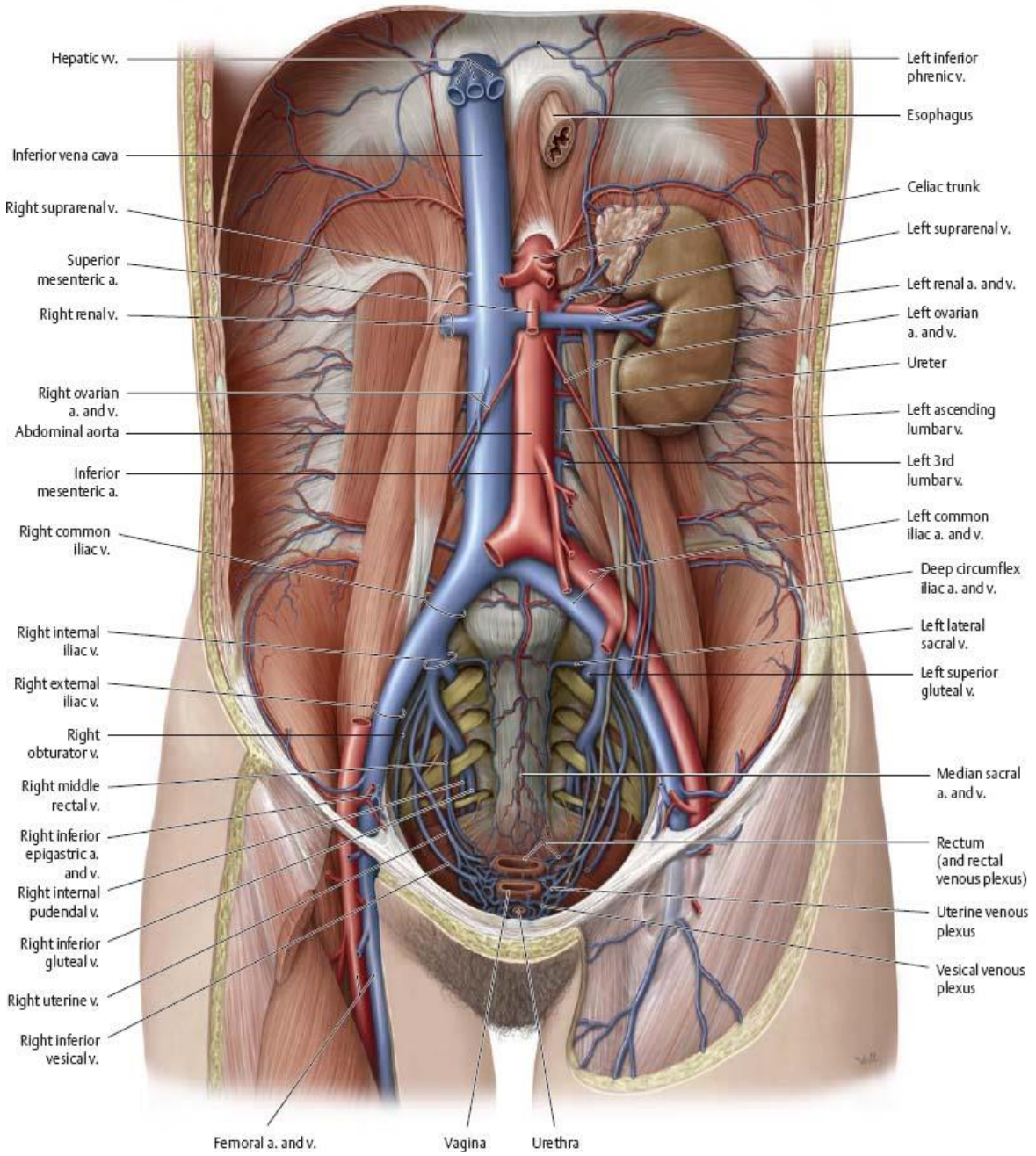
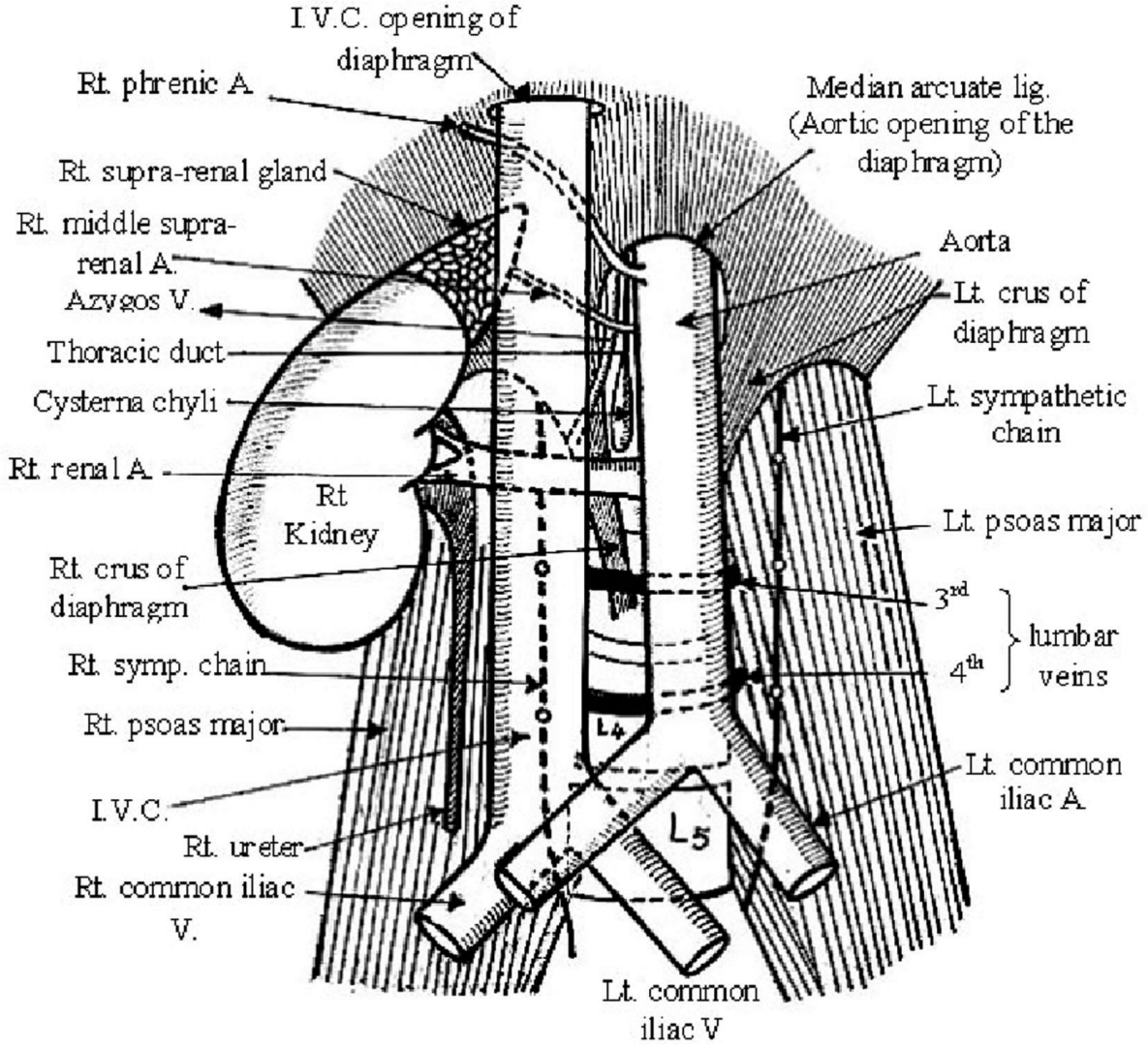
Abdominal Aorta

★ **It begins** at the aortic opening in the diaphragm at level of T_{12} vertebra as continuation for descending throracic aorta.

★ **It ends** at level of lower border of L_4 vertebra by dividing into right & left common iliac arteries.





*** Origin, Course, End & Relations of Aorta & I.V.C. ***

★ Relations:

I) Anterior Relations: from above downwards.

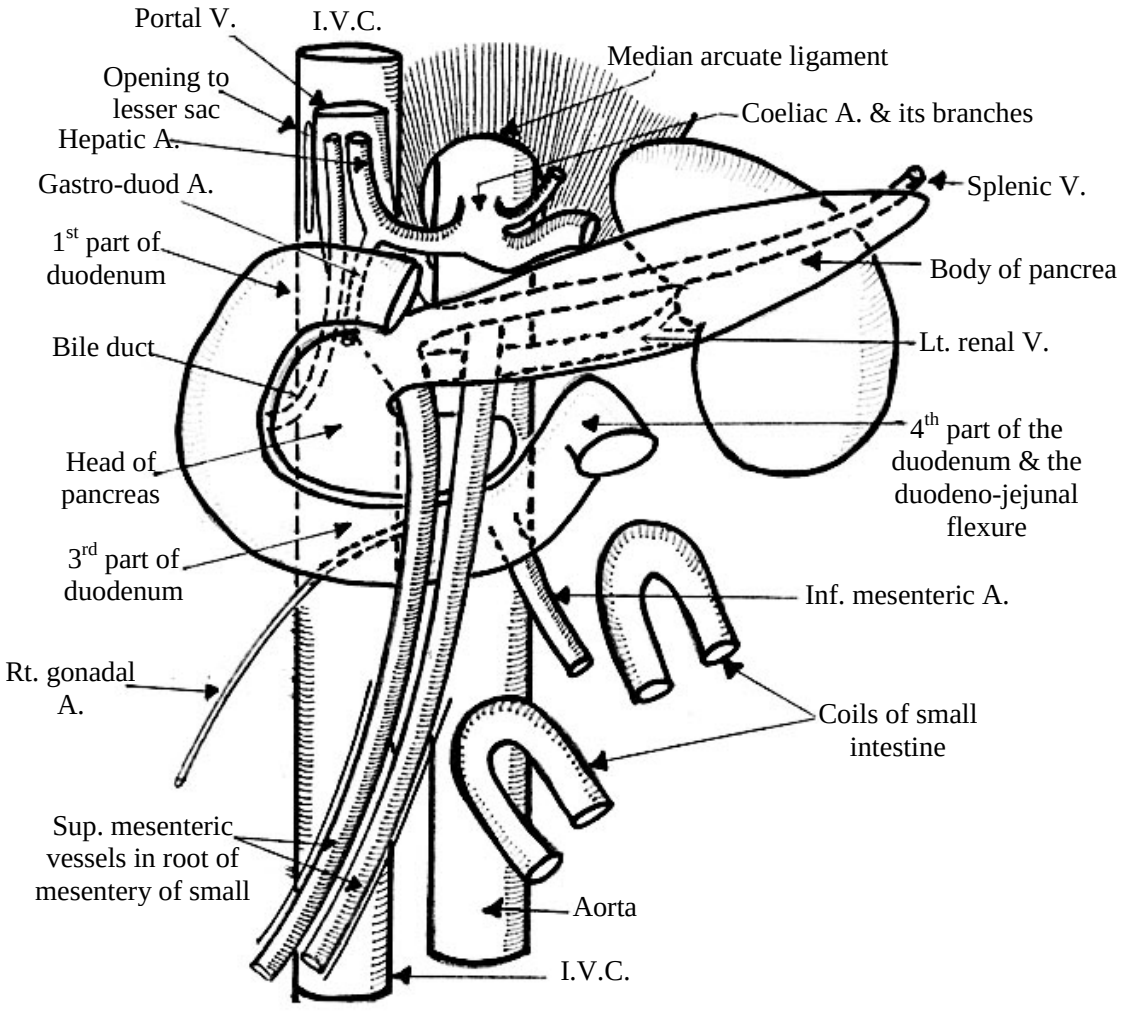
1) **Coeliac trunk.**
2) **Body of pancreas separated** from aorta by the splenic vein, above and left renal vein below the origin of superior mesenteric artery.
3) **Uncinate process** of pancreas.
4) The **3rd part of duodenum** separated from aorta by inferior

mesenteric artery.

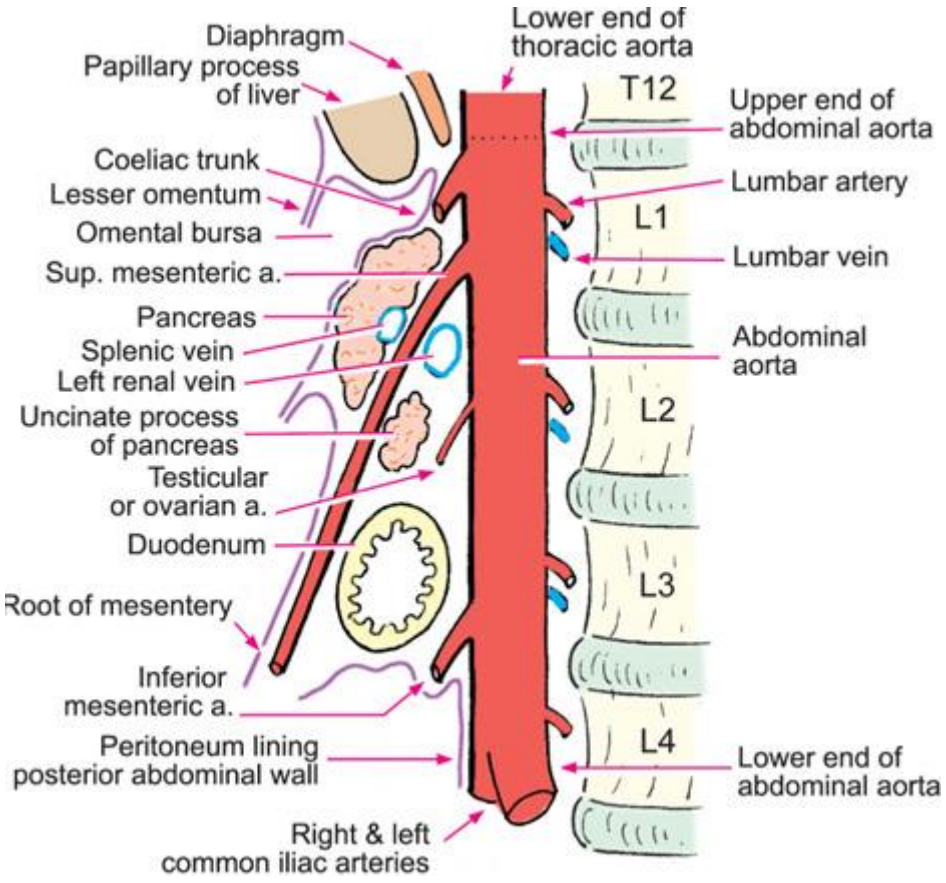
5) **Root of mesentery** of small intestine containing **superio**r **mesenteric** artery.

6) **Peritoneum** of the posterior abdominal wall.

7) Coils of **small intestine**.



*** Relations of Aorta & I.V.C.***



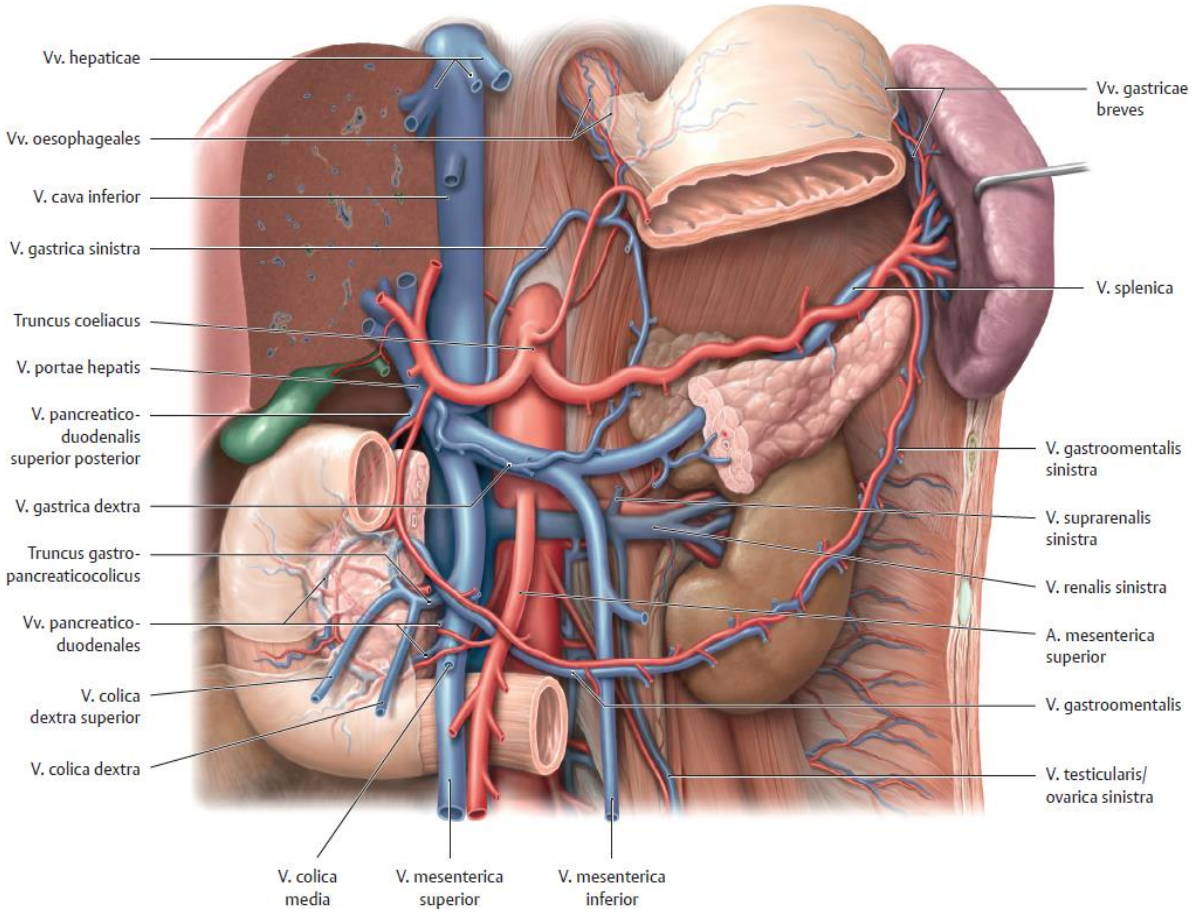
II)Posterior Relations:

1- Bodies of the **upper 4 lumbar vertebrae** and intervening discs with the anterior longitudinal ligament.

