

The Large Intestine (Intestinum Crassum)



Arterial Supply

- **SMA** -
  - Ileocolic artery (absent in up to 20% of people), terminal ileum and proximal ascending colon
  - Right colic artery - ascending colon
  - Middle colic artery - transverse colon
- **IMA** -
  - Left colic artery - descending colon
  - Sigmoidal branches - sigmoid colon
  - Superior rectal artery - proximal rectum
  - Communicate via the marginal artery of Drummond, complete in only 15 to 20% of people


Middle colic
Superior mesenteric
Right colic
Ileo-colic
Appendicular
Inferior mesenteric
Left colic
Sigmoid
Superior rectal
Middle and inferior rectal

Veins, Lymphatics, and Innervation

Veins

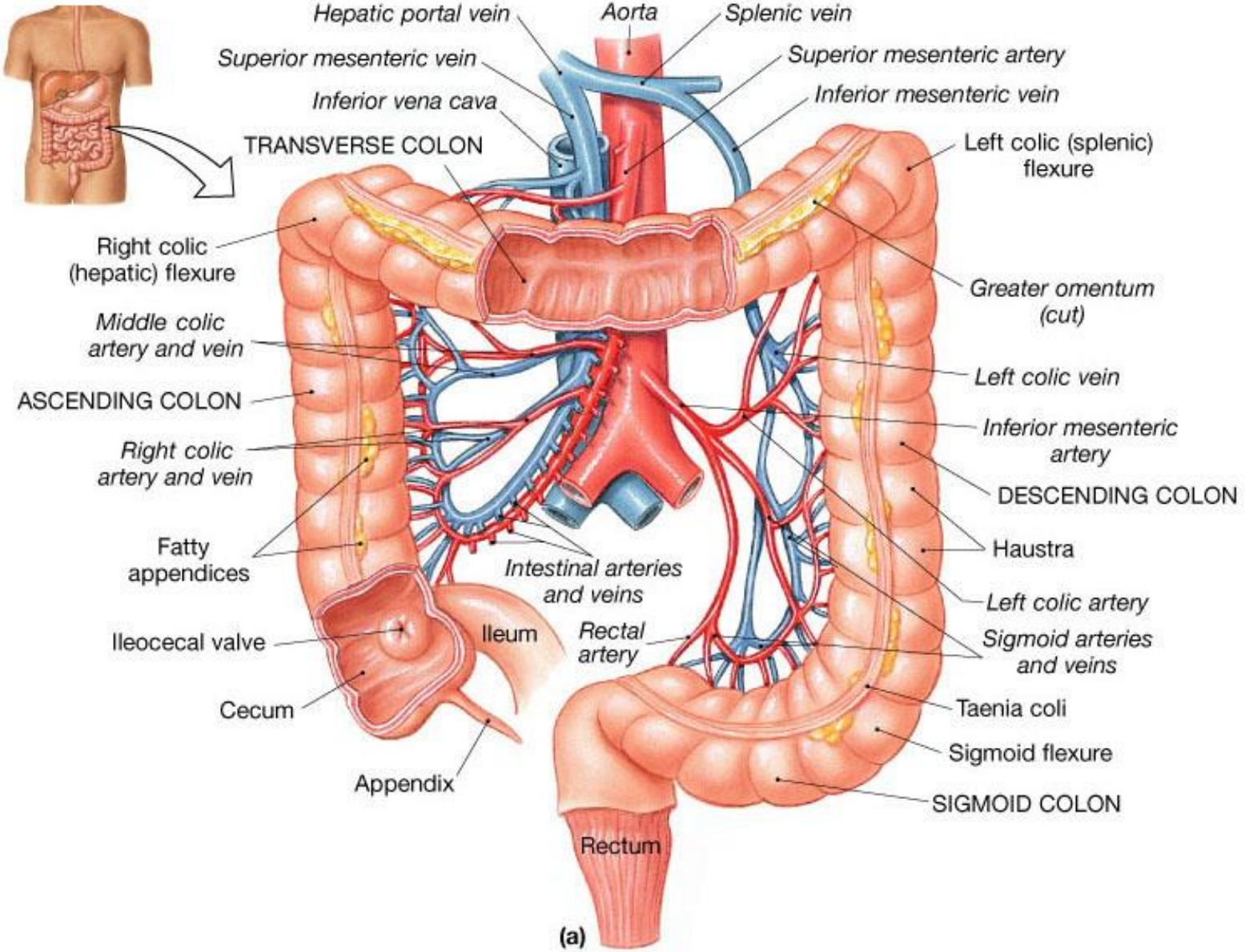
- Veins of the colon parallel their corresponding arteries (except IMV)
- Inferior mesenteric vein ascends in the retroperitoneal plane over the psoas muscle, posterior to the pancreas to join the splenic vein

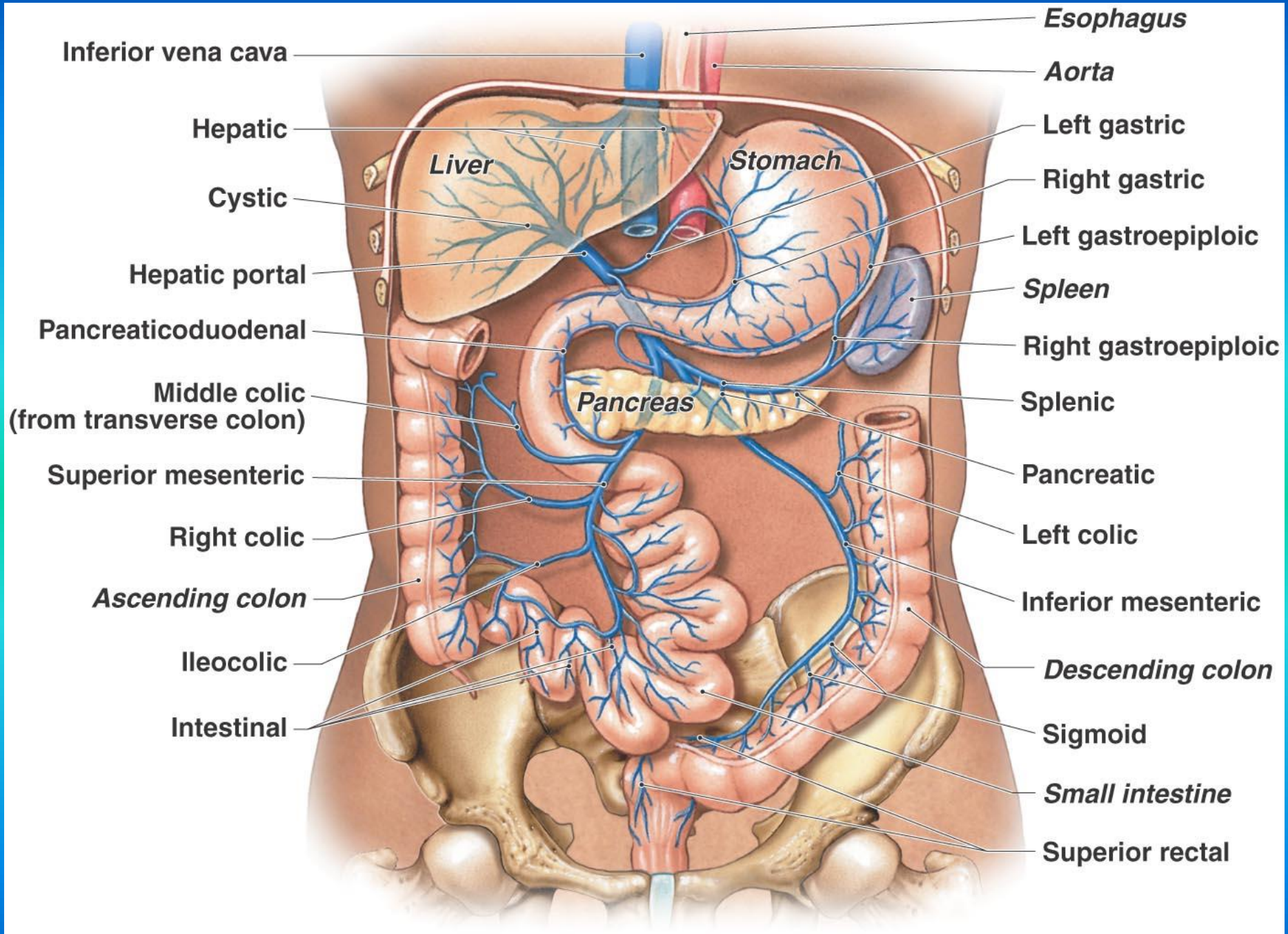
Lymphatic Drainage

- Muscularis mucosa -> follow the regional arteries. Lymph nodes are found on the bowel wall (epicolic), along the inner margin of the bowel adjacent to the arterial arcades (paracolic), around the named mesenteric vessels (intermediate), and at the origin of the superior and inferior mesenteric arteries (main).

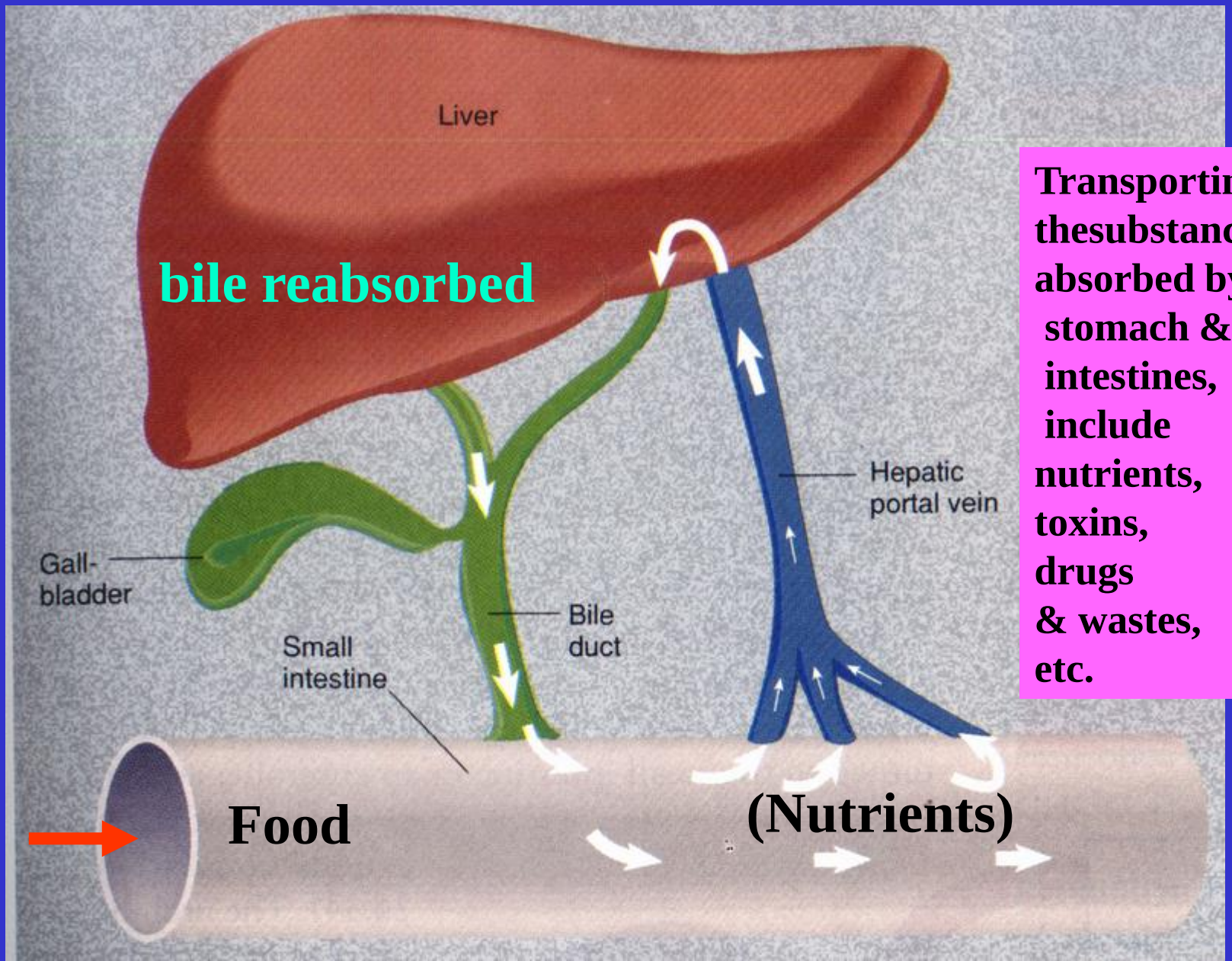
Nerve Supply

- Sympathetic nerves arise from T6–T12 and L1–L3. Vagus nerve ->parasympathetic innervation to the right and transverse colon; parasympathetic nerves to the left colon arise from sacral nerves S2–S4 .


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
Fatty appendices
Haustra
Intestinal arteries and veins
Left colic artery
Ileocecal valve
Ileum
Rectal artery
Sigmoid arteries and veins
Cecum
Taenia coli
Sigmoid flexure
Appendix
SIGMOID COLON
Rectum
(a)



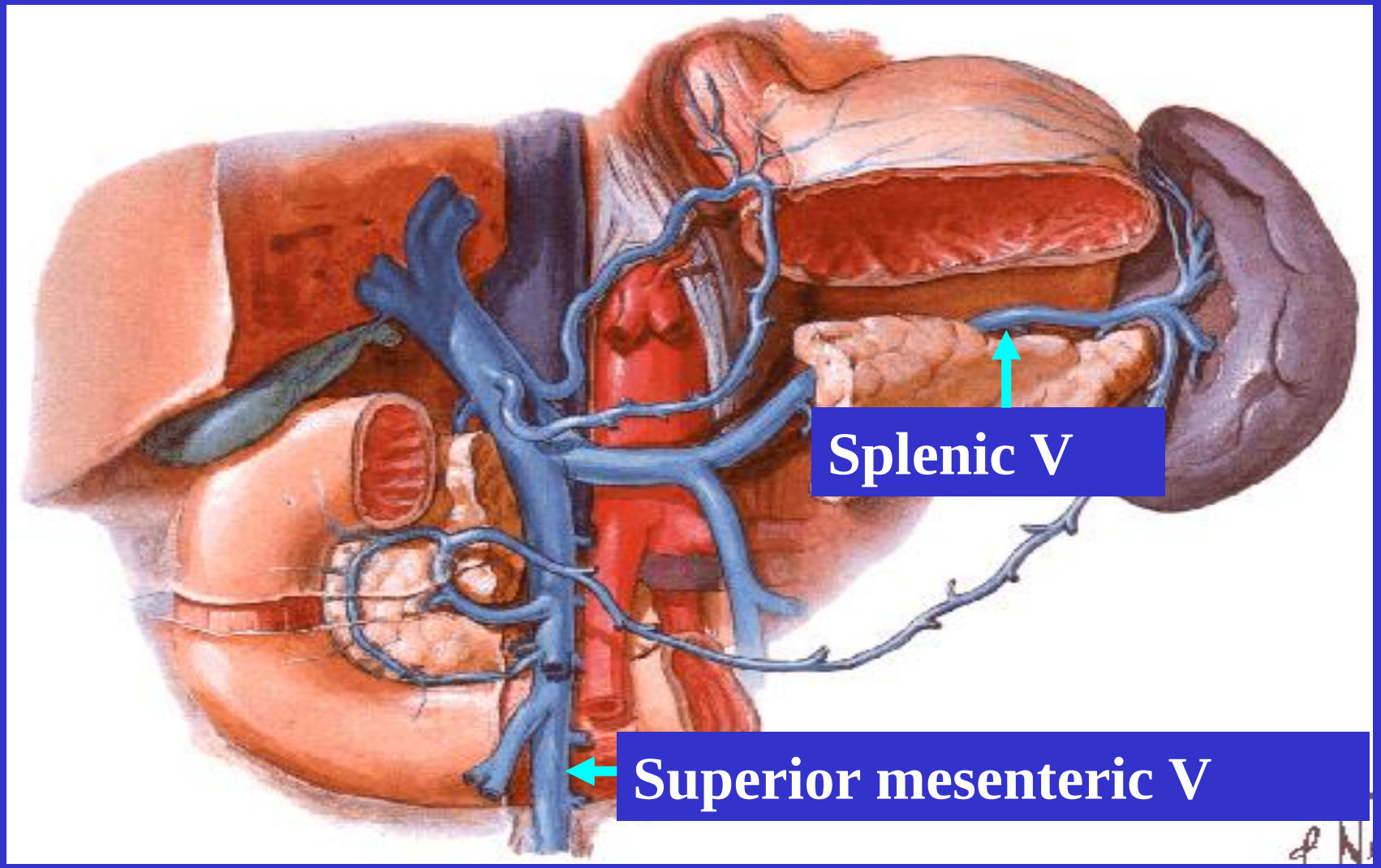
6. Characteristics of Hepatic Portal V



Transporting thesubstances absorbed by stomach & intestines, include nutrients, toxins, drugs & wastes, etc.

④ Hepatic Portal Vein

1. Composition: splenic V, superior mesenteric V (both union behind the head of pancreas)



4.Tributaries of Hepatic Portal Vein

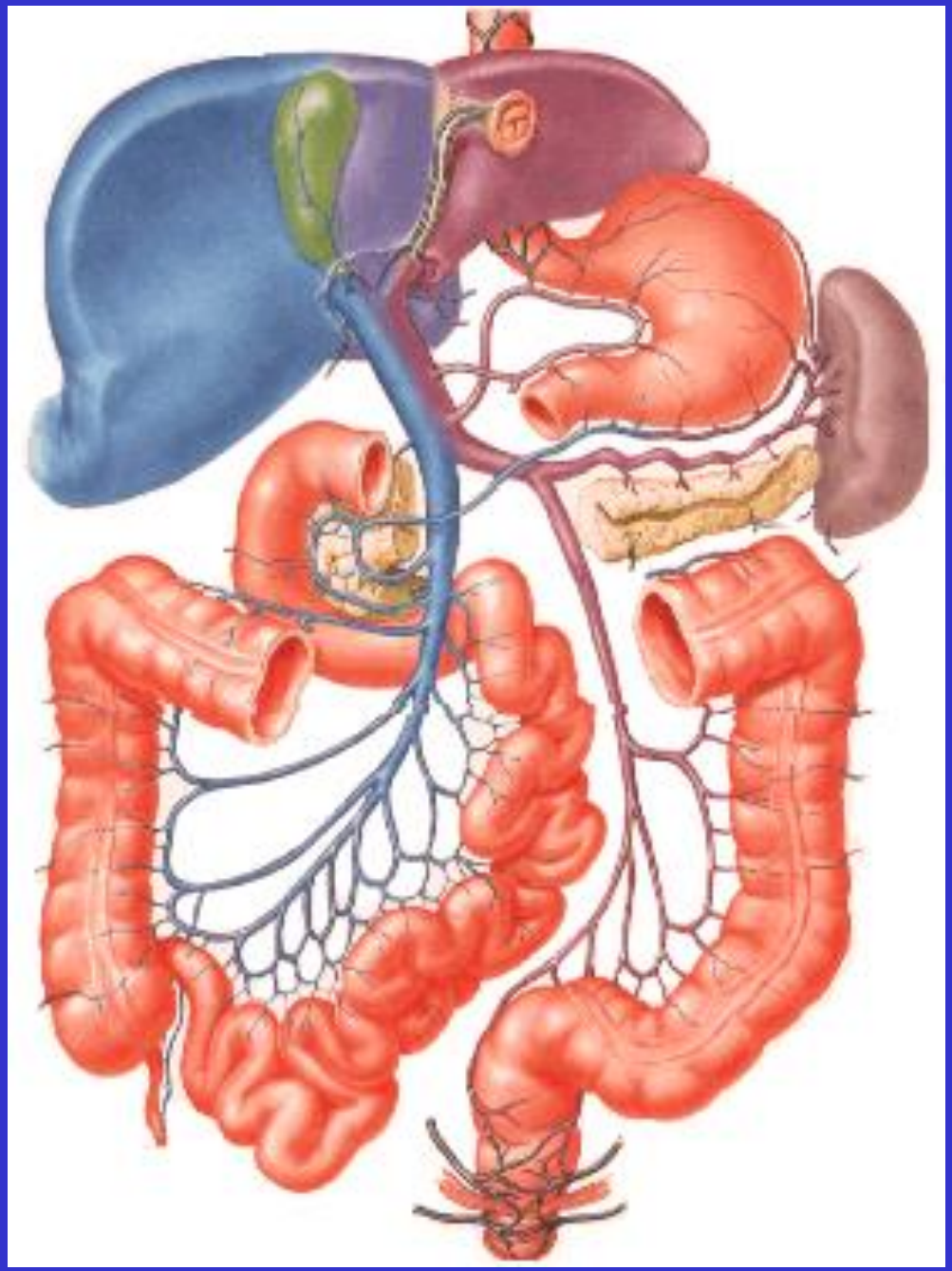
(1) Splenic V

(2) Superior mesenteric V

(3) Inferior mesenteric V

(4) Left gastric V

(5) Right gastric V



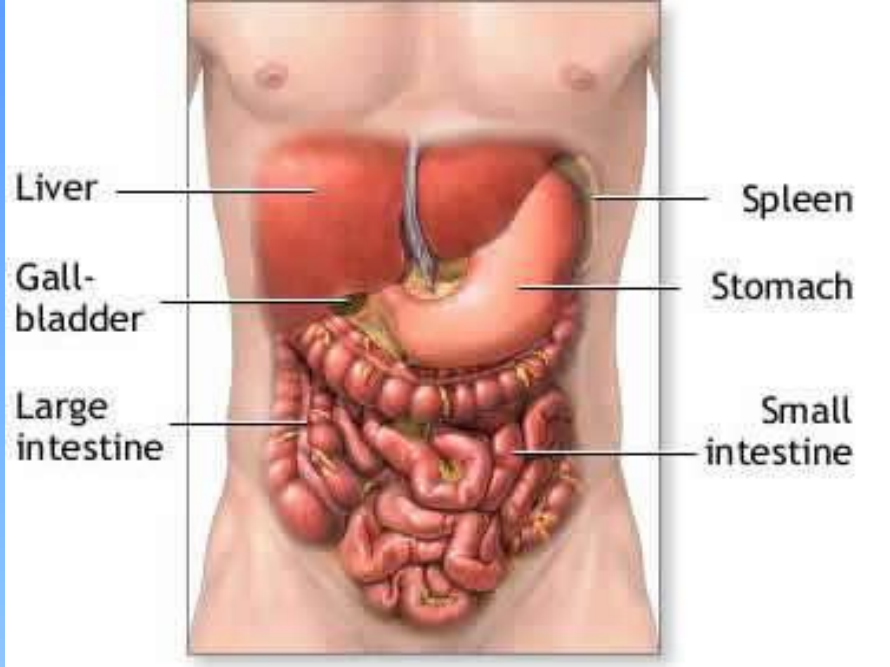
Liver

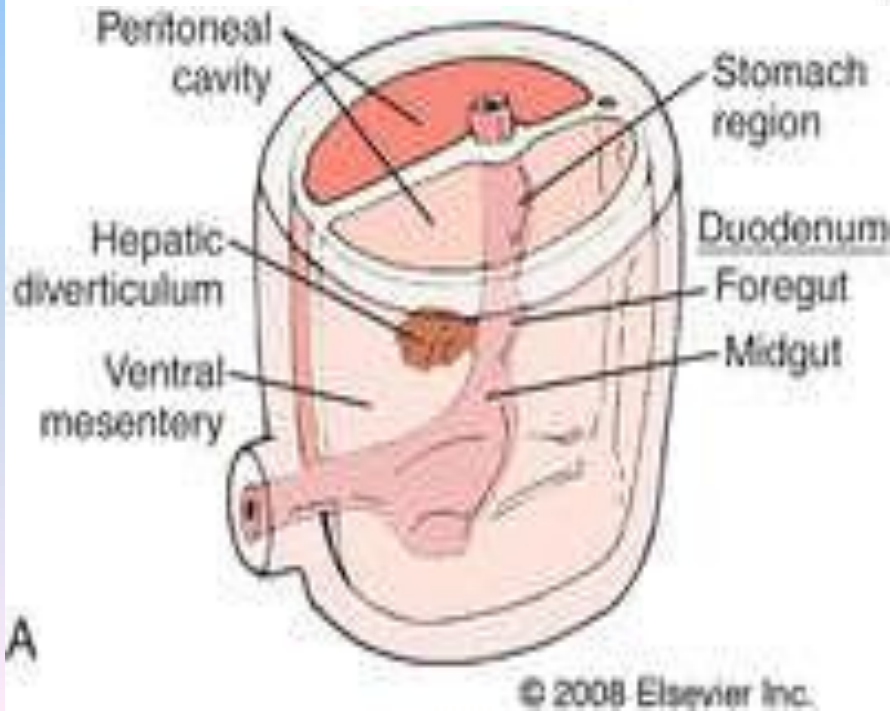
- Largest gland in the body (1.5 Kg)
- Under the diaphragm, within the rib cage in the upper right

quadrant of the abdomen

- **Function of the liver**

- **Secretion of bile & bile salt**
- **Metabolism of carbohydrate, fat and protein**
- **Formation of heparin & anticoagulant substances**
- **Detoxication**
- **Storage of glycogen and vitamins**
- **Activation of vita .D**



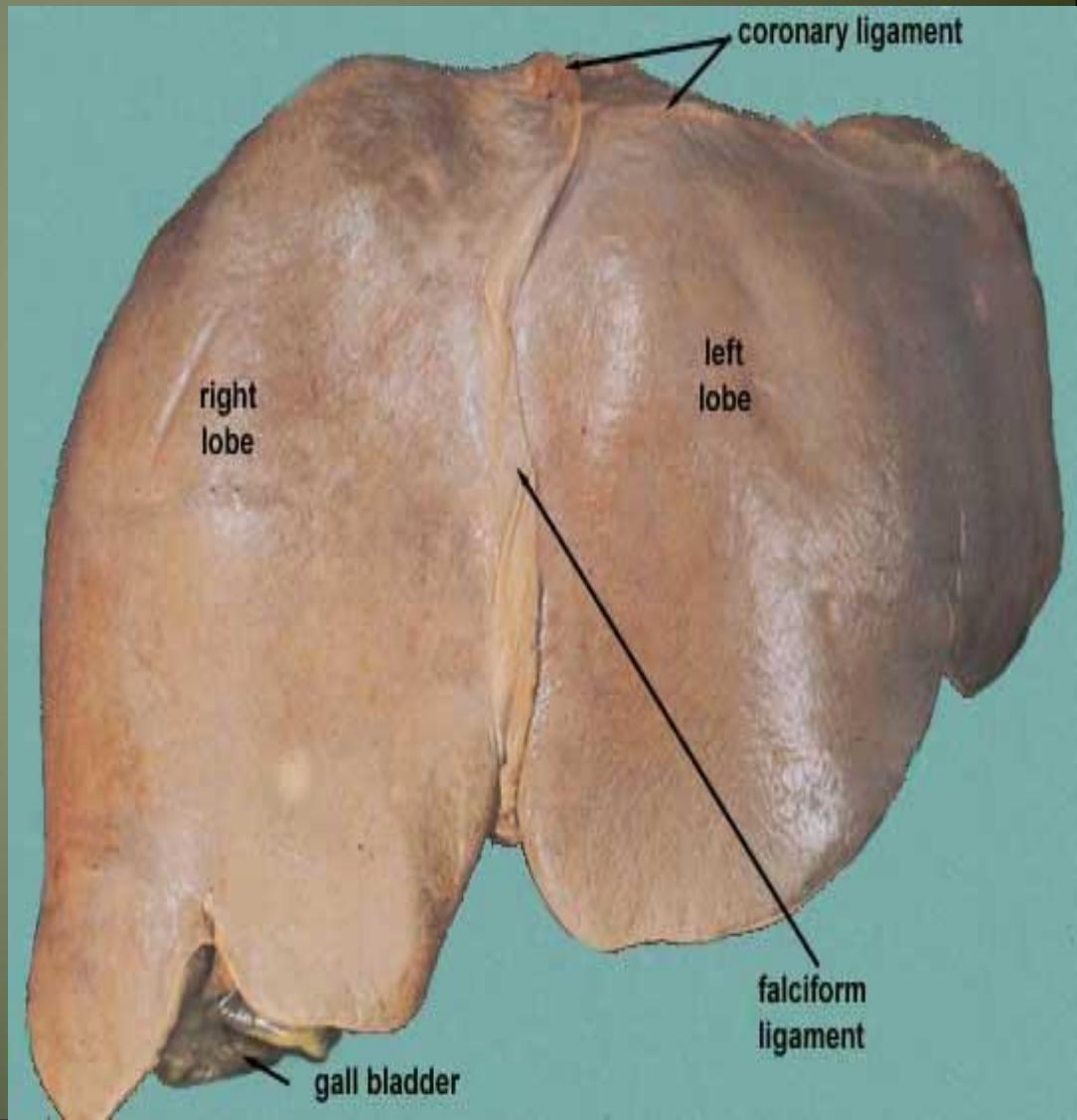


Relations of the liver Anteriorly

- Diaphragm
- Rt & Lt pleura and lung
- Costal cartilage
- Xiphoid process
- Ant. abdominal wall

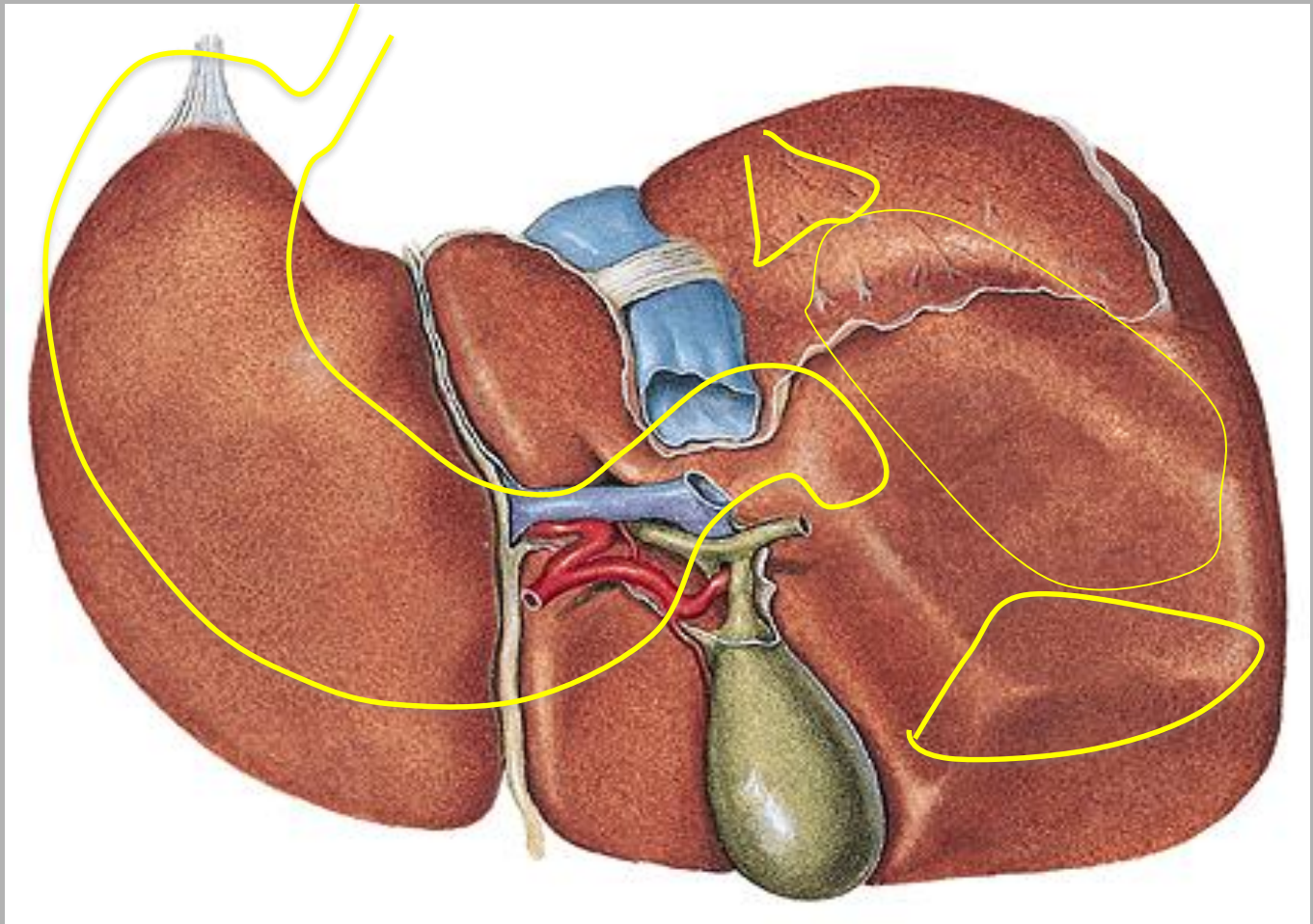
Ant. View of the liver

- Right lobe
- Cut edge of the Falciform ligament left lobe
- Diverging cut edges of the superior part of the coronary ligament
- Fundus of the gall bladder

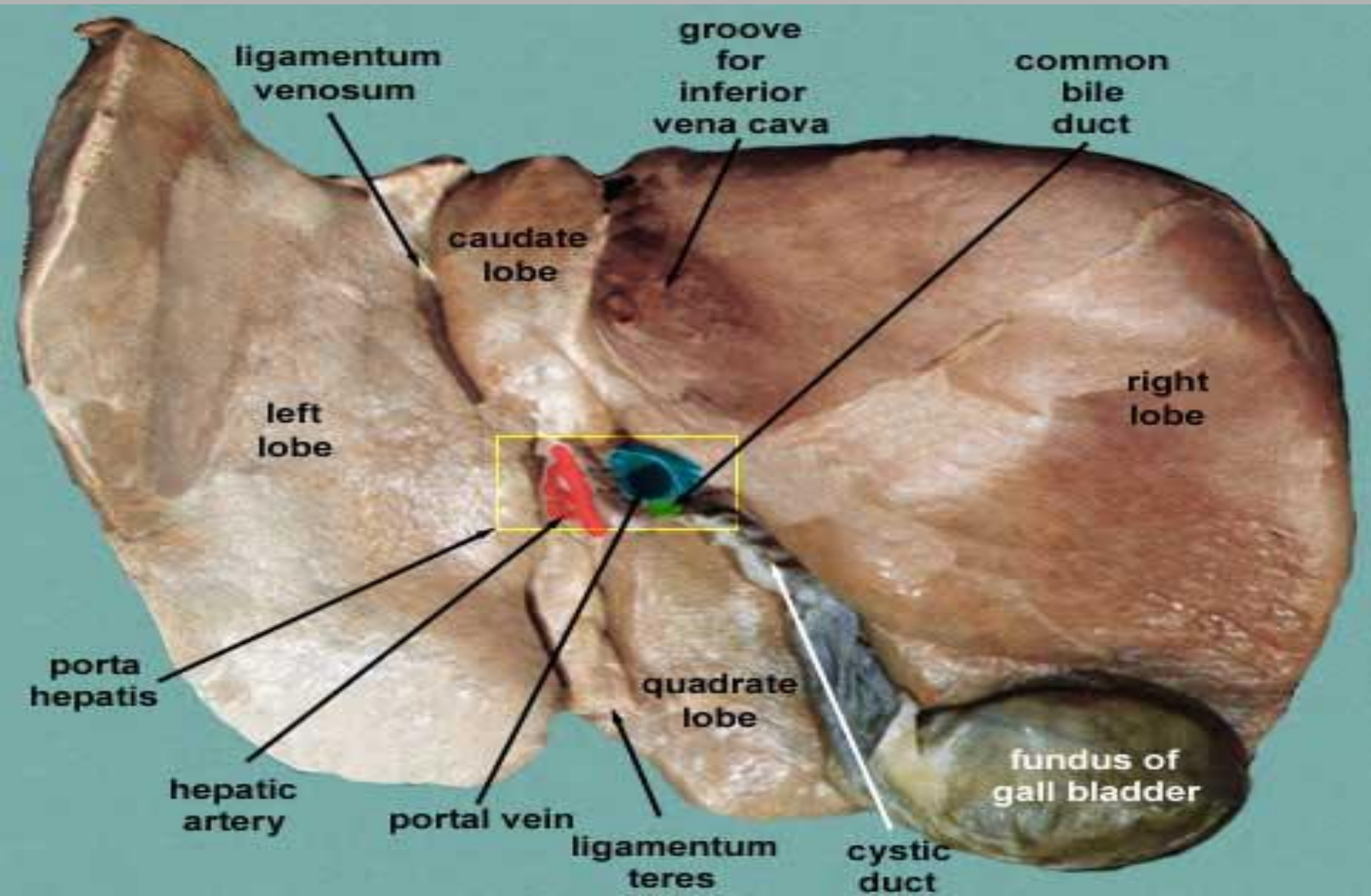


Visceral surface of the liver

Porta hepatis – a central depression for the passage of the portal vein, hepatic artery and common bile duct
Anterior to this is the gallbladder fossa with the quadrate lobe to its left
Posteriorly the caudate lobe separates the porta from IVC
Several shallow impressions relate to the shape of adjacent organs