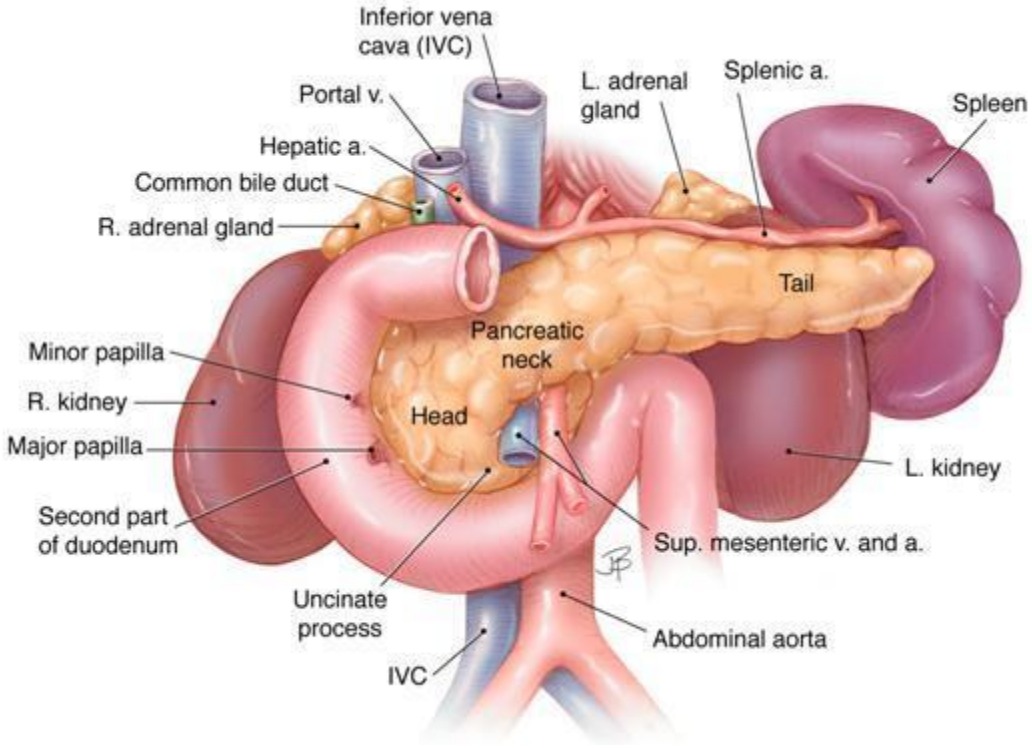
2- The **left 3rd and 4th lumbar veins** which cross behind the aorta to end in the inferior vena cava.

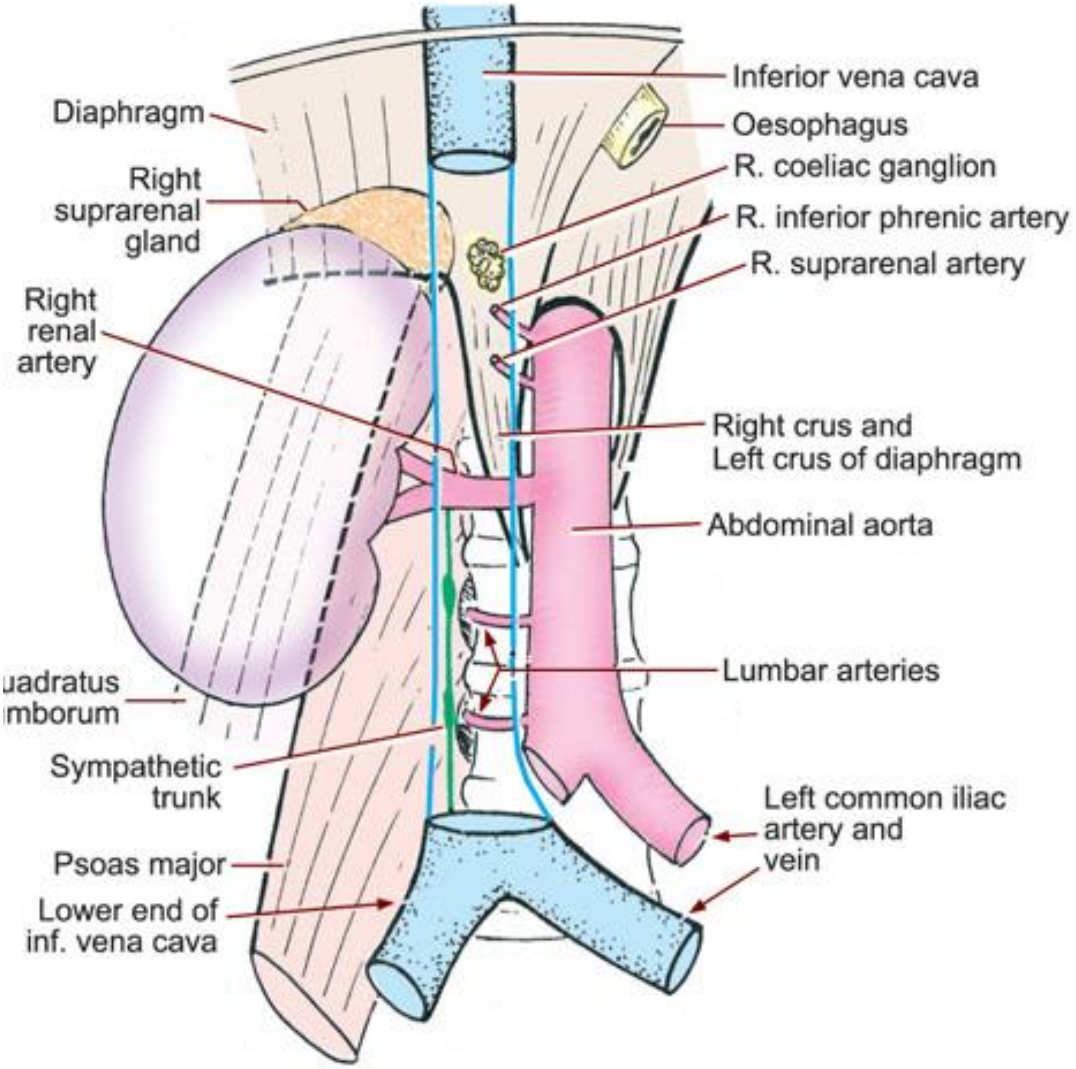
III) On the sides:

1) **Azygos vein and cysterna chyli** : on the right side above L_2 (i.e structures passing in **aortic opening** in the diaphragm).
2) **Crus of diaphragm**: on each side of its upper part.
3) **Sympathetic chain**: on left side of its lower part.
4) **Inferior vena cava** on the right side, below L_2 vertebra.
5) The.**4th part of duodenum** on the left side, opposite L_2 vertebra.



- **N.B.** The aorta and its branches are surrounded by networks of autonomic nerves, lymph vessels and lymph nodes.




Inferior vena cava
Diaphragm
Oesophagus
Right suprarenal gland
R. coeliac ganglion
R. inferior phrenic artery
R. suprarenal artery
Right renal artery
Right crus and Left crus of diaphragm
Abdominal aorta
Lumbar arteries
Sympathetic trunk
Left common iliac artery and vein
Psoas major
Lower end of inf. vena cava

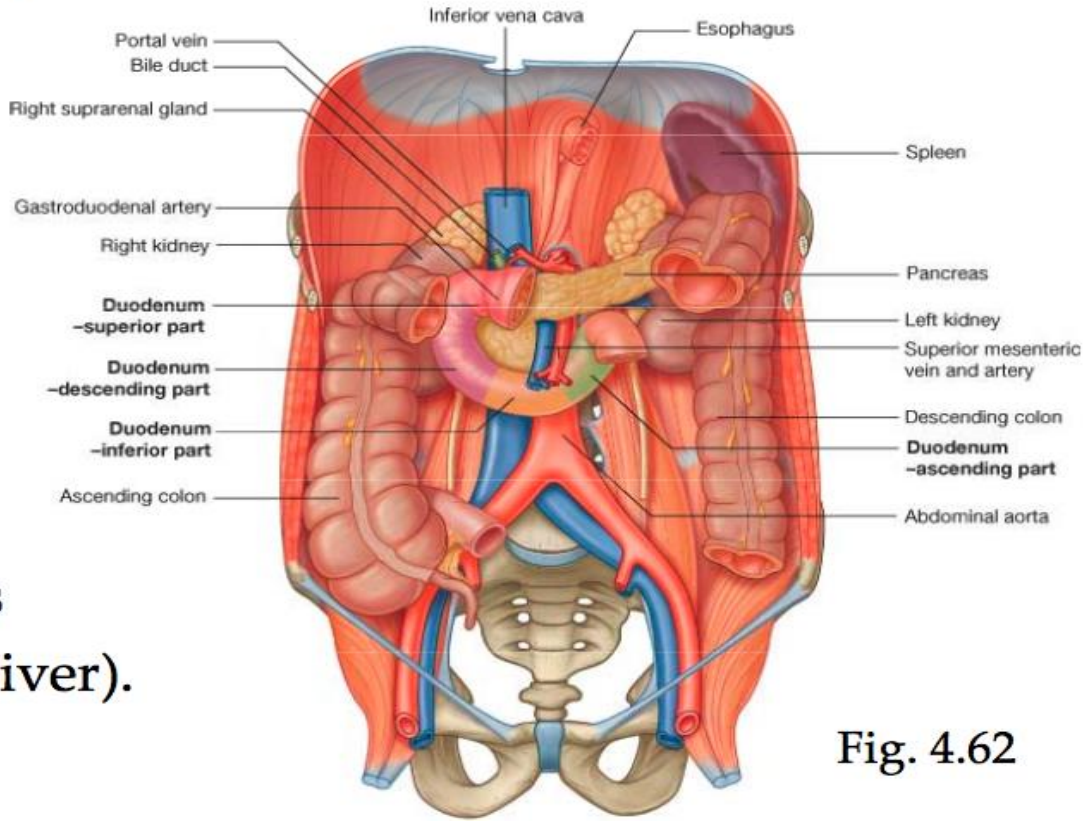
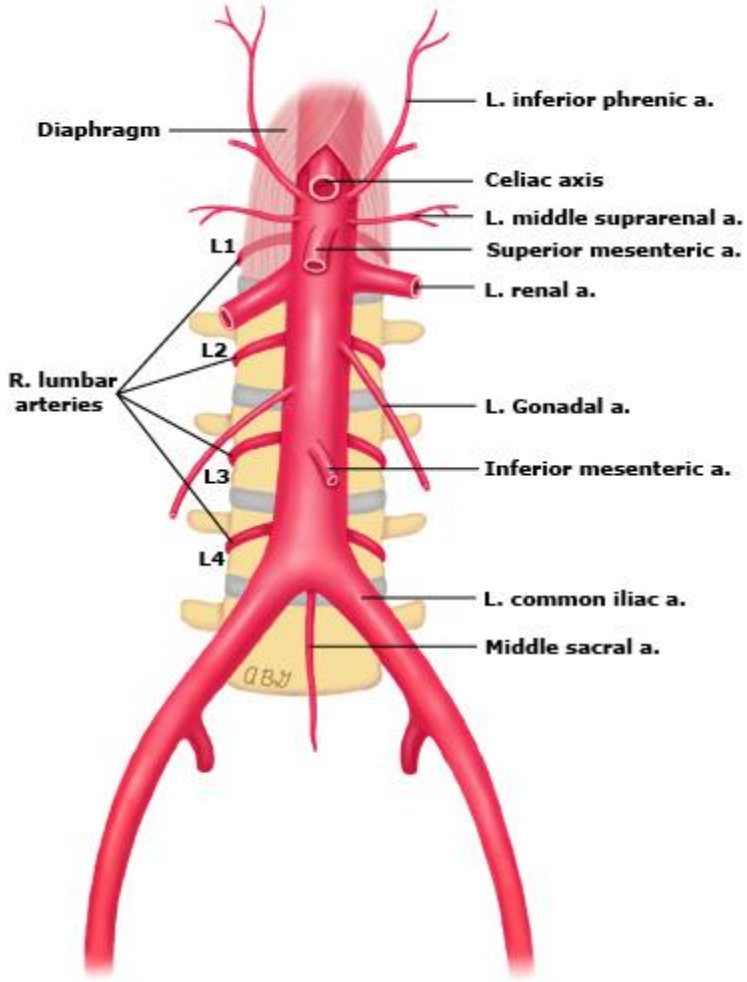

Inferior vena cava
Esophagus
Portal vein
Bile duct
Right suprarenal gland
Spleen
Gastroduodenal artery
Right kidney
Pancreas
Duodenum –superior part
Left kidney
Superior mesenteric vein and artery
Duodenum –descending part
Descending colon
Duodenum –inferior part
Duodenum –ascending part
Ascending colon
Abdominal aorta

Fig. 4.62

★ **Branches:**

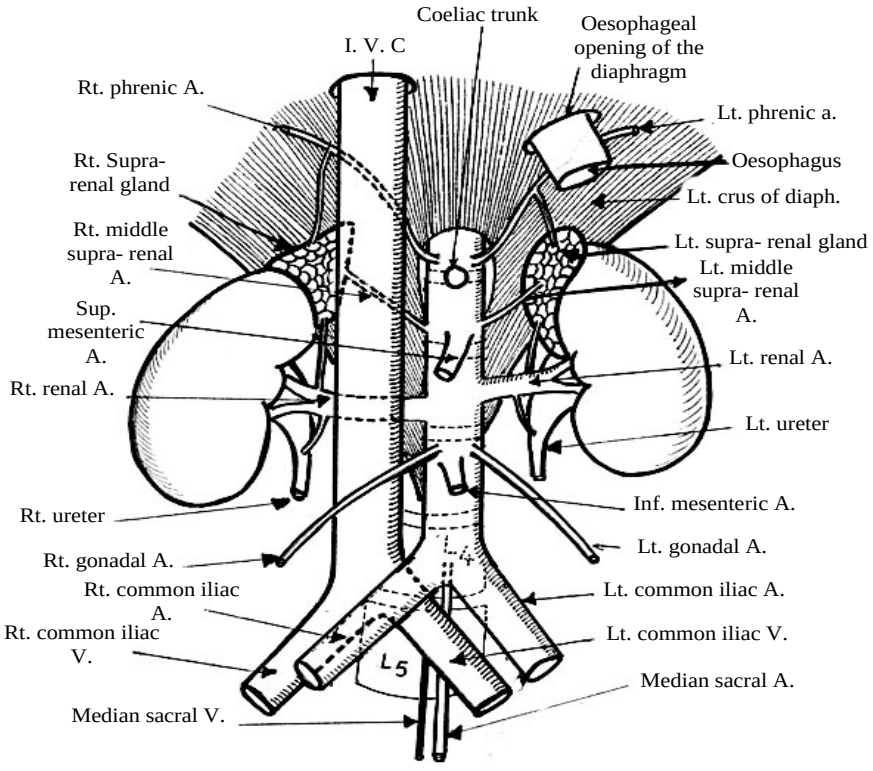
a) Single branches :

- **Coeliac trunk** (at the level of upper border of L_1).
- **Superior mesenteric artery** (lower border of L_1).
- **Inferior mesenteric artery** (level of L_3).
- **Median sacral artery:**
  - It arises from **back of bifurcation** at level of L_4.
  - It descends in **middle line** in front of L $_{4\&5}$ vertebrae and sacrum.
  - It **gives** pair of 5th. lumbar arteries and branches to posterior wall of rectum.



b) Paired branches:

- **Inferior phrenic artery:**
  - It supplies the inferior surface of diaphragm and gives superior suprarenal artery.
- **Middle suprarenal artery.**
- **Renal artery:** (L_2).
  - It is the largest paired branch and gives inferior suprareanal artery.
- **Gonadal** (testicular or ovarian) **artery** (L_2).
- 4 pairs of **lumbar arteries:**
  - 4 pairs arise from aorta and the 5th arises from median sacral.
  - They pass laterally on the body of lumbar vertebrae and deep to psoas major then in the neurovascular plane of the anterior abdominal wall.



*** Branches of Aorta ***

Arterial Supply of Gut

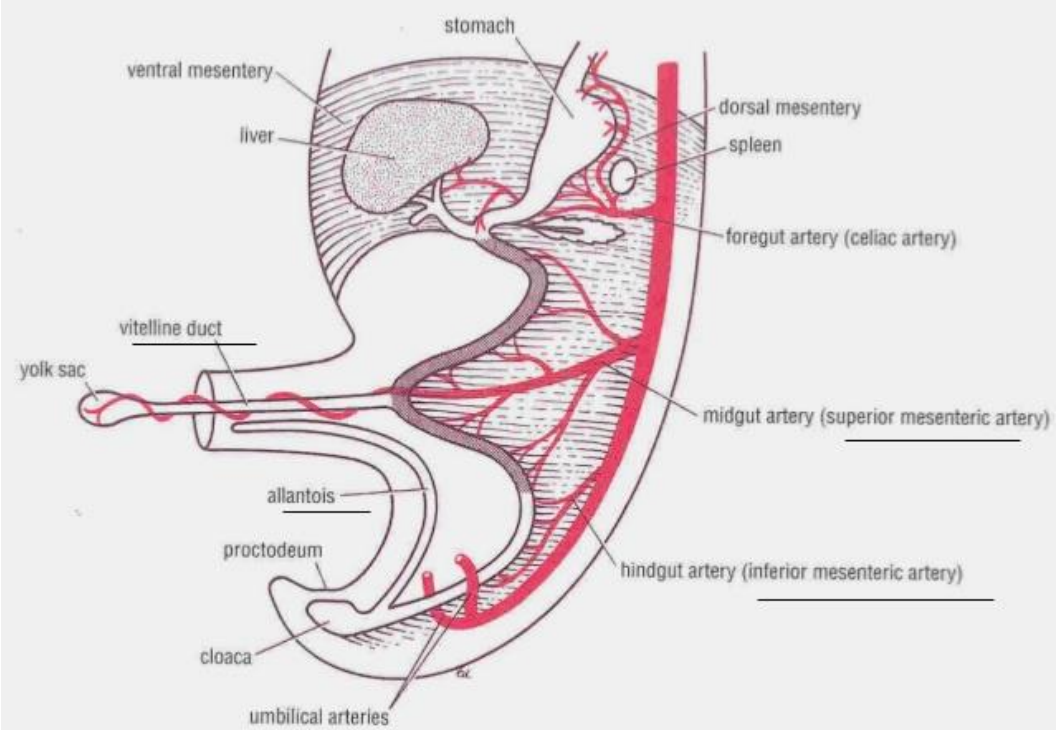
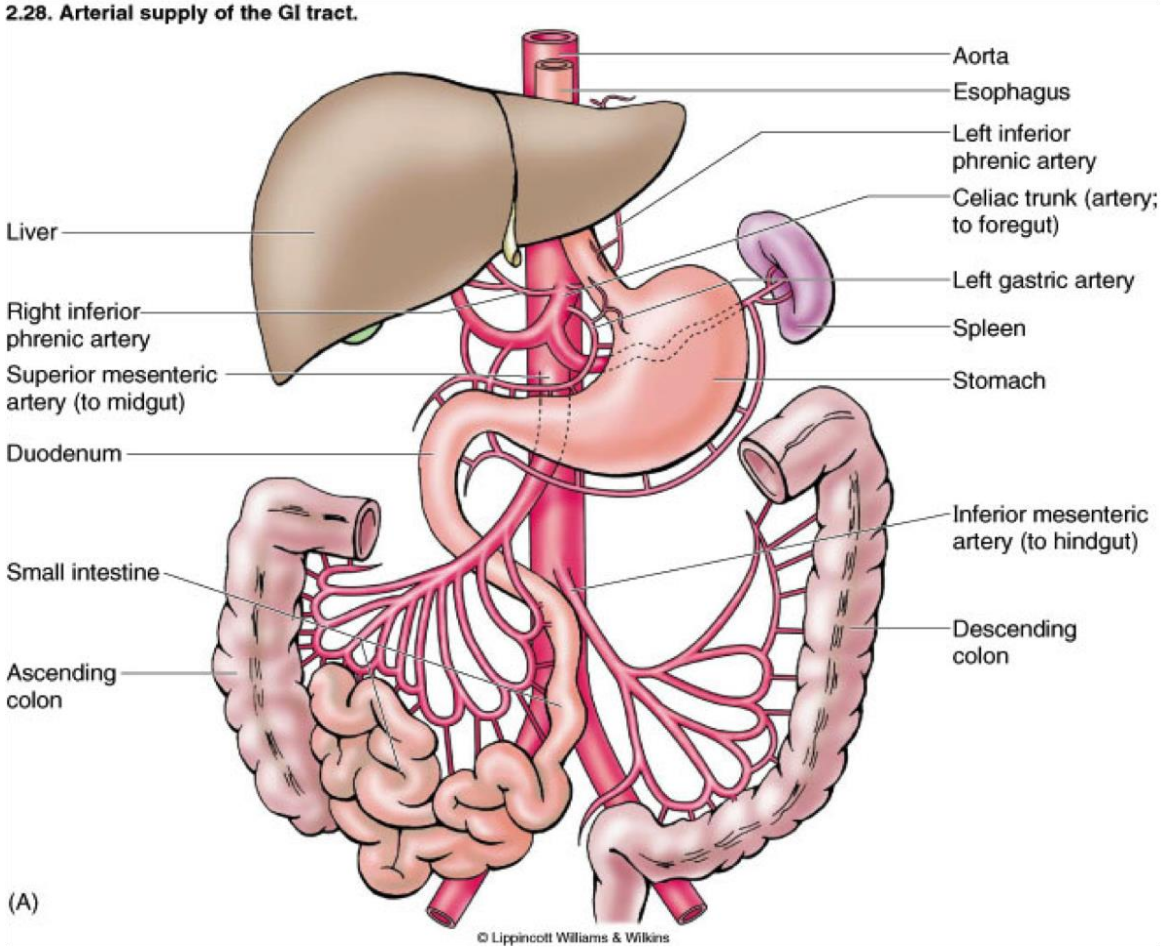


Figure 5-46 Formation of the midgut loop (*shaded*). Note how the superior mesenteric artery and vitelline duct form an axis for the future rotation of the midgut loop.

2.28. Arterial supply of the GI tract.



★ The gut is divided **embryologically** into 3 parts:

1) **Foregut:** includes the oesophagus, stomach, upper 1/2 of the duodenum, upper 1/2 of head, neck, body and tail of pancreas & liver.
   - It is supplied by the **coeliac trunk**.
2) **Midgut:** isncludes, lower 1/2 of head and uncinate process of pancreas, the lower 1/2 of the duodenum, jejunum, ileum, ascending colon and right 2/3 of transverse colon.
   - It is supplied by the **superior mesenteric artery**.
3) **Hindgut:** includes the left 1/3 of transverse colon, descending colon, sigmoid colon, rectum and upper 1/2 of anal canal.
   - It is supplied by the **inferior mesenteric artery**.

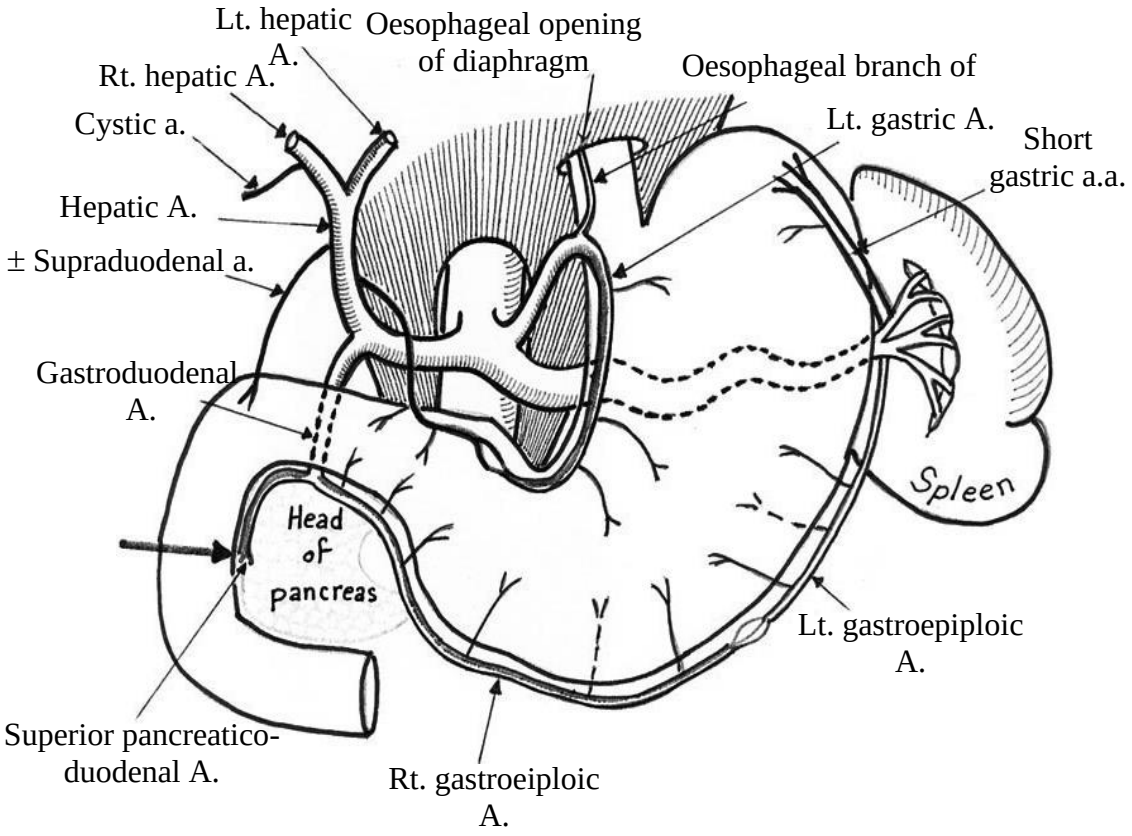
I) Coeliac Trunk

★ **It arises** from front of aorta at level of upper border of L_1, passes forwards for 1cm then it **ends** by dividing into 3 terminal branches.

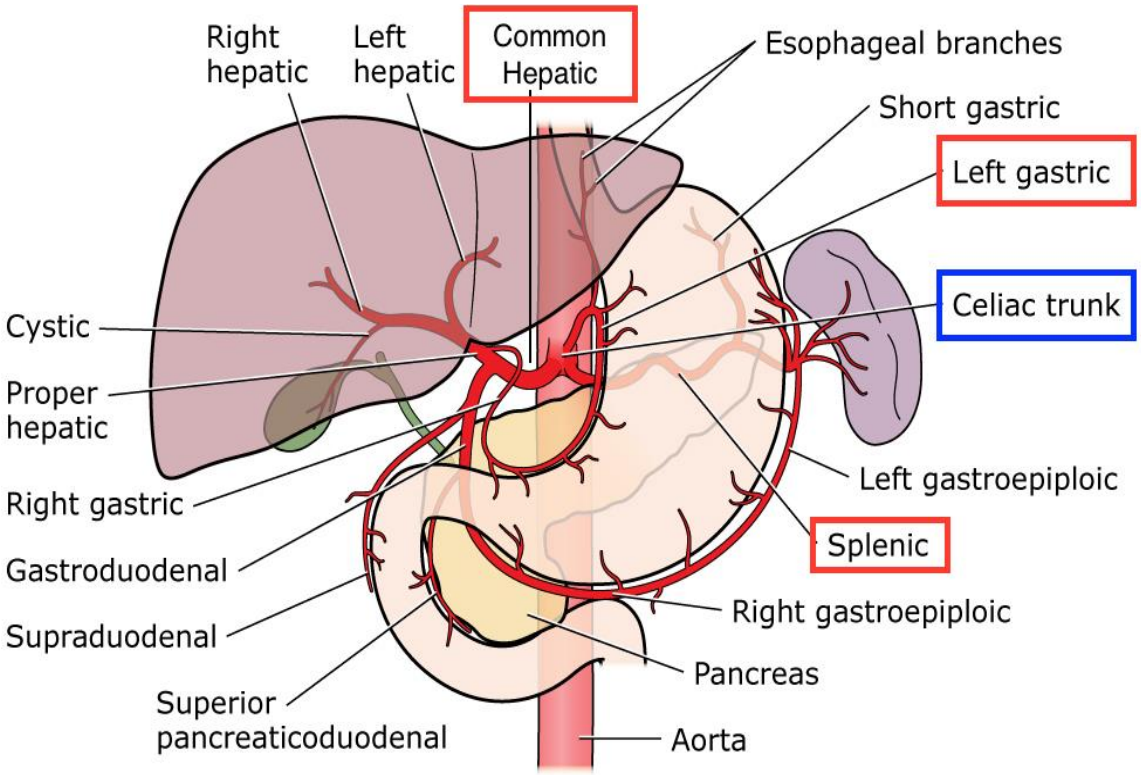
★ It is the artery of **foregut.**

★ **Relations:**

- **On each side** it is related to coeliac ganglion & a crus of diaphram.
- **Anterior relations:** it is separated from lesser omentum by the cavity of lesser sac.
- **Inferiorly** it is related to upper border of body of pancreas.



* Coeliac Trunk; Branches *



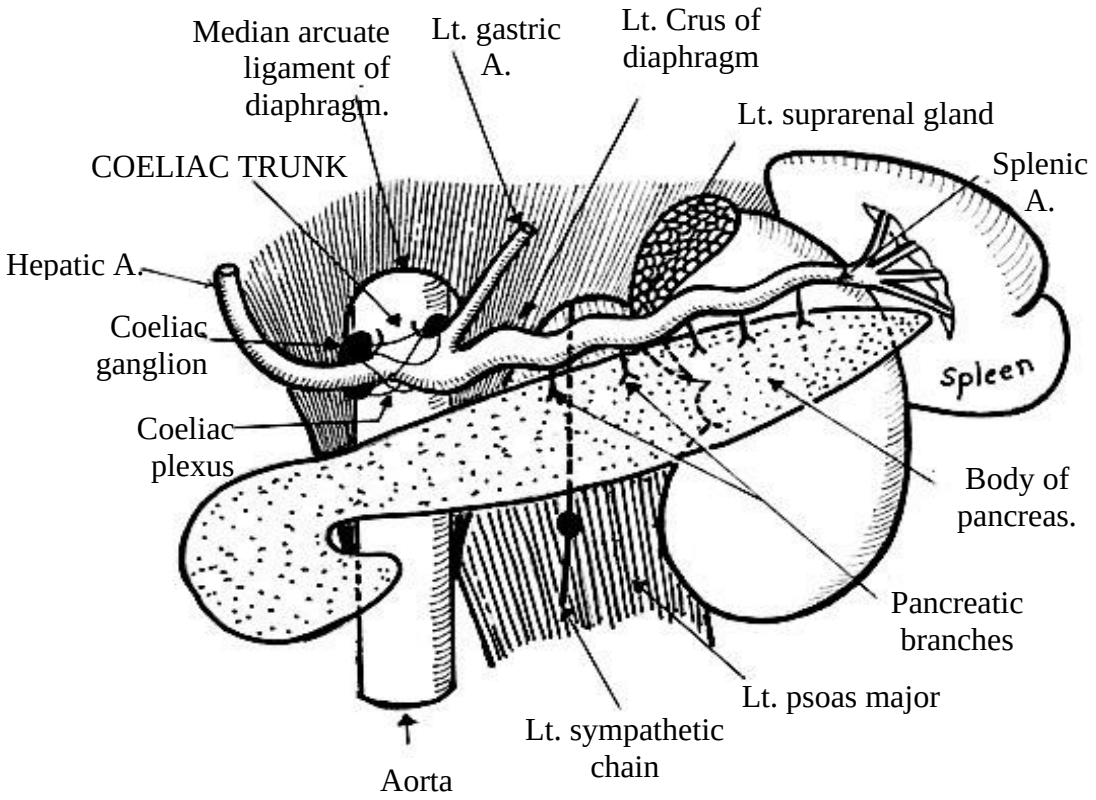
- **Branches:**

  a) Left gastric artery:

  - It ascends upwards to the cardiac end of stomach then **runs** on lesser curvature between the 2 layers of lesser omentum to **anastomose** with the right gastric artery.
  - It **gives** oesophageal branches to abdominal part of oesophagus & gastric branches to the stomach.

  b) Splenic artery: (**largest branch**)

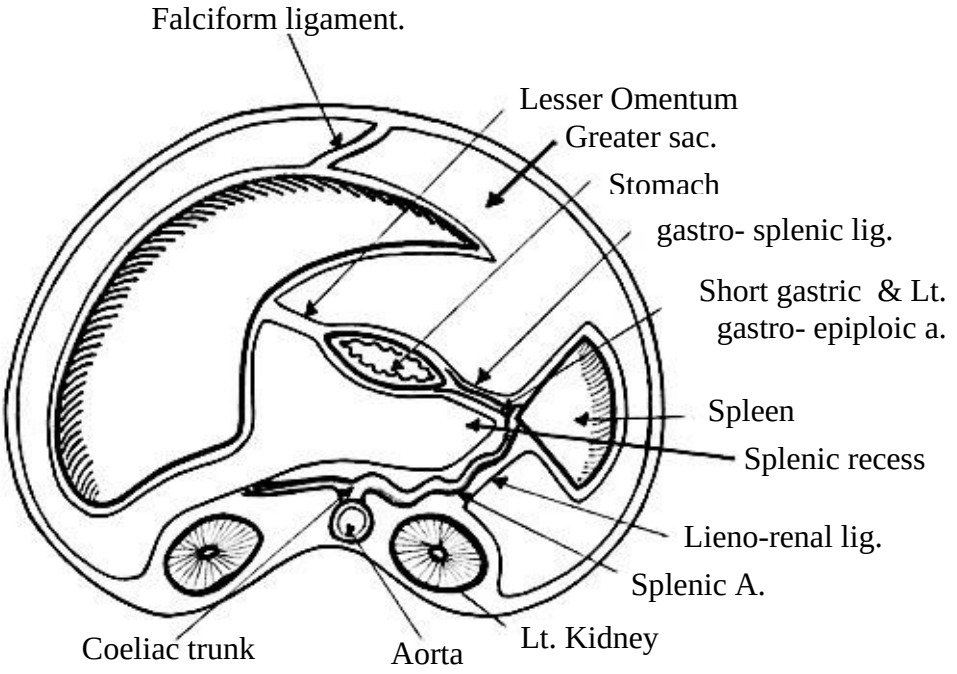
  - It is **tortuous**, runs above body of pancreas, **crosses** in front of left suprarenal gland and left kidney and passes with the tail pancreas in the **lienorenal** ligament to reach the hilum of spleen.



*** Coeliac Trunk & Splenic Artery ***

- **Branches:**

1) **Pancreatic branches** to neck , body & tail of pancreas.
2) **5 short gastric arteries** arise from the end of splenic artery and pass in gastorsplenic ligament to supply fundus stomach.
3) **Left gastroepiploic artery** : arise from the end of splenic artery , passes on the greater curvature between the anterior 2 layers of the greater omentum and supplying the stomach and greater omentum.
4) **Terminal splenic branches.**



Coeliac Trunk & Splenic Artery in transverse section

c) Hepatic artery:

- It **passes** to the right side **above** the first part of the **duodenum** then in the **free border of lesser omentum** in front of portal vein and on the left side of C.B.D.

- Proximal to origin of gastroduodenal artery , it is called **common hepatic artery** while its distal part is called **hepatic artery proper.**
- **Branches:**

1) Right gastric artery: It **runs** on lesser curvature between the 2 layers of lesser omentum to **anastomose** with the left gastric artery.

2) Gastroduodenal artery:

- It descends behind 1st part of duodenum in front of portal vein and on the left side of C.B.D.
- **Branches:**

a- Superior panceatico-duodenal artery: **runs** in groove between head of pancreas and duodenum to **supply** upper part of head of pancreas and duodenum proximal to ampula of Vater.

b- **Right gastro-epiploic artery: runs** along greater curvature of stomach to anastomose with left gastro-epiploic artery. It **supplies** the stomach and greater omentum.

3) Supraduodenal artery supply 1st part of duodenum.

4) Right & left **terminal branches** to the liver.

- The right hepatic artery gives **cystic artery** to GB.