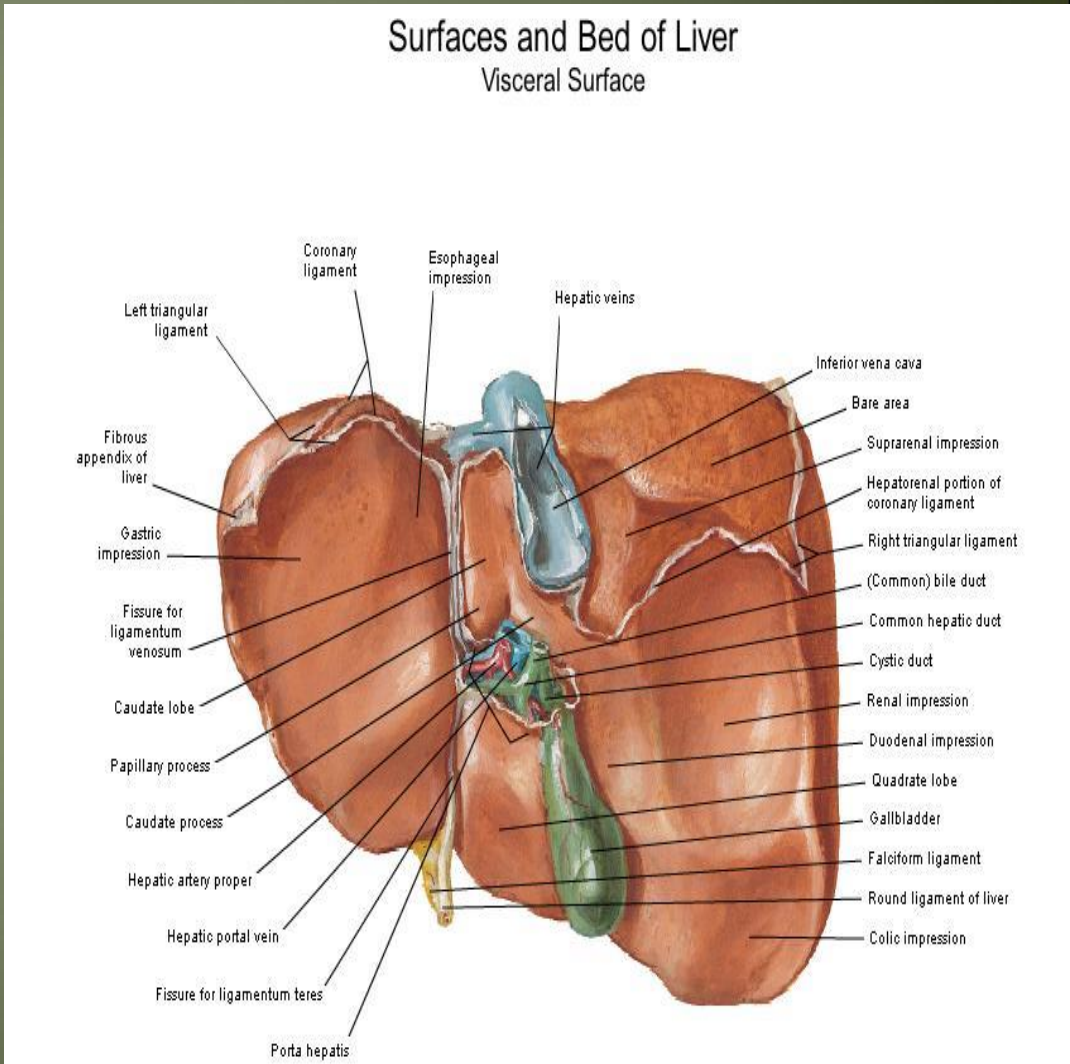
Visceral surface of the liver

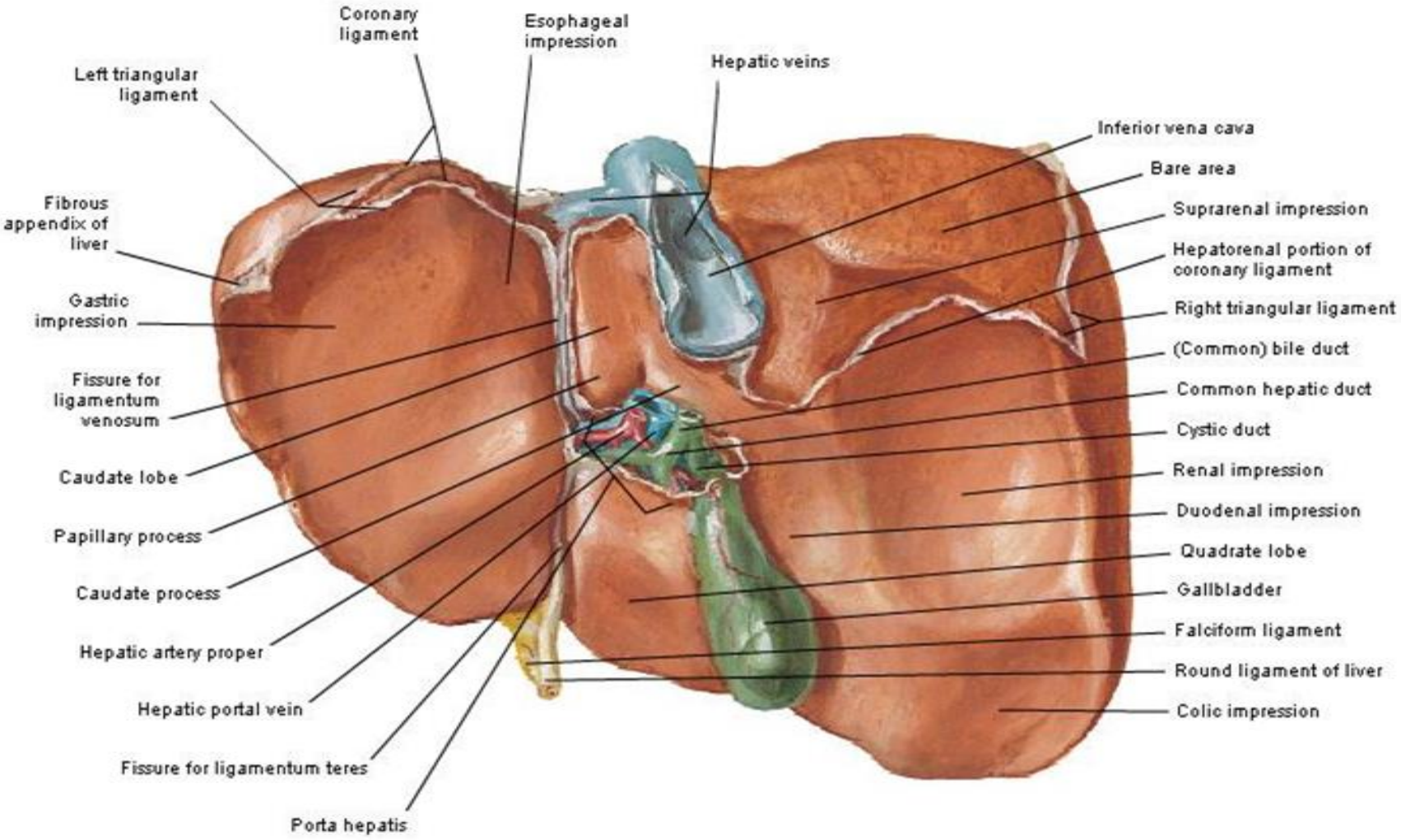


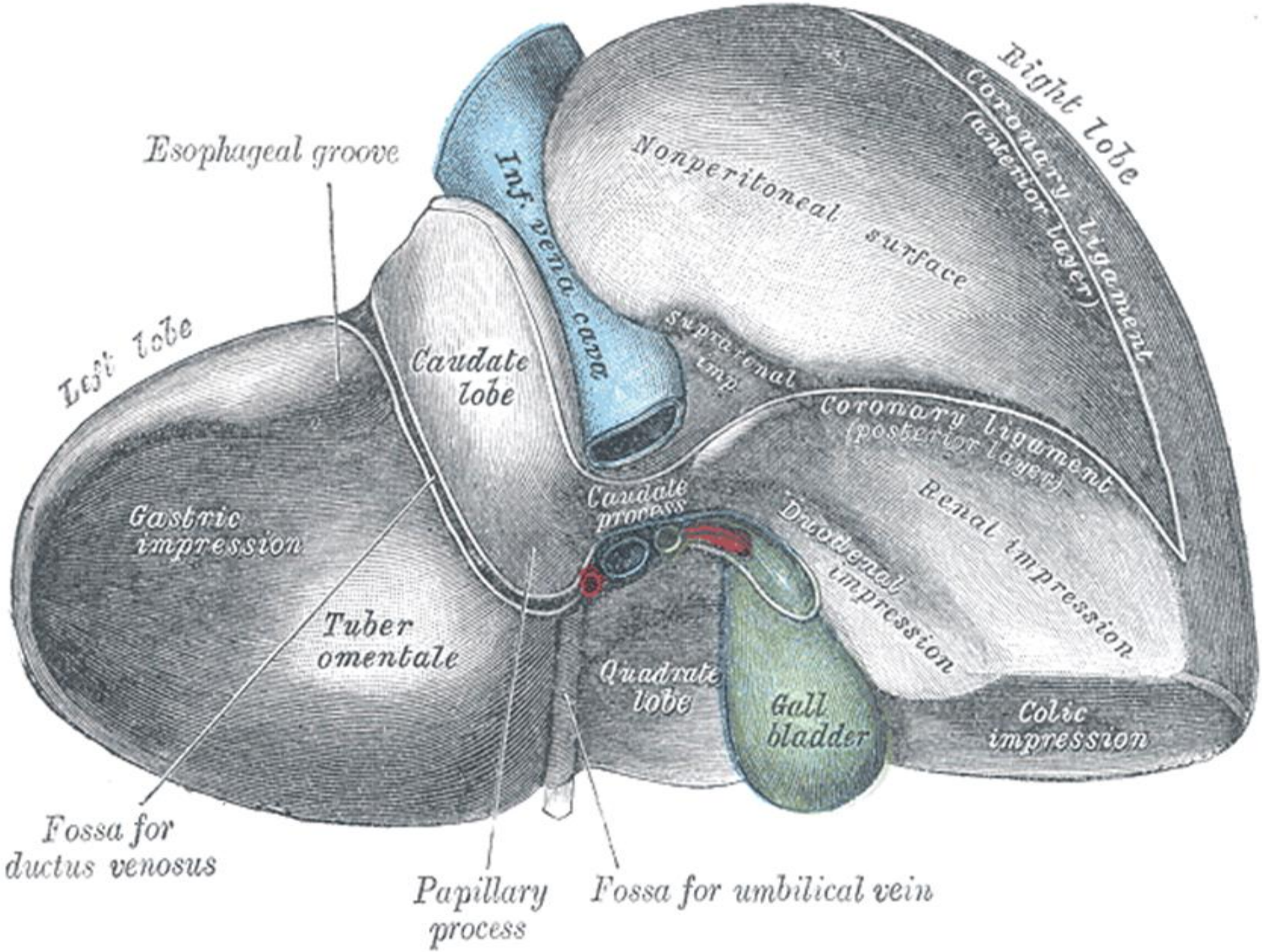
Postero- infero surface= visceral surface

Relations

- I.V.C
- the esophagus
- the stomach
- the duodenum
- the right colic flexure
- the right kidney
- Rt. Suprarenal gland
- the gallbladder.
- Porta hepatic(bile duct,H.a.H.V)
- Fissure for lig. Venoosum & lesser omentum
- Tubular omentum
- Lig.teres




Coronary ligament
Esophageal impression
Hepatic veins
Left triangular ligament
Inferior vena cava
Bare area
Fibrous appendix of liver
Suprarenal impression
Hepatorenal portion of coronary ligament
Gastric impression
Right triangular ligament
(Common) bile duct
Fissure for ligamentum venosum
Common hepatic duct
Cystic duct
Caudate lobe
Renal impression
Papillary process
Duodenal impression
Caudate process
Quadrate lobe
Gallbladder
Hepatic artery proper
Falciform ligament
Round ligament of liver
Hepatic portal vein
Colic impression
Fissure for ligamentum teres
Porta hepatis

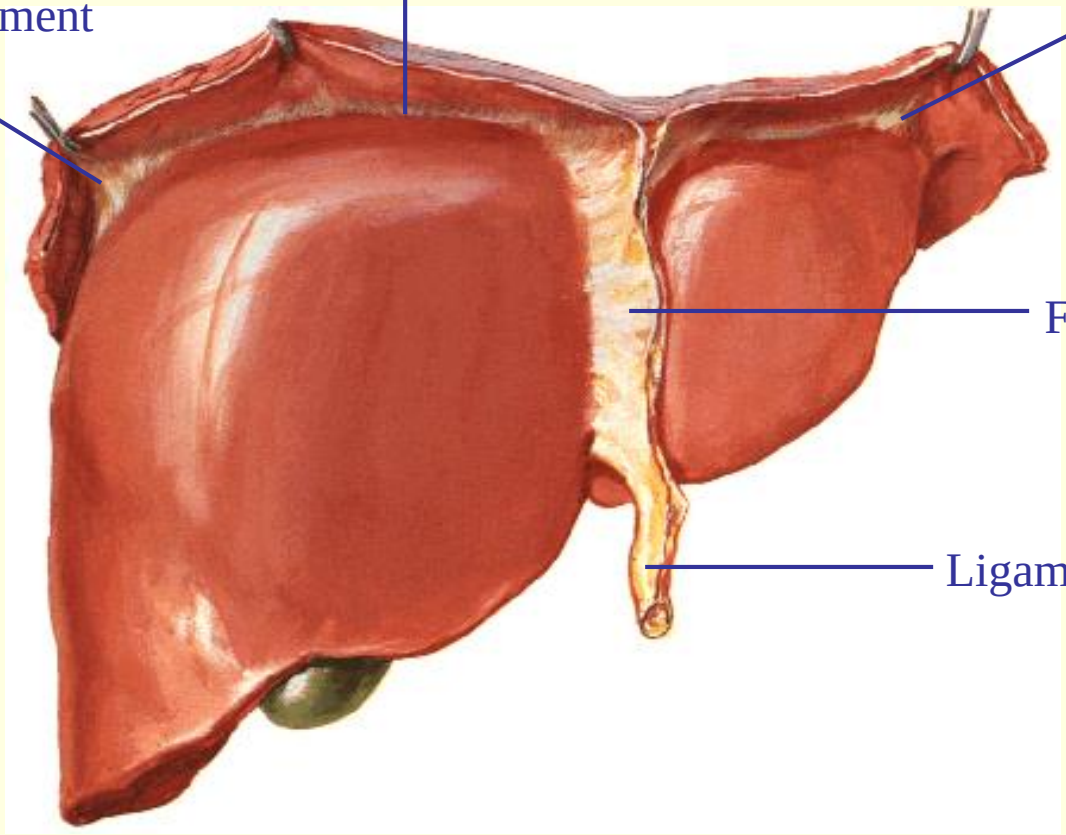

Esophageal groove
Inf. vena cava
Nonperitoneal surface
Right lobe
Coronary ligament (anterior layer)
Left lobe
Caudate lobe
Suprarenal impr.
Coronary ligament (posterior layer)
Caudate process
Renal impression
Duodenal impression
Gastric impression
Tuber omentale
Quadrate lobe
Gall bladder
Colic impression
Fossa for ductus venosus
Papillary process
Fossa for umbilical vein

1. The ligaments of the liver

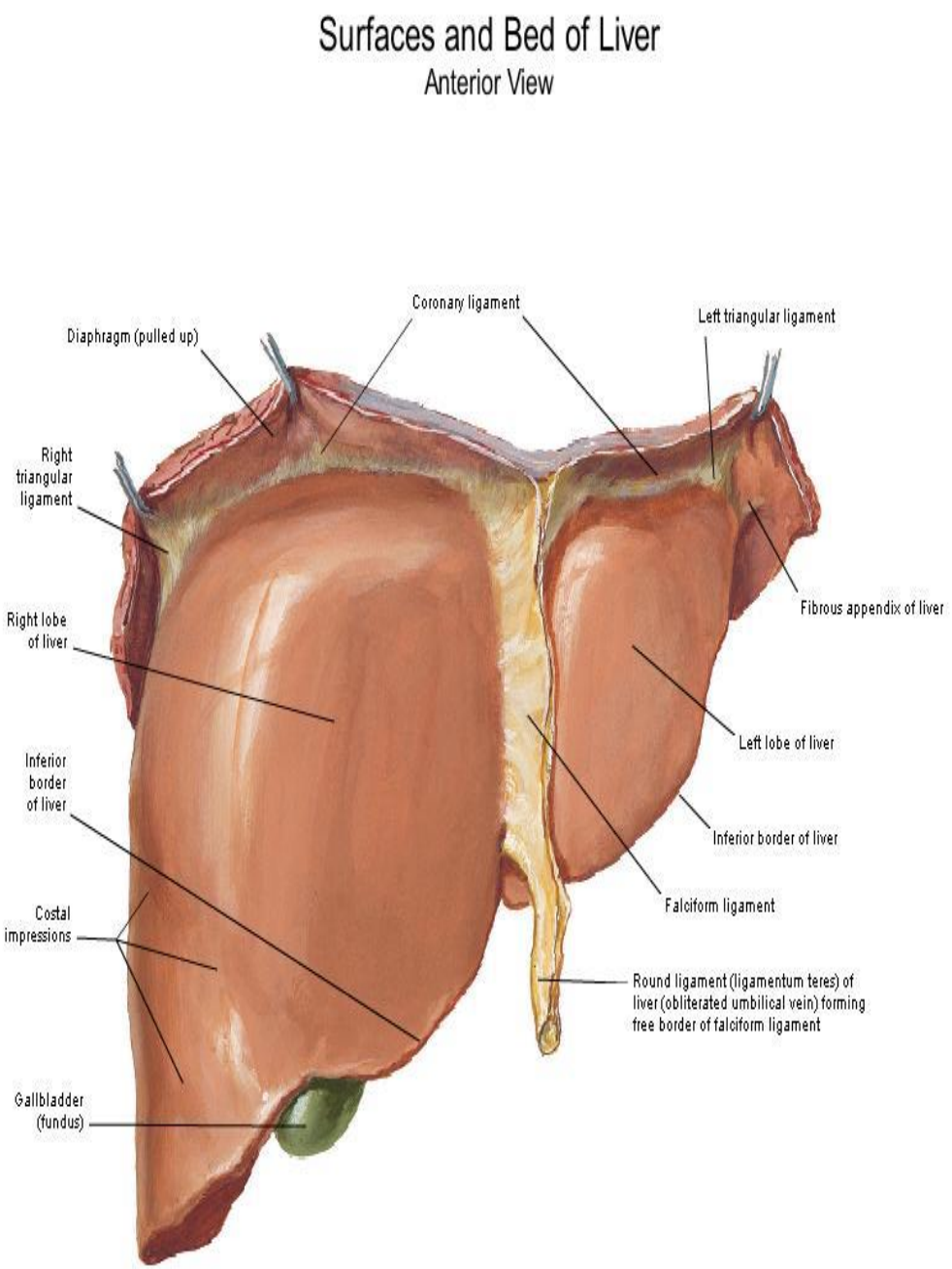
1- The **Falciform ligament of liver**
2- The **Ligamentum teres hepatis**
3- The **coronary ligament**
4- The **right triangular ligament**
5- The **left triangular ligament**
6- The **Hepatogastric ligament**
7- The **hepatoduonedenal ligament**
8- The Ligamentum Venoosum

III) The ligaments

1. The ligments of the liver

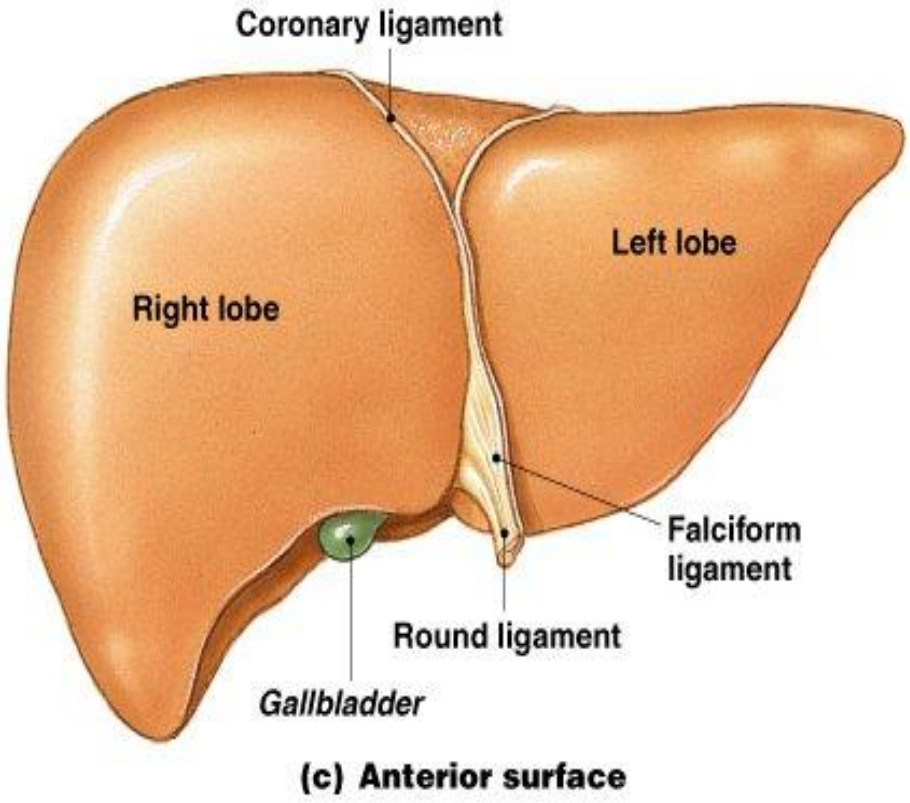


- **Falciform ligament of liver**
  - Consists of double peritoneal layer
  - Sickle shape
  - Extends from anterior abdominal wall (umbilicus) to liver
  - Free border of the ligament contains Ligamentum teres (obliterated umbilical vein)



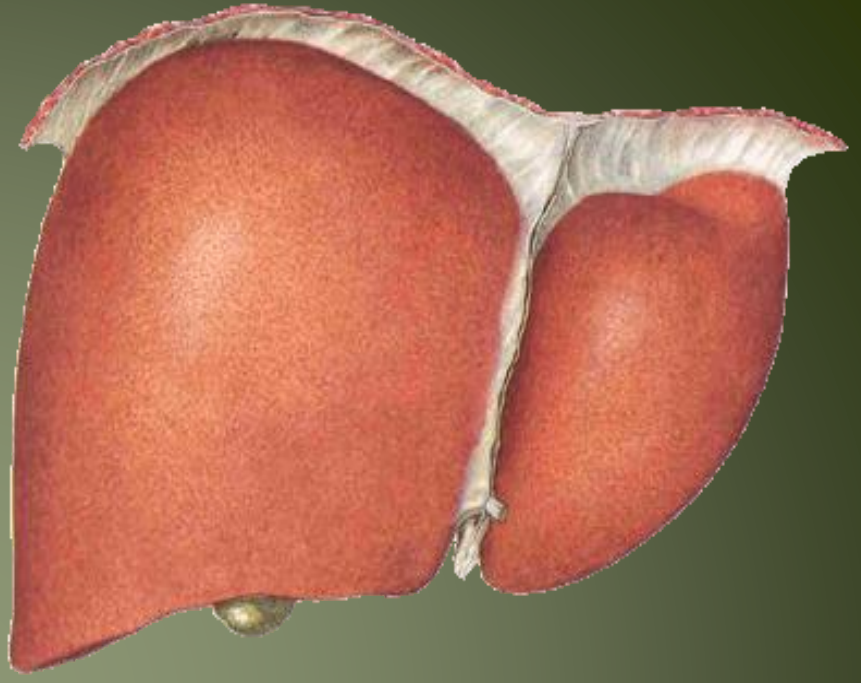
Peritoneal folds related to the Liver

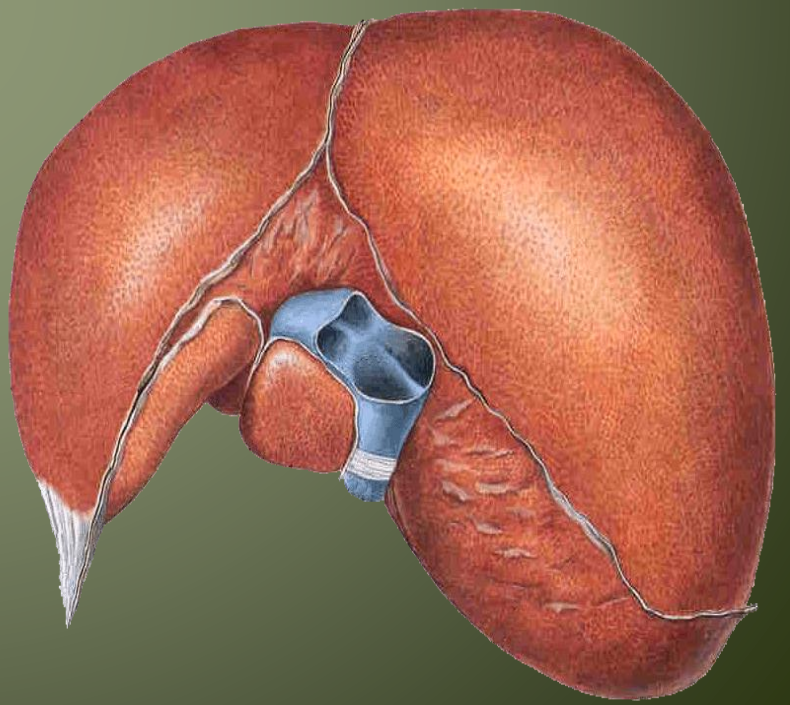
- The Falciform ligament:
  Passes from the parietal peritoneum on the anterior abdominal wall to the visceral peritoneum on the surface of the liver.
- The round ligament of the liver (ligamentum teres hepatis):
- Is the obliterated umbilical vein and it is found in the inferior free margin of the Falciform ligament.



- **Coronary ligament**
  the area between upper and lower layer of the coronary ligament is the bare area of liver which contract with the diaphragm;

- **Left and right triangular ligaments** formed by left and right extremity of coronary ligament

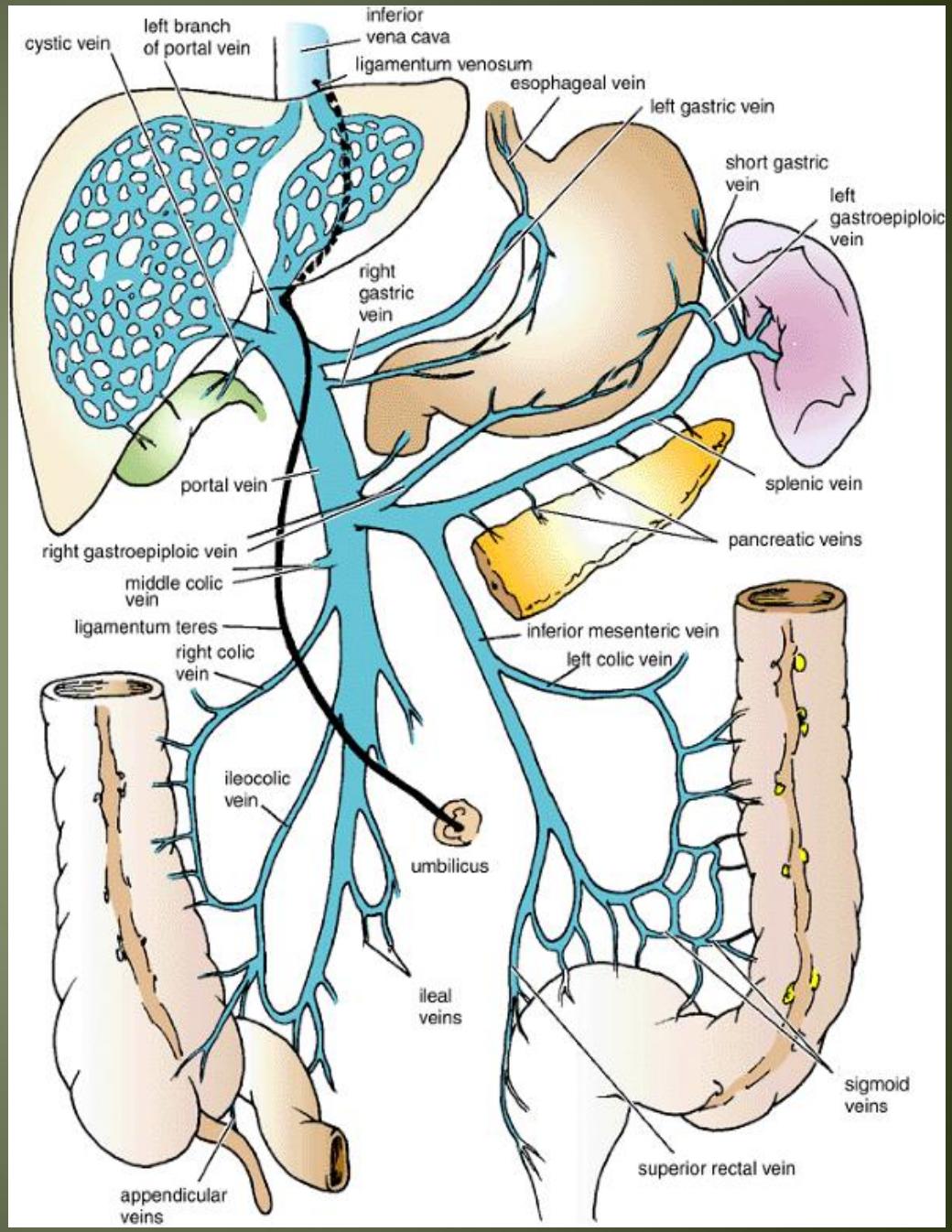




The Ligamentum Venoosum

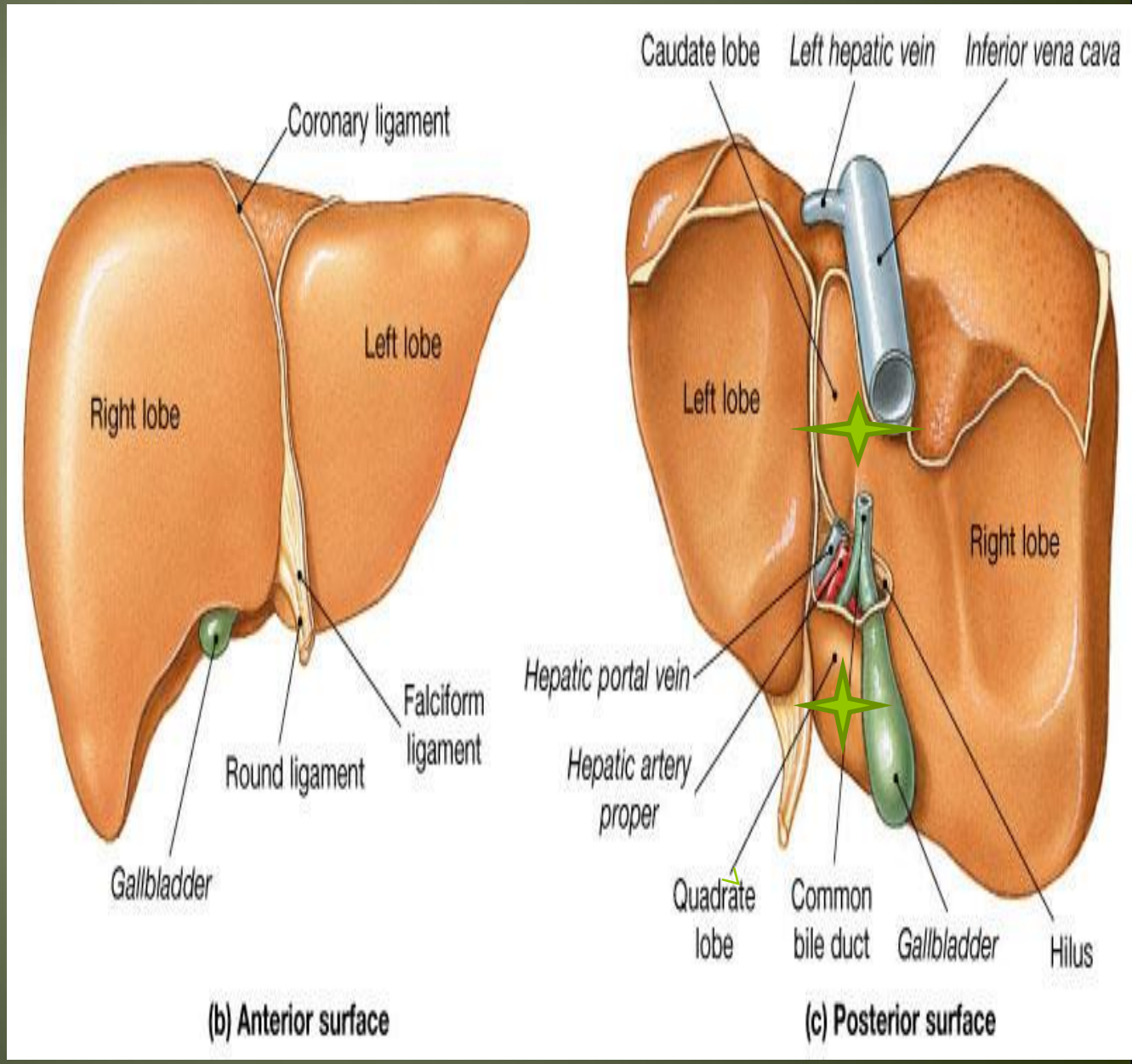
-Fibrous band that is the remains of the ductus venosus

- Is attached to the left branch of the portal vein and ascends in a fissure on the visceral surface of the liver to be attached above to the inferior vena cava



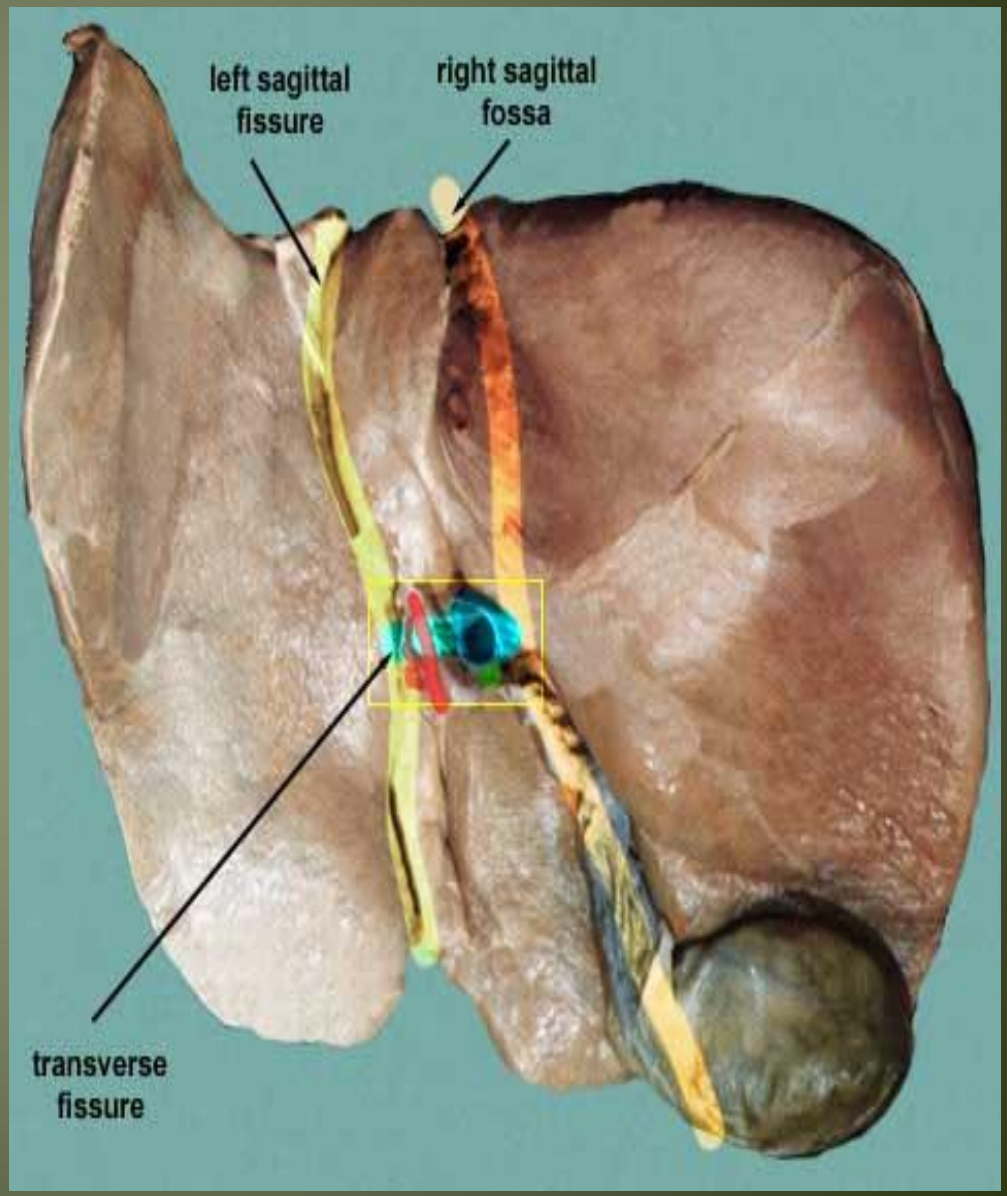
Lobes of the liver

- Rt. Lobe
- Lt .lobe
- Quadrate lobe
- Caudate lobe



Separation of the four lobes of the liver:

- Right sagittal fossa - groove for inferior vena cava and gall bladder
- left sagittal fissure - contains the Ligamentum Venoosum and round ligament of liver
- Transverse fissure (also porta hepatis) - bile ducts, portal vein, hepatic arteries

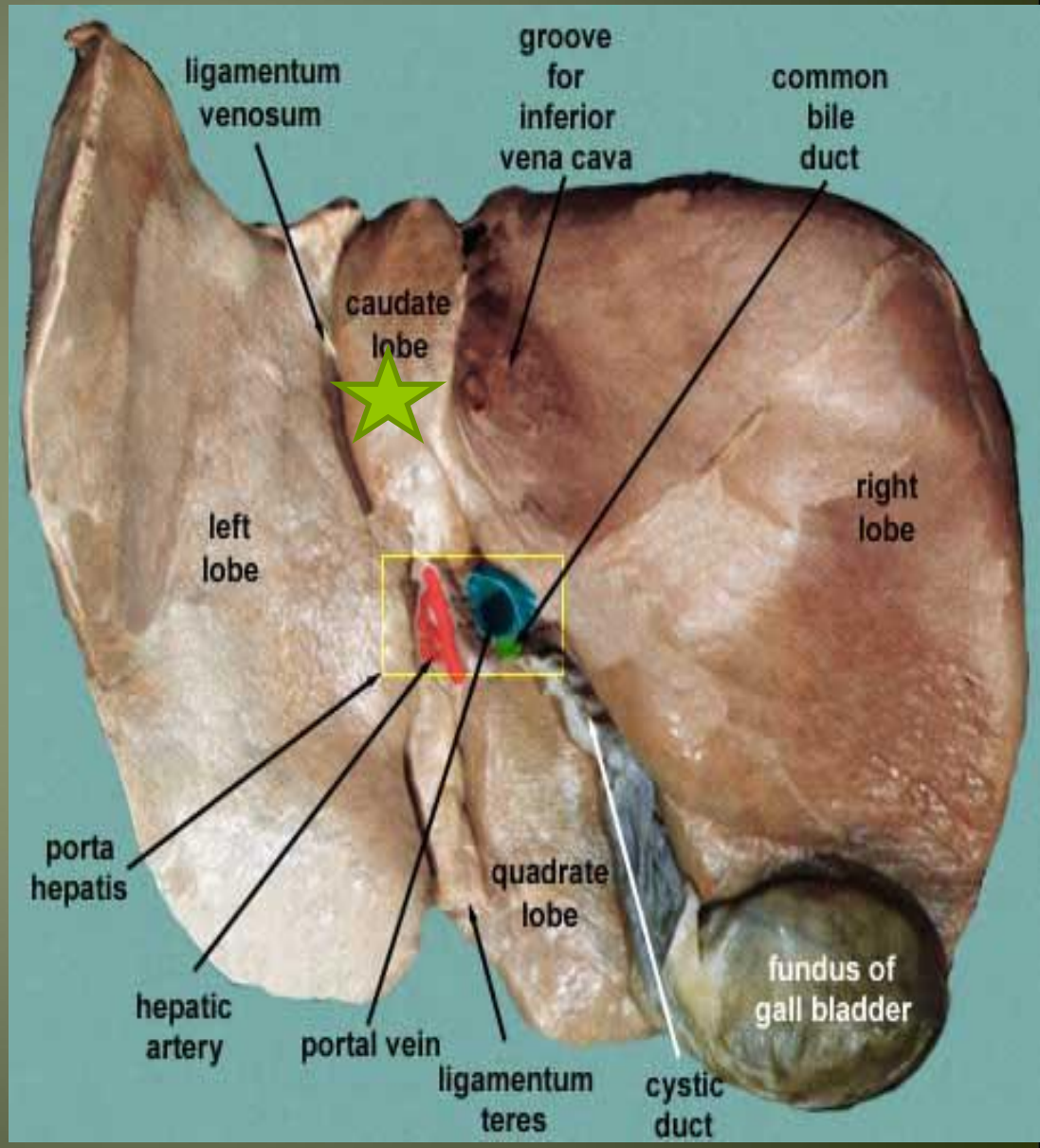


Caudate Lobe

-present in the posterior surface from the Rt. Lobe

Relations of caudate lobe

- Inf. → the porta hepatis
- The right → the fossa for the inferior vena cava
- The left →the fossa for the lig.venosum.

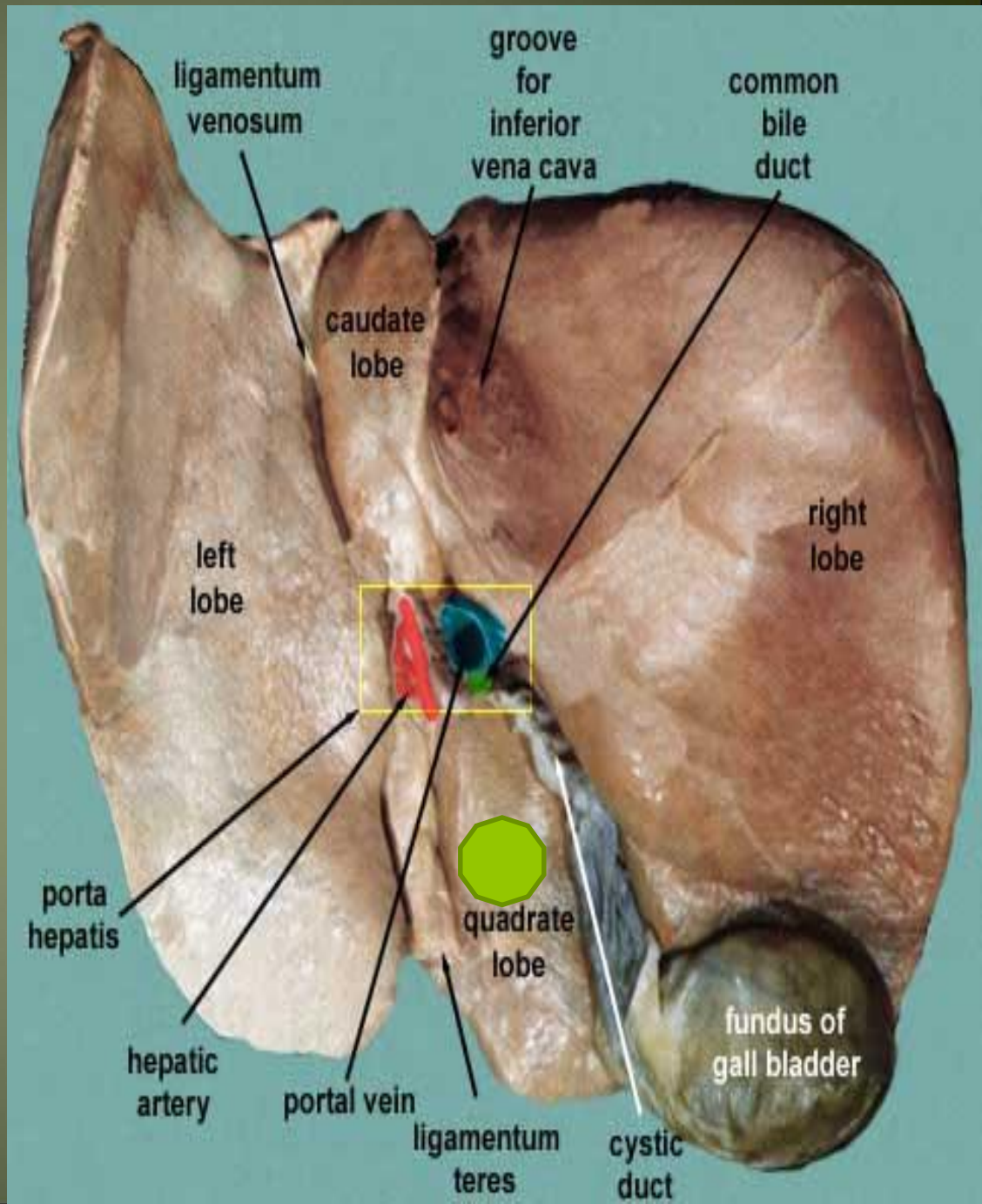


Quadrate lobe

Present on the inferior surface from the Rt. Lobe

Relation

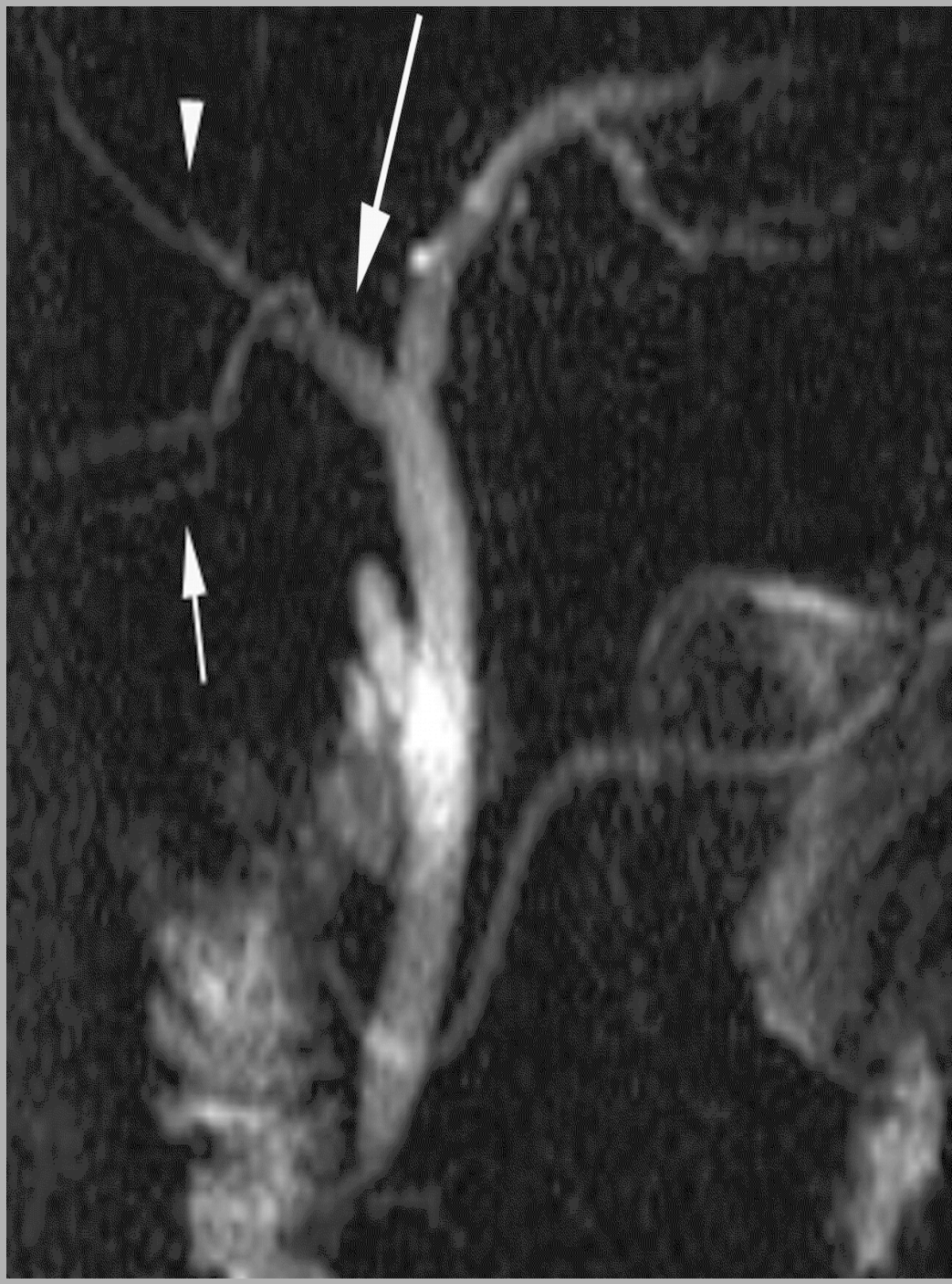
- **Ant.**→ anterior margin of the liver
- **Sup.**→ porta hepatis
- **Rt.** →fossa for the gallbladder
- **Lt**→ by the fossa for lig.teres



Biliary tract anatomy

The left hepatic duct drains 3 segmments of the left liver, and the right hepatic duct 4 segments of the right liver. The right hepatic duct arises from the union of two main sectorial ducts: an anterior division draining segments 5 and 8 and a posterior division draining 6 and 7.

The caudate lobe (segment 1) has a variable drainage pattern, but in the majority (78%) drainage is into both main ducts.



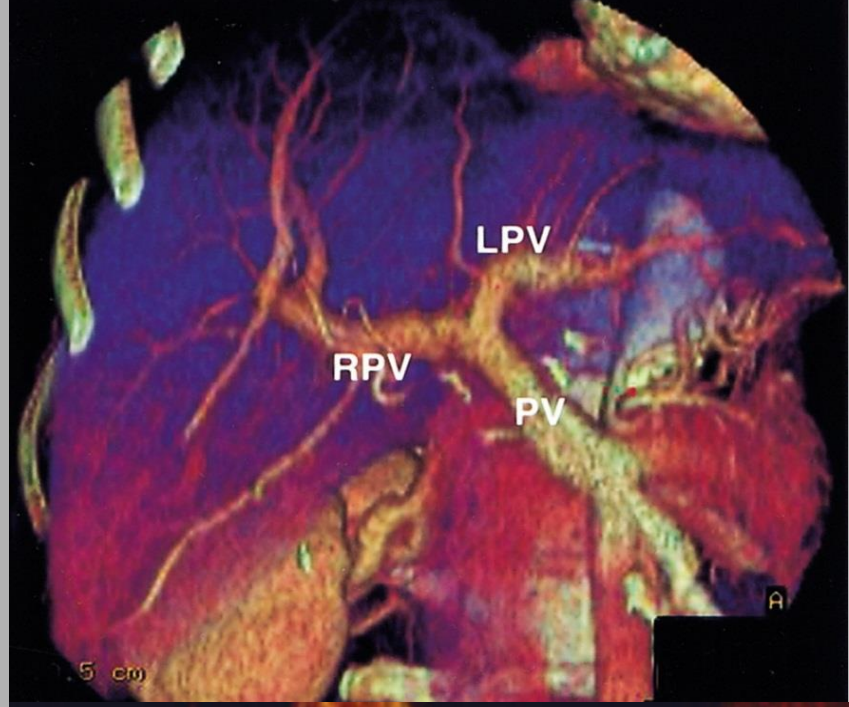
Liver vascular supply

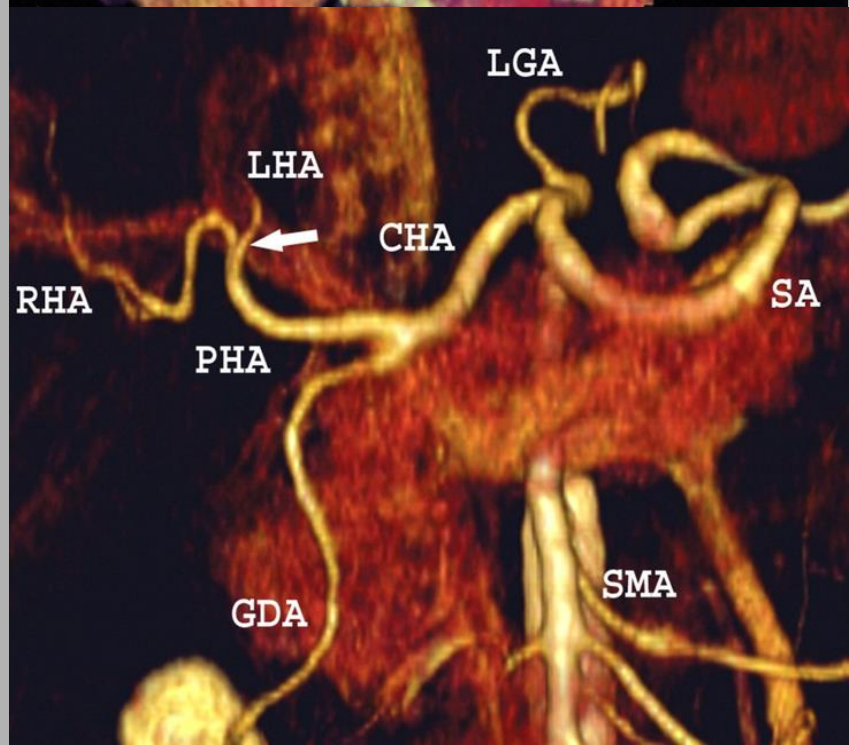
1- Portal supply:

The liver receives app. 2/3 of its blood supply from the portal vein.
Normally the superior mesenteric vein and splenic vein become confluent to form a single portal vein, which courses to the hepatic hilum and divides into the right end left branch.
Portal vein lenght – 6-7cm, diameter 6-13mm.

2- Arterial supply – hepatic artery proper 20- 30% of blood supply

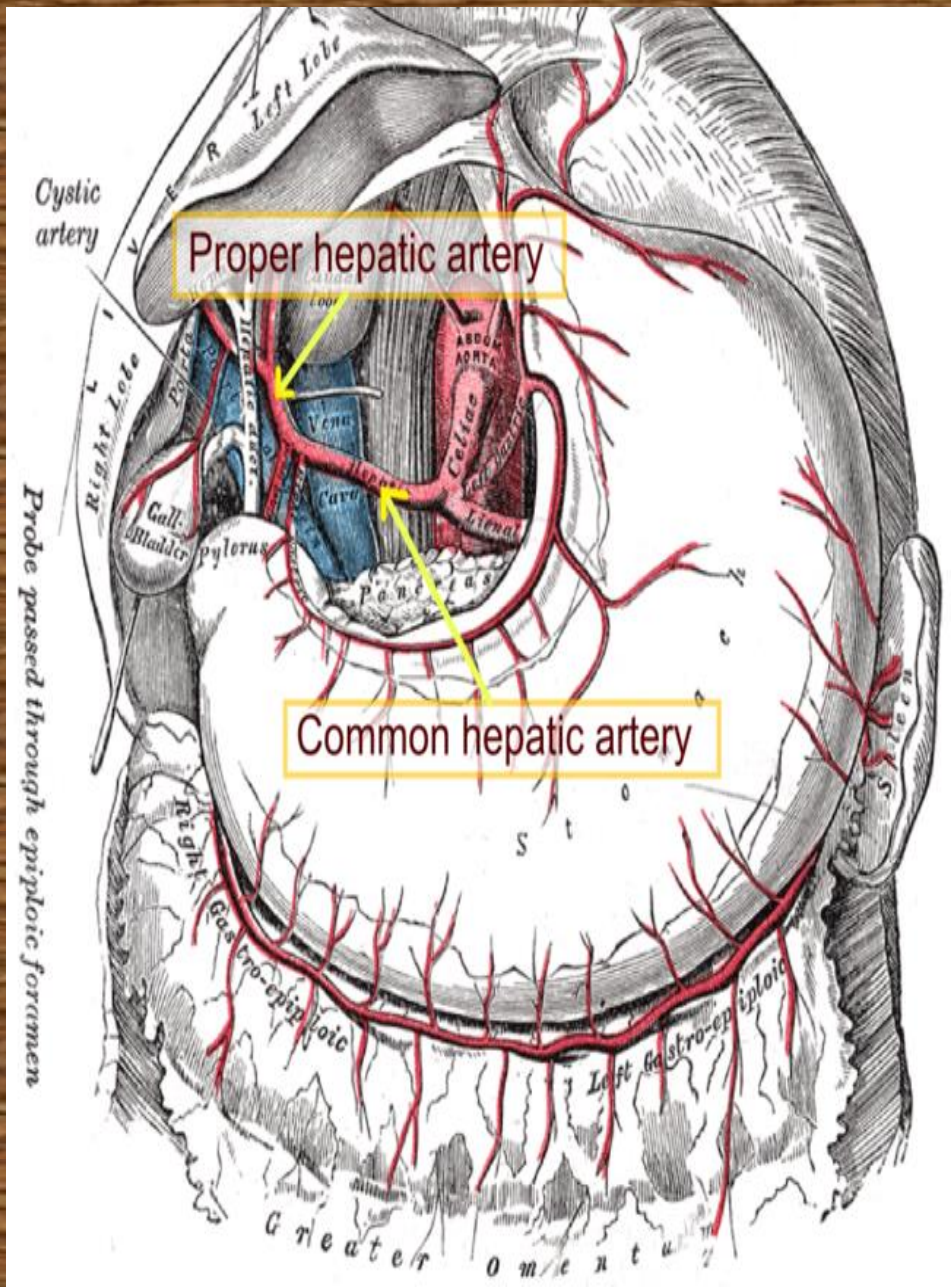
The usual arterial arrangement is for the common hepatic artery to arise as one of the three major branches of the coeliac trunk. After giving off the gastroduodenal artery , it continues as the main hepatic artery, which in turns divides into the right and left hepatic arteries.

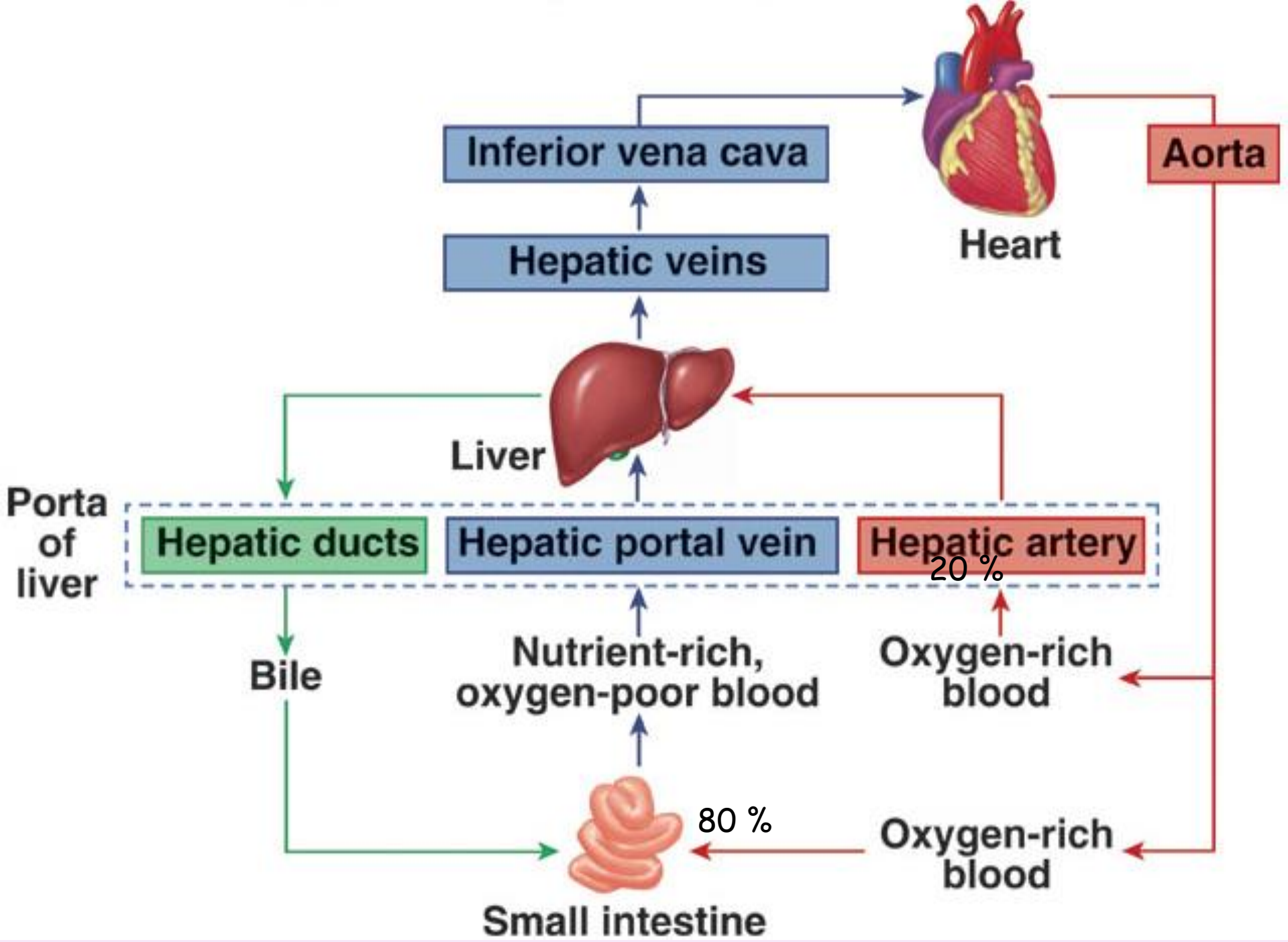




- Proper hepatic artery → The right and left hepatic arteries enter the porta hepatis.
- The right hepatic artery usually gives off the cystic artery, which runs to the neck of the gallbladder.
- Lamph : lamph nodes in hepatic porta , and to celiac nodes .
- Number of the lumph run from the bar area acros the diaphracm to lamphes nodes posterior mediastenom

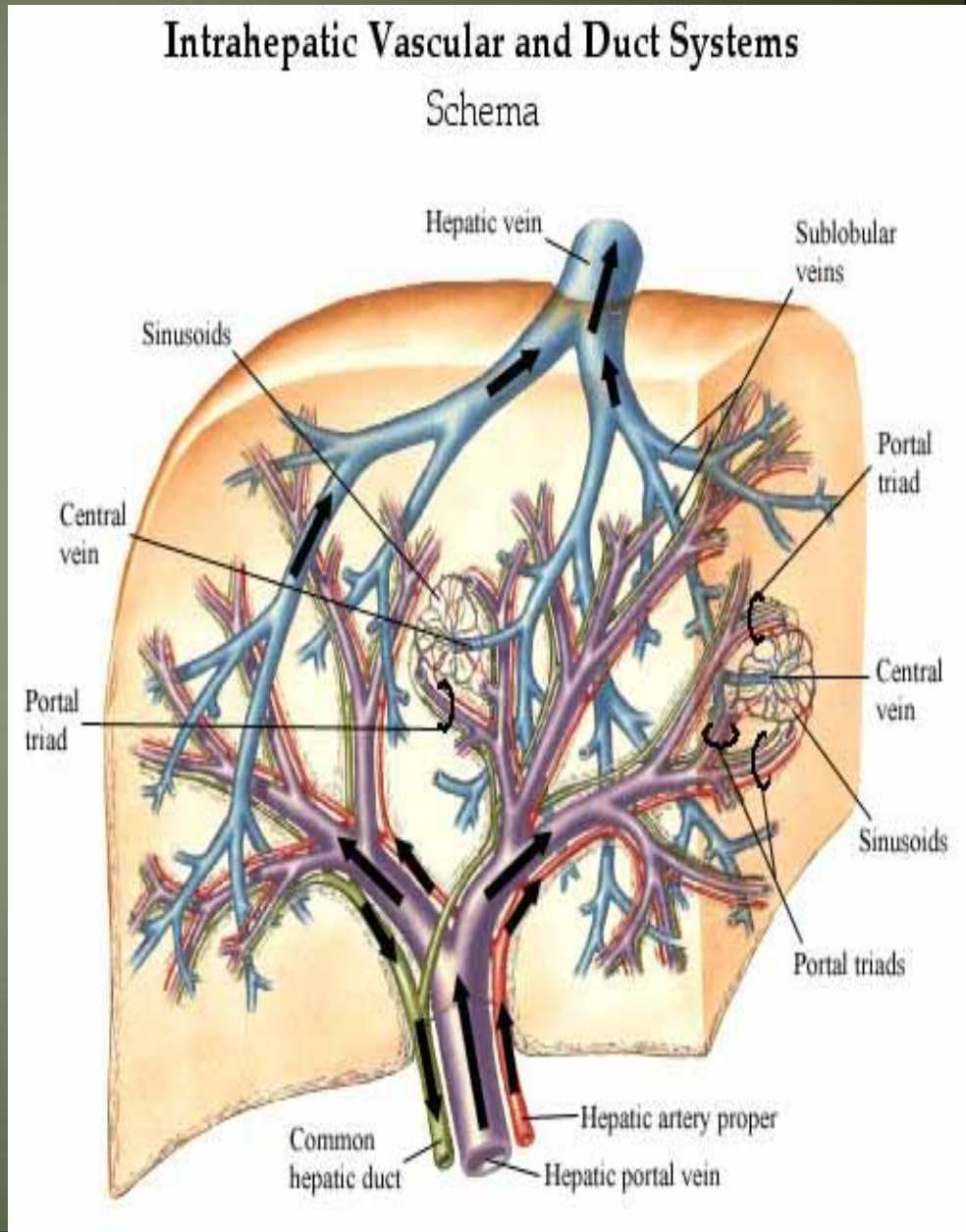
- Nerve: symp and para symp of the celiac plexus , branch to the liver (ant vagus trunk)



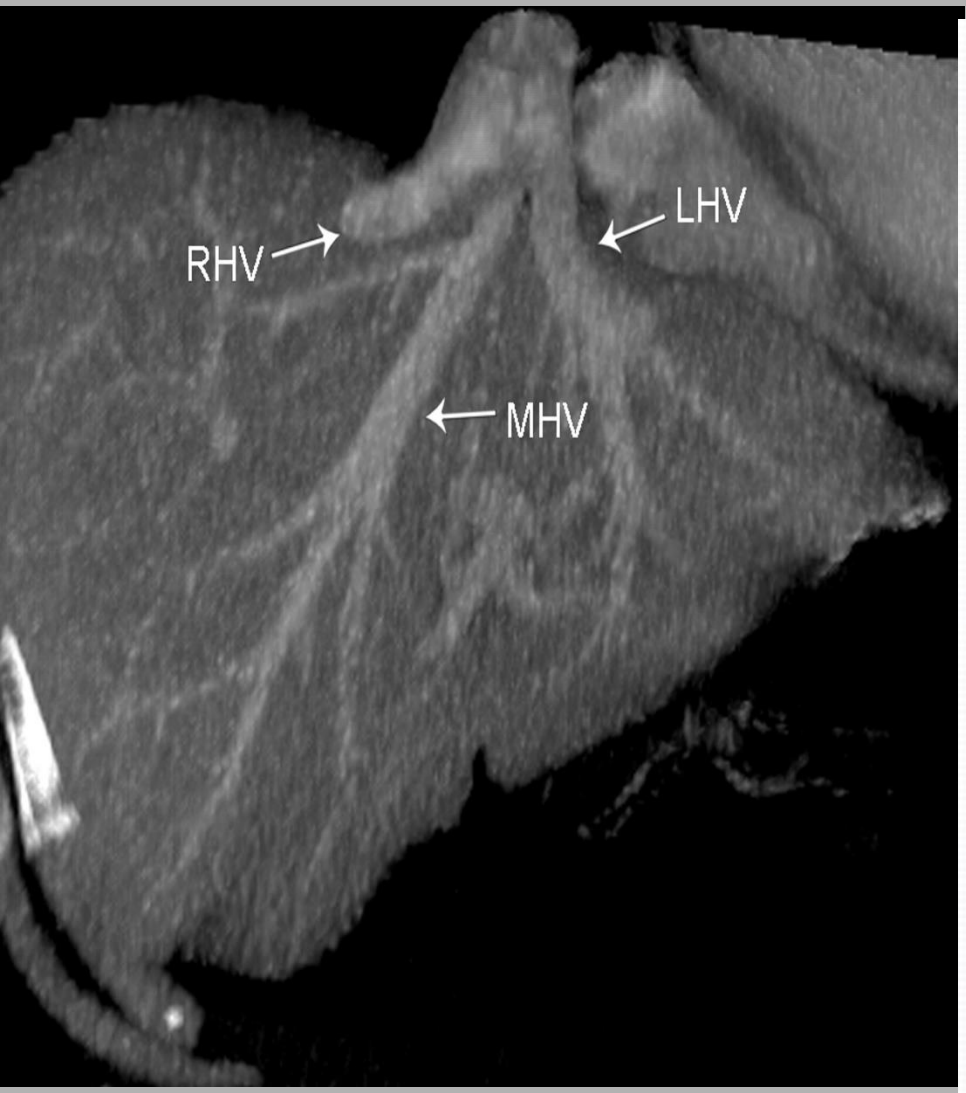

Inferior vena cava
Aorta
Heart
Hepatic veins
Liver
Porta of liver
Hepatic ducts
Hepatic portal vein
Hepatic artery
20 %
Bile
Nutrient-rich, oxygen-poor blood
Oxygen-rich blood
80 %
Oxygen-rich blood
Small intestine

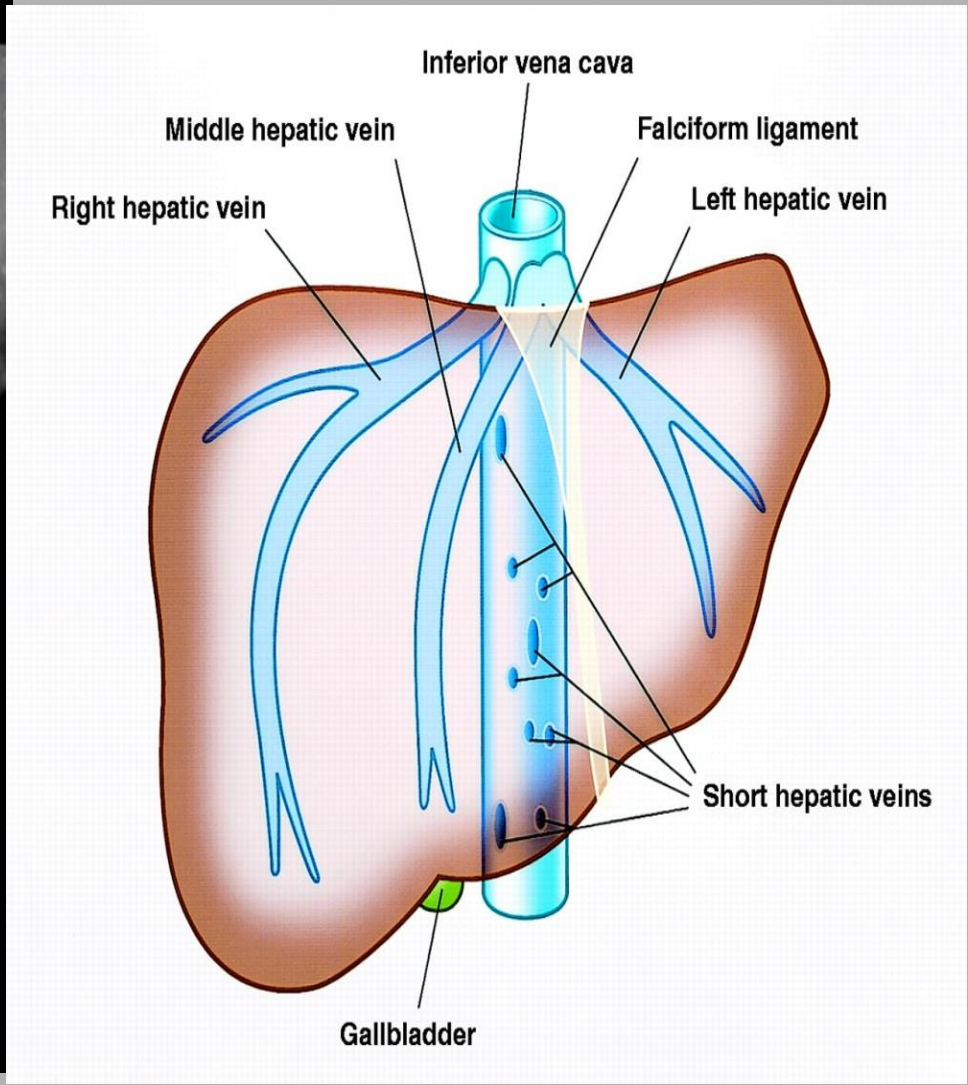
Vein drainage of the liver

- The portal vein divides into right and left terminal branches that enter the porta hepatis behind the arteries.
- The hepatic veins (three or more) emerge from the posterior surface of the liver and drain into the inferior vena cava.