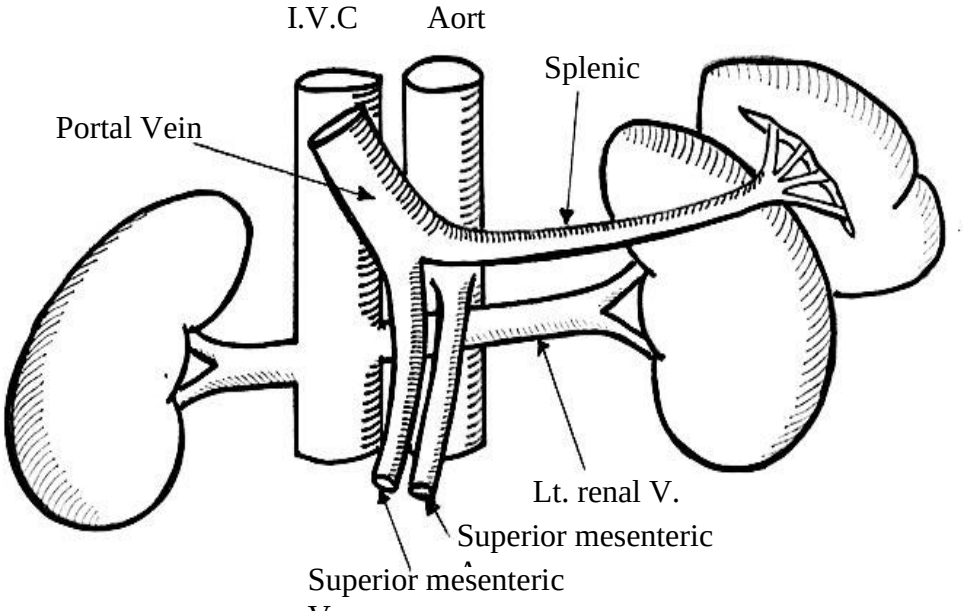
II) Superior Mesenteric Artery

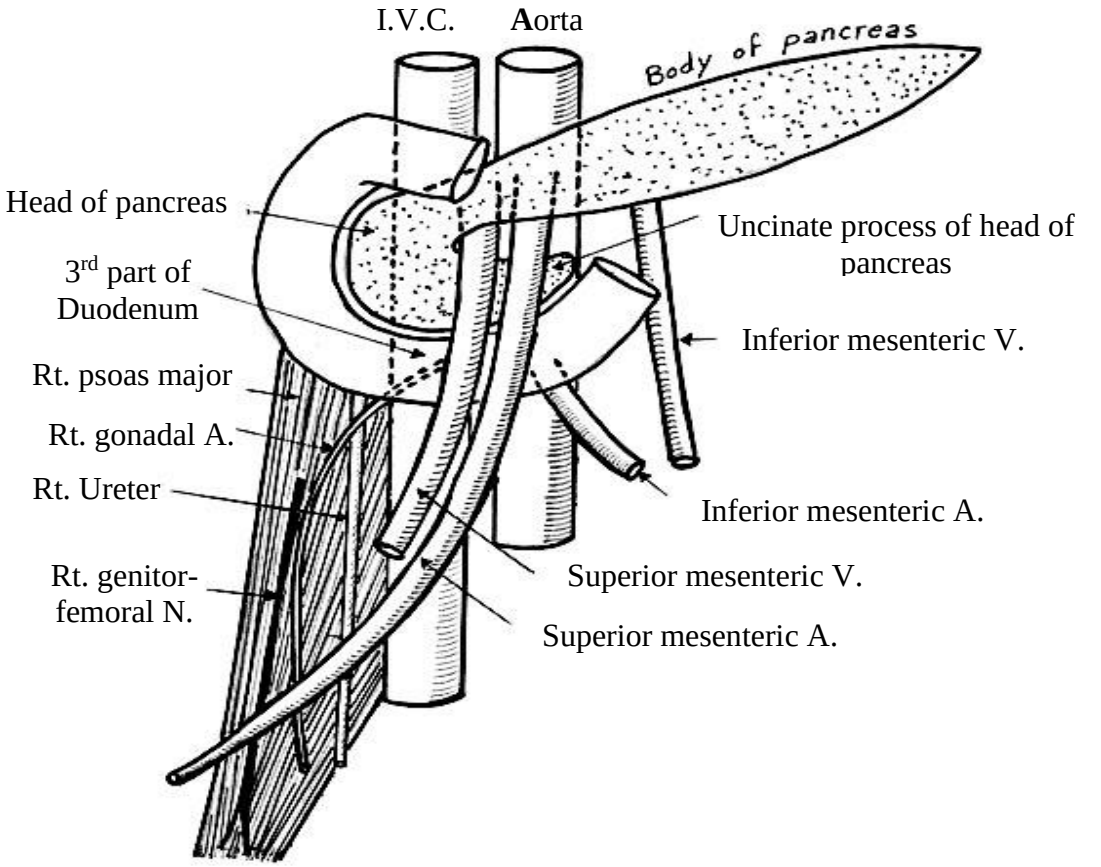
★ **It arises** from front of aorta at level of lower border of L_1 vertebra & **ends** at the ileocaecal junction by anastomosing with ileo-colic artery.

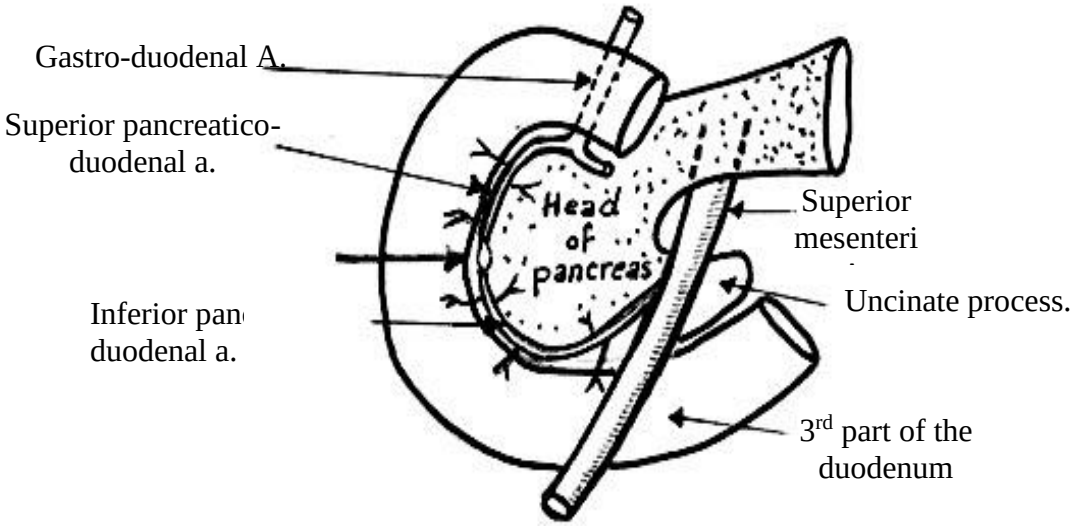
★ It is the artery of **midgut**.

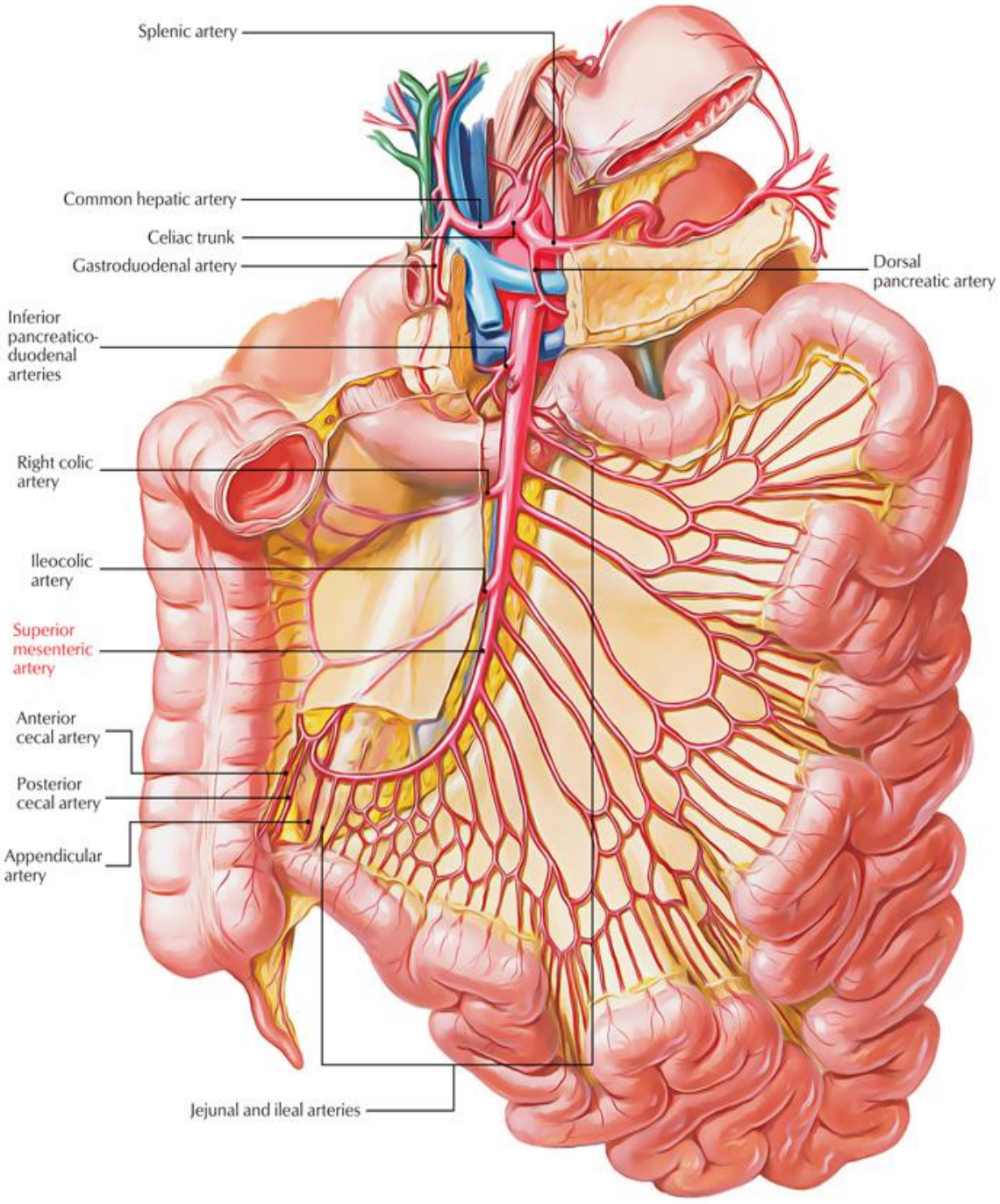
★ **Relation:**

- It arises behind **body of pancreas** with the **splenic vein** above and **left renal vein** below its origin.
- It descends on the left side of its vein, in front of uncinate process of pancreas and 3rd part of duodenum.
- Then it passes in the **root of mesentery** of small intestine crossing aorta , IVC , right psoas major , right ureter , right gonadal vessels and right genitofemoral nerve.
- Most of course of superior mesenteric is related **anterior** to loops of **small intestine**.




I.V.C.
Aorta
Body of pancreas
Head of pancreas
Uncinate process of head of pancreas
3rd part of Duodenum
Inferior mesenteric V.
Rt. psoas major
Rt. gonadal A.
Rt. Ureter
Inferior mesenteric A.
Rt. genitor-femoral N.
Superior mesenteric V.
Superior mesenteric A.


Gastro-duodenal A.
Superior pancreatico-duodenal a.
Head of pancreas
Superior mesenteri
Uncinate process.
Inferior pan
duodenal a.
3rd part of the duodenum



★ **Branches:** It gives the followings branches in sequence

1) Inferior pancreatico-duodenal artery: **runs** in groove between head of pancreas and duodenum to **supply** lower part of head & uncinate process of pancreas and duodenum distal to ampula of Vater.

2) Jejunal and ileal branches:

- They arise from the left convex border of the artery and pass between the 2 layers of the mesentery of small intestine where they divides and anastomoses repeatedly forming arterial archades.

3) Middle colic artery:

- They pass between the 2 layers of the transverse mesocolon where it the divides into right and left branches to anastomose with ascending branches of right and left colic arteries respectively.
- It supplies the right 2/3 of transverse colon.

4) Right colic artery:

- It is passes retoperitoneal to right side crossing the right psoas major and the 3 structures in front of it (gonadal vessels , ureter & genitofemoral).
- Then it divides into descending and ascending branches to anastomose with ileocolic and middle colic arteries respectively.
- It supplies upper 2/3 of ascending colon and right colic fexure.

5) Ileocolic artery:

- It passes retroperitoneal downwards to the right iliac fossa where it divides into superior and inferior branches.
- The inferior branch ends by anastomosis with termination of superior mesenteric artery .

- The inferior branch gives ascending branch (to lower 1/3 of ascending colon), anterior & posterior caecal , appendicular artery and ileal branches(to terminal ileum).

❖ **All colic branches of superior mesentery artery arise from its right concave border .**

III) Inferior Mesenteric Artery.

★ **It arises** from front of aorta at level of L3 behind 3rd part of duodenum.

★ It passes retroperitoneal downwards and to the left. It lies first in front of aorta then descends on its left side.

★ **It ends** by entering the pelvis, by crossing in front of left common iliac artery and passes in the medial limb of sigmoid mesocolon as superior rectal artery.

★ It is the artery of **hindgut.**

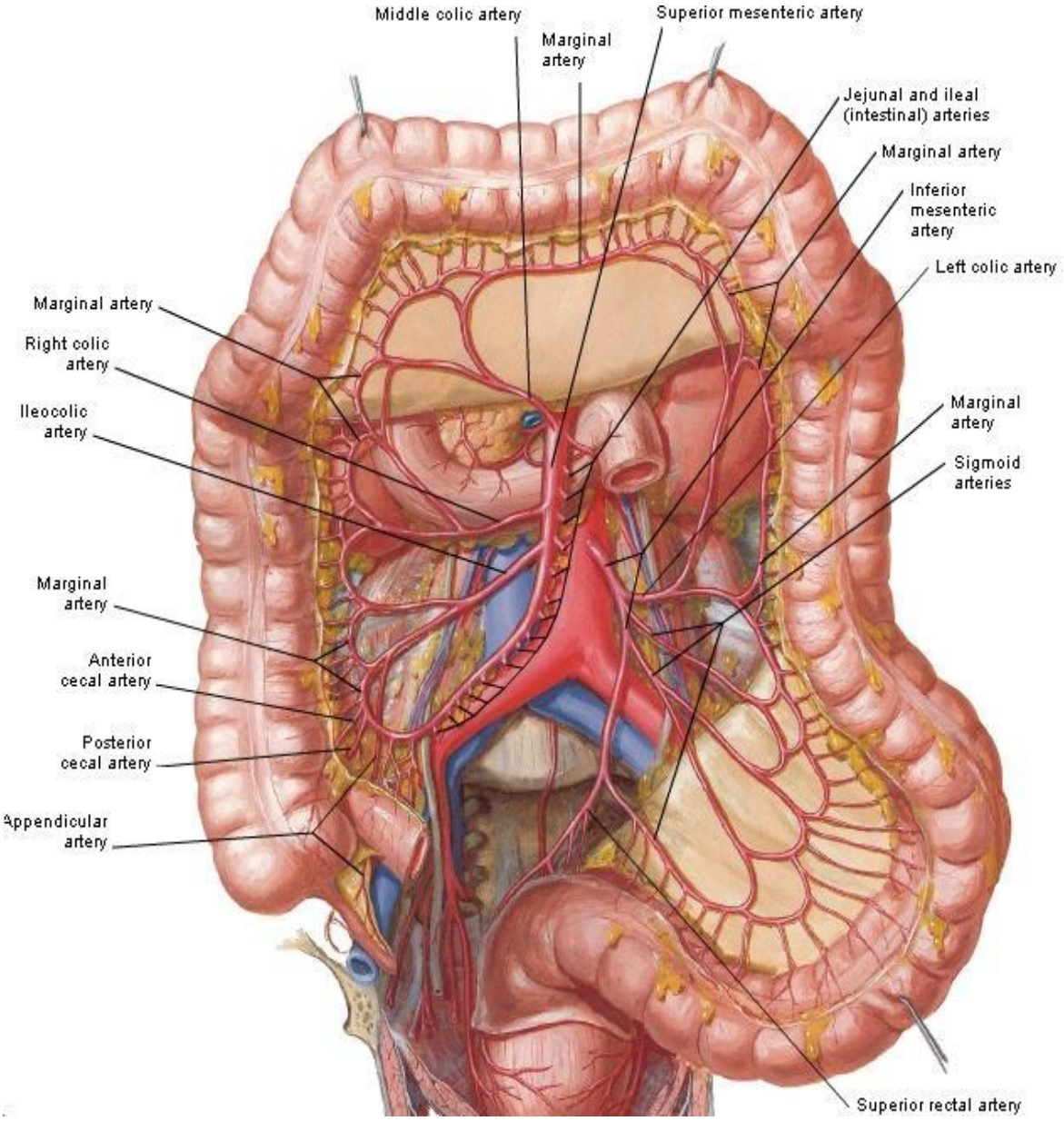
★ **Relations:**

- **Anterior:** 3rd part of duodenum and peritoneum of posterior abdominal wall.
- **Posterior:** aort , left sympathetic chain,left psoas and left common iliac artery**.**
- **Left side:** Inferior mesenteric vein and left ureter.
- **Right side:** Lower part of aorta.

★ **Branches:**

1) Superior left colic artery:

★ It **passes** retroperitoneal upwards and to the left towards the descending colon, and divides into ascending and descending branches.



★ Its ascending **branch anastamoses** with the left branch of the middle colic artery, while its **descending branch** anastomoses with the highest sigmoid artery.

★ It **supplies** the left 1/3 of the transverse colon, left colic flexure and upper part of the descending colon.

2) Inferior left colic arteries: (Sigmoid arteries)

★ These are 2-3 branches which run downwards and to the left in the **lateral limb** of the sigmoid mesocolon to reach the **sigmoid colon**.

★ They **anastomose above** with the superior left colic artery and below with the superior rectal artery.

★ They **supply** the sigmoid colon and lower part of the descending colon.