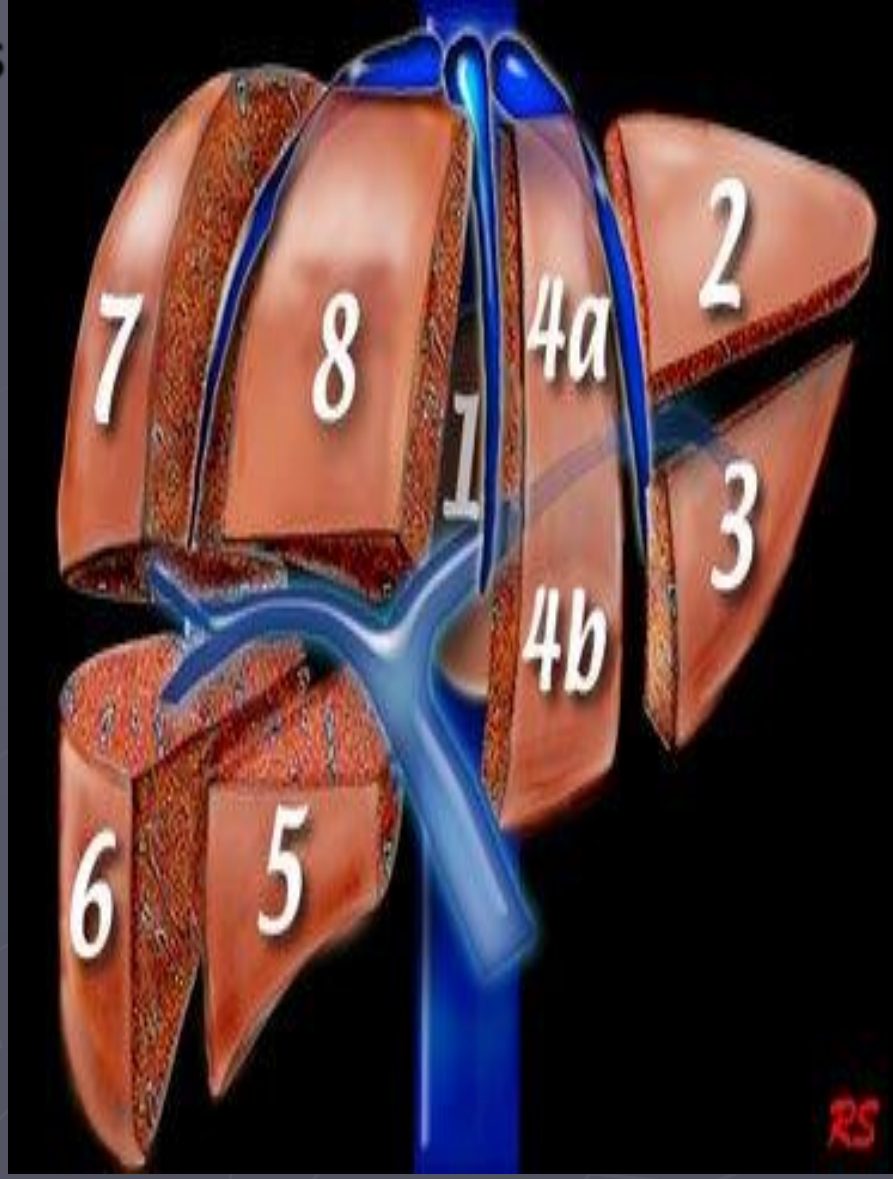


Venous outflow – three major hepatic veins drain into the IVC





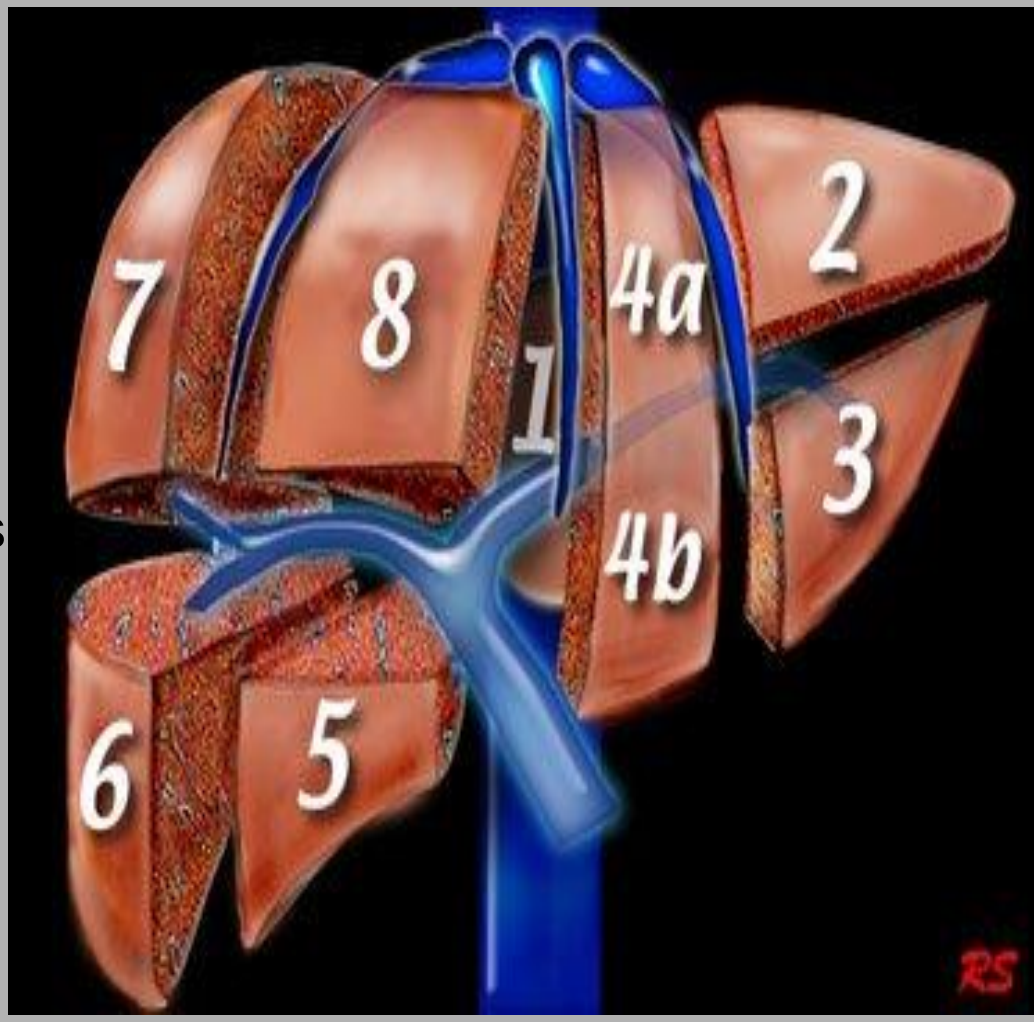
- **Right hepatic vein** divides the right lobe into anterior and posterior segments (segment 6& 7 usually not visulaized at the frontal view).
- **Middle hepatic vein** divides the liver into right and left lobes (or right and left hemiliver). This plane runs from the inferior vena cava to the gallbladder fossa (Cantlie's line)
- **Left hepatic vein** divides the left lobe into a medial and lateral part.
- **Portal vein** divides the liver into upper & lower segments.

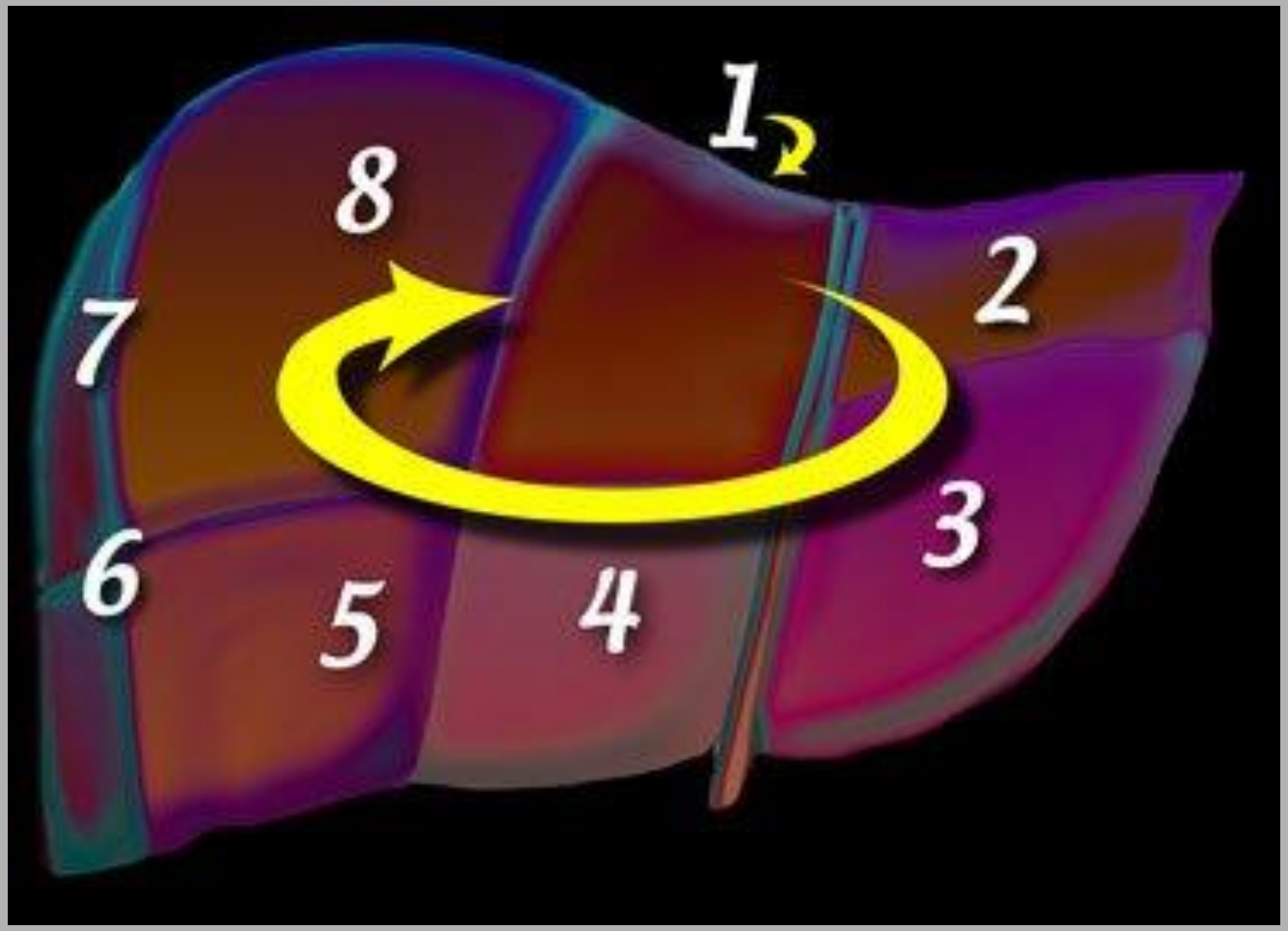


Couinaud divided the liver into a functional left and right liver by a main portal scissurae containing the middle hepatic vein. This is known as Cantlie's line.

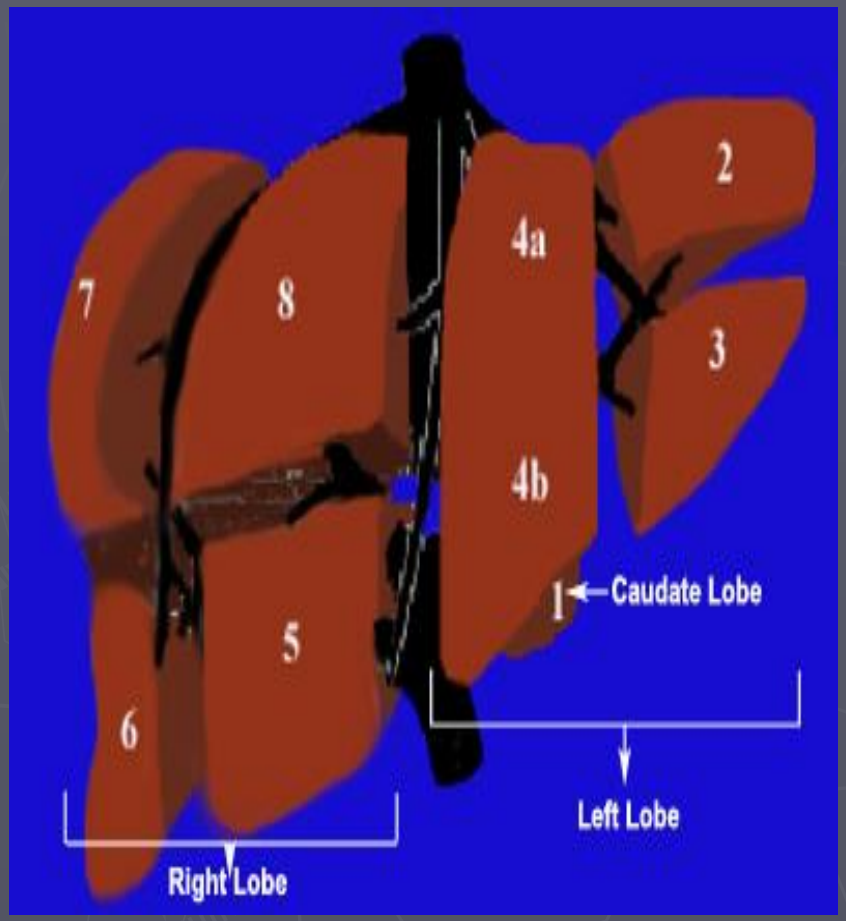
Cantlie's line runs from the middle of the gallbladder fossa anteriorly to the inferior **vena cava posteriorly**.

- Portal vein – superior and inferior segments
- Right hepatic vein – anterior and posterior segments of RL (5,6,7,8)
- Middle hepatic vein – Cantlie's line
- Left hepatic vein – medial and lateral segments of LL (4,2,3)



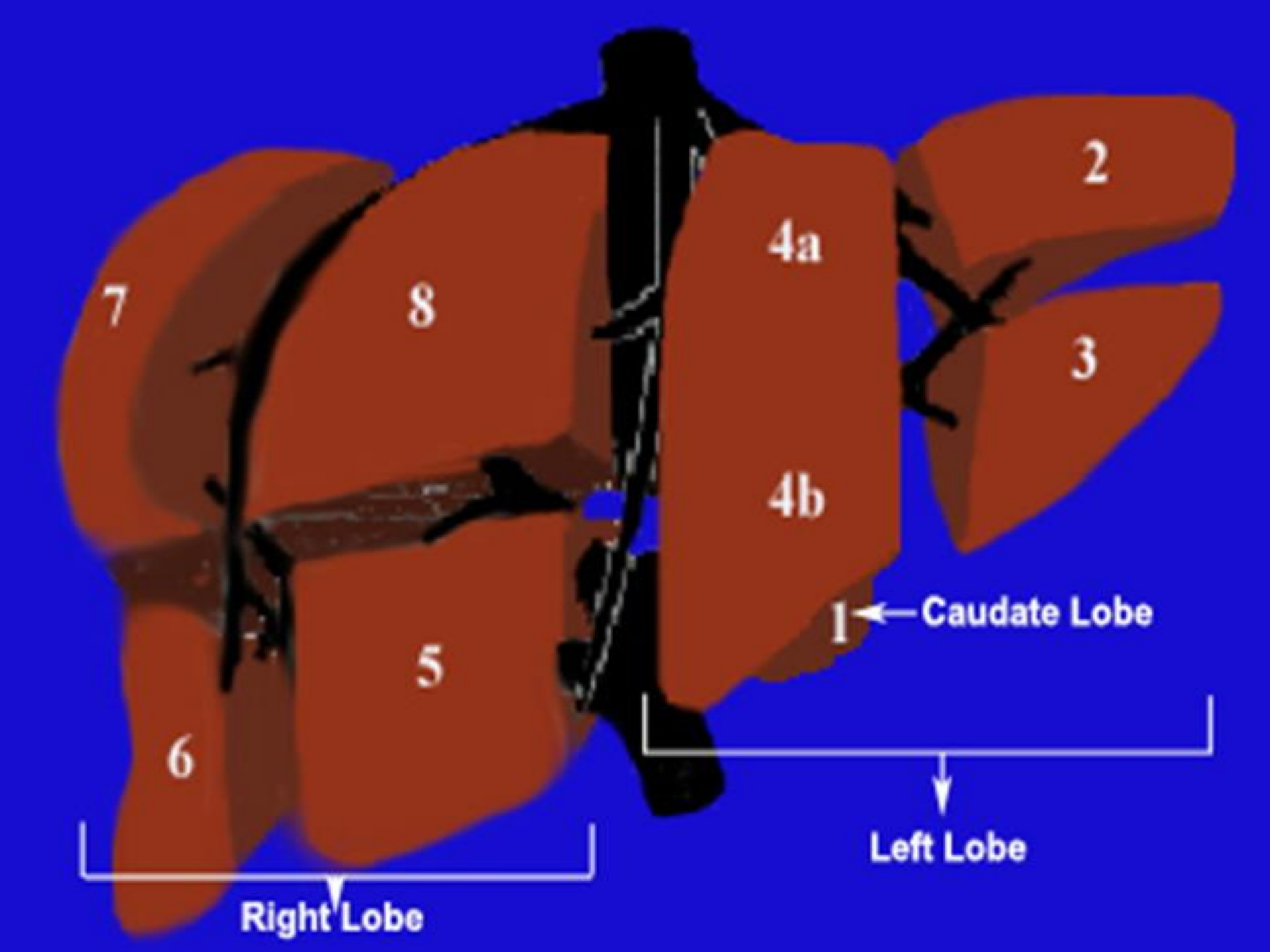


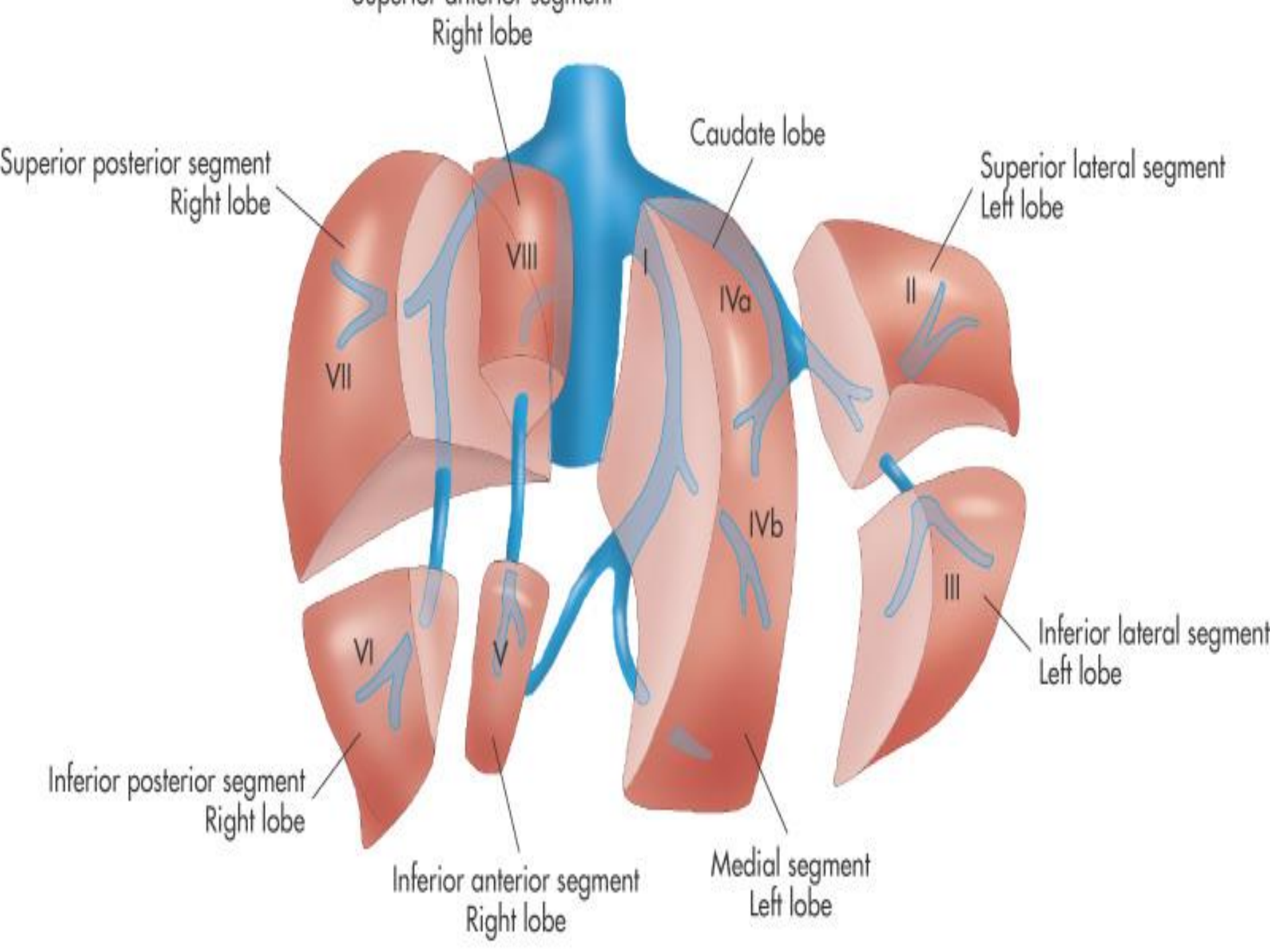
There are eight liver segments.
Segment 4 is sometimes divided into segment 4a and 4b according to Bismuth.
The numbering of the segments is in a clockwise manner (figure).
Segment 1 (caudate lobe) is located posteriorly. It is not visible on a frontal view.



- **Couinaud's numbering system:**

1-Caudate Lobe (posteriorly)
2-Left Superior Lateral segment
3-Left Inferior Lateral segment
4a-Left Superior Medial segment
4b-Left Inferior Medial segment
5-Right Inferior Anterior segment
6-Right Inferior Postrior segment
7-Right Superior Postrior segment
8-Right Superior Anterior segment


7
8
4a
2
3
4b
1
Caudate Lobe
5
6
Left Lobe
Right Lobe


Right lobe
Caudate lobe
Superior posterior segment
Right lobe
Superior lateral segment
Left lobe
VIII
I
IVa
II
VII
IVb
III
VI
V
Inferior lateral segment
Left lobe
Inferior posterior segment
Right lobe
Inferior anterior segment
Right lobe
Medial segment
Left lobe

Anatomical lobes

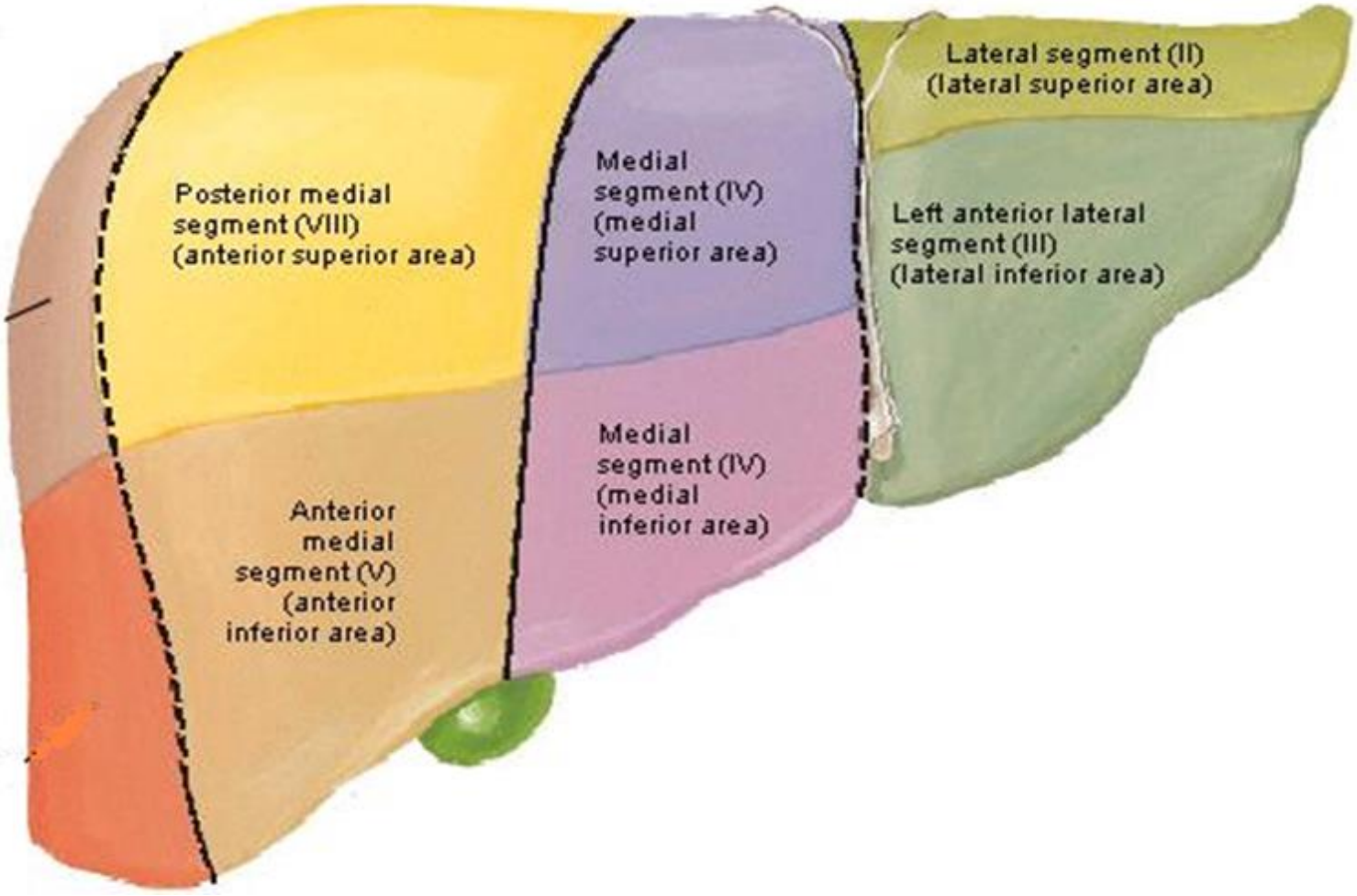
Right lobe

Left lobe

Functional segments

Right (part of) liver

Left (part of) liver



R
151
L
189

Abdominal Aorta

- Extends from: T12. To L4
  - Aorta enters the abdomen through the aortic opening of the diaphragm
  - The opening lies in front of twelfth thoracic vertebra
  - It descends behind the peritoneum on the anterior surface of the bodies of the lumbar vertebrae
  - On its right side lies the inferior vena cava, the cisterna chyli and beginning of the azygos vein
  - On the left side lies the left sympathetic trunk
  - It divides into two common iliac arteries at the level of fourth lumbar vertebra
- Branches:

  Three unpaired anterior visceral branches.

  Three paired lateral visceral branches.

  Five paired lateral abdominal wall branches.

  Three terminal branches (one unpaired).

Unpaired Anterior Visceral Branches

- Celiac trunk (artery):

1- Left gastric: To inferior esophagus, Travels in lesser omentum

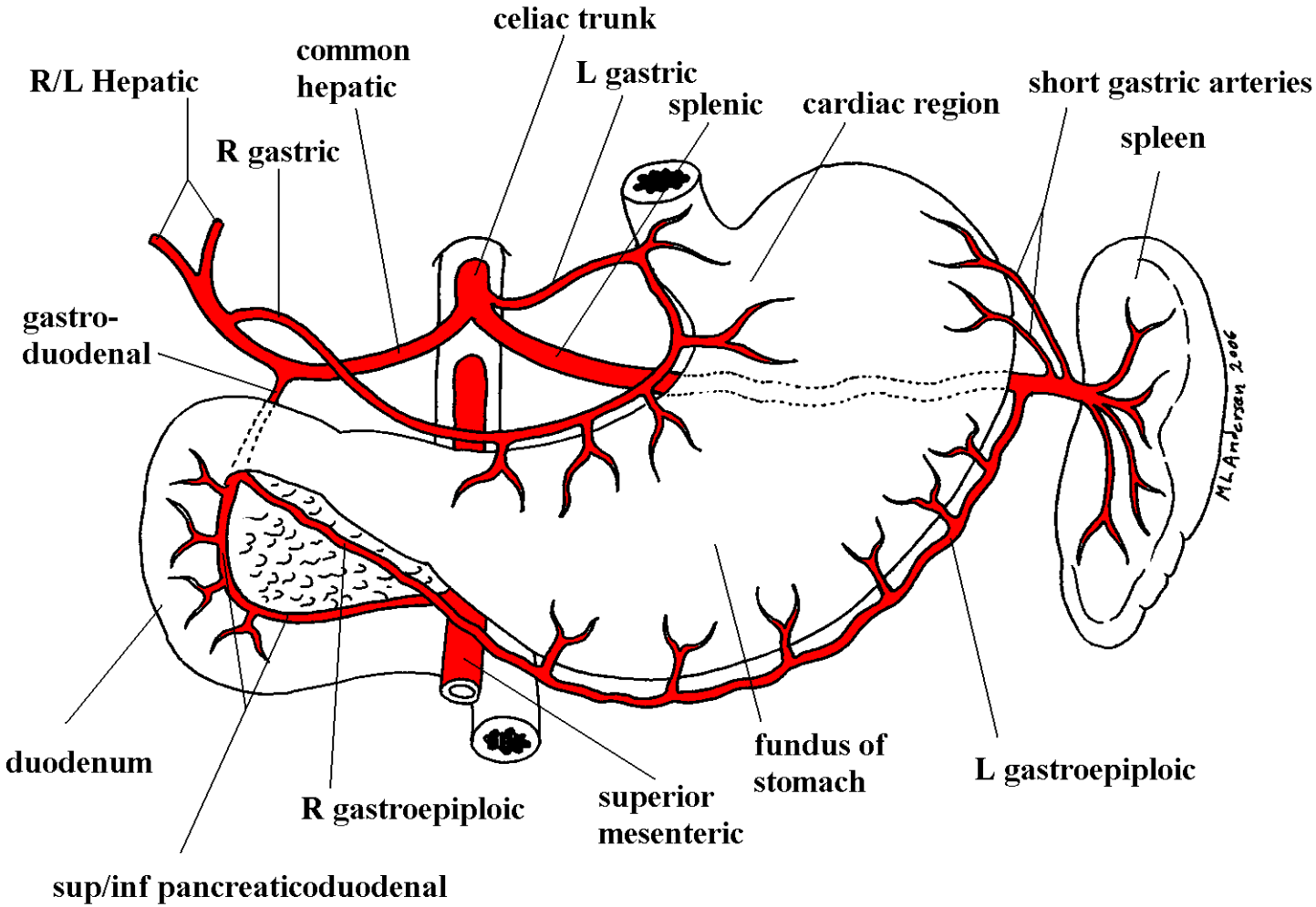
2- Splenic artery branches: Short gastric arteries (6). Left gastroepiploic artery, Splenic arteries (6).

3 - Hepatic branches: Right gastric Travels along lesser curvature of the stomach. Cystic artery.

- Gastroduodenal:

Right gastroepiploic

Superior pancreaticoduodenal


celiac trunk
common hepatic
R/L Hepatic
L gastric
splenic
cardiac region
short gastric arteries
spleen
R gastric
gastro-duodenal
ML Anderson 2006
duodenum
R gastroepiploic
superior mesenteric
fundus of stomach
L gastroepiploic
sup/inf pancreaticoduodenal

- **Superior mesenteric artery:**

  - Jejunal and ileal arteries.

  - Inferior pancreaticoduodenal artery:

  - Middle colic artery:

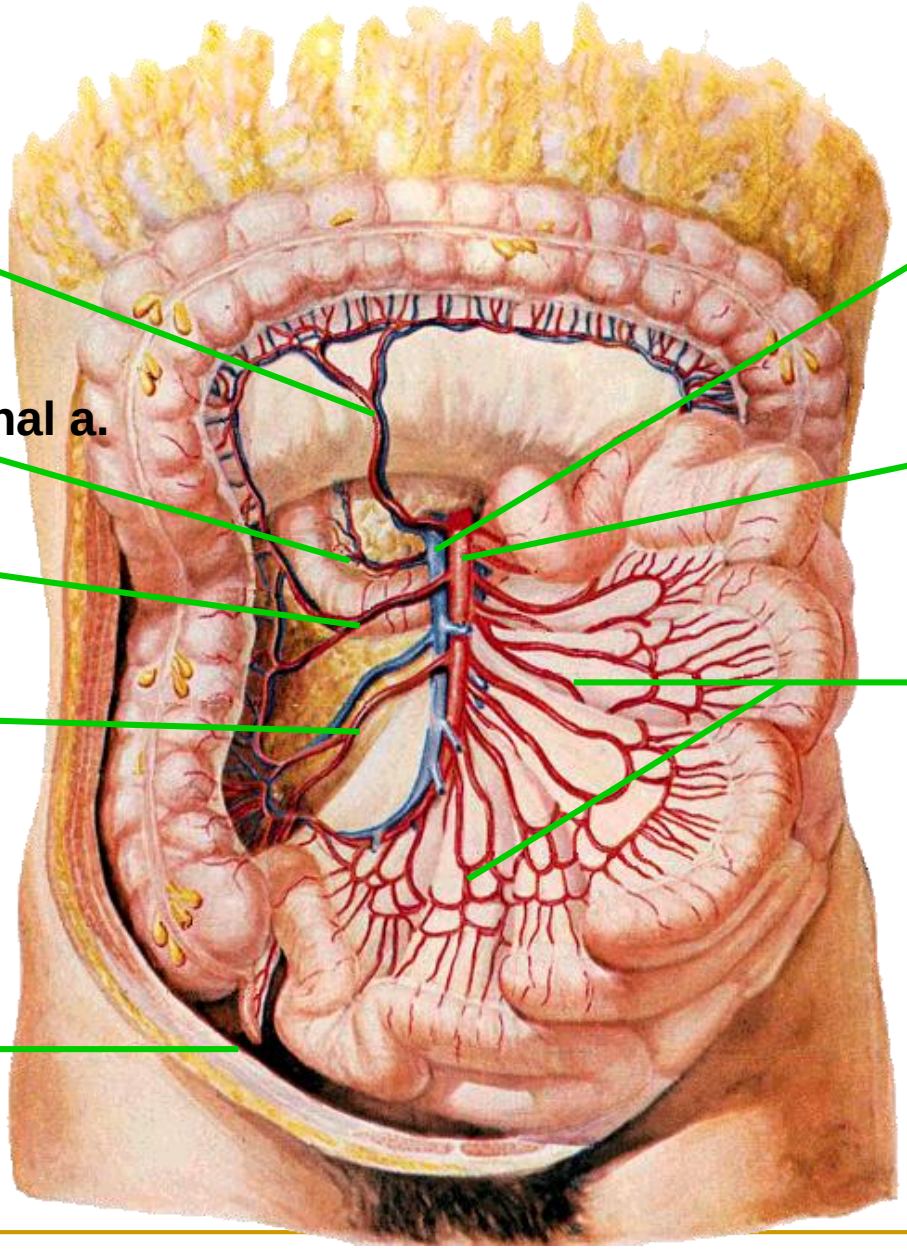
  -Right colic artery:Supplies ascending colon.