3) Superior rectal artery:

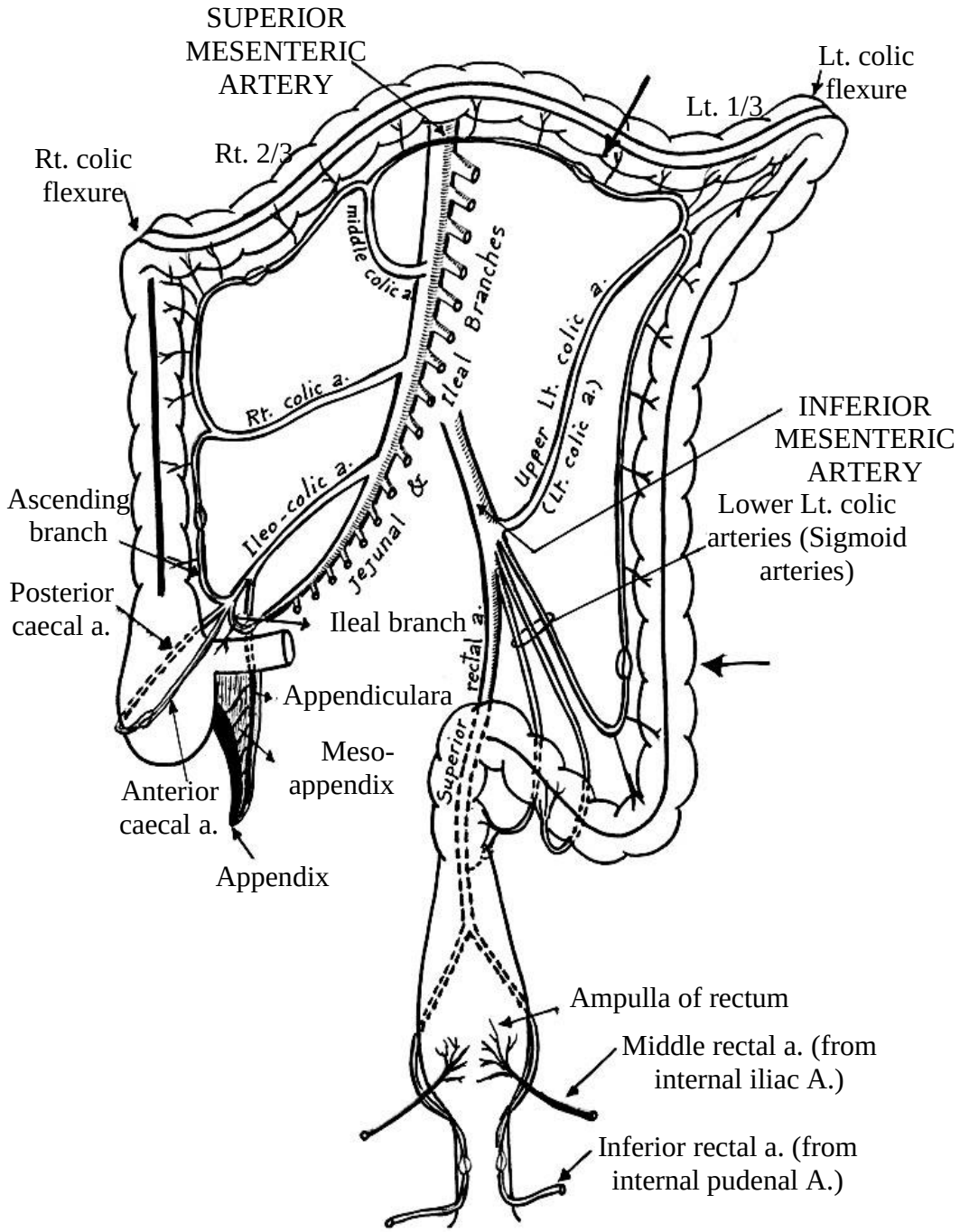
★ It is the **downward continuation** of the inferior mesenteric artery from the point where it crosses in front of the common iliac artery down to the rectum.

★ It **descends** in the medial limb of the sigmoid mesocolon **as far as the 3rd sacral vertebra** then descends along the posterior surface of rectum where it divides into terminal branches which pierce the wall of the rectum.

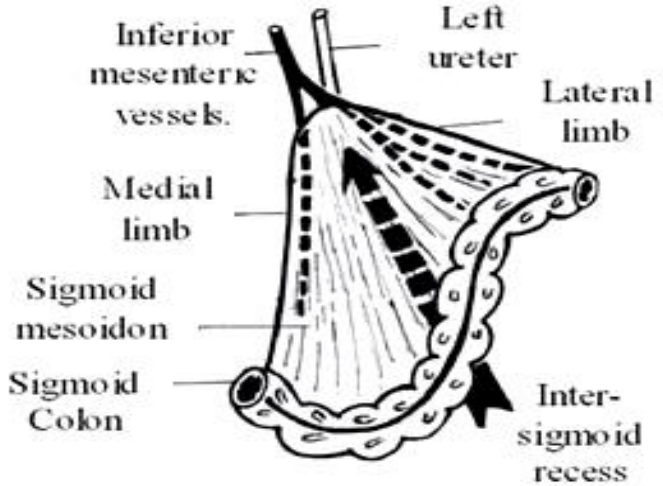
★ It is the main arterial supply of rectum & upper ½ of anal canal.

❖ **N.B: According to blood supply, the colon is divided to 4 surgical segments:**

1. **1st segment:** supplied by ileocolic and right colic arteries include terminal 10 inches of ileum, caecum, ascending colon, Rt. colic flexure & Rt. 1/3 of transverse colon.
2. **2nd segment:** supplied mainly by middle colic artery include middle 1/3 of transverse colon.
3. **3rd segment:** supplied by superior left colic incluce left 1/3 of transverse colon and descending colon.
4. **4th segment:** supplied by inferior left colic arteries include sigmoid colon.



*** Branches of Sup. & Inf. Mesenteric artery ***



Portal Circulation

★ The portal circulation receives **venous blood from** four sites:

1) Abdominal part of the GIT (from abdominal part of esophagus to the upper 1/2 of anal canal).
2) Pancreas.
3) Gall bladder.
4) Spleen.

★ Blood pass through portal vein **to the liver** where metabolism occurs.

★ Portal circulation **begins capillaries and ends by sinusoids** i.e. arterial blood which leaves the heart has to pass through two peripheral networds before it reaches the heart as follows:

(a) **The 1st. network** of capillaries lies in the drained organ e.g. submucosa of the GIT.

(b) **The 2nd network** of sinusoids in the liver.

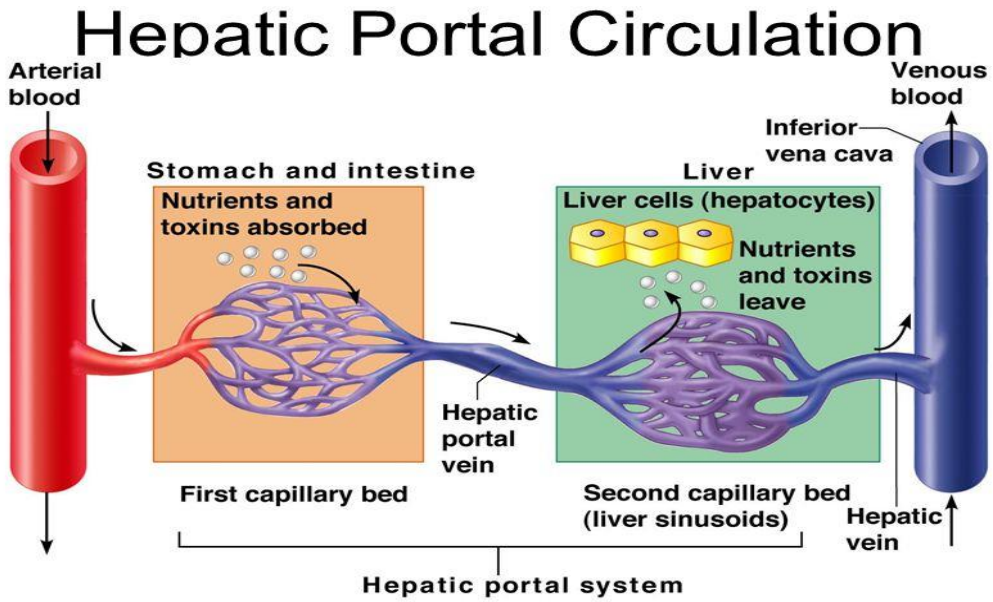
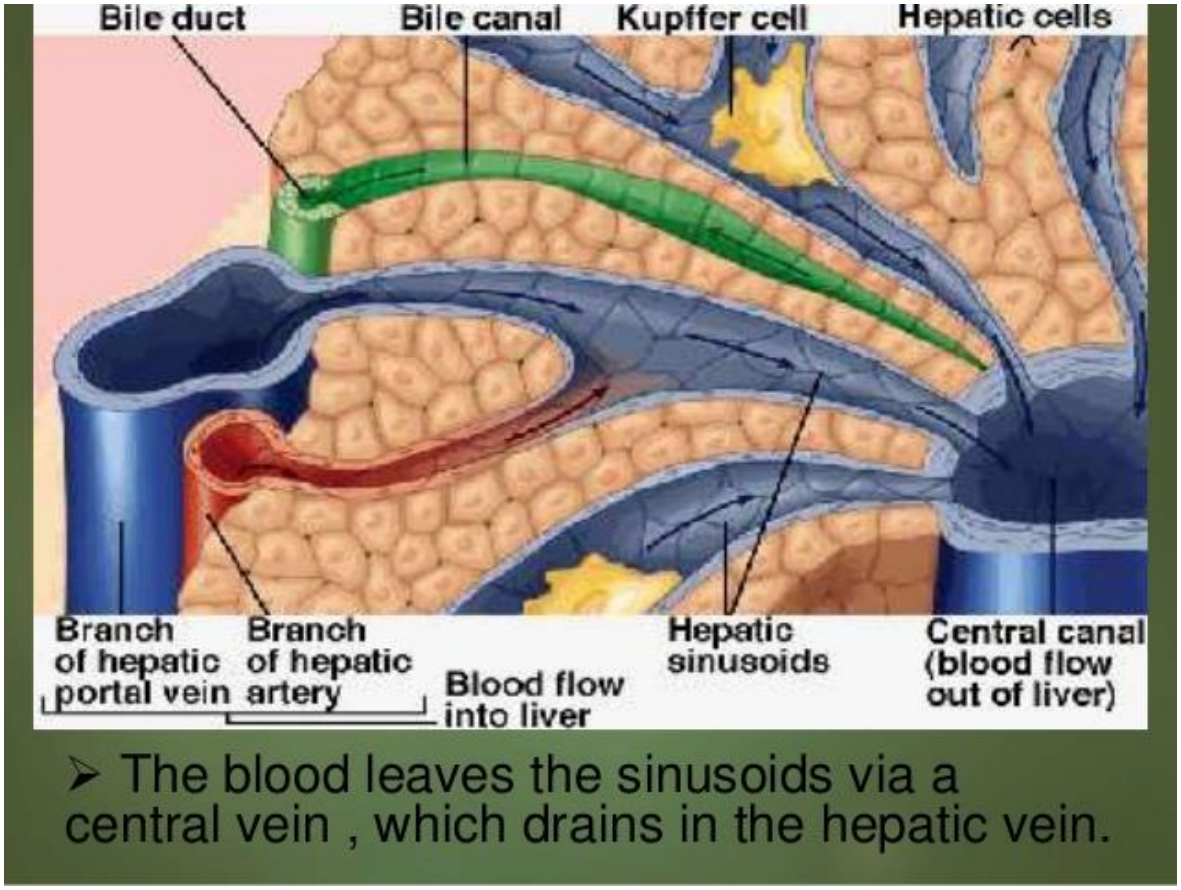
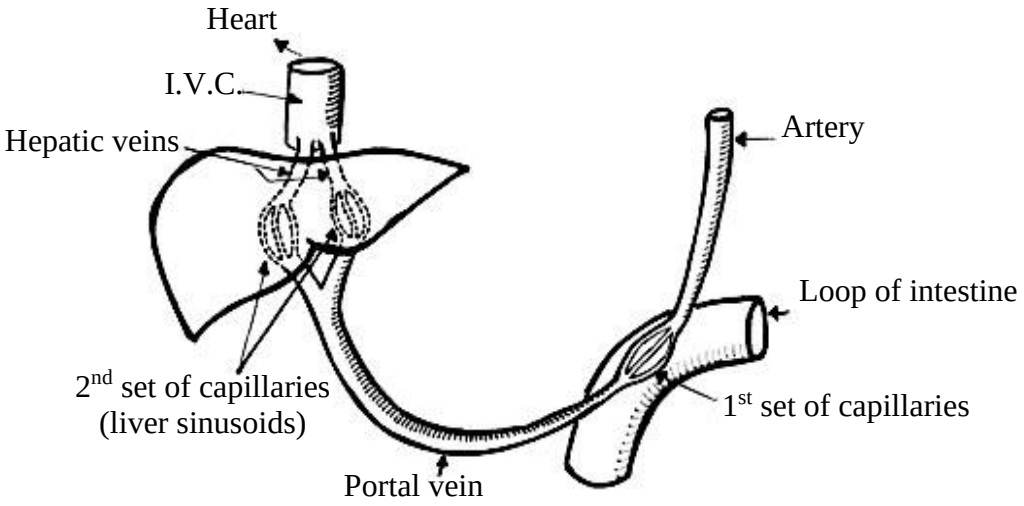


Figure 11.16

★ Portal blood circulates in the sinusoids of the liver, pass to **centeral veins** which are collected in 3 **hepatic** veins which end in the **inferior vena cava**.



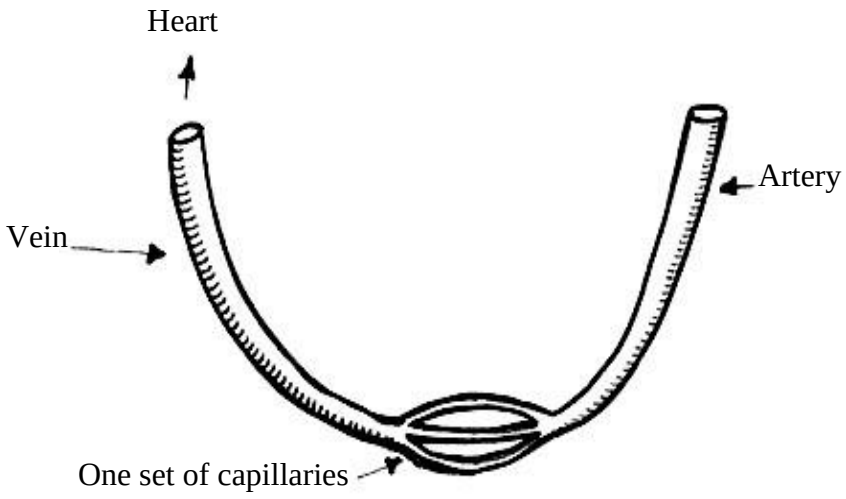
* Portal Circulation*



★ Difference between the portal and systemic veins.

Portal vein	Systemic vein
1- Formed by the portal vein and its tributaries	1- Formed by the I.V.C. & S.V.C. and their tributaries.
2- Has no valves .	2-May contain valves.
3- Starts by tributaries and ends by branches.	3- Starts by tributaries and ends in larger vein.
4- Has two sets of capillaries .	4- Has one set only.
5- The blood inside contains absorbed digested foods . (glucose, amino acids .. etc.)	5- Contains the products of metabolism from the different organs.
6- Contains incompletely deoxygenated blood.	6- Contains completely deoxygenated blood.
7 - The pressure inside is higher.	7- The pressure inside is lower

* Systemic circulation *



Portal Vein

★ **Beginning, course, size and termination:**

- The portal vein **begins** behind the neck of the pancreas by the union of splenic vein & superior mesenteric vein.
- It ascends behind 1st. part of duodenum to enter the free margin of the lesser omentum behind the hepatic artery and the common bile duct.
- It **ends in** the **porta hepatis** where it divides into right and left branches.
- It has **no valves**. So, it allows the passage of blood in the two directions.
- It is about **3 inches** long and up to **12 mm.** in diameter.

★ **Relations:** (From below upwards).

1) Before it reaches the lesser omentum : It is related to :

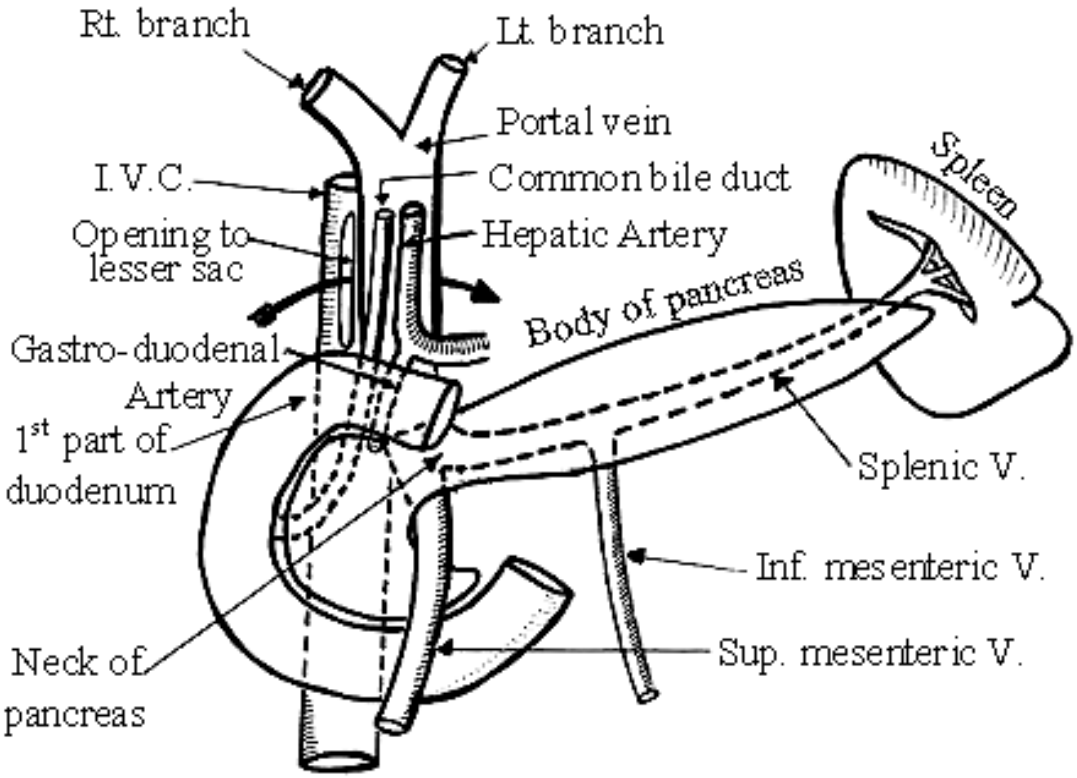
- **Anteriorly:** The 1st. part of duodenum, separated from it by:
  a- The common bile duct , to the right.
  b- The gastro-duodenal artery, to the left.
- **Posteriorly:** The inferior vena cava.

2) In the lesser omentum: It is related to:

- **Anteriorly:**
  a- The bile duct, anterior and to the right
  b- The hepatic artery, anterior and to the left.
- **Posteriorly:** The inferior vena cava, separated from it by the epiploic foramen.

3) In the porta hepatis: It is related to:

- **Anteriorly:** Terminal branches of hepatic artery.
- **Posteriorly:** The caudate process of caudate lobe of liver which separates it from the inferior vena cava.