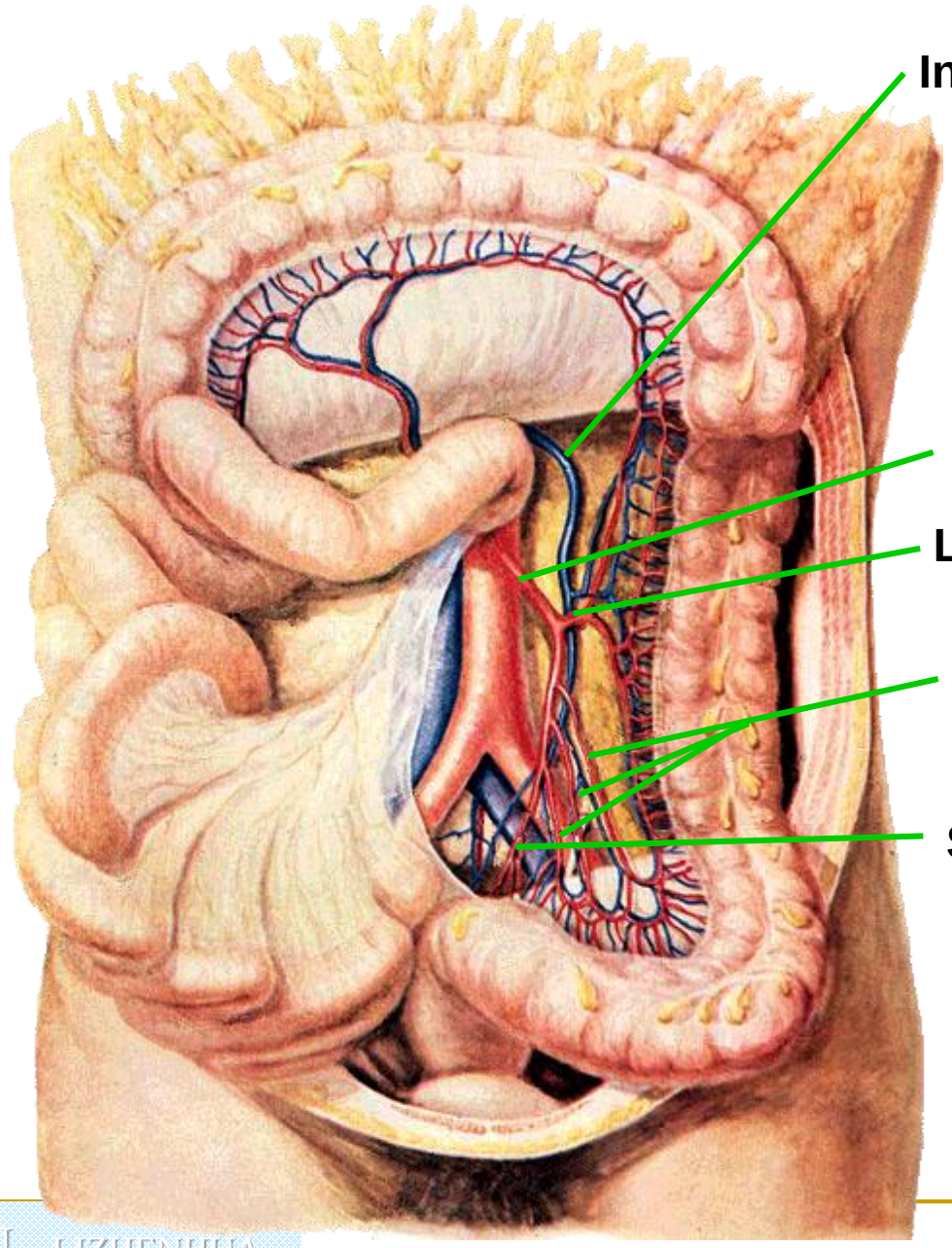
  - Ileocolic artery:Terminal branch. Supplies ileum, cecum and ascending colon. Appendicular artery.

- **Inferior mesenteric artery:**

  left colic artery ,Sigmoid arteries . Marginal artery

  Superior rectal artery: Terminal branch , Supplies proximal rectum.


Middle colic a.
Inf. pancreaticodudenal a.
Right colic a.
Ileocolic a.
Appendicular a.
Superior Mesenteric v.
Superior mesenteric a.
Jejunal and ileal a.

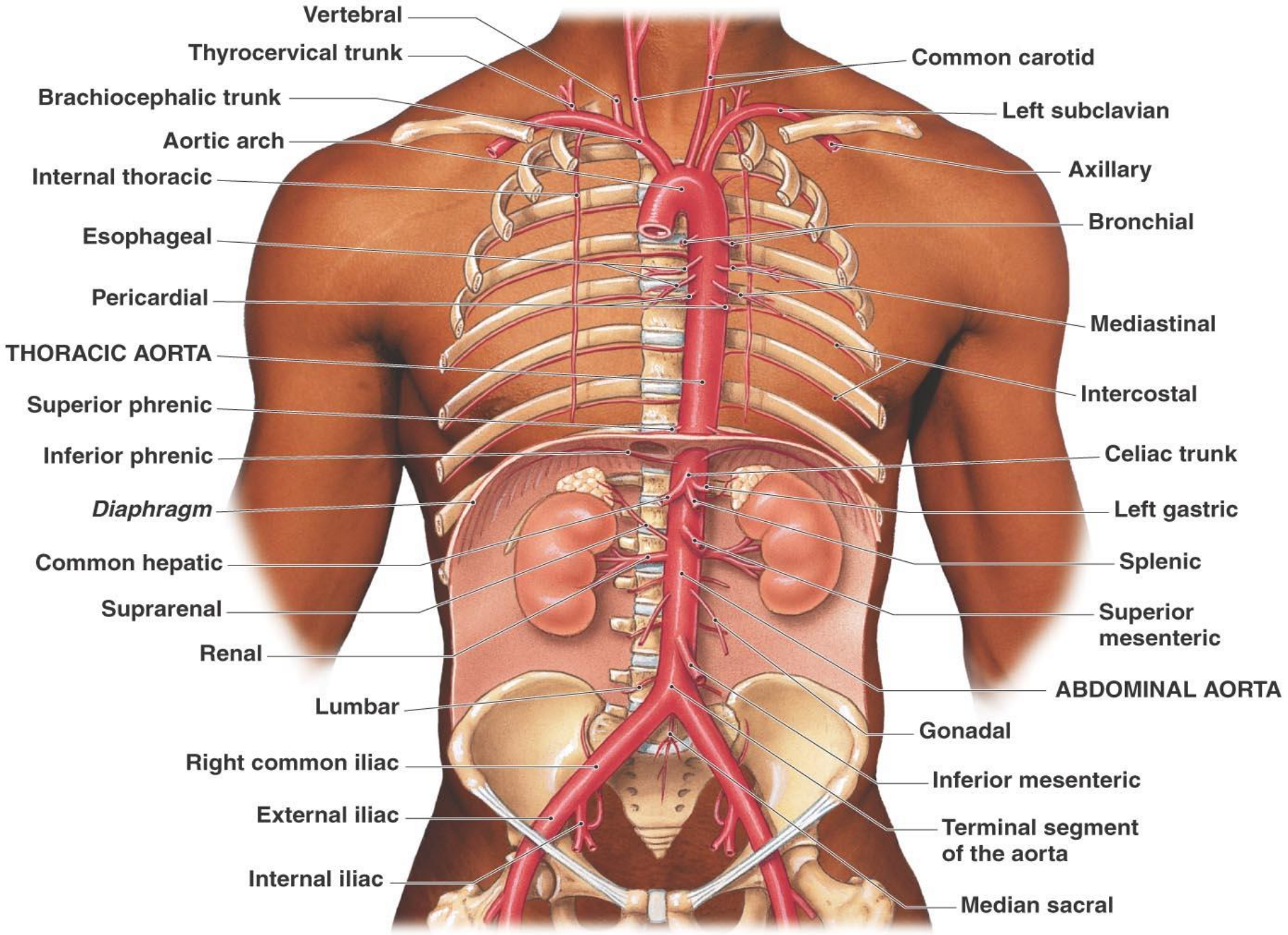

Inferior mesenteric v.
Inferior mesenteric a.
Left colic a.
Sigmoid a.
Superior rectal a.

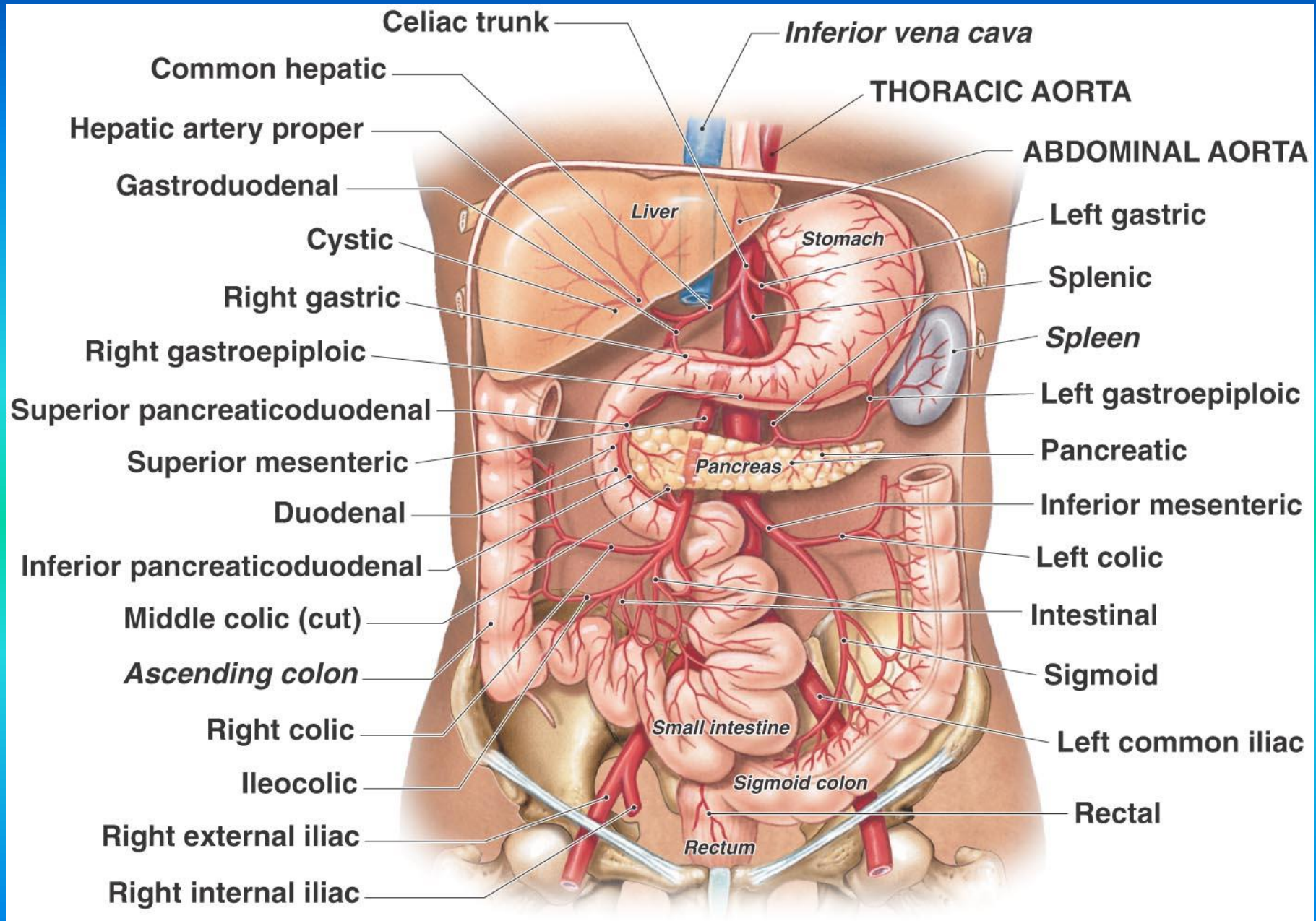
Paired Lateral Visceral Branches

- Suprarenal.
  Renal: Gives off five segmental arteries.
  Testicular or ovarian.
- Paired Lateral Abdominal Wall
- Inferior phrenic.
- Lumbar (4 pairs).

Terminal Branches

- Common iliacs:
  External iliacs: Become femoral arteries distal to inguinal ligament.
  Inferior epigastrics, Deep circumflex iliacs
  Internal iliacs.
- Median sacral

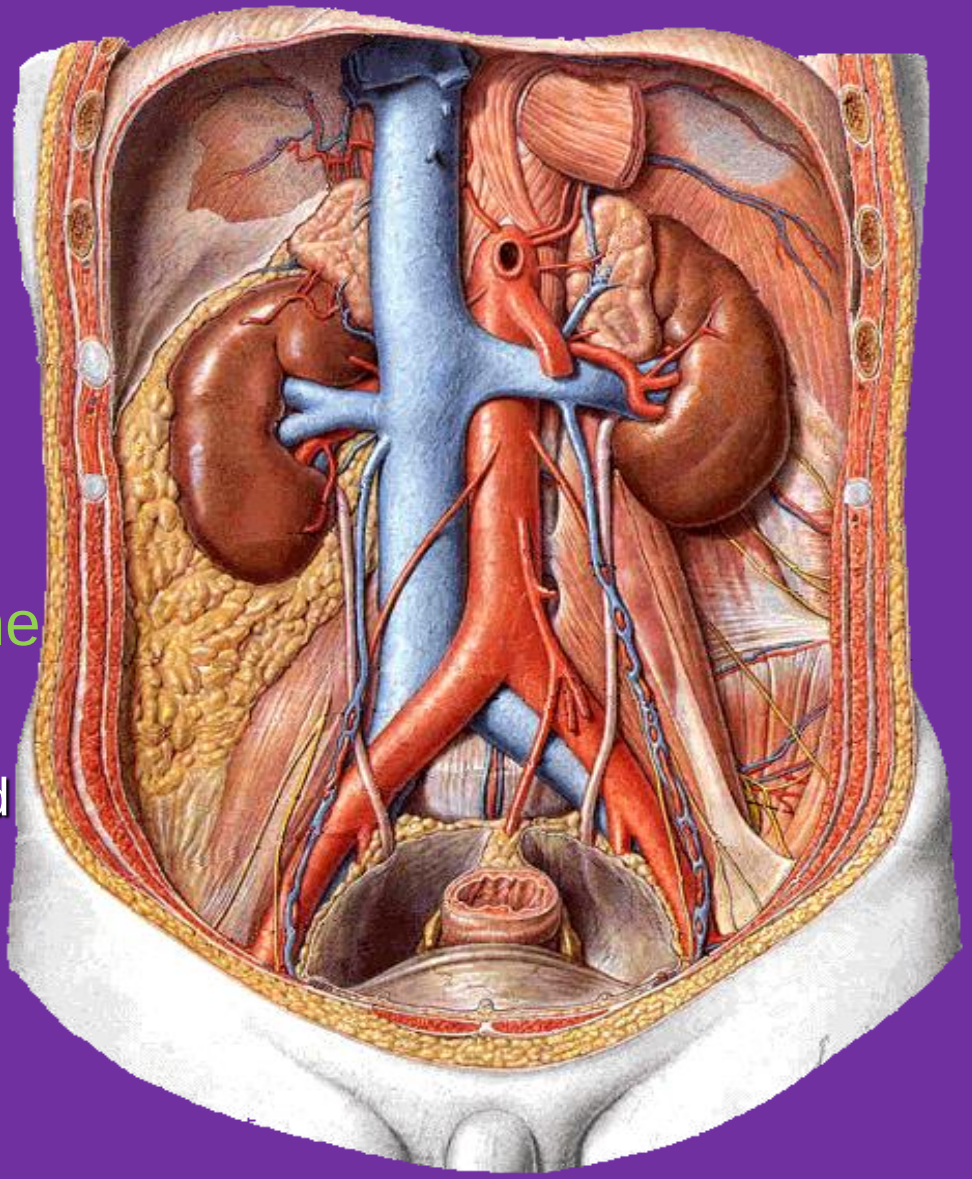




(a) Arteries supplying the abdominal organs (anterior view)

Inferior vena cava

- Formed by union of two common iliac veins anterior and just to the right ofL4~L 5
- Ascends on the right side of aorta, pierces vena cava foramen of diaphragm at the level of T8, and drains into the right atrium
  - Right sympathetic trunk lies behind its right margin
  - Right ureter lies close to its right border



- Tributaries:

  Gonadal veins (testicular or ovarian): Dump into left renal vein on left).

  Renal veins.

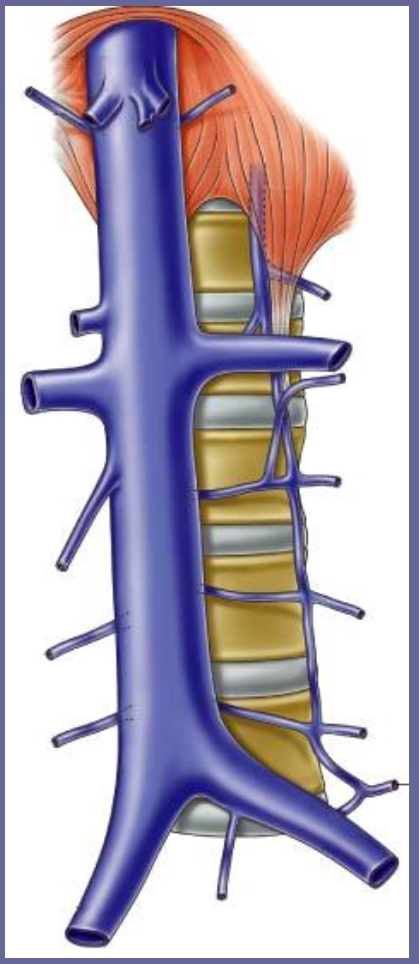
  Suprarenal veins: Dump into left renal vein on left.

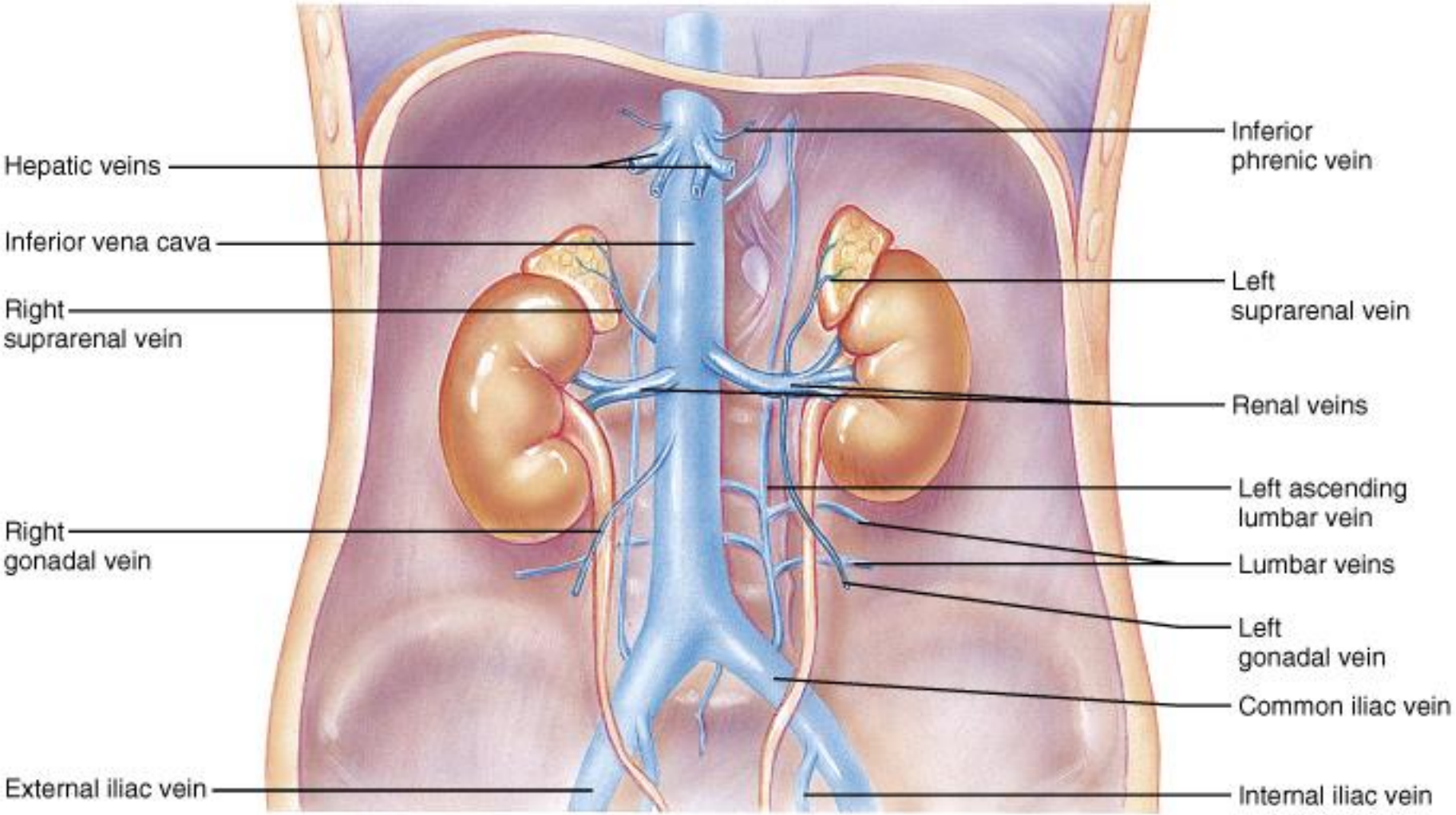
  - Inferior phrenic veins, and four lumbar veins
- Hepatic veins: Right, left, middle.
  - Three veins of origin: two common iliac veins and the median sacral vein

Inferior vena cava

Chief tributaries

- **Parietal**
  - Paired inferior phrenic v.
  - paired lumbar v. (four)
- **Visceral**
  - Right and left renal veins
  - Right suprarenal vein (left drain into left renal vein)
  - Right testicular or ovarian v. (left drain into left renal vein)
  - Hepatic veins : right, left and intermediate

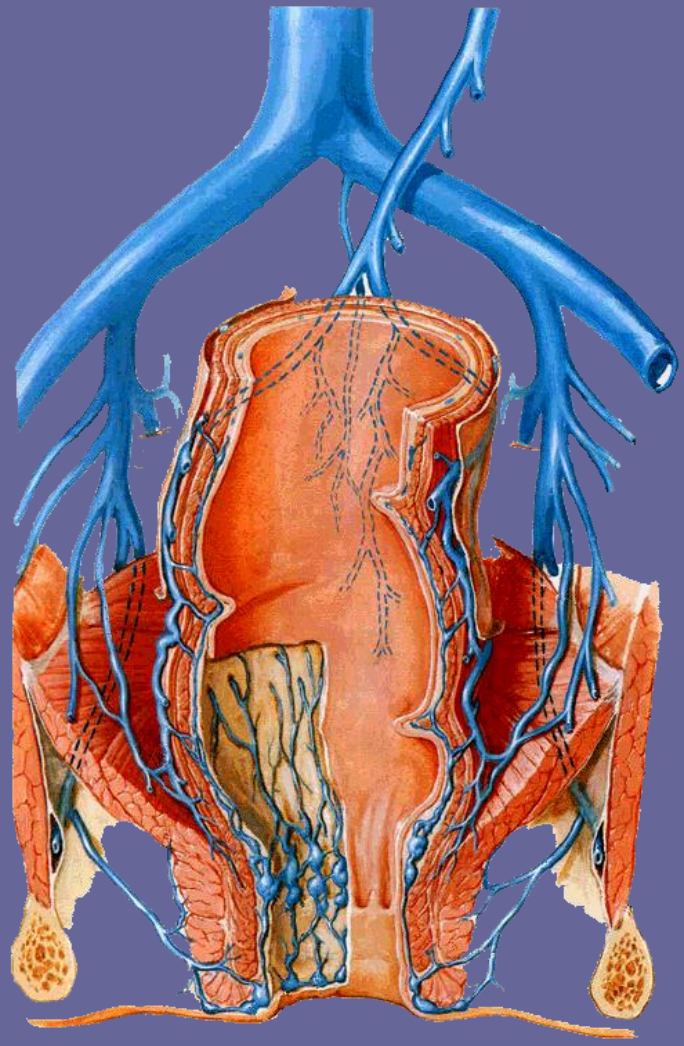




(b)

Veins of pelvis

- **Internal iliac vein**
  - Parietal tributaries: accompany with arteries
  - Visceral tributaries
- **External iliac vein**– accompany the artery
- **Common iliac vein**– formed by union of internal and external iliac veins in front of sacroiliac joint, end upon L4~L5 by uniting each other to form inferior vena cava

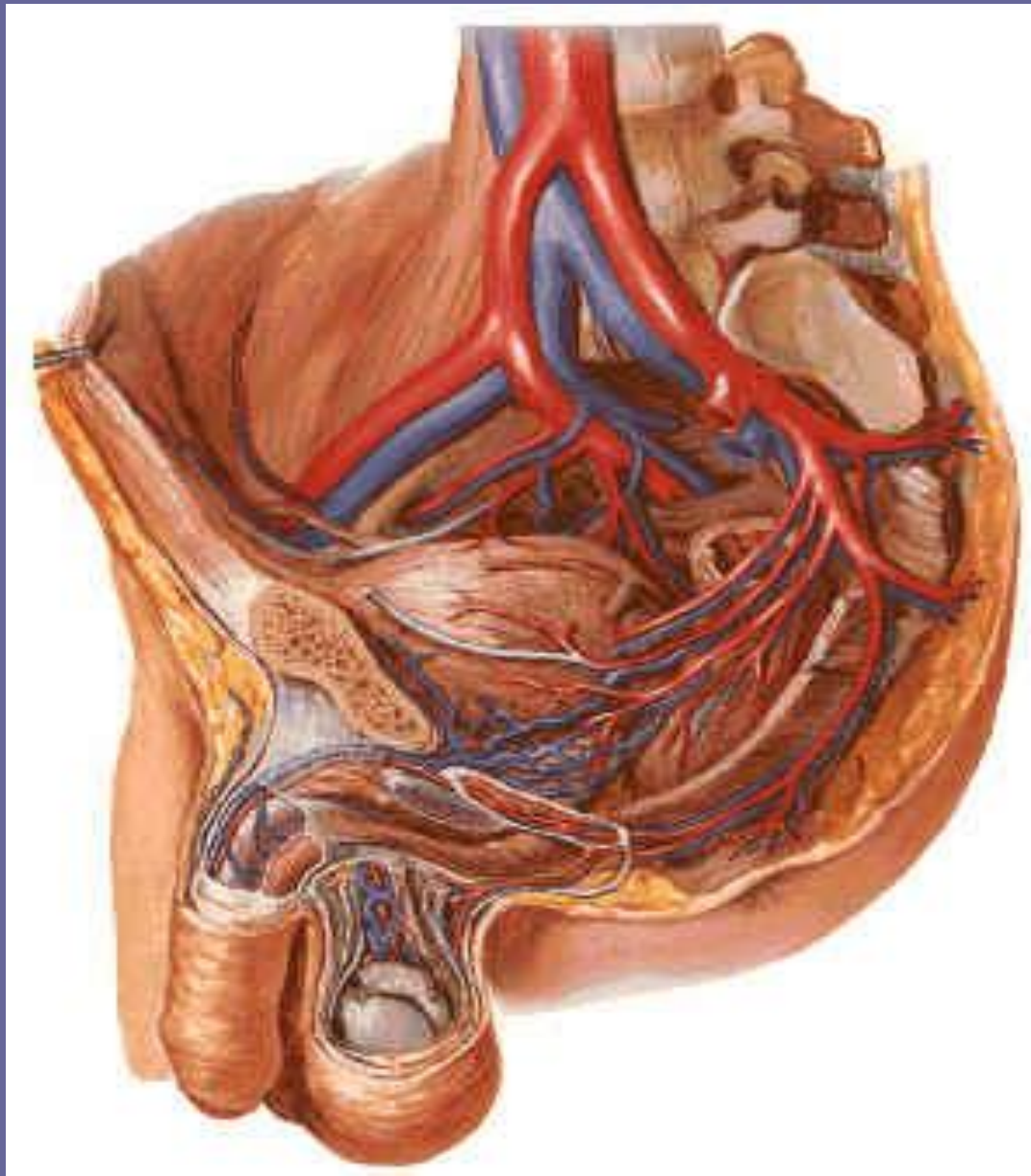


Veins of the Pelvis

Internal iliac vein

A. Parietal Tributaries:

1. Superior gluteal v.
2. Inferior gluteal v.
3. Obturator v.
4. Lateral sacral v.



Veins of the Pelvis

B. Visceral Tributaries

1. Rectal venous plexus

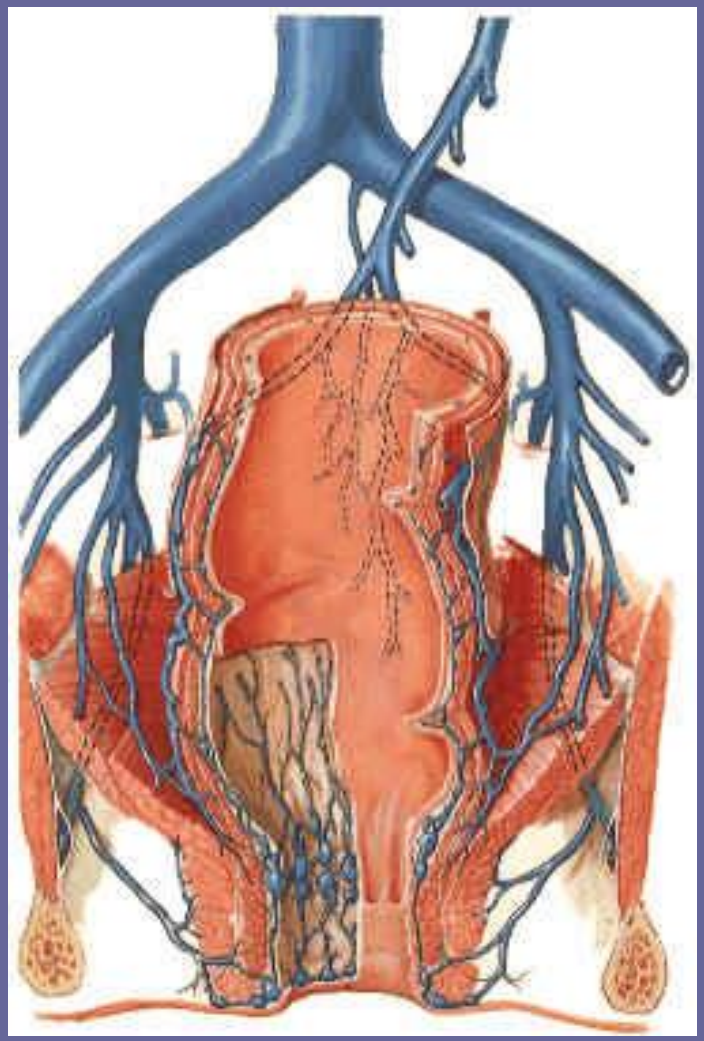
- →superior rectal vein→inferior mesenteric v.
  →inferior rectal vein→internal iliac v.
  →anal vein→internal pudendal v.

2. Vesical venous plexus →vesical v.

3. Uterine venous plexus →uterine v.

4. **Veins of perineum**

- **internal pudendal v.**



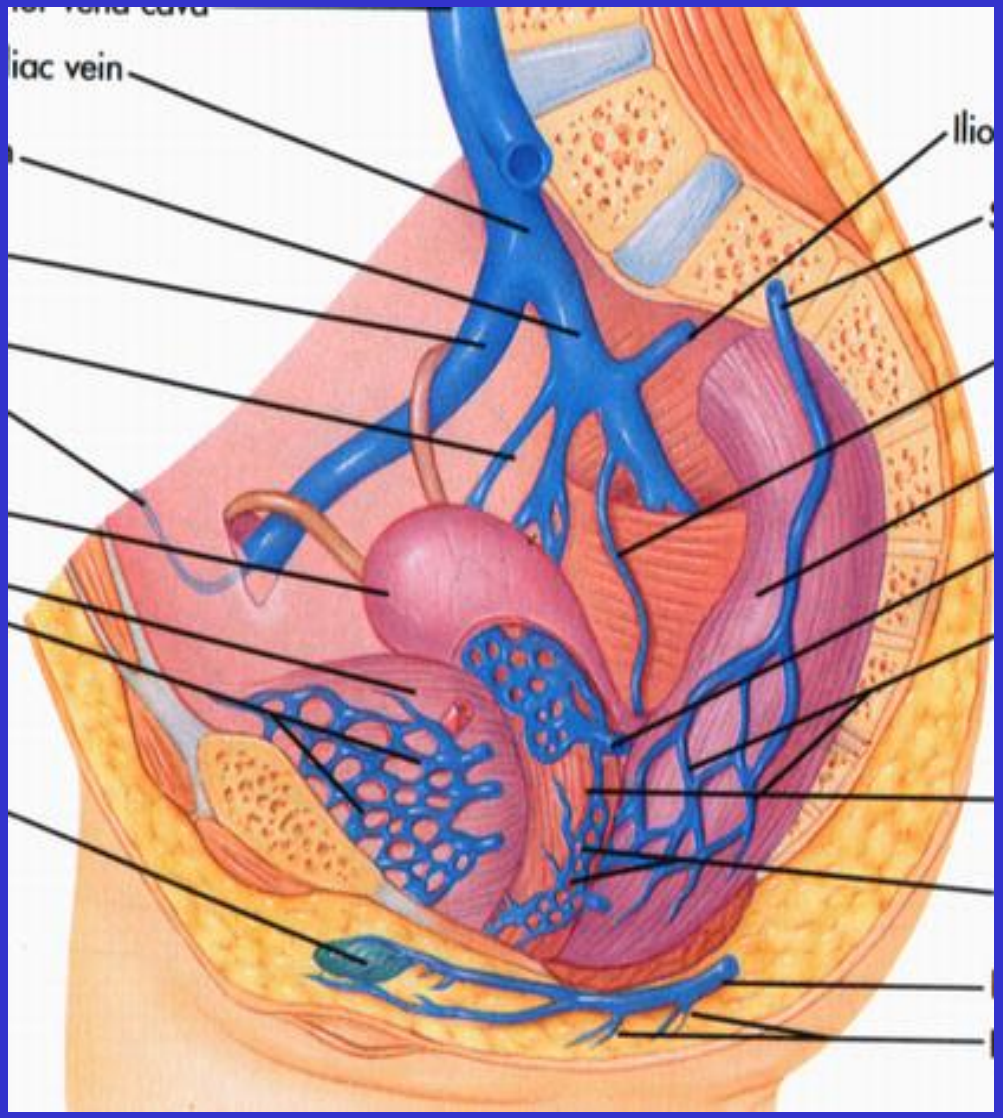
Veins in Pelvis

Internal iliac vein

The venous plexuses in the pelvis are:

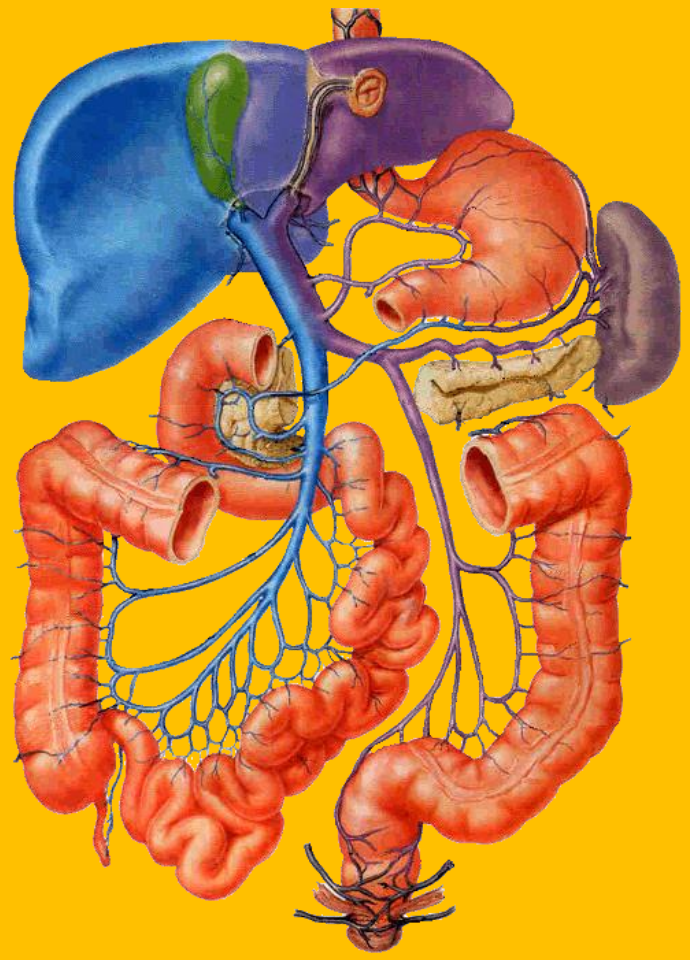
1)Vesical venous plexus
2)Uterine venous plexus
3)Rectal venous plexus

All the plexuses lack valves to enable the blood to freely flow forward or backward (bi-directional flows).