PORTAL VEIN

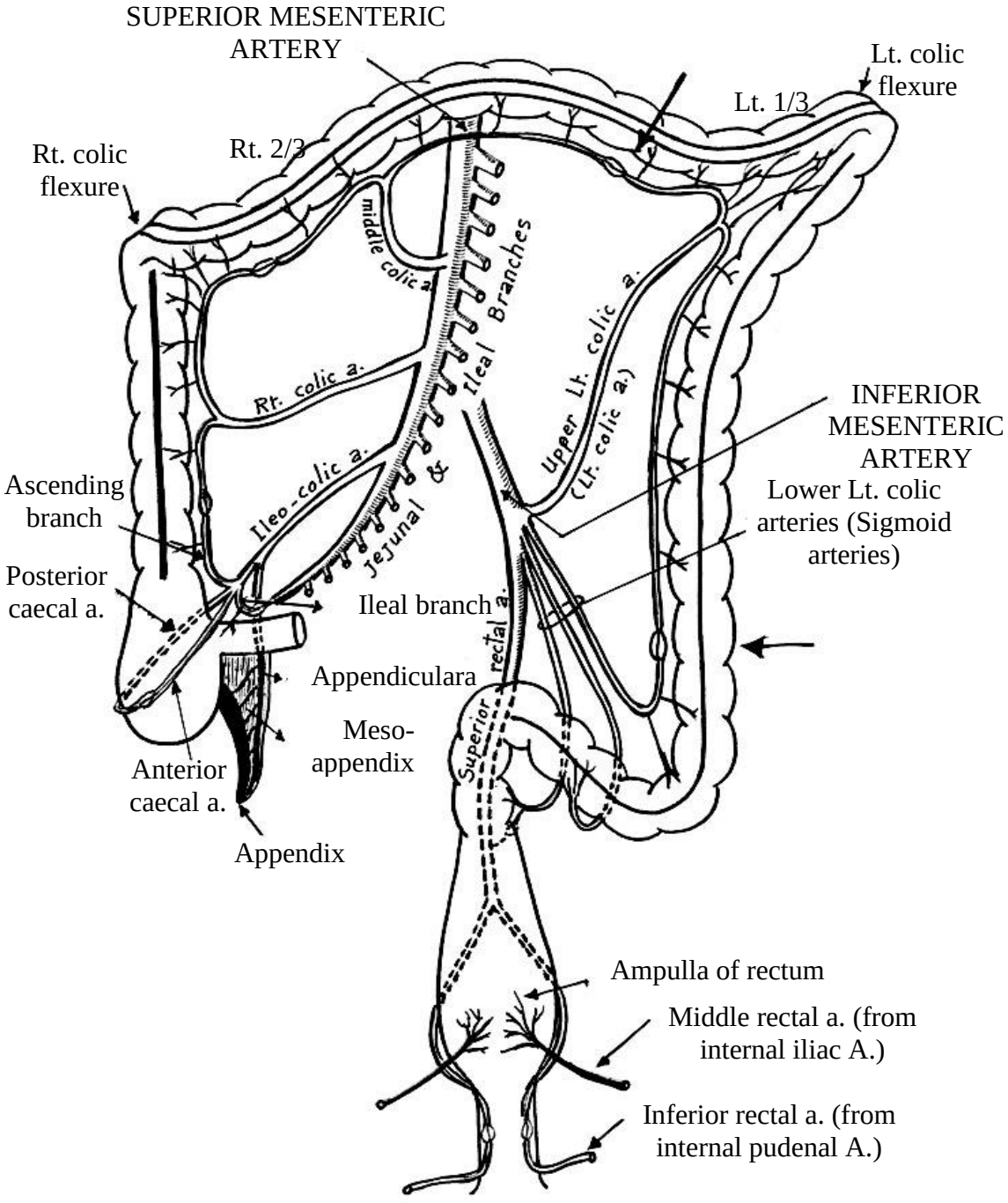
★ **Tributaries of the portal vein:**

- It is formed by union of 2 veins, ends by dividing into 2 veins and its main trunk receive 2 veins ,its 2 terminal branches have 2 tributaries and its left terminal branch gives attachement to 2 ligaments (Rule of 2 in portal vein):
  1) **Splenic vein** & its tributaries.
  2) **Superior mesenteric vein** & its tributaries.
  3) **Right and left gastric veins:** draining the lesser curvature of the stomach.

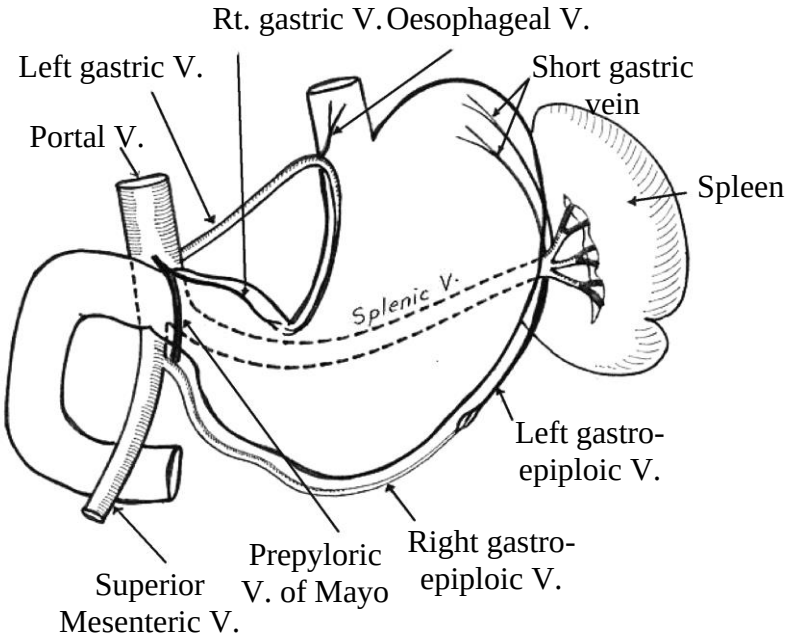
4) **Superior pancreatico-duodenal vein.**

5) **Para-umbilical veins: (If persist)** Drain the skin around the umbilicus and accompany the ligamentum teres in the falciform ligament to end in the left branch of the portal vein.

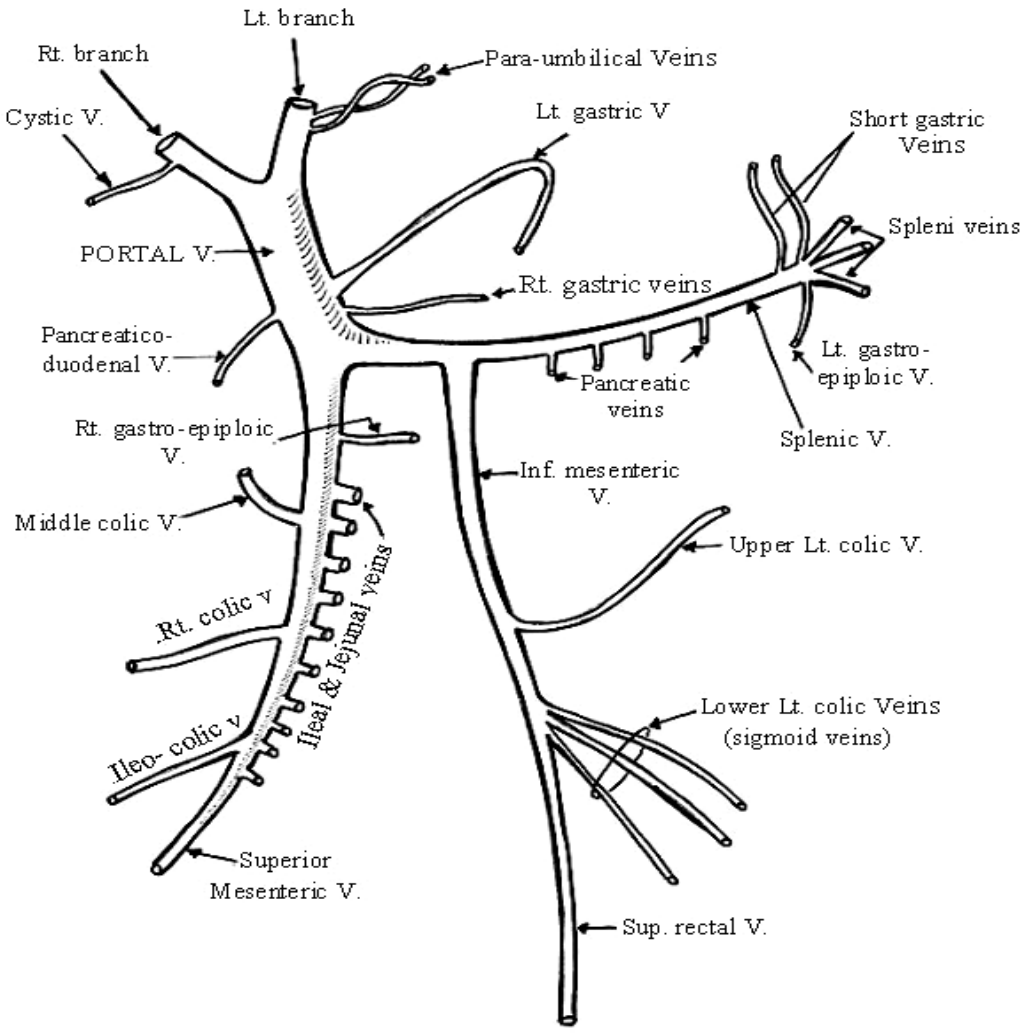
6) **Cystic Vein: (usually absent)** drain the gall bladder, to end in the right division of the portal vein.

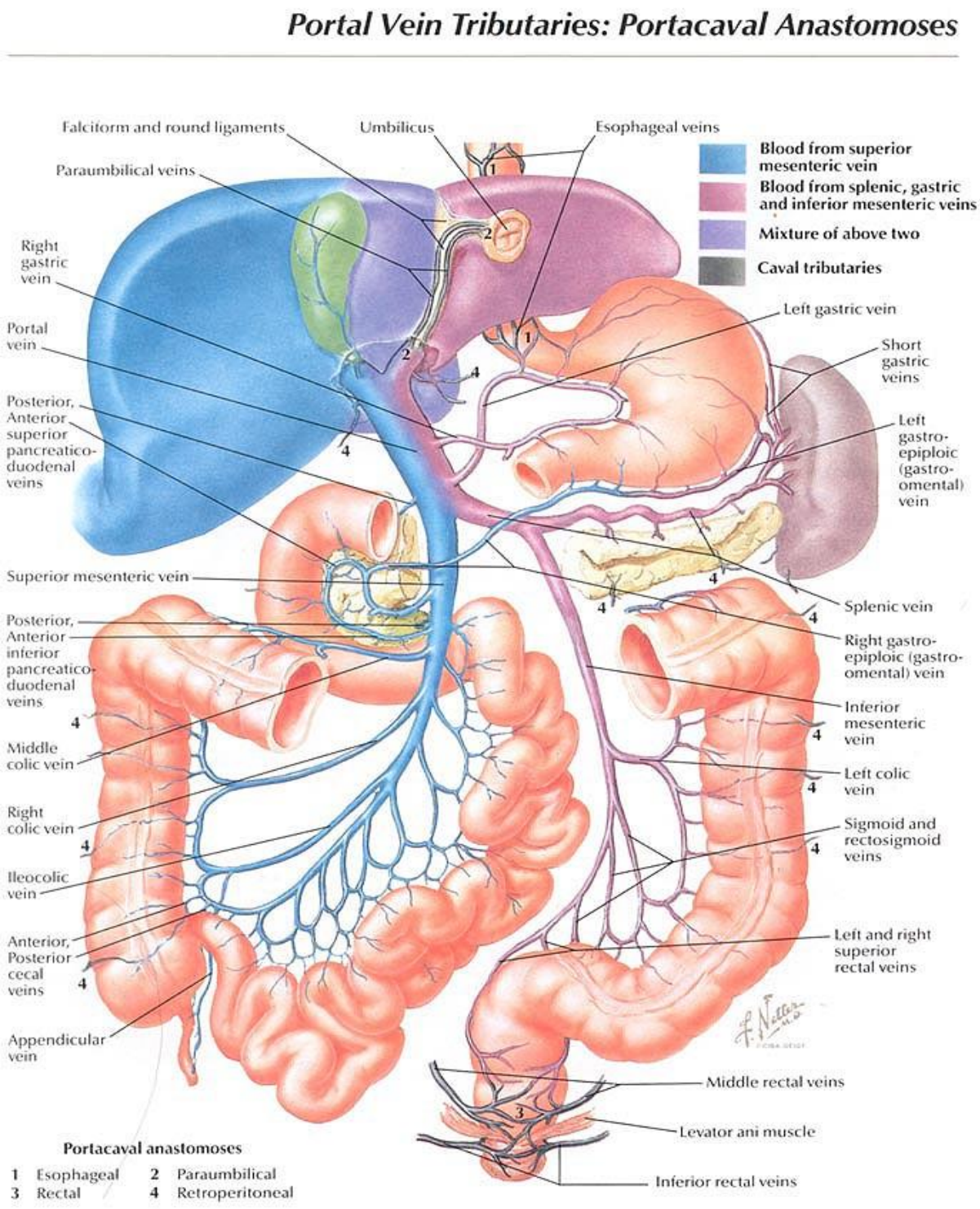


*** Branches of Sup. & Inf. Mesenteric artery ***



Venous Drainage of the Stomach





★ 2 **Ligaments attached to left branch of portal vein:**

1) **Ligamentum teres:** It is obliterated left umbilical vien of the fetus.
2) **Ligamentum venosum :** It is obliterated ductus venosus of the fetus .

Splenic Vein

★ **Beginning and course:**

- By union of 5 or 6 splenic tributaries at the hilum of the spleen.
- It leaves the spleen and passes in the lieno-renal ligament then directed to the right behind the pancreas and below its artery.
- It is not tortuous like the splenic artery.

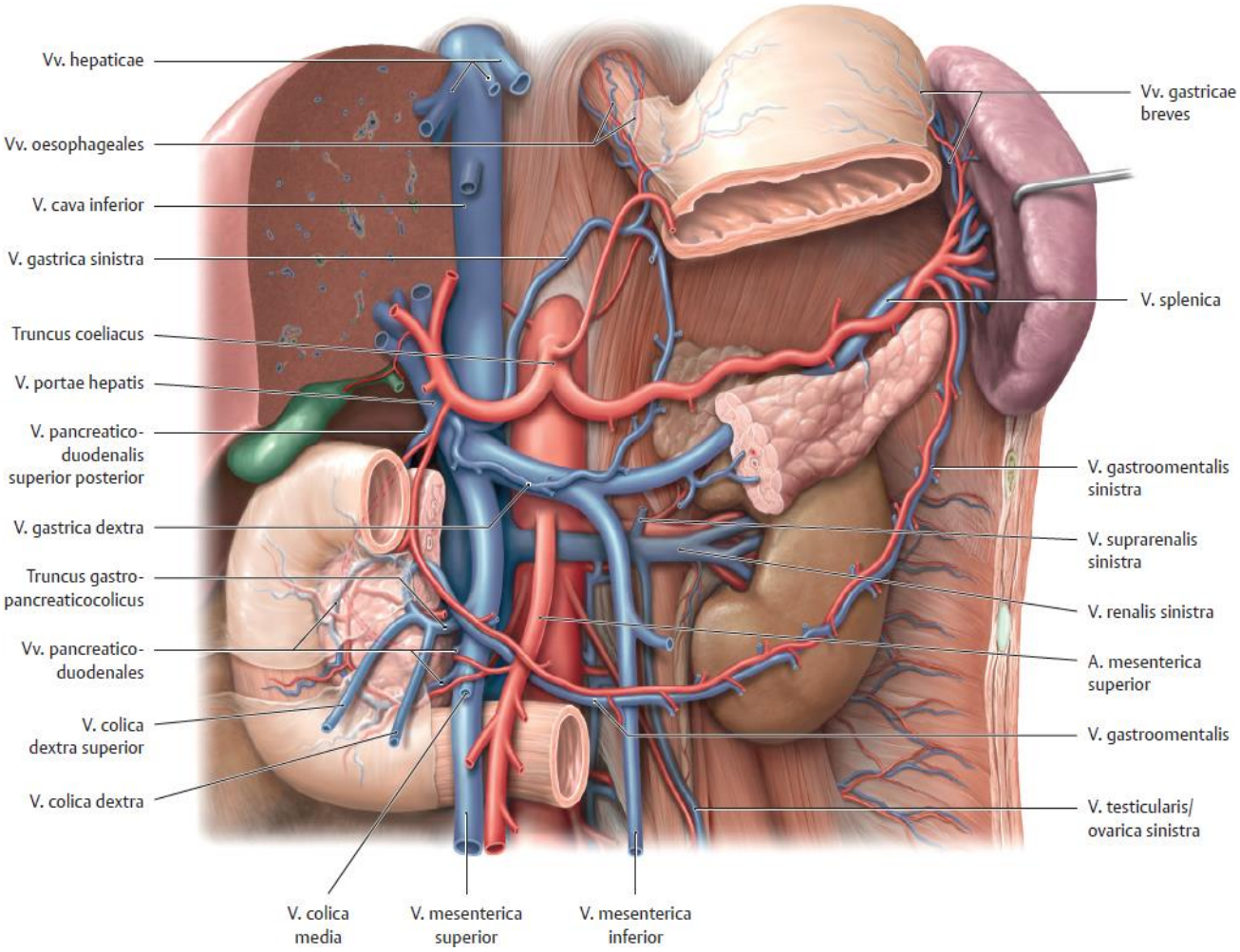
★ **Relations:**

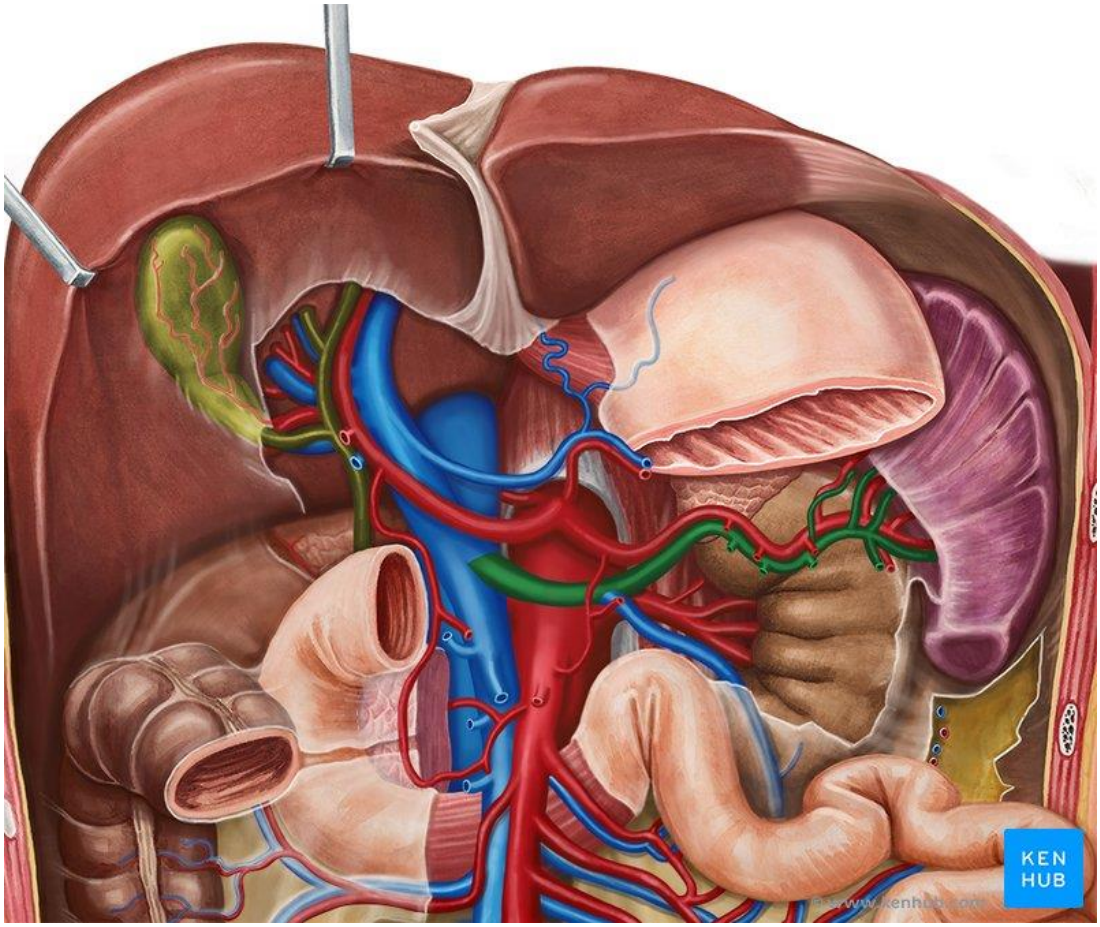
- **Anterior :** body of pancreas**.**
- **Posteriot:** The left kidney , left sympathetic trunk , left crus of diaphragm and abdominal aorta
- **Superior:** Splenic artery.
- **Inferior:** superior mesenteric artery & left renal vein.