Hepatic portal vein

- Formed behind the neck of pancreas by the union of superior mesenteric vein and splenic vein
- Ascends upwards and to the right, posterior to the first part of duodenum and then enters the lesser omentum to the porta hepatis, where it divides into right and left branches
- There are no functioning valves in hepatic portal system
- Drains blood from gastrointestinal tract from the lower end of oesophagus to the upper end of anal canal, pancreas, gall bladder, bile ducts and spleen



Portal Vein

Tributaries :

- Superior mesenteric vein:

  Middle colic vein (drains transverse colon).

  Right colic vein (drains ascending colon).

  Ileocolic vein (drains ileum, ileocecal junction, cecum, and ascending colon).

  Ileal vein (drains ileum).

  Right gastroepiploic vein (drains right aspect of greater curvature of stomach).

  Pancreaticoduodenal (drains duodenum and head of pancreas).

- Splenic vein:

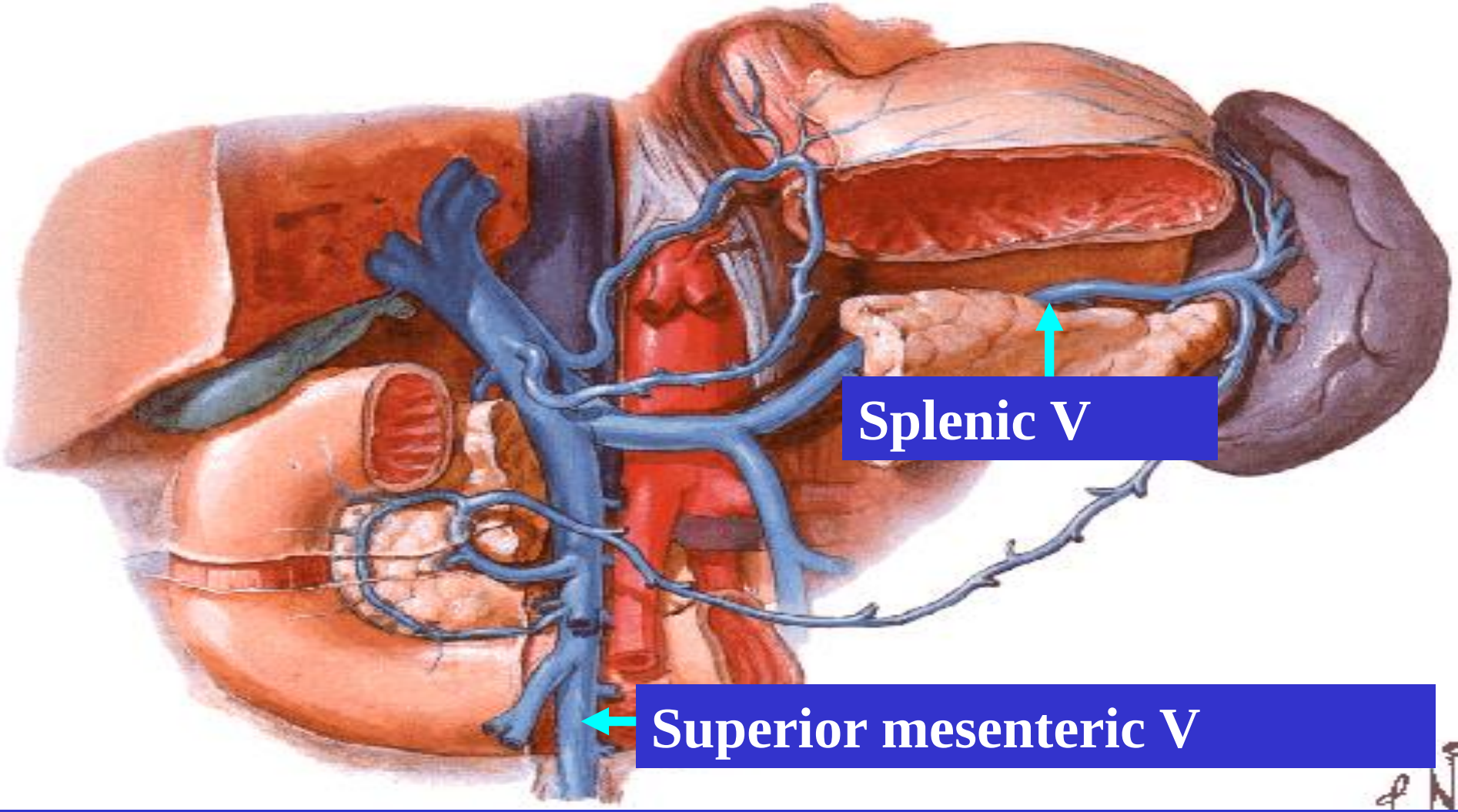
  Right gastric vein (lesser curvature of stomach).

  Left gastric vein (lesser curvature of stomach).

  Paraumbilical vein (umbilical region).

Hepatic Portal

splenic V, superior mesenteric V
(both union behind the head of pancreas)



4.Tributaries of Hepatic Portal Vein

(1) Splenic V

(2) Superior mesenteric V

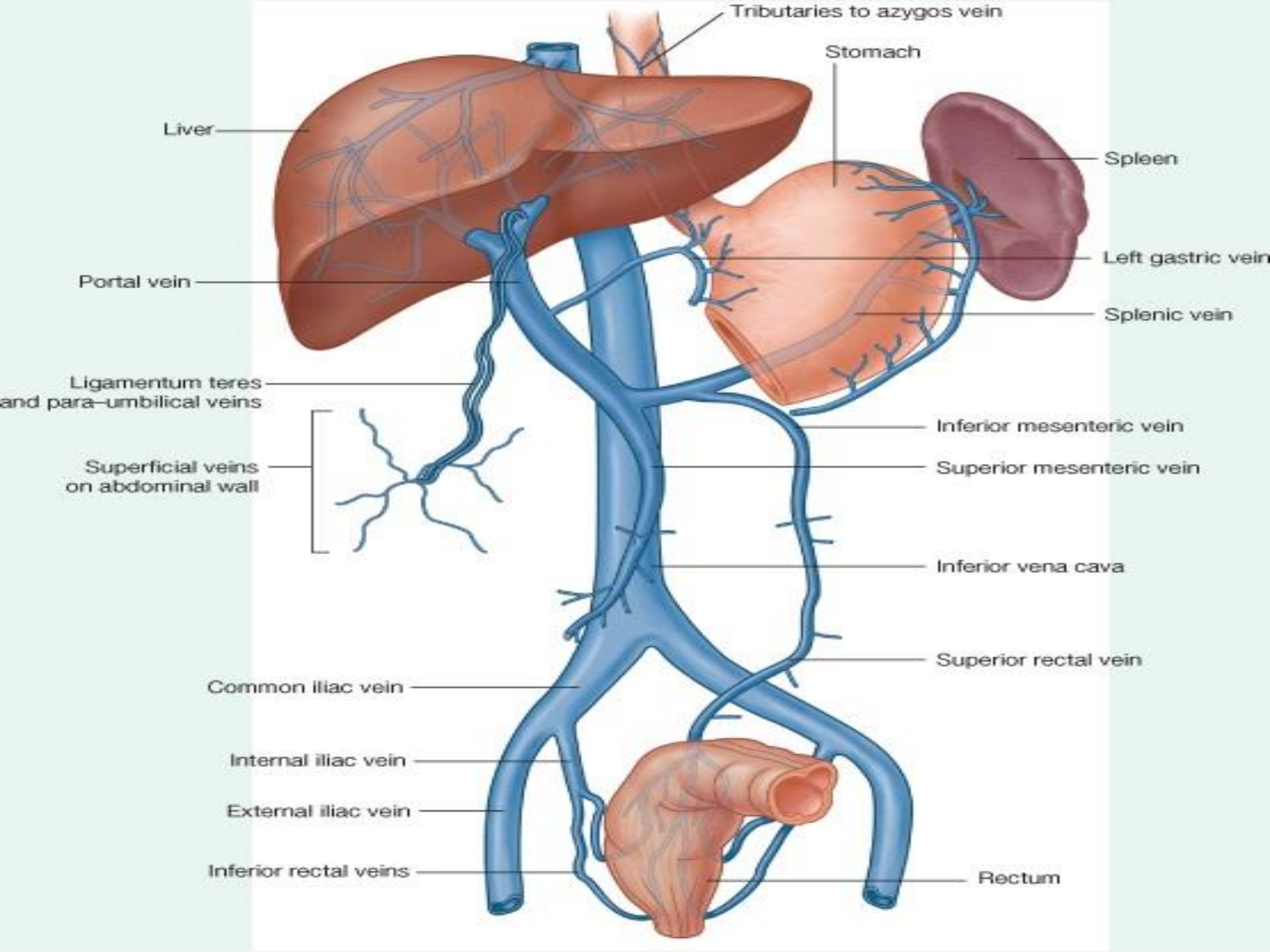
(3) Inferior mesenteric V

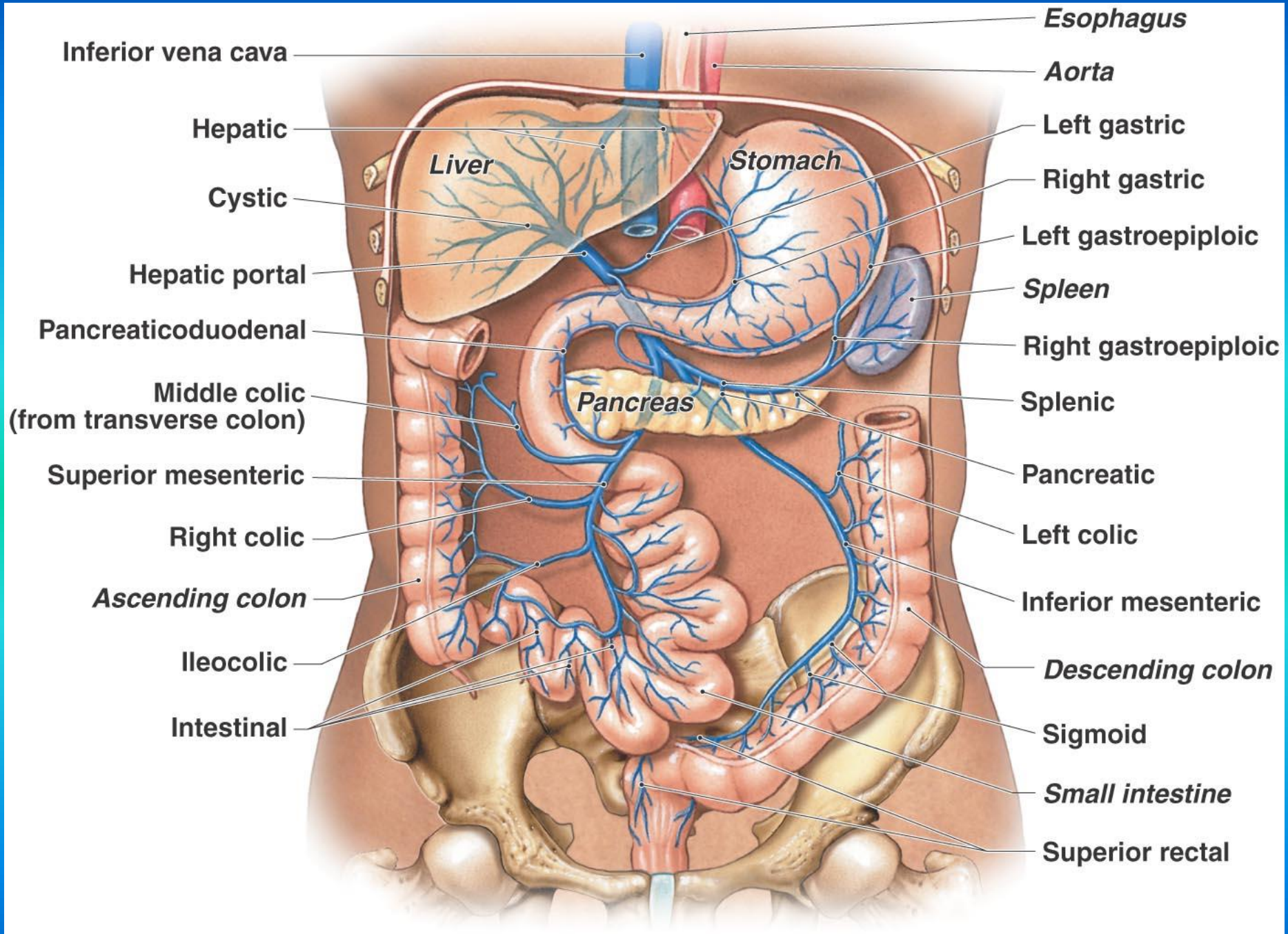
(4) Left gastric V

5- right gastric v

6. Cystic v.

7. Paraumbilical v.


Tributaries to azygos vein
Stomach
Liver
Spleen
Left gastric vein
Portal vein
Splenic vein
Ligamentum teres
and para–umbilical veins
Inferior mesenteric vein
Superficial veins
on abdominal wall
Superior mesenteric vein
Inferior vena cava
Superior rectal vein
Common iliac vein
Internal iliac vein
External iliac vein
Inferior rectal veins
Rectum



Portal-systemic anastomoses

1) Esophageal venous plexus

a. position: low part

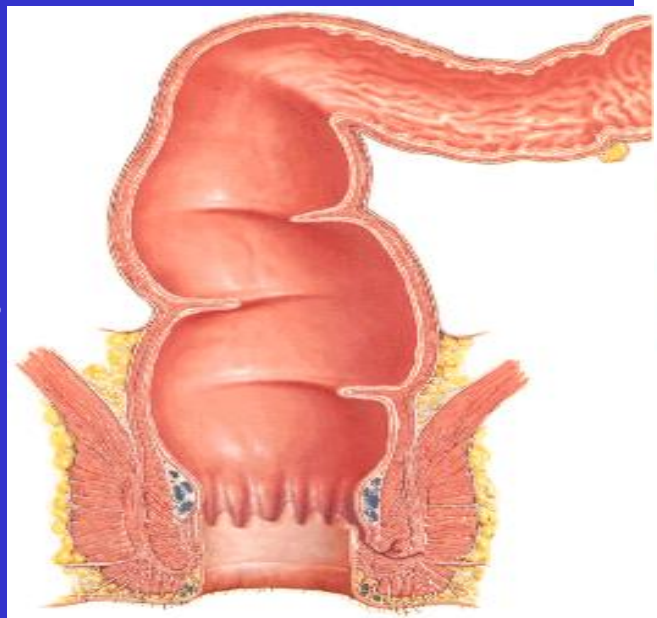
2) Rectal venous plexus

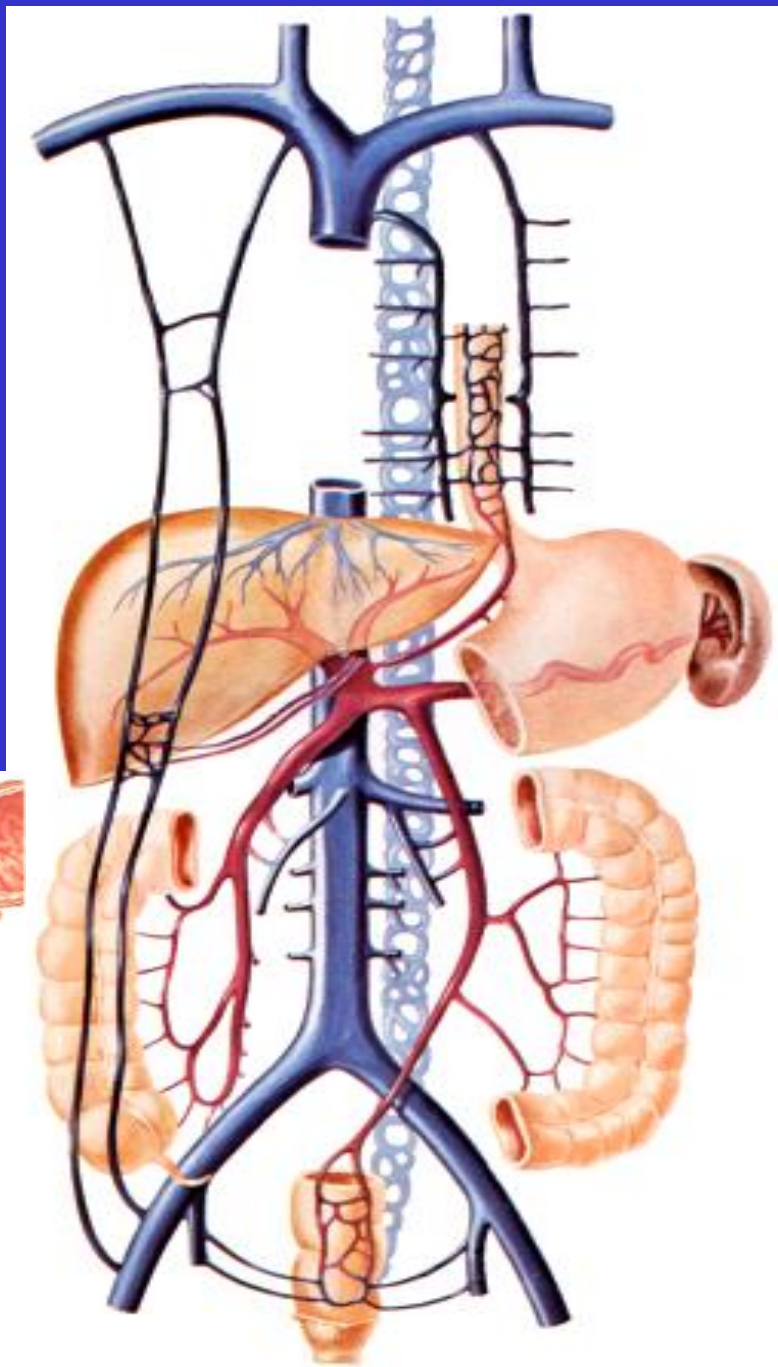
a. position: rectum

b. sigificance : hemorrhoids.

3)Periumbilical venous plexus

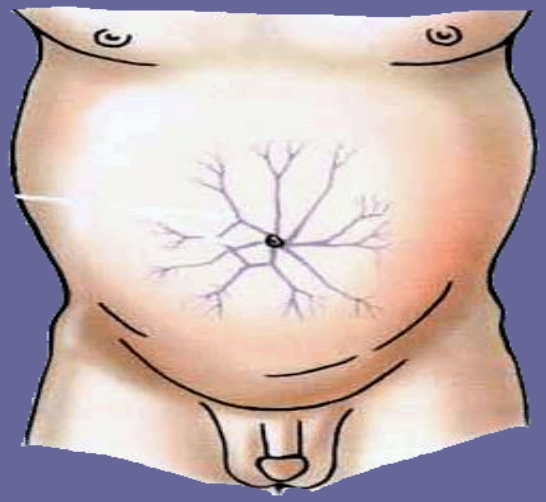
a. position: around umbilicus

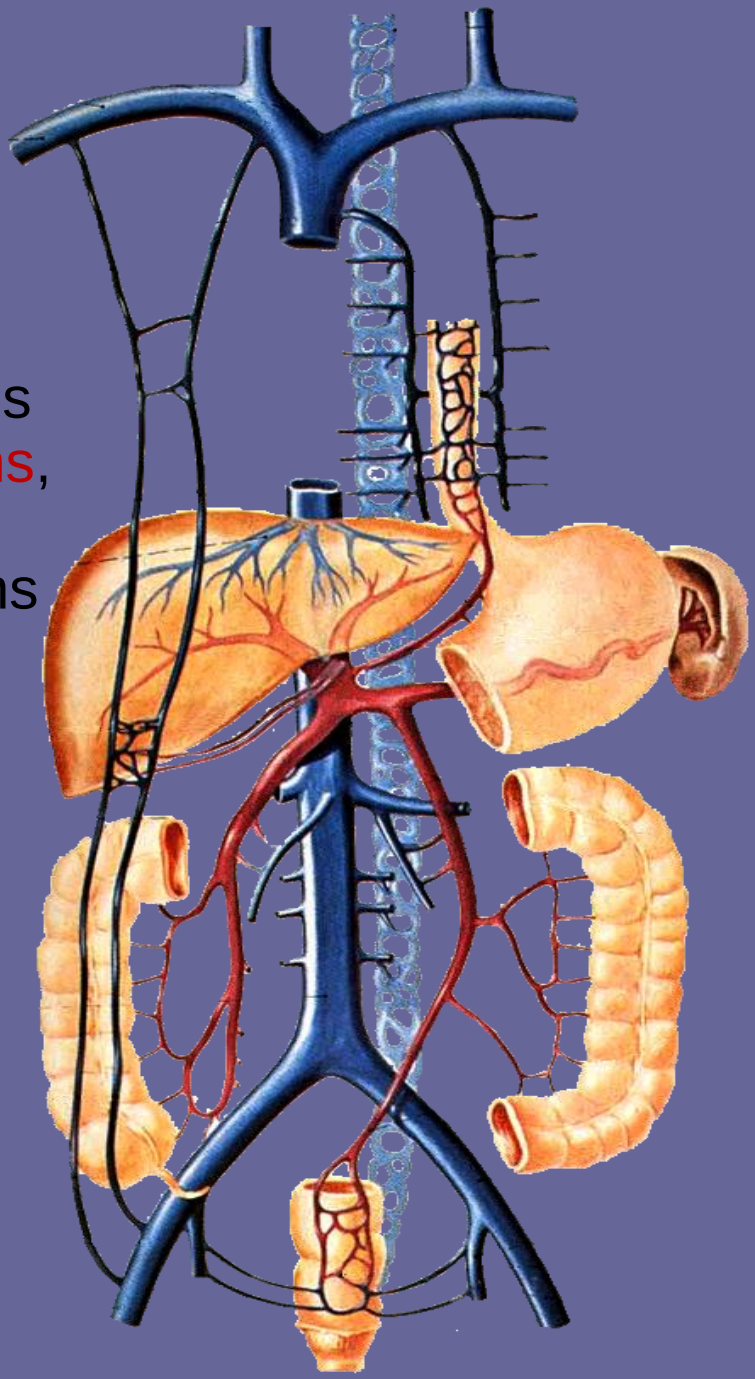




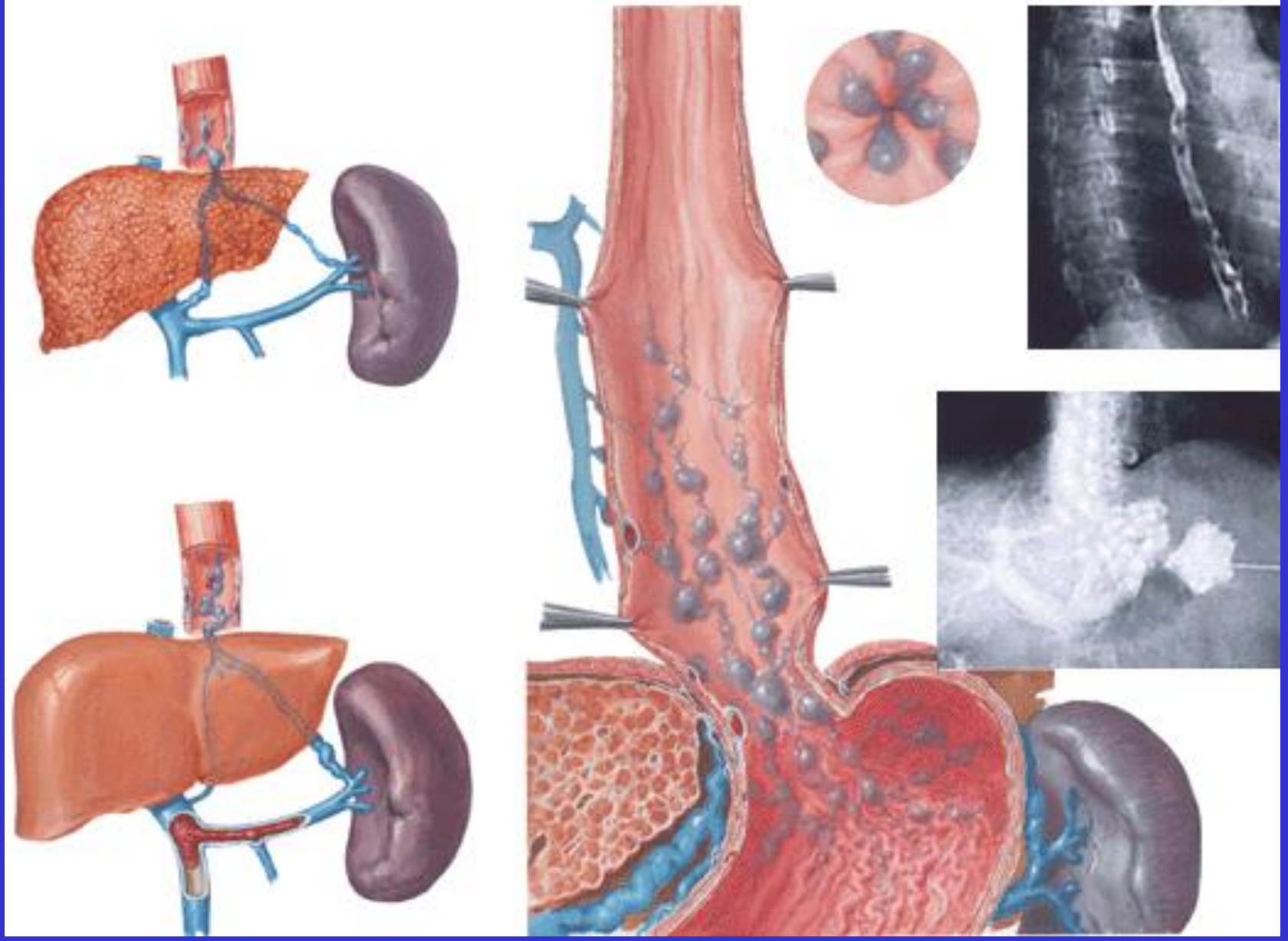
4. Portal-retroperitoneal anastomosis

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

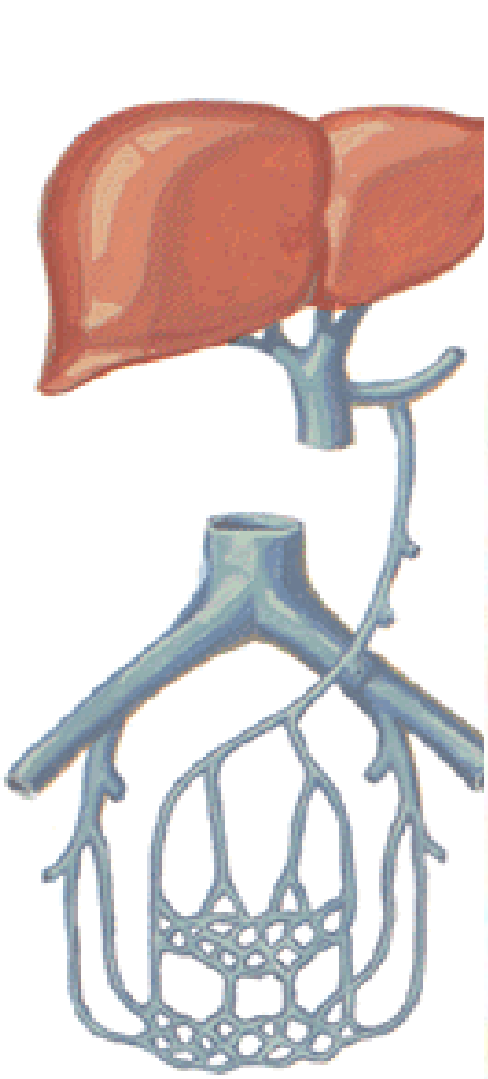


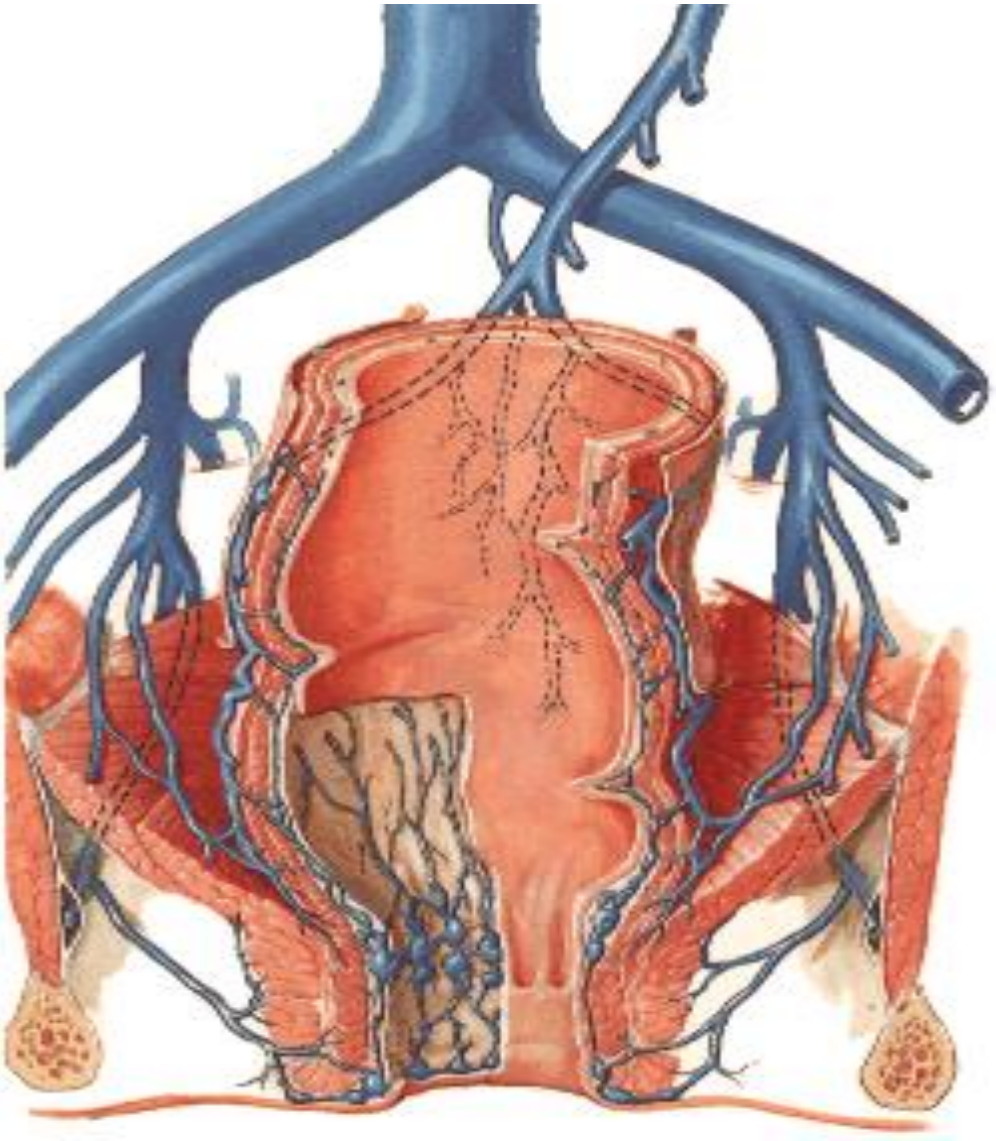


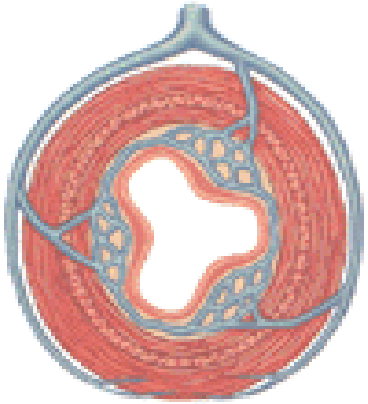
Esophageal Varicosis

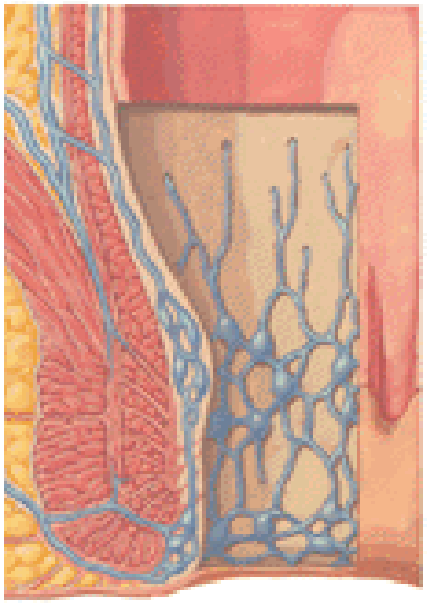


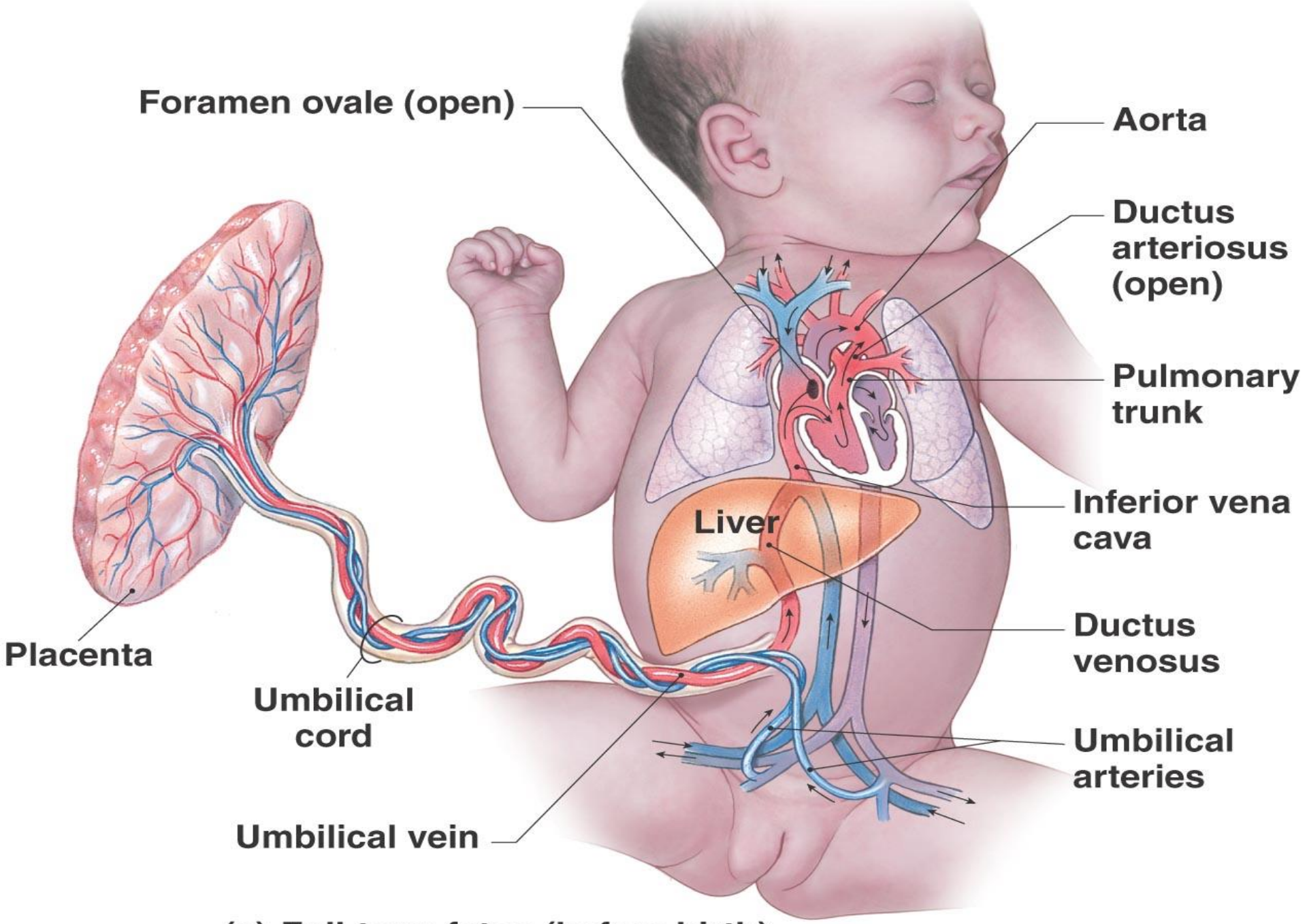
Venous Drainage of Anal Canal









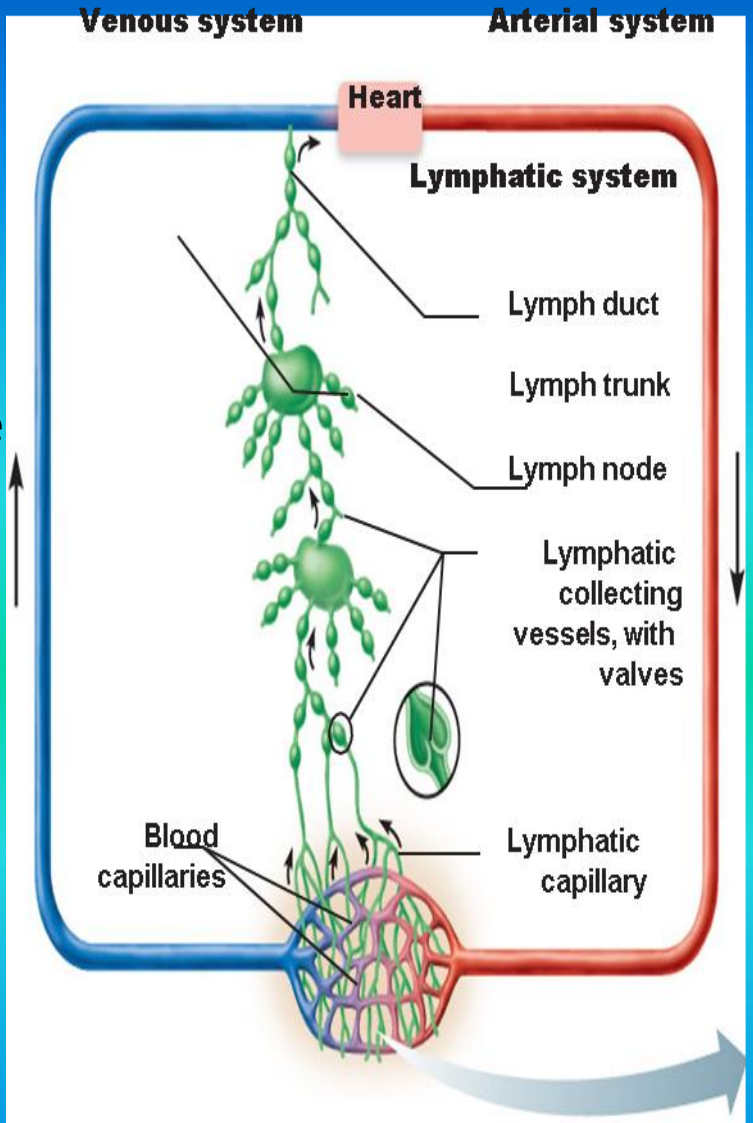


(a) Full-term fetus (before birth)

The Lymphatic System

The lymphatic system consists of lymphatic vessels and various lymphatic tissues and organs

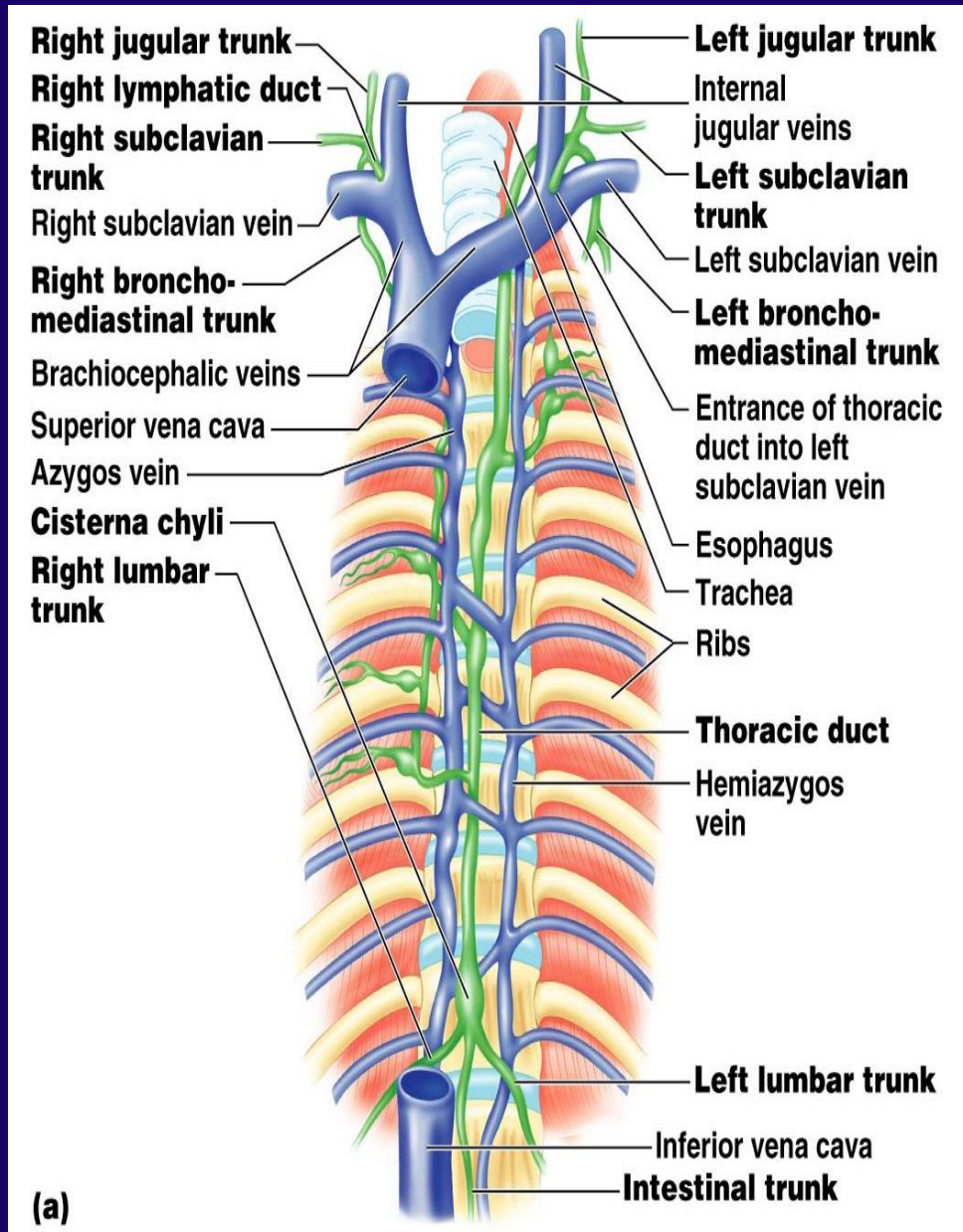
- Lymphatic vessels collect tissue fluid from loose connective tissue
  - Carry fluid to great veins in the neck
  - Fluid flows only toward the heart
- Functions of lymphatic vessels – collect excess tissue fluid and blood proteins
- **Lymph capillaries – s**mallest lymph vessels
  - First to receive lymph
- **Lymphatic collecting vessels – c**ollect from lymph capillaries
  - **Lymph nodes**

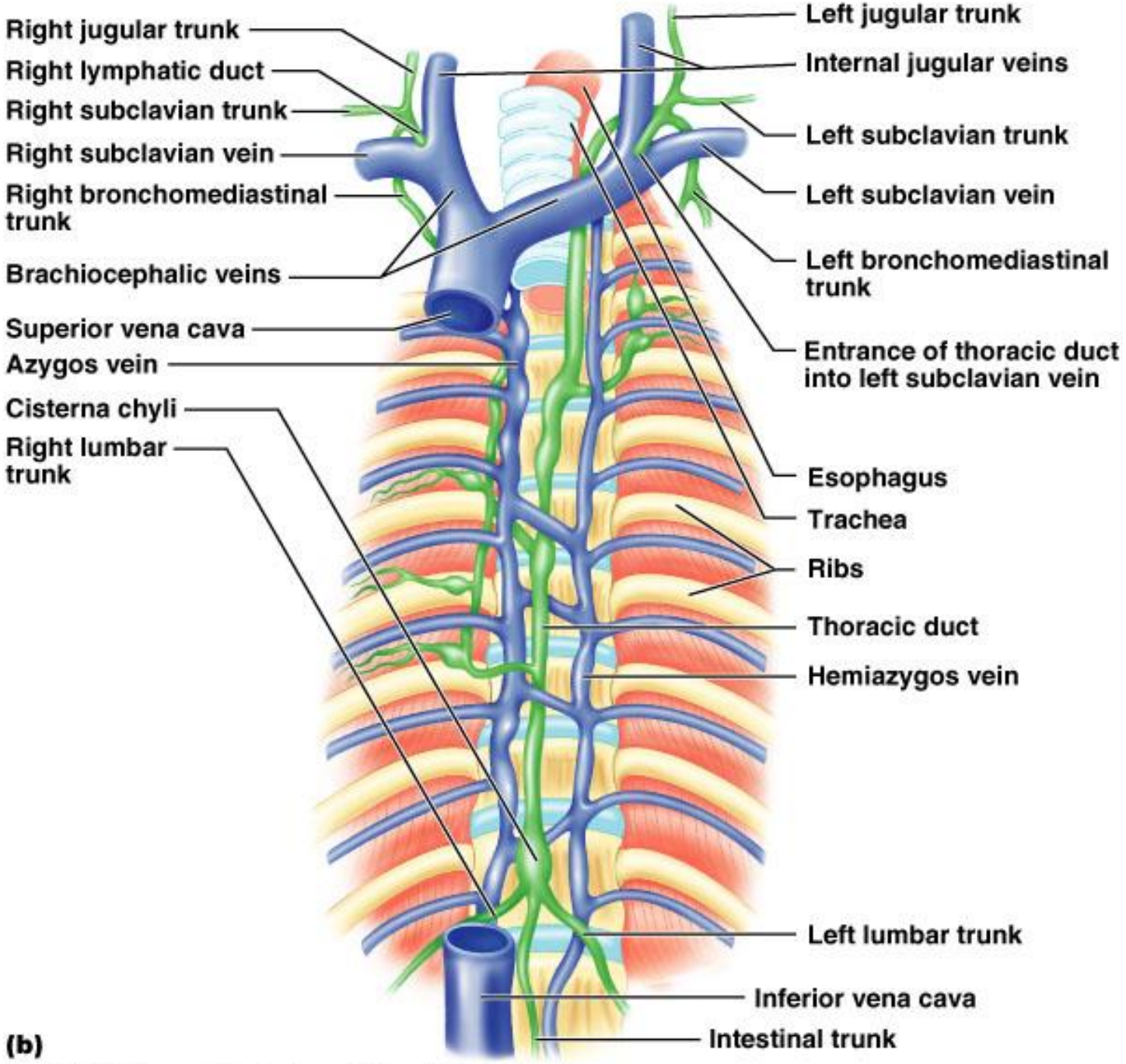


(a) Structural relationship between a capillary bed of the blood vascular system and lymphatic capillaries

Lymph Trunks

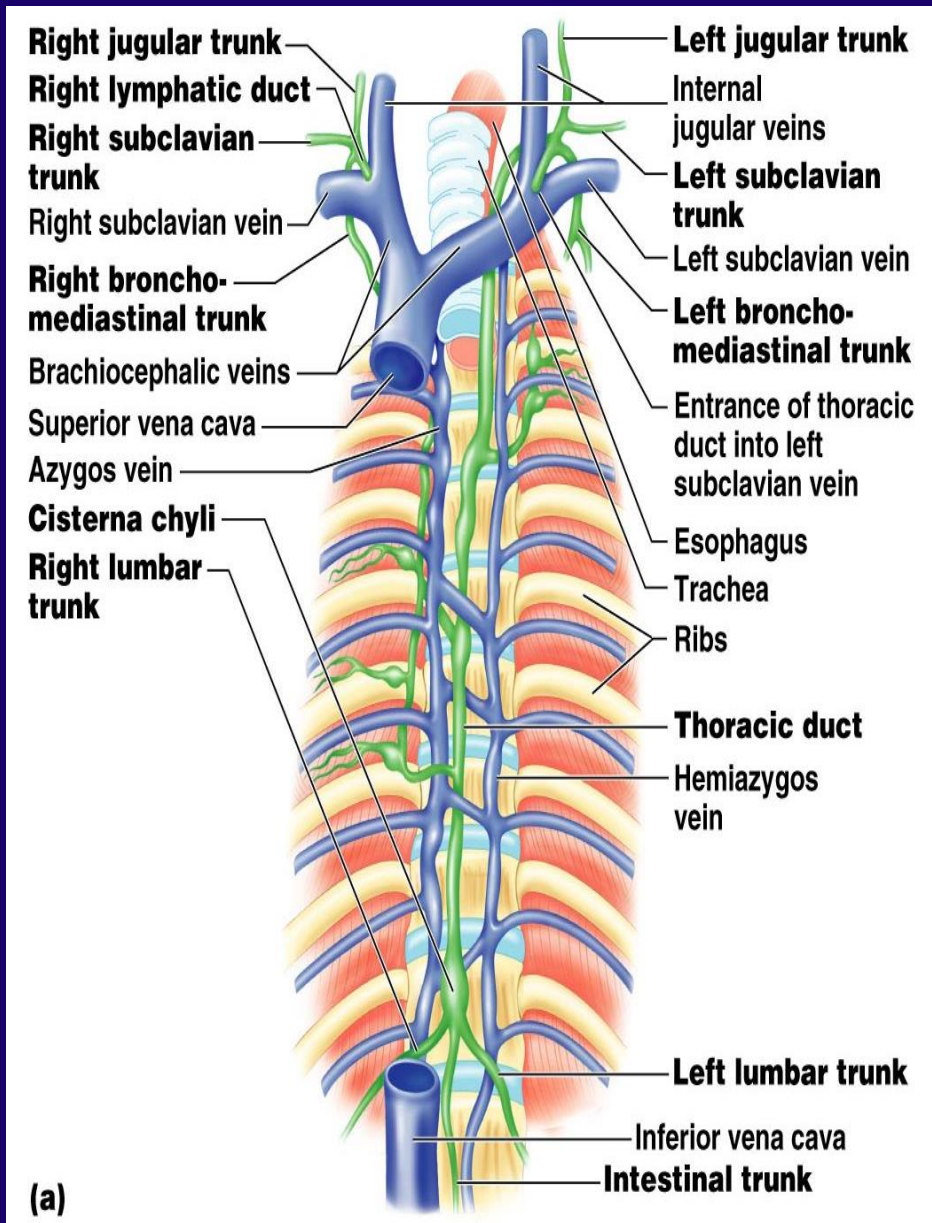
- Lymphatic collecting vessels converge
- Five major lymph trunks
  - **1 - Lumbar trunks**
    - Receives lymph from lower limbs
  - **2 - Intestinal trunk**
    - Receives chyle from digestive organs
  - **3 - Bronchomediastinal trunks**
    - Collects lymph from thoracic viscera
  - **4 - Subclavian trunks**
    - Receive lymph from upper limbs and thoracic wall
  - **5 - Jugular trunks**
    - Drain lymph from the head and neck





Lymph Ducts

- **Cisterna chyli** - located at the union of lumbar and intestinal trunks
- On the right side of the oarta
- **Thoracic duct** - ascends along vertebral bodies
  - Empties into venous circulation
  - Junction of left internal jugular and left subclavian veins
  - Drains three quarters of the body
- **Right lymphatic duct** - empties into right internal jugular and subclavian veins

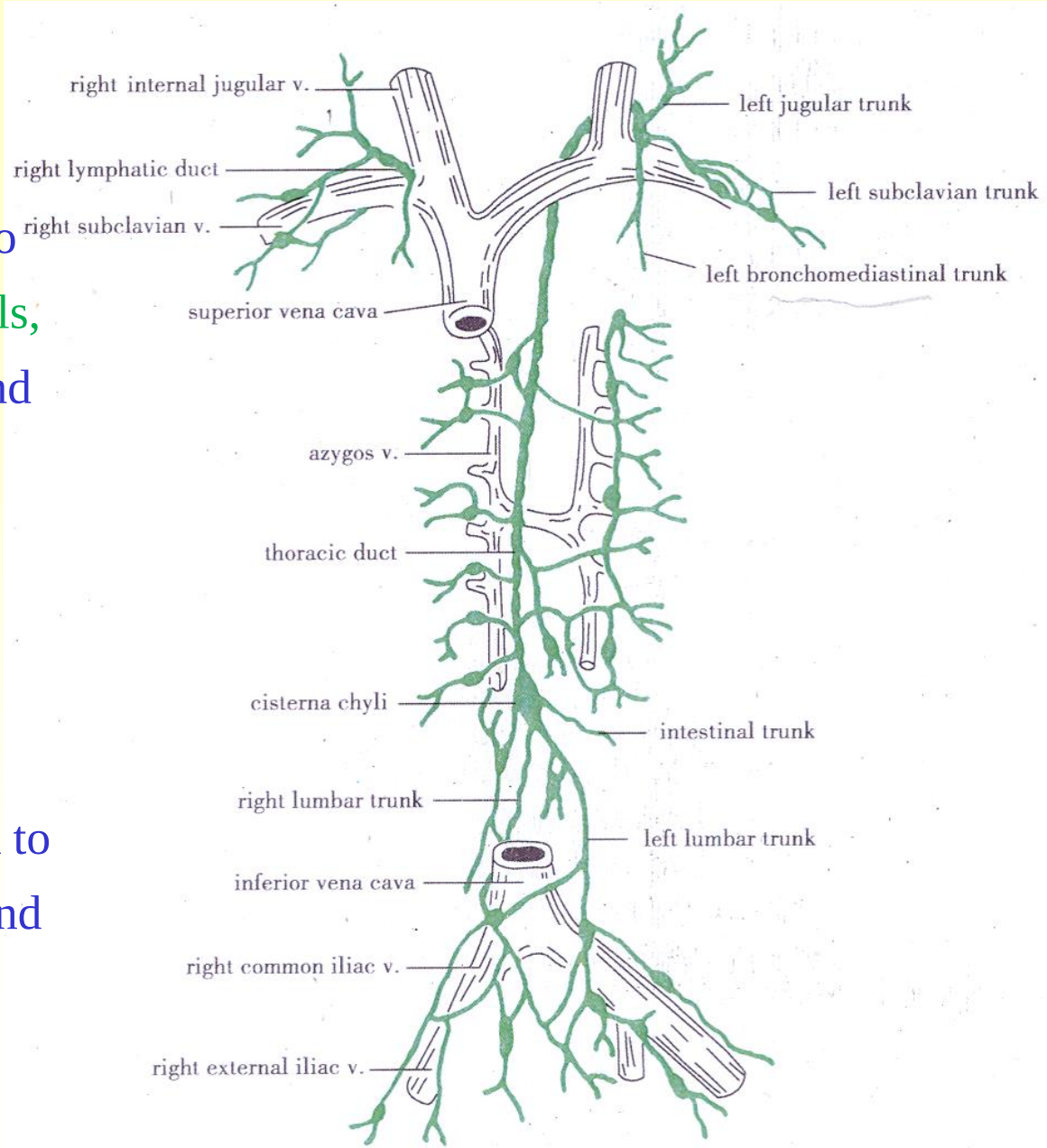


lymphatic duct

The lymphatic capillaries join to form progressively larger vessels, until finally the thoracic duct and the right lymphatic duct

the thoracic duct return to left venous angle, and the right lymphatic duct return to right venous angle,

a few lymphatic vessels return to renal vein、superarenal vein and inferior vena cava.



lymphatic duct

thoracic duct

left venous angle

thoracic duct

left jugular trunk : conveying lymph from the left side of the head and neck

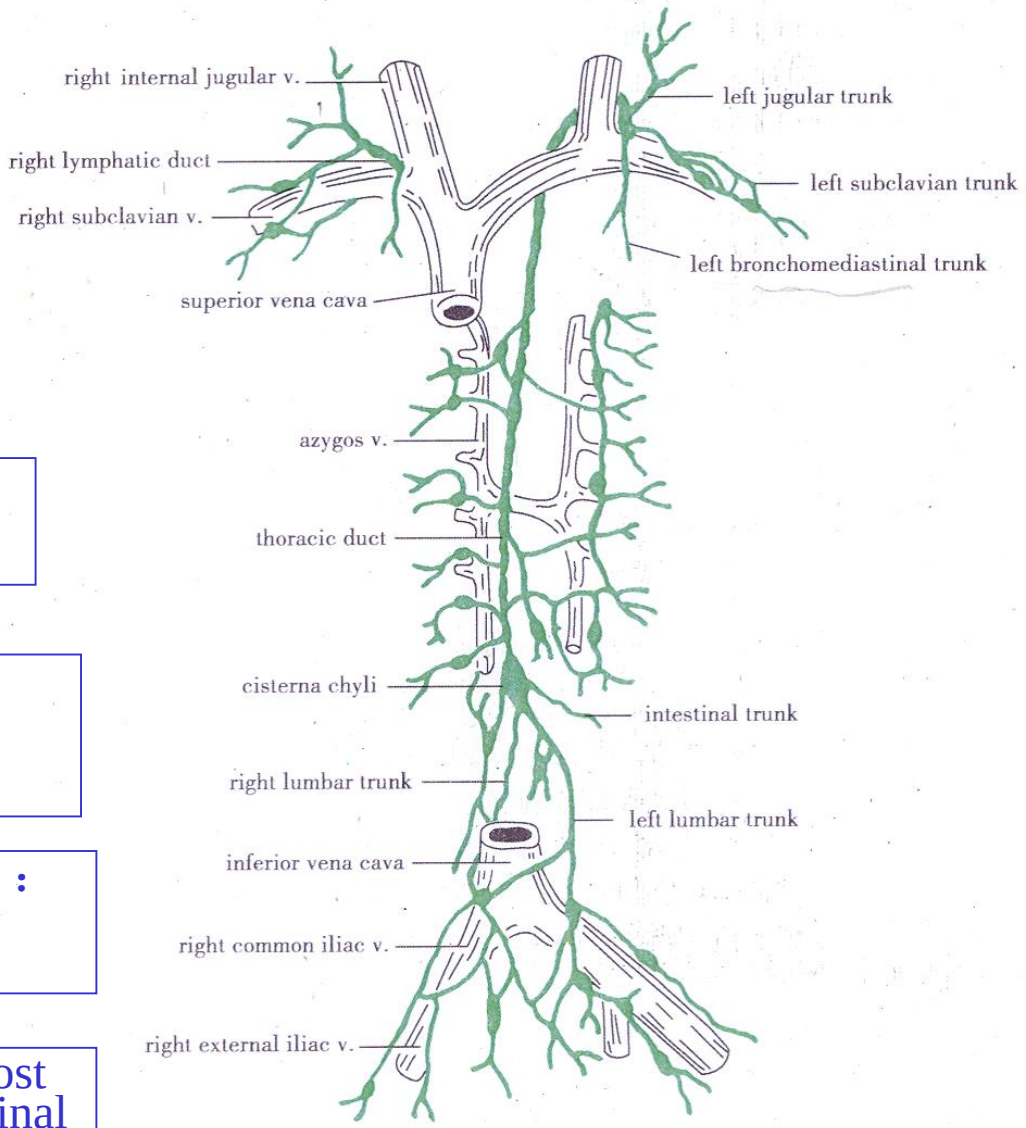
left subclavian trunk : draining lymph from the left upper limb and part of the thorax on the left side

left bronchomediastinal trunk : draining lymph from Left thoracic cavity

cisterna chyli

intestinal trunk, : draining most of the lymph from the abdominal part of the alimentary canal, liver, pancreas and spleen

left and right 1umbar trunks : conveying lymph from the lower limbs and the pelvic viscera

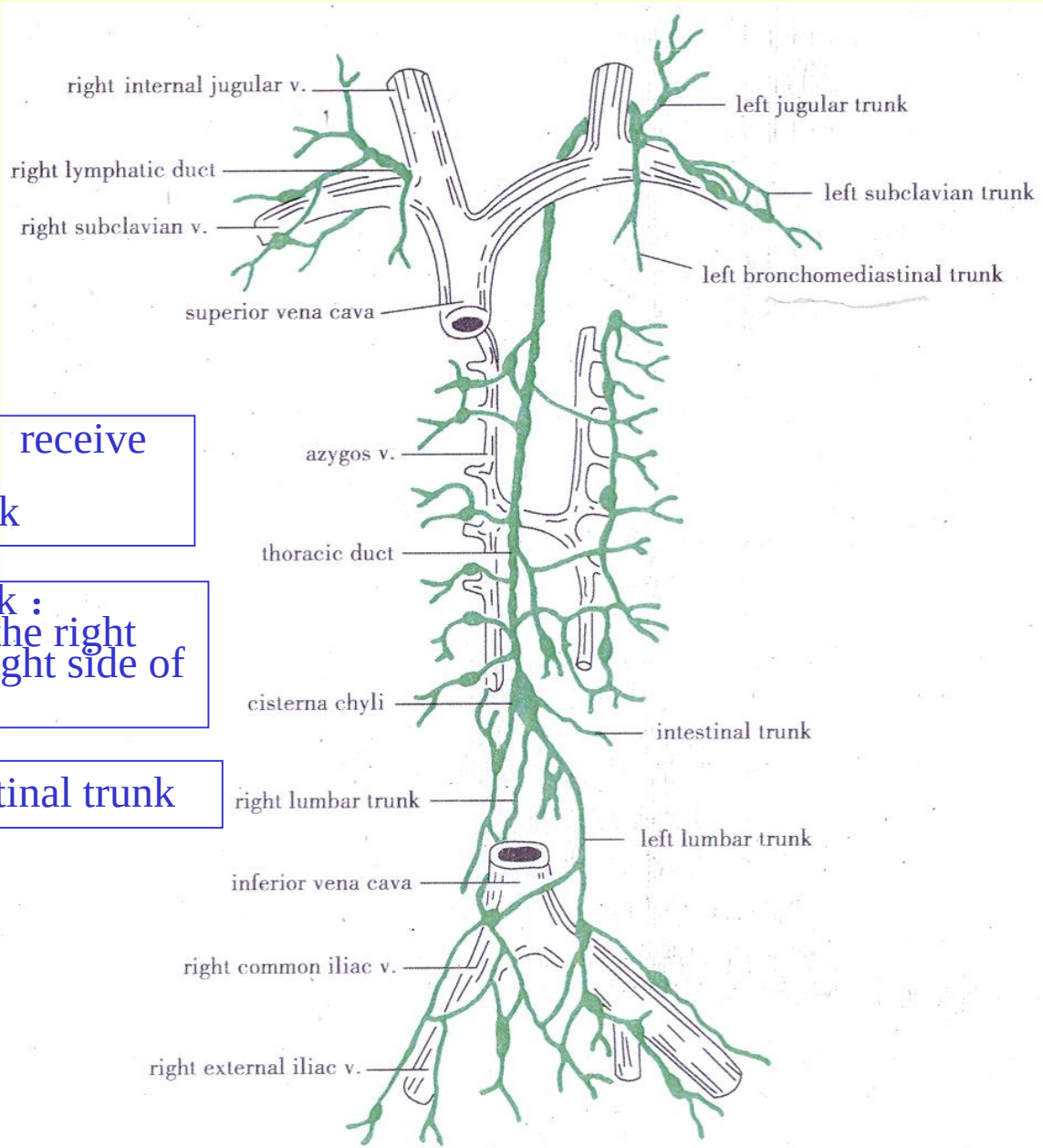


right lymphatic duct

right venous angle

right lymphatic duct

- right jugular trunk： receive lymph from the right Side of head and neck
- right subclavian trunk： receive lymph from the right upper limb and the right side of the thorax
- right bronchomediastinal trunk

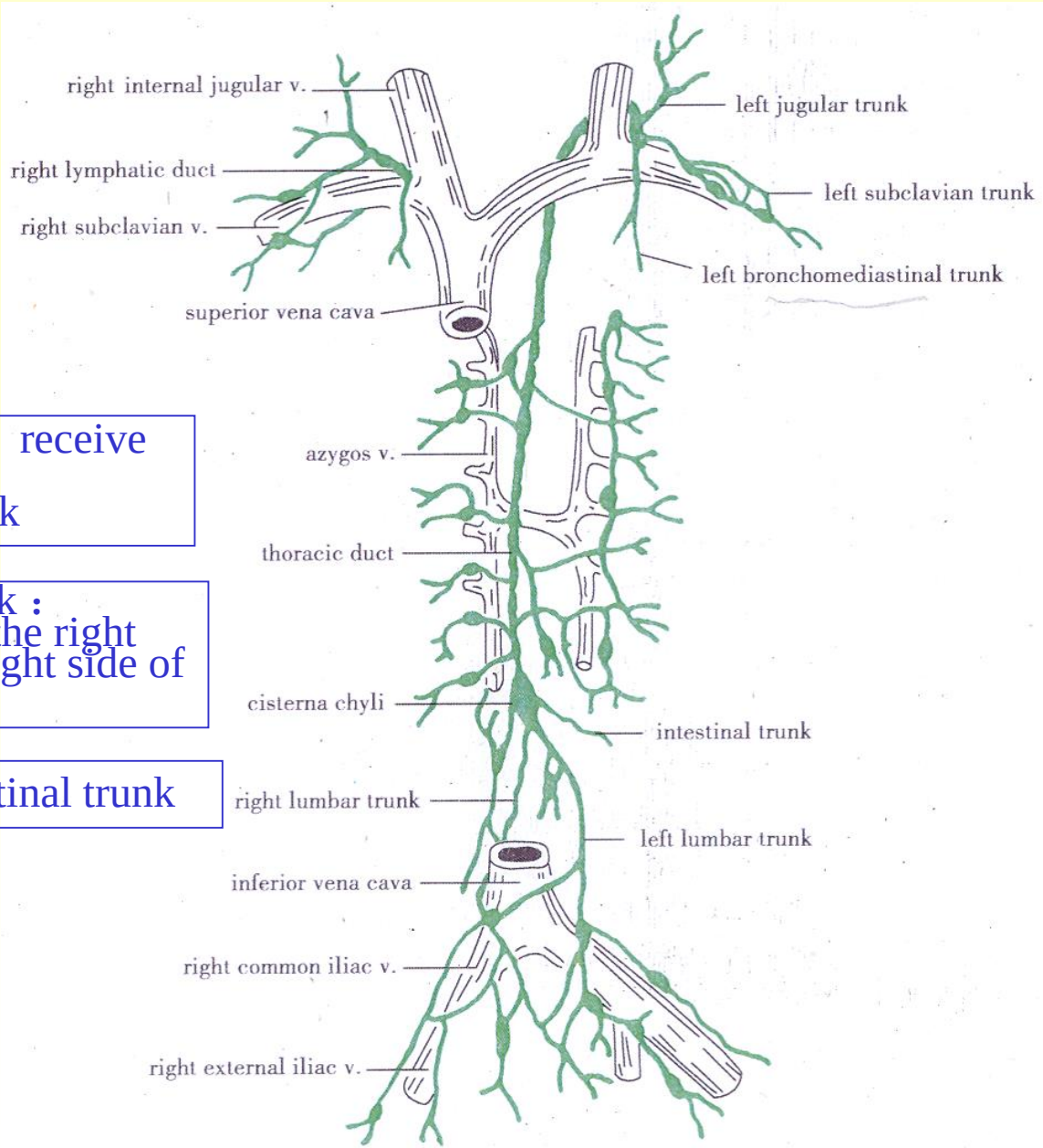


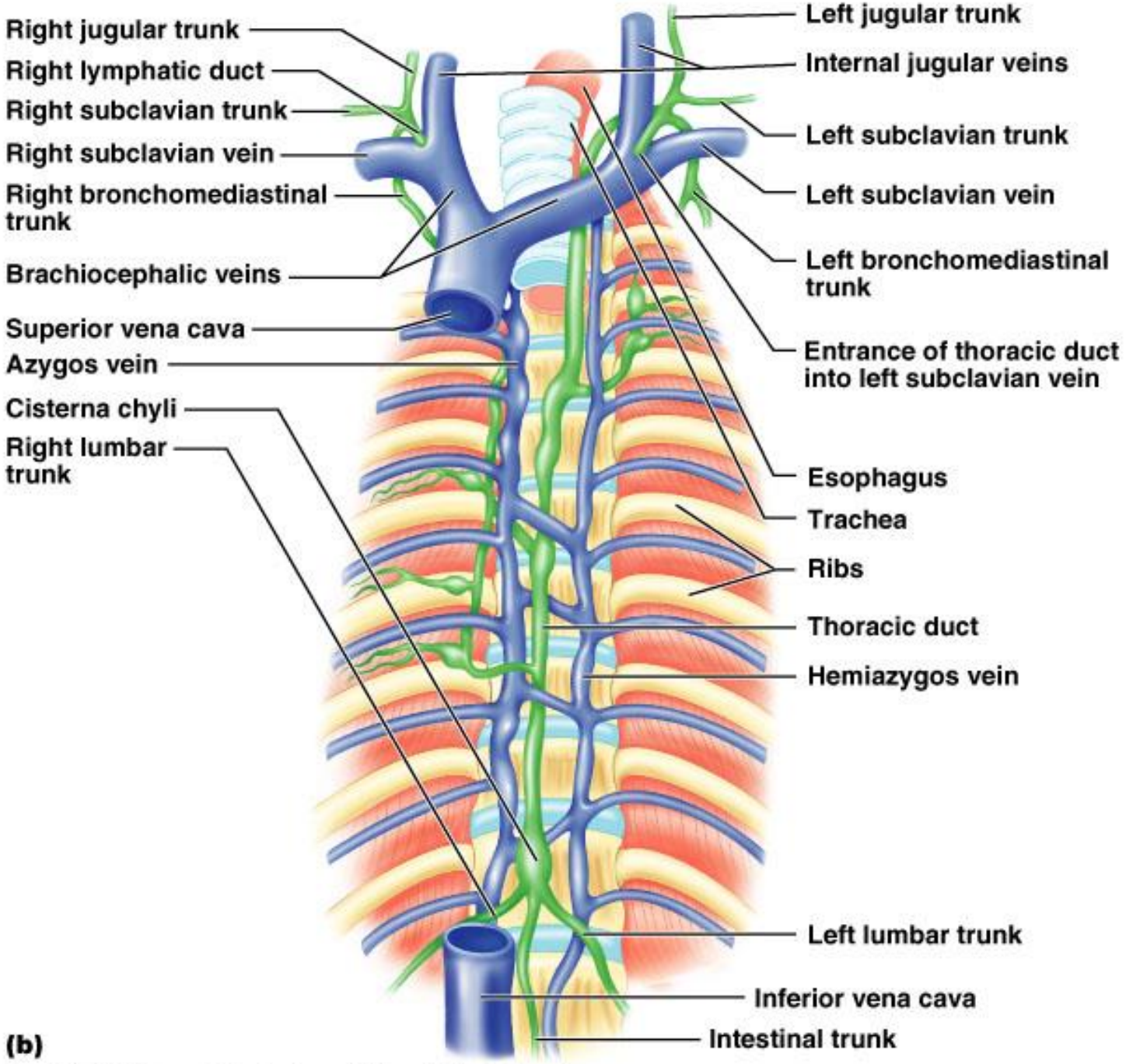
right lymphatic duct

right venous angle

right lymphatic duct

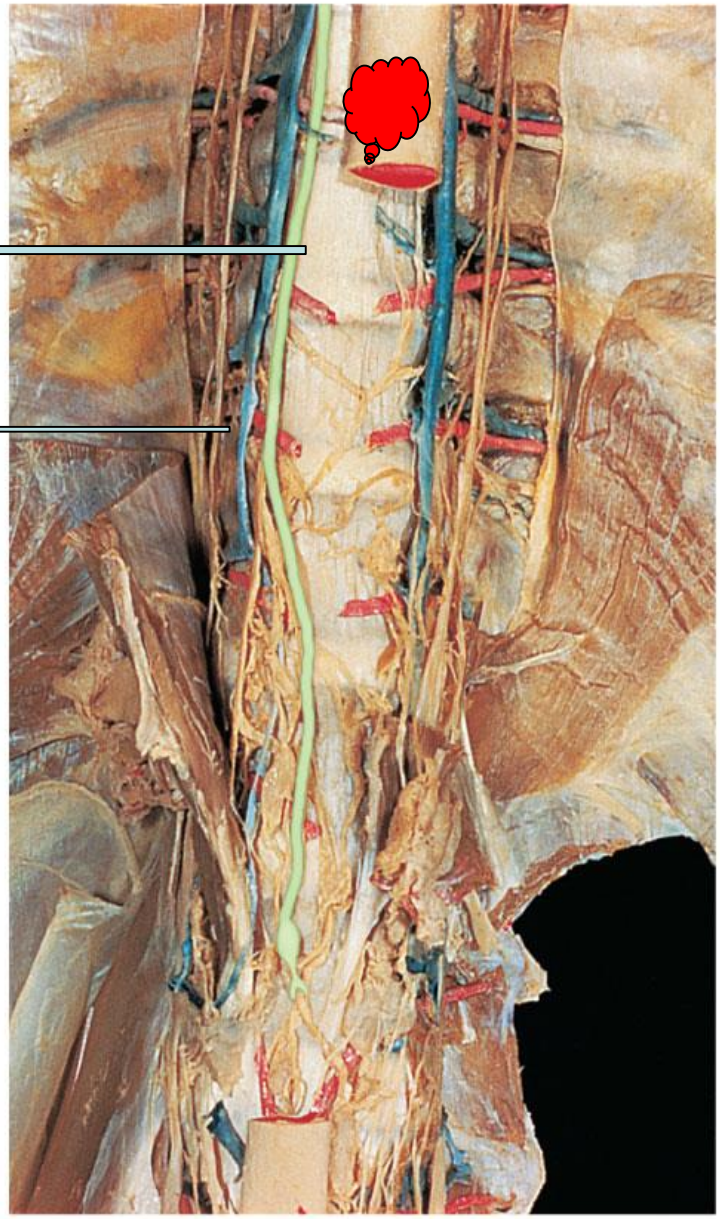
- right jugular trunk： receive lymph from the right Side of head and neck
- right subclavian trunk： receive lymph from the right upper limb and the right side of the thorax
- right bronchomediastinal trunk