★ **Ends:** By joining the superior mesenteric vein to form the portal vein, behind the neck of the pancreas.

★ **Tributaries:**

1) Tributaries from the spleen .
2) Short gastric veins; from the fundus of the stomach
3) The left gastro-epiploic vein, from the greater curvature of the stomach.
4) The pancreatic veins ; from the body of the pancreas.
5) **Inferior mesenteric vein:**
   - It is begins in front of left common iliac artery as the continuation of the superior rectal vein.
   - It receives the superior and inferior left colic veins.
   - It is the most important tributary of splenic vein.
   - It ascends in front of left psoas major with inferior mesenteric artery on its right side and left ureter on its left side.


Vv. hepaticae
Vv. oesophageales
V. cava inferior
V. gastrica sinistra
Truncus coeliacus
V. portae hepatis
V. pancreatico-duodenalis superior posterior
V. gastrica dextra
Truncus gastro-pancreaticocolicus
Vv. pancreatico-duodenales
V. colica dextra superior
V. colica dextra
V. colica media
V. mesenterica superior
V. mesenterica inferior
Vv. gastricae breves
V. splenica
V. gastroomentalis sinistra
V. suprarenalis sinistra
V. renalis sinistra
A. mesenterica superior
V. gastroomentalis
V. testicularis/ ovarica sinistra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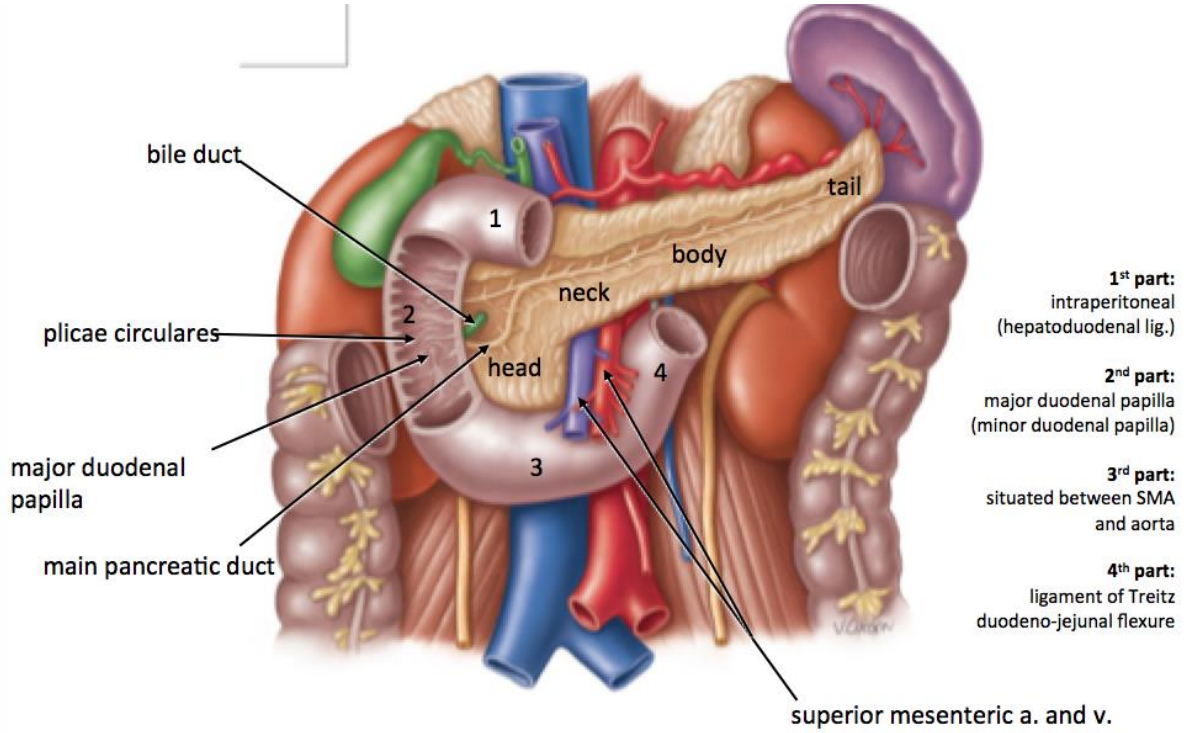


Superior Mesenteric Vein

★ **Beginning and course:** By the tributaries of the midgut veins at the lower end of the root of mesentery.

- It passes in the **root of the mesentery** of the small intestine on the right side of the superior mesenteric artery.
- It ascends, crossing anterior to the 3rd part of the duodenum and uncinate process of pancreas.

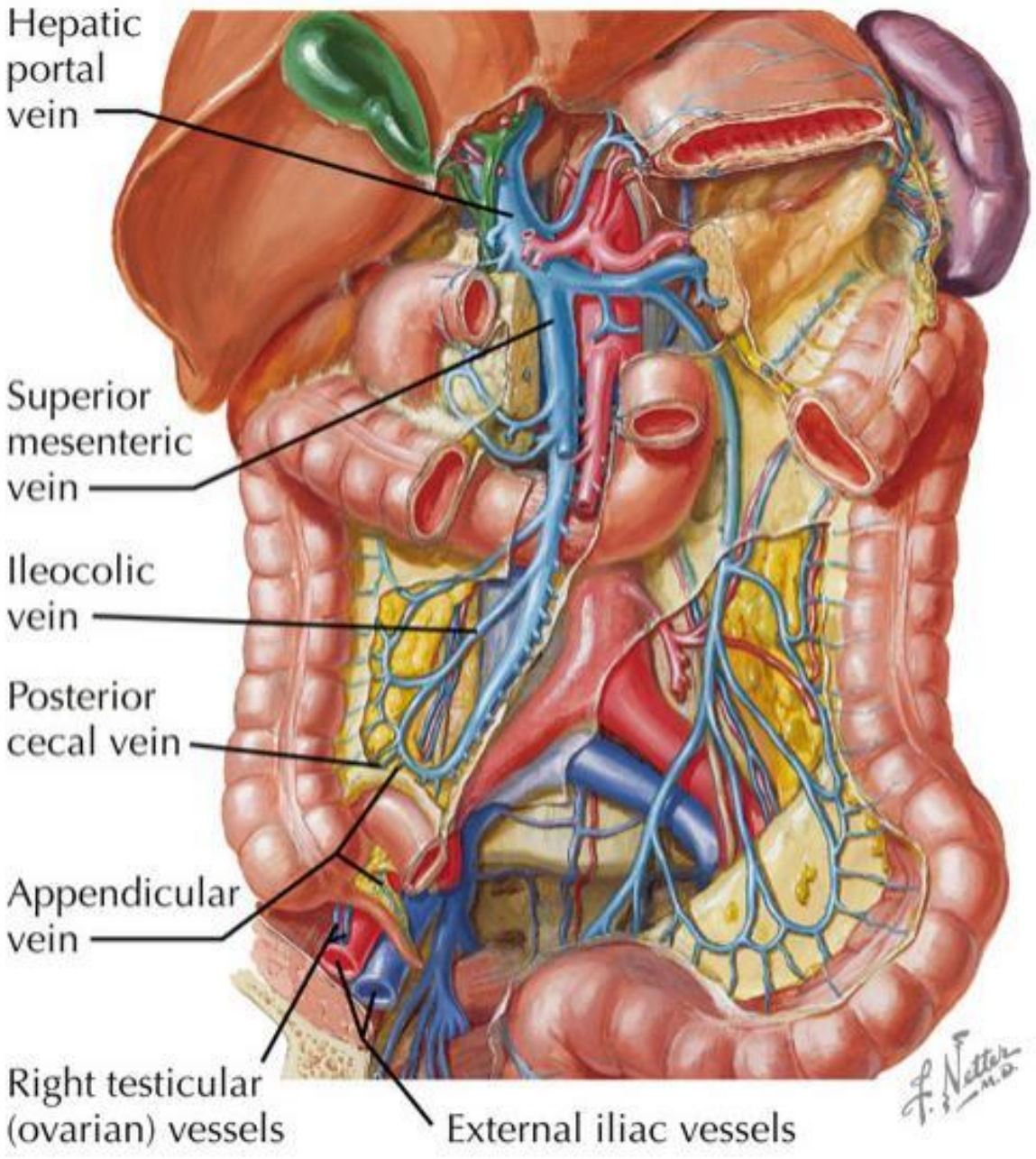
★ **Ends:** By joining the splenic vein behind the neck of pancreas to form the portal vein.

★ **Tributaries:**

1) Ileocolic vein: from the ileum and ascending colon.
2) Right colic vein: from the ascending colon.
3) Middle colic vein: from the transverse colon.
4) Jejunal and ileal veins: from the small intestine.
5) Inferior pancreatico-duodenal vein: from the duodenum and

head of pancreas.

6) Right gastro-epiploic vein: from the right part of the greater curvature of the stomach.



Superior Mesenteric Vein

Porto-Systemic Anastomoses

★ In case of portal vein obstruction , anastomoses occurs between the portal and systemic circulations at the following sites :

A] Anastomoses at lower part of esophagus between:

- Esophageal veins of left gastric & short gastric veins (portal).
- Esophageal veins of vena azygos (systemic).

❖ **In portal hypertension** opening of this anastomosis, leads to **esophageal** and **gastric varices**. Its rupture leads to haematemesis and melona.

B] Anastomoses at lower end of rectum and upper end of anal canal between:

- Superior rectal vein (portal).
- Middle and inferior rectal veins (systemic).

❖ **In portal hypertension** opening of this anastomosis leads to formation of **piles (haemorrhoids)** and bleeding per rectum.

c] Anastomoses around the umbilicus:

- Para- umbilical veins (portal).
- Superior & inferior epigastric veins (systemic).

❖ In portal hypertension opening of this anastomoses leads to dilatation of the veins in a radial direction around the umbilicus, a condition called **caput medusa**.

d] Other areas of anastomoses:

1- At the ***bare areas of the liver***:

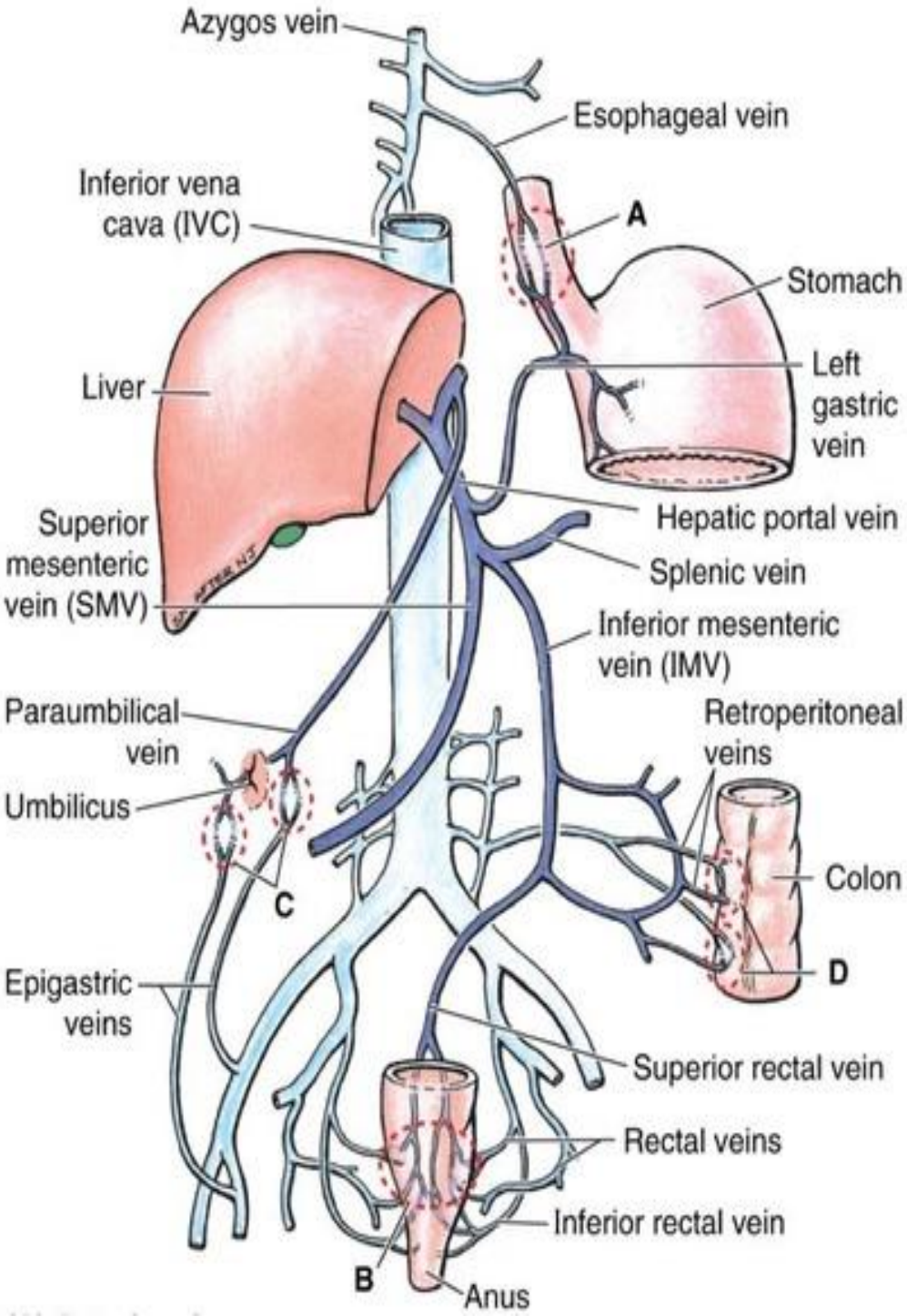
- Between capillaries inside the liver (portal) .
- Phrenic veins of the diaphragm (systemic).

2- At the **posterior abdominal wall**:

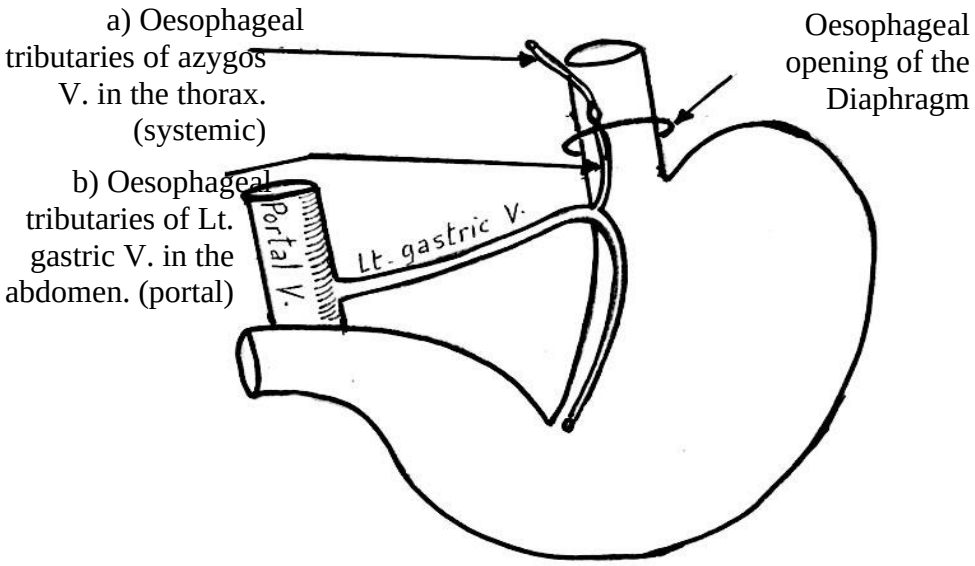
- Between the pancreatico-duodenal , splenic and colic veins

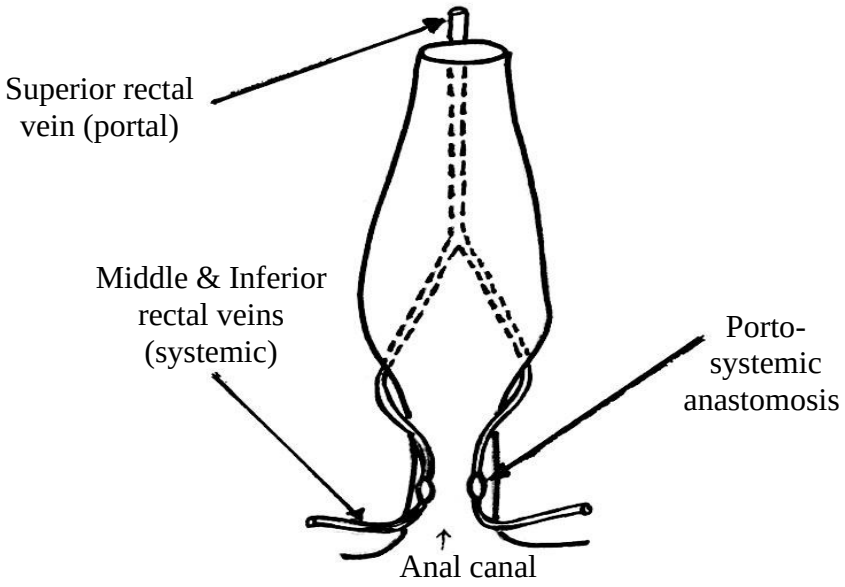
(portal).