Thoracic duct

Azygos vein on vertebral bodiesc



Sympathetic trunk

Sympathetic Trunk Ganglia -- Located on both sides of the vertebral column

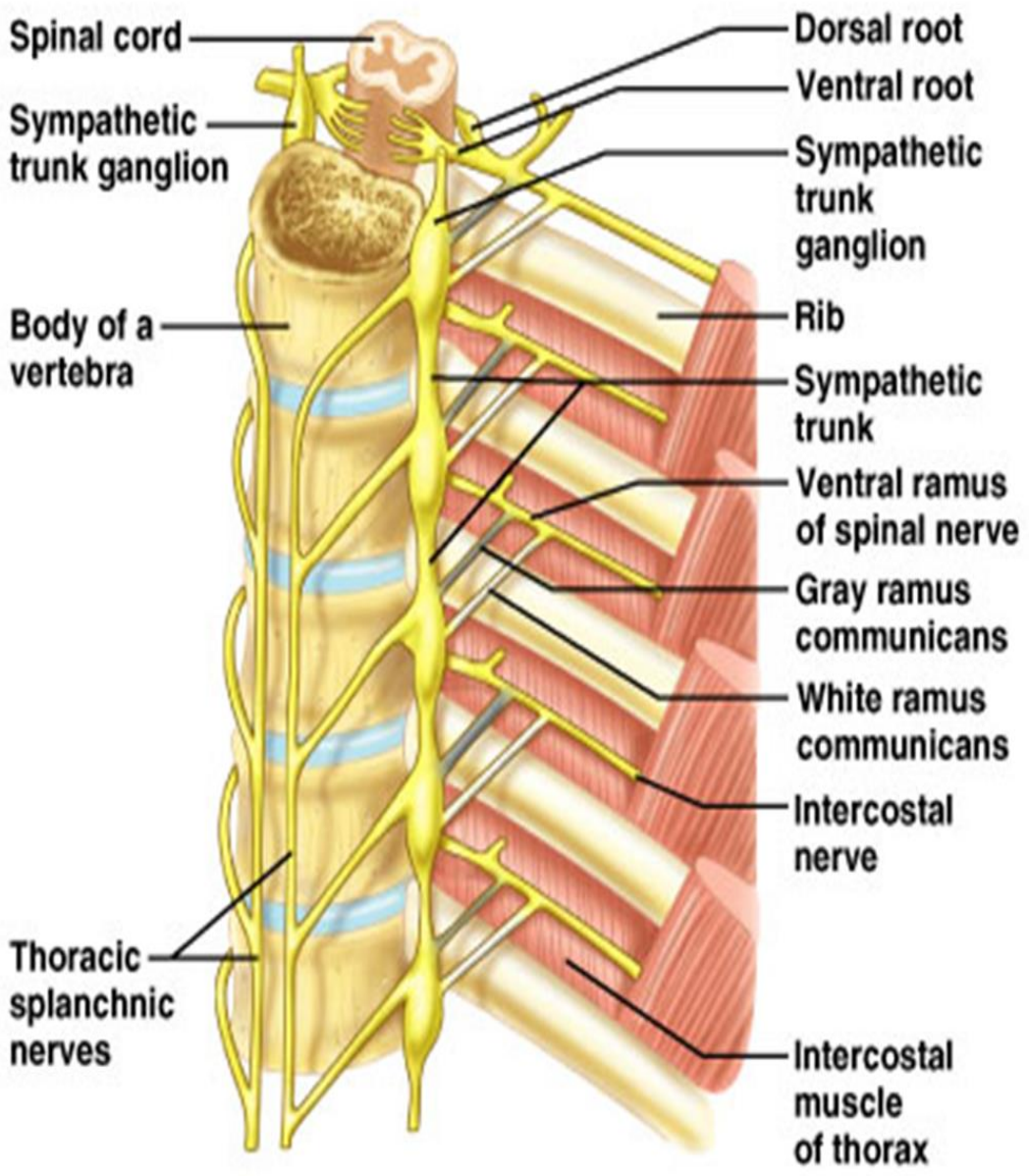
Joined to ventral rami by white and gray rami communicantes

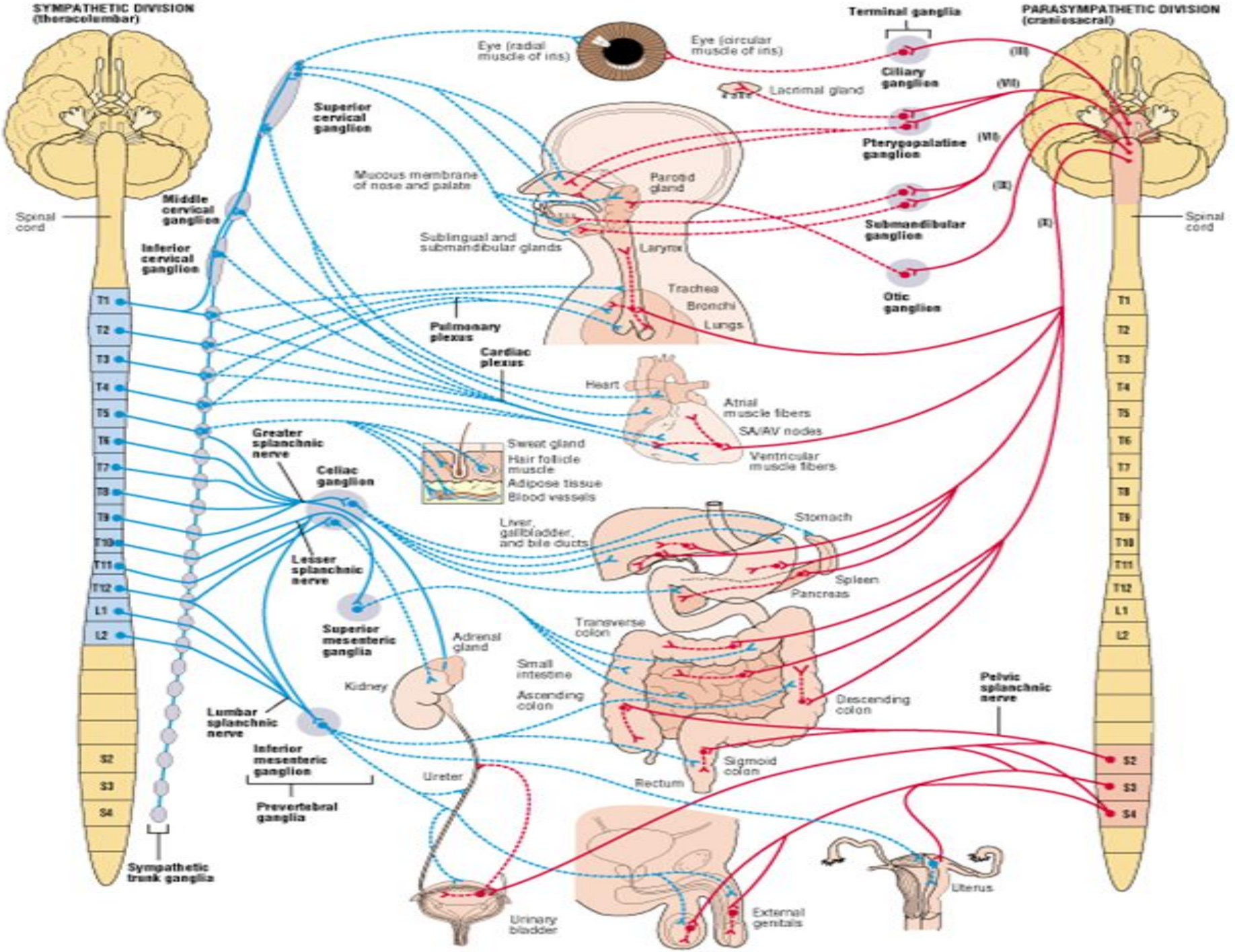
Prevertebral Ganglia :

Occur only in abdomen and pelvis

Lie anterior to the vertebral column

Main ganglia : Celiac, superior mesenteric, inferior mesenteric, inferior hypogastric ganglia

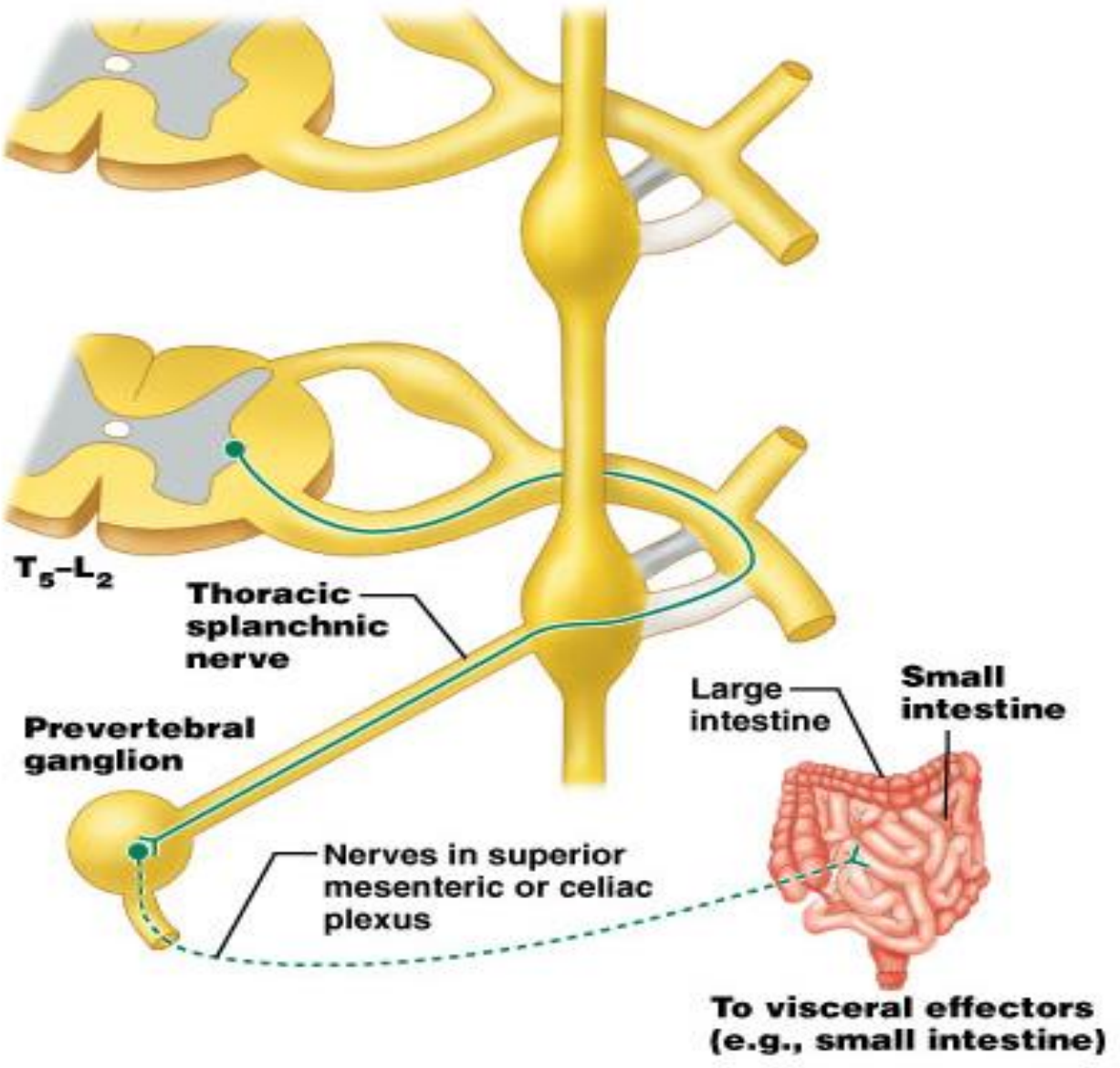



SYMPATHETIC DIVISION
(thoracolumbar)
PARASYMPATHETIC DIVISION
(craniosacral)
Terminal ganglia
Eye (radial muscle of iris)
Eye (circular muscle of iris)
Ciliary ganglion
(III)
Lacrimal gland
(VII)
Superior cervical ganglion
Pterygopalatine ganglion
(VII)
Mucous membrane of nose and palate
Parotid gland
(IX)
Middle cervical ganglion
Submandibular ganglion
Spinal cord
Sublingual and submandibular glands
Larynx
Inferior cervical ganglion
Otic ganglion
Trachea
Bronchi
Lungs
Pulmonary plexus
Cardiac plexus
Heart
Atrial muscle fibers
SA/AV nodes
Ventricular muscle fibers
Sweat gland
Hair follicle muscle
Adipose tissue
Blood vessels
Greater splanchnic nerve
Celiac ganglion
Stomach
Liver, gallbladder, and bile ducts
Lesser splanchnic nerve
Spleen
Pancreas
Superior mesenteric ganglia
Transverse colon
Adrenal gland
Small intestine
Kidney
Ascending colon
Descending colon
Pelvic splanchnic nerve
Lumbar splanchnic nerve
Sigmoid colon
Inferior mesenteric ganglion
Ureter
Rectum
Prevertebral ganglia
Uterus
Urinary bladder
External genitals
Sympathetic trunk ganglia
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
L1
L2
S2
S3
S4

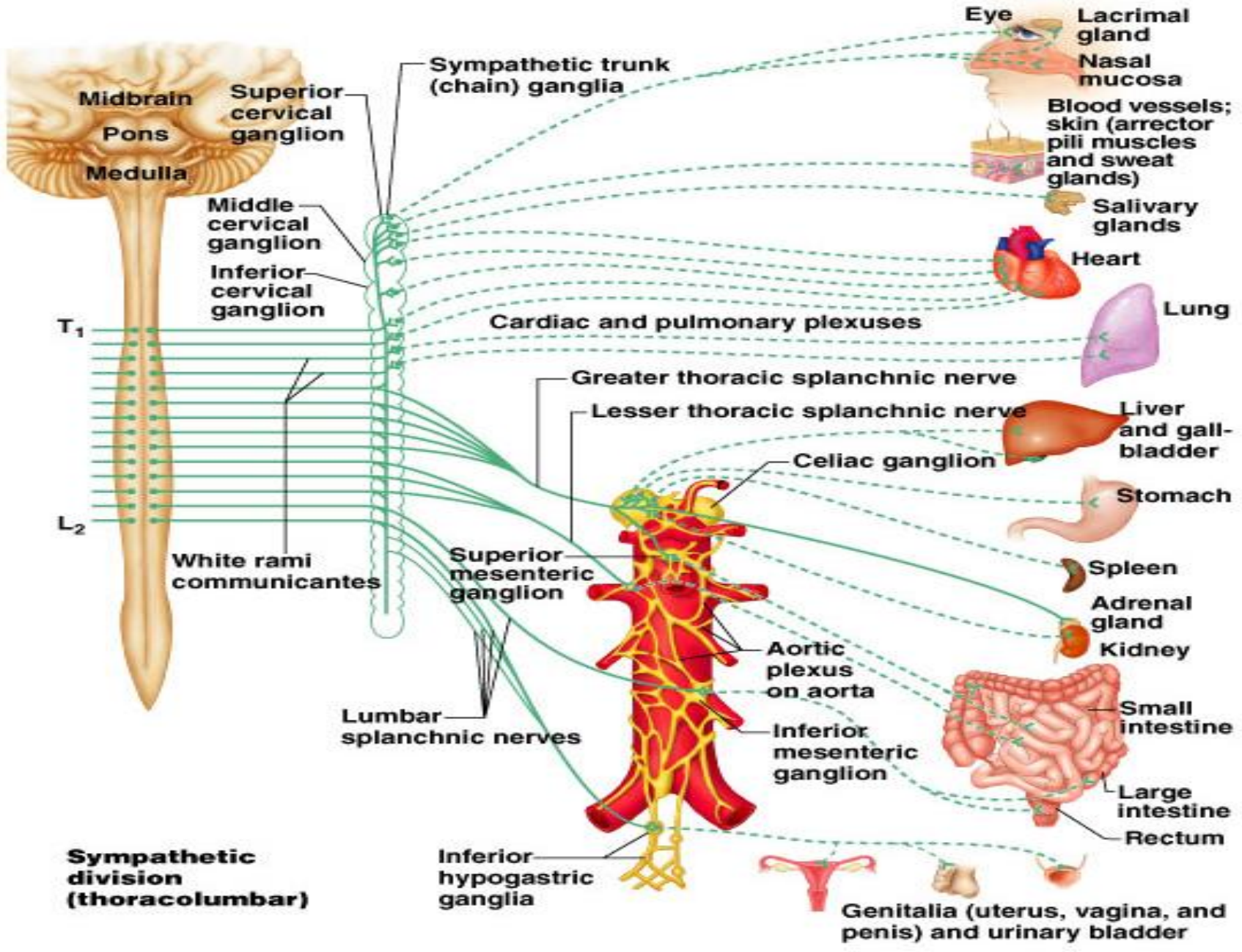
Splanchnic Nerves

- Some sympathetic preganglionic axons pass through the sympathetic trunk without terminating in it. Beyond the trunk they form nerves called splanchnic nerves which extend to prevertebral ganglia.
- T5-T9 or T10- Greater splanchnic nerve.(serves: stomach, spleen, liver, kidneys, and small intestines)
- T10-T11- Lesser splanchnic nerve. (serves: blood vessels of small intestine and proximal colon)
- L1-L4- Lumbar splanchnic nerve. Terminate in the inferior mesenteric ganglion

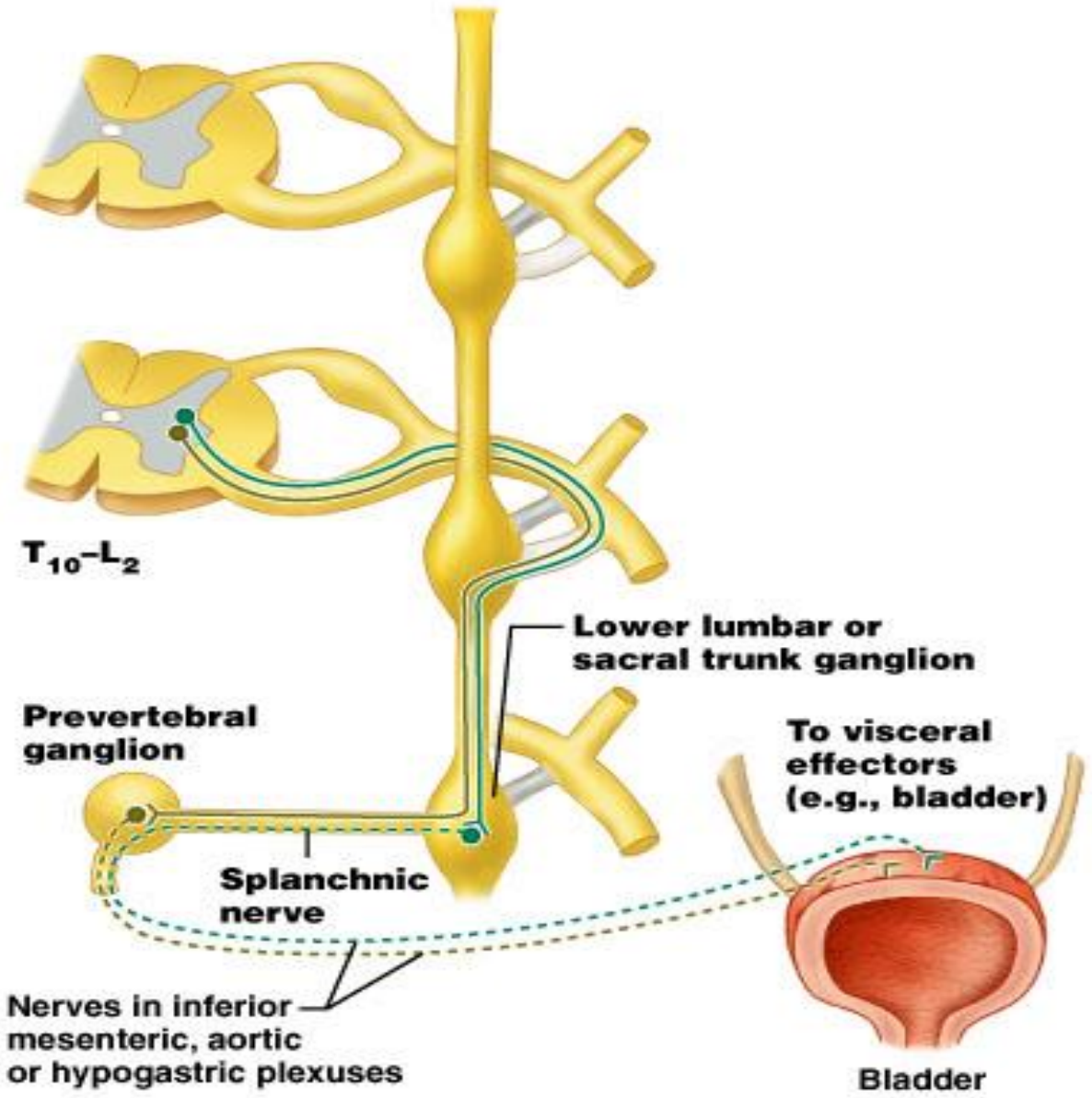
Sympathetic Pathways to the Abdominal Organs

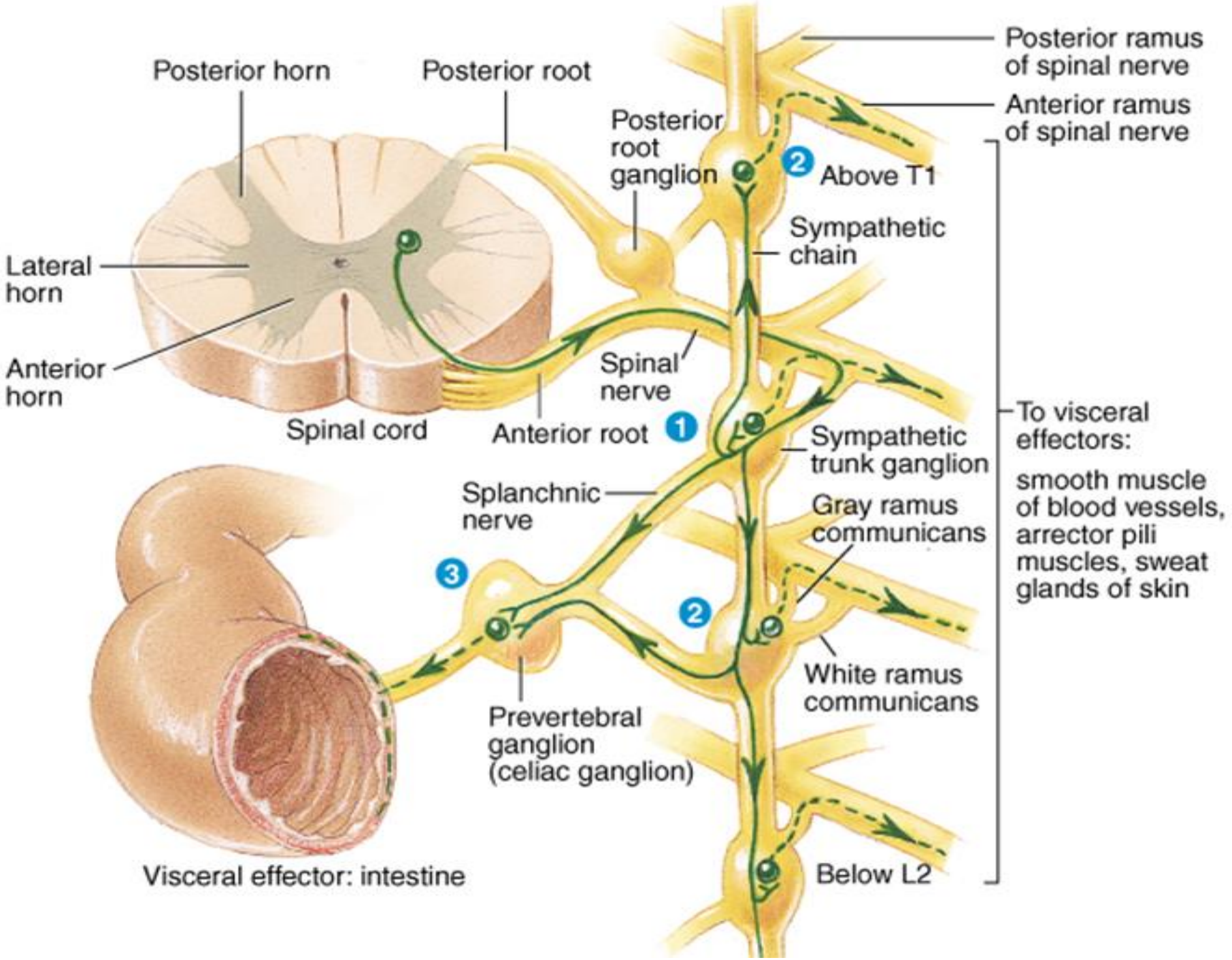


Sympathetic Division of the ANS



Sympathetic Pathways to the Pelvic Organs




Posterior horn
Posterior root
Posterior ramus of spinal nerve
Anterior ramus of spinal nerve
Posterior root ganglion
2
Above T1
Sympathetic chain
Lateral horn
Anterior horn
Spinal nerve
Spinal cord
Anterior root
1
Sympathetic trunk ganglion
To visceral effectors:
smooth muscle of blood vessels, arrector pili muscles, sweat glands of skin
Splanchnic nerve
Gray ramus communicans
3
2
White ramus communicans
Prevertebral ganglion (celiac ganglion)
Visceral effector: intestine
Below L2

Sacral Parasympathetic

- Consists of S2-S4.
- Innervates organs of the pelvis and lower abdomen
- form Pelvic splanchnic nerves

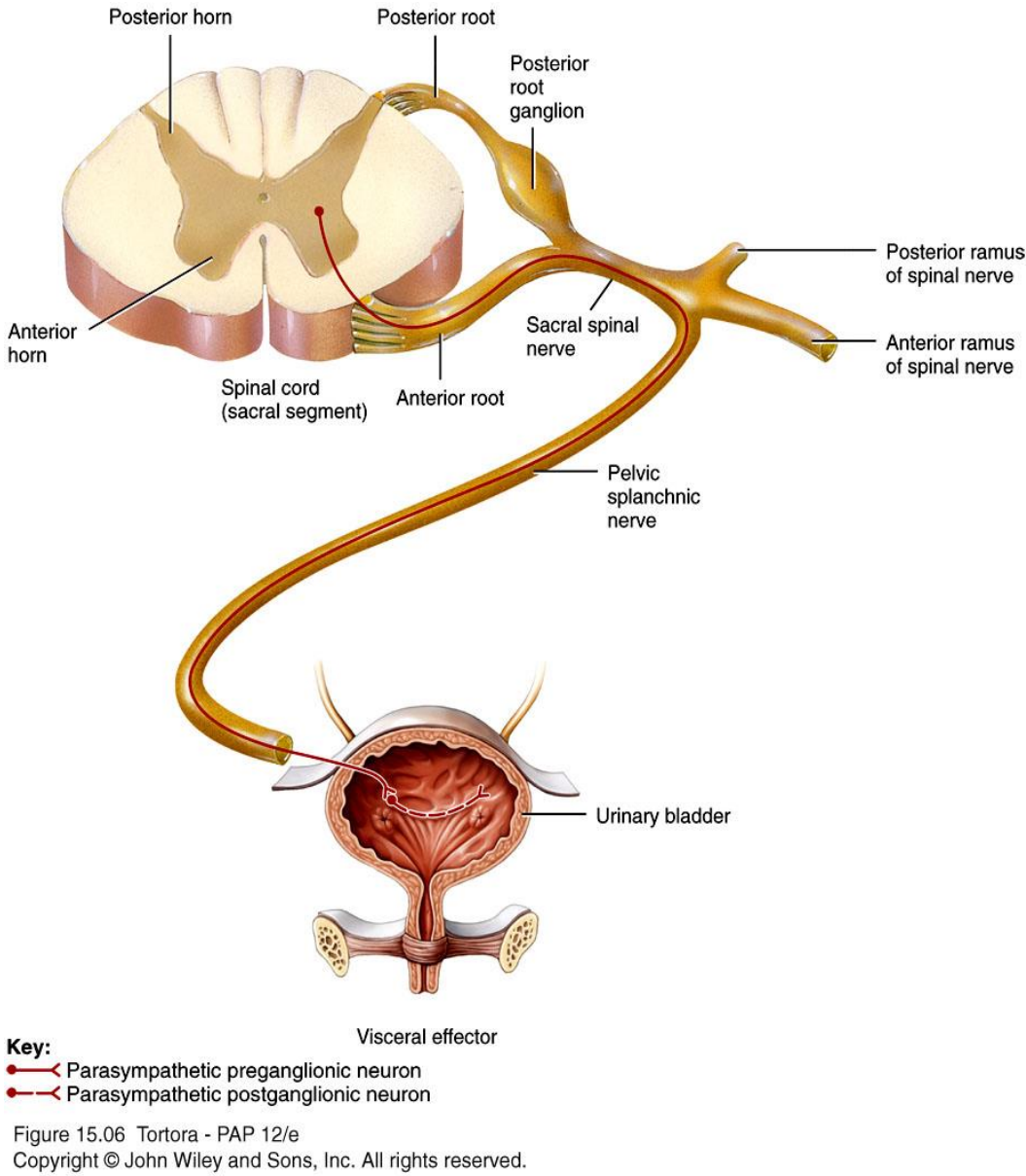
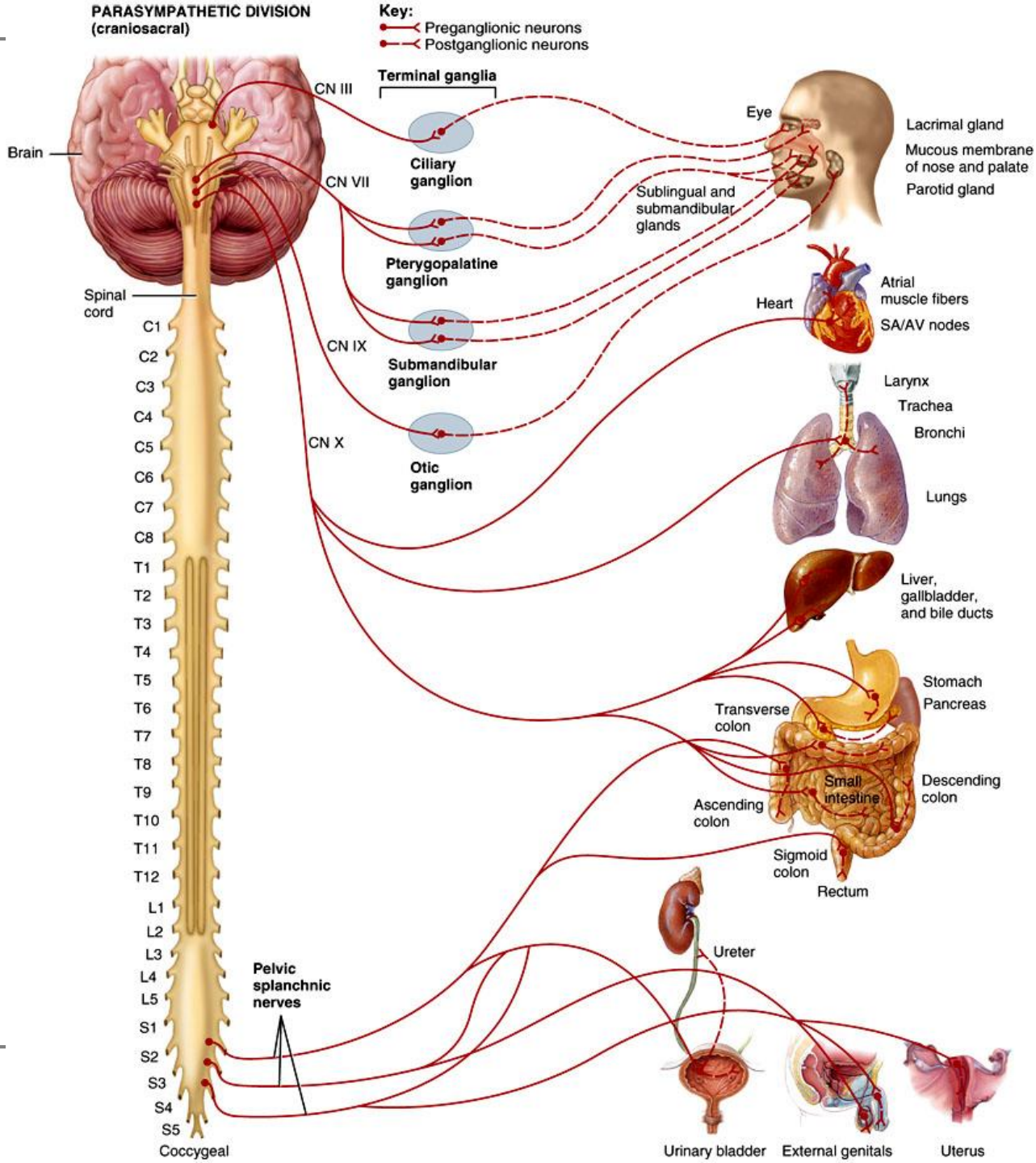


Figure 15.06 Tortora - PAP 12/e

Structure of the Parasympathetic Division



1. Which one of the following organs is attached to the lesser omentum ?

a. Pancreas.

b. Spleen.

c. Liver.

d. Transverse colon.

2. Which structure does contribute in the anterior wall of the omental bursa ?

a.Transverse colon.

b.Lesser omentum.

c.Transverse mesocolon.

d. pancreas.

3. Which structure is belonged to the posterior boundary of epiploic foramen ?

a.Portal vien.

b.Inferior vena cava.

c.Hepatic artery.

d.Common bile duct.

س١- أي الأغلفة التي تغلف الجوف البطني الحوضي :

A– Pleural B ® - Peritoneal C– Pericardial D- Synovial

س٢- طبقة الغشاء البريتواني التي تغلف جوف البطن هي :

A- Pleural B- Visceral C- ® Parietal D– Mucous

-

س٣- يقسم الجوف الأمامي إلى مستويين :

A - العمود الفقري B–القلب C- المنصف D- ® الحجاب الحاجز E– الحجاب الحوضي

- س4- الروافد الحشوية للوريد الأجوف السفلي كل ما يلي ما عدا :
- A– الوريد الكلوي B- الوريد المبيضي الأيمن C– الوريد الكظري الأيمن D– الأوردة الكبدية® E– الوريد الحجابي السفلي
-
- س٥– في الصهريج الكيلوسي كل ما يلي صحيح ما عدا :
- A- يتلقى الجذع المعوي B- يتلقى الجذع القطني الأيمن
  C– يقع في مستوى تحت الحجاب الحاجز D– ® يتوضع على الجانب الأيسر للأبهر
-
- س٦- يشارك في حدود جيب موريسون كل ما يلي ما عدا :
- A– الفص الكبدي الأيمن B- ® جدار البطن الأمامي C– الكلية اليمنى D– الإنثناء القولوني الأيمن