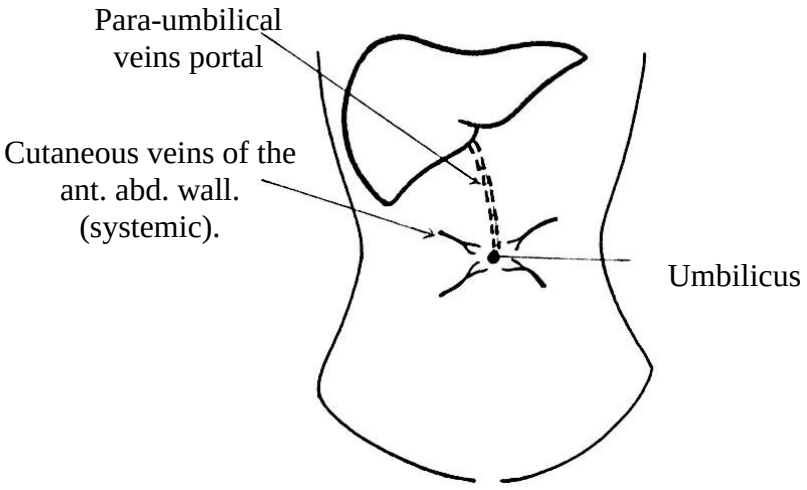
- Phrenic and Lumbar veins (systemic).

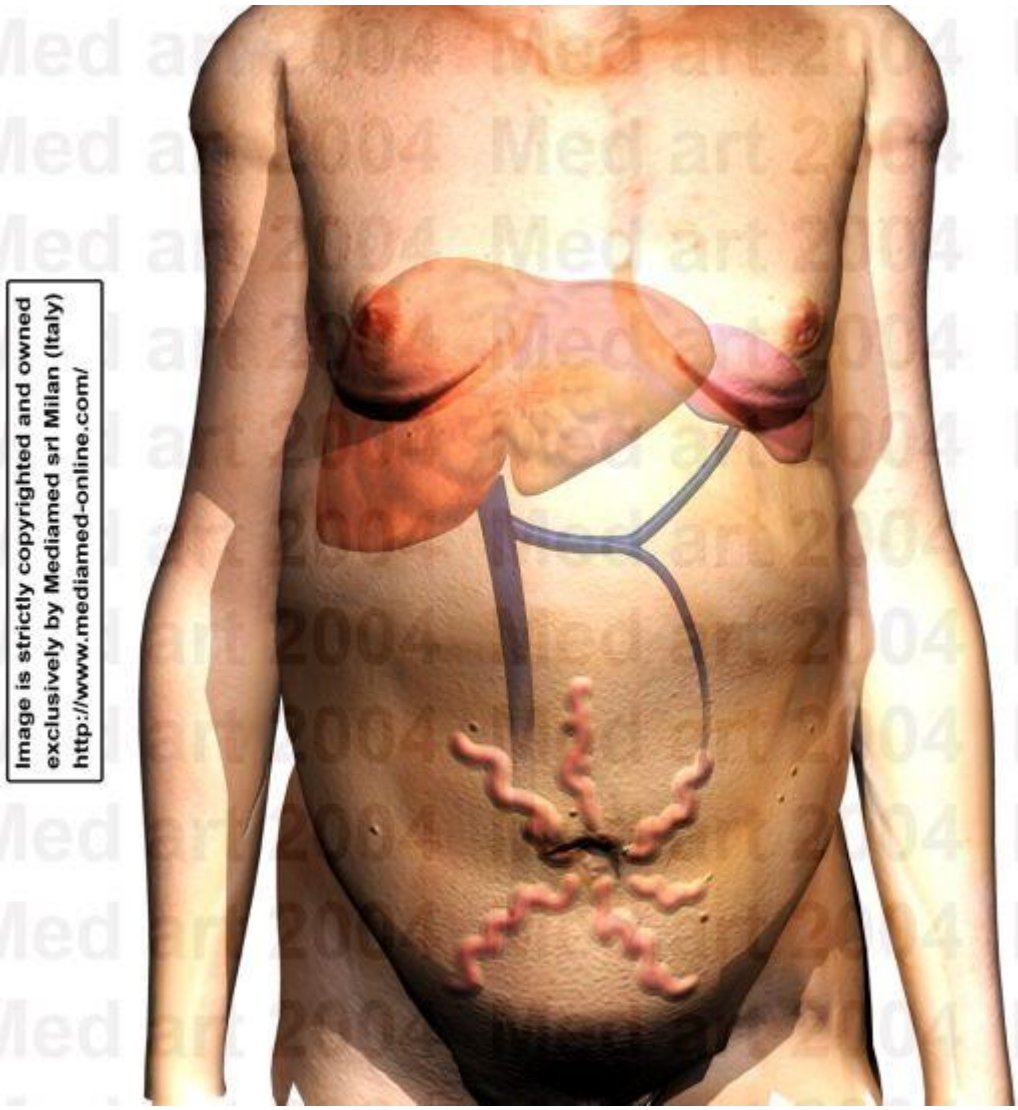


Porto- systemic anastomoses





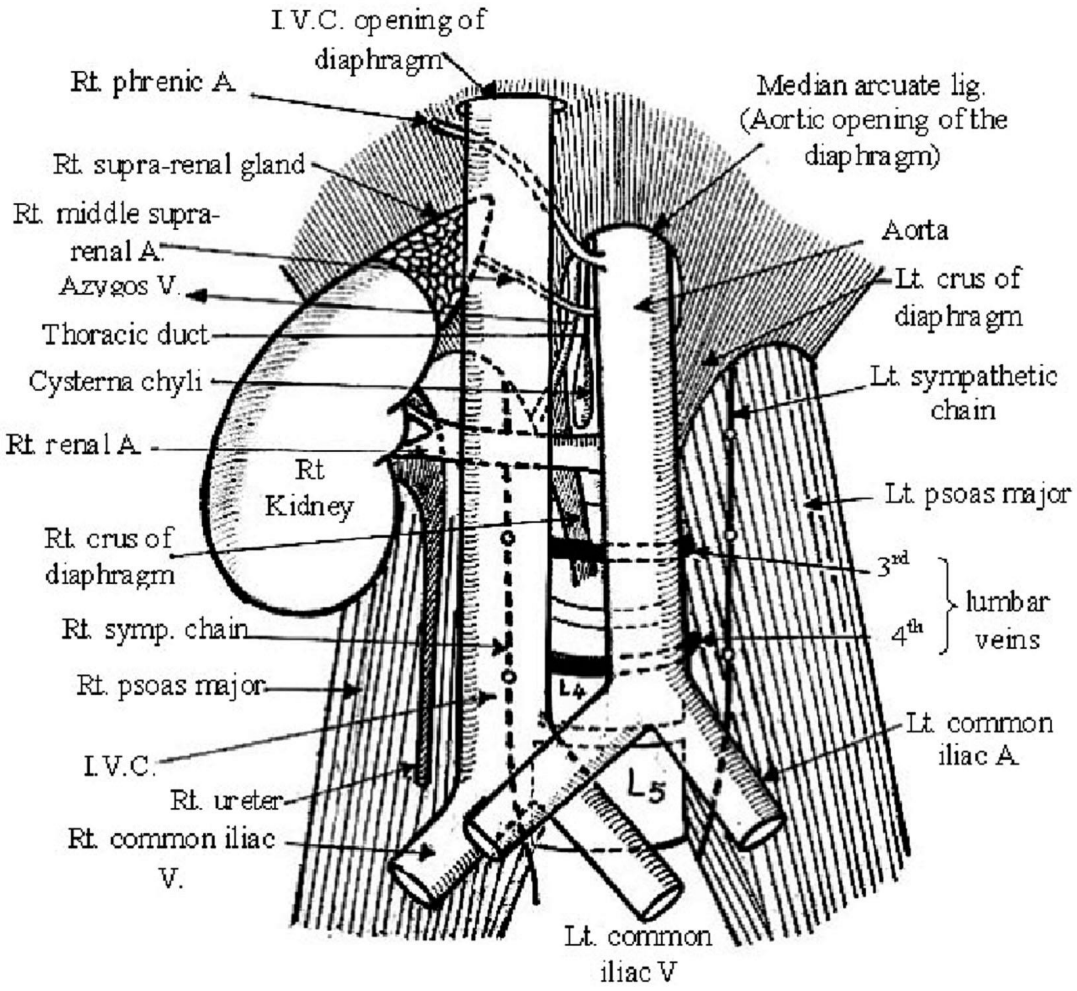


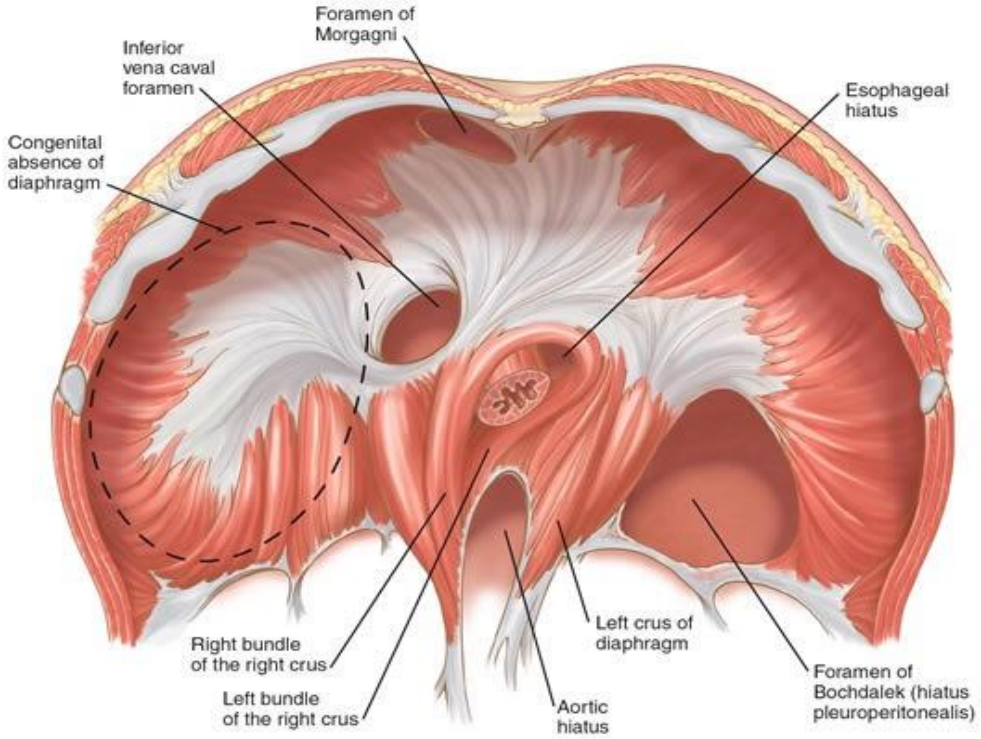


Inferior Vena Cava

★ **It begins** at the level of L_5 vertebra , slightly to the right side of middle line ,by union of 2 common iliac veins .

★ **It ends** by passing through the IVC opening in the diaphragm to open into the right atrium one inch to the right side , at the level of right 6th. costal cartilage.

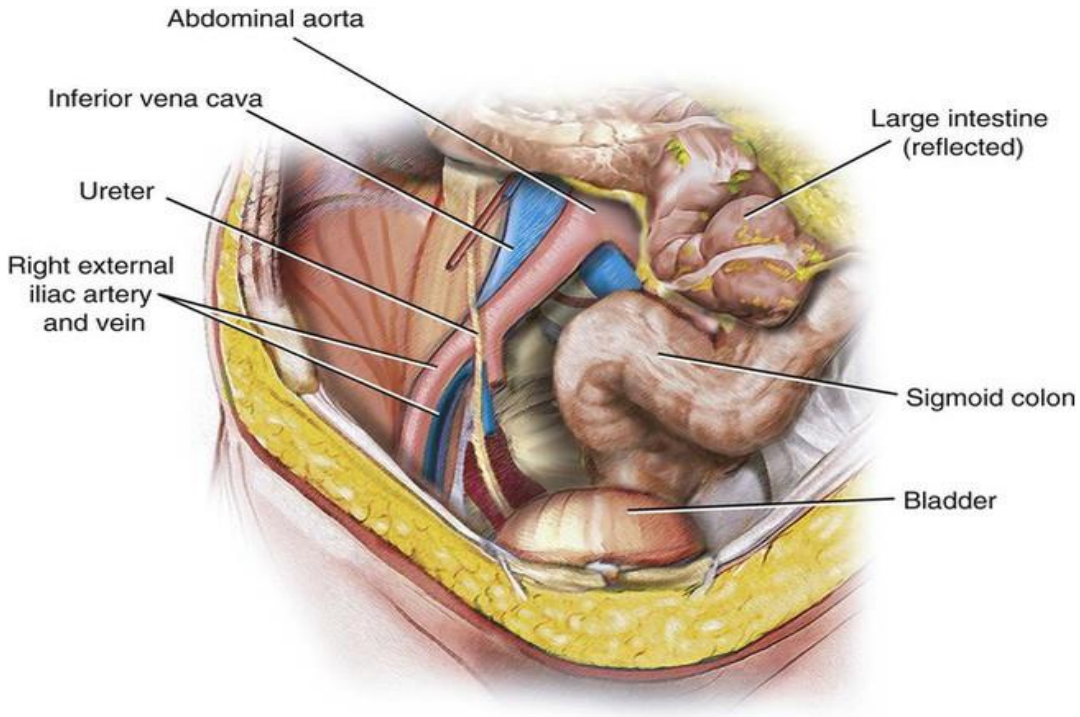

I.V.C. opening of diaphragm
Rt. phrenic A.
Median arcuate lig. (Aortic opening of the diaphragm)
Rt. supra-renal gland
Rt. middle supra-renal A.
Aorta
Azygos V.
Lt. crus of diaphragm
Thoracic duct
Cysterna chyli
Lt. sympathetic chain
Rt. renal A.
Rt Kidney
Lt. psoas major
Rt. crus of diaphragm
3rd
4th
lumbar veins
Rt. symp. chain
Rt. psoas major
L4
Lt. common iliac A.
I.V.C.
L5
Rt. ureter
Rt. common iliac V.
Lt. common iliac V

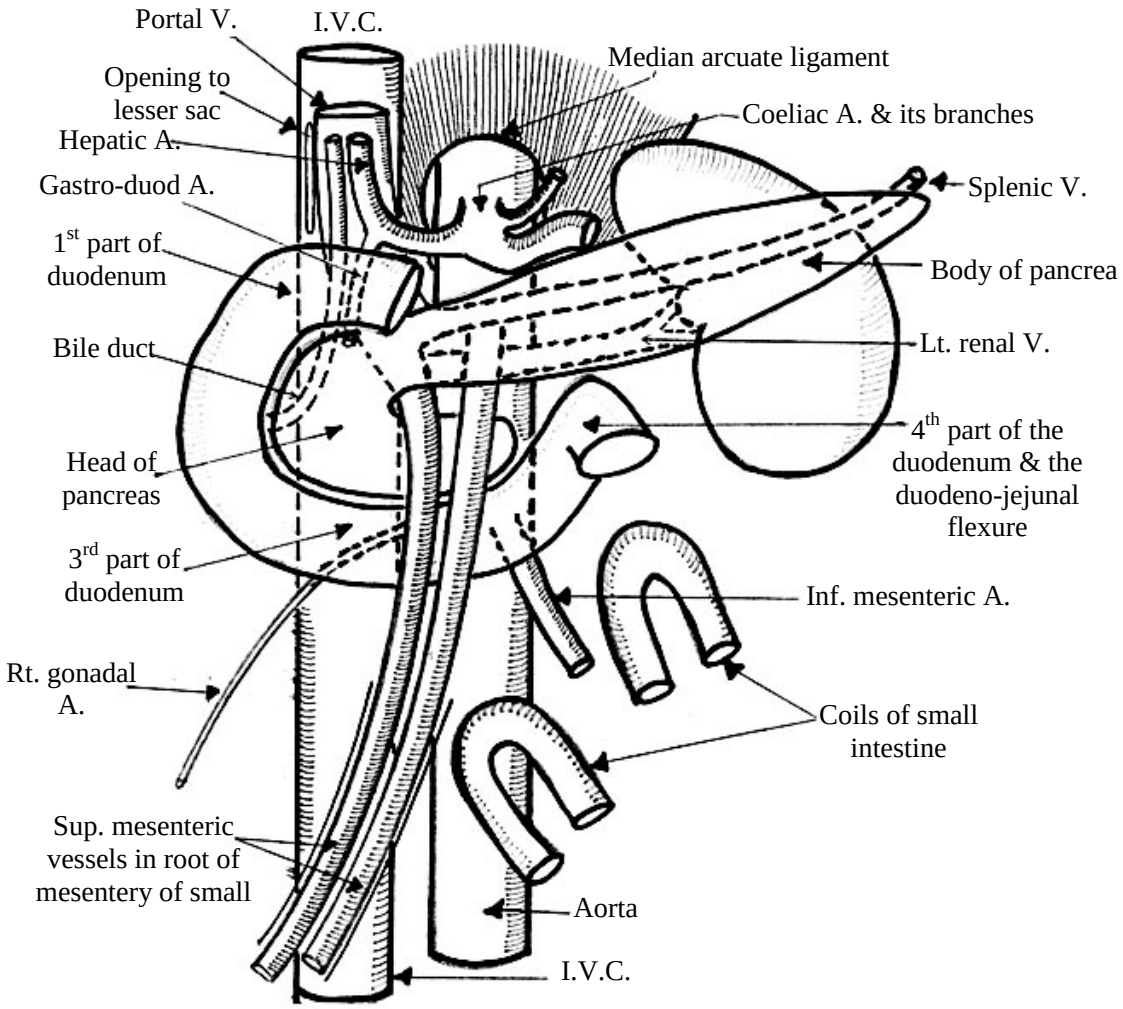

Foramen of Morgagni
Inferior vena caval foramen
Esophageal hiatus
Congenital absence of diaphragm
Left crus of diaphragm
Right bundle of the right crus
Foramen of Bochdalek (hiatus pleuroperitonealis)
Left bundle of the right crus
Aortic hiatus

★ **Relations :**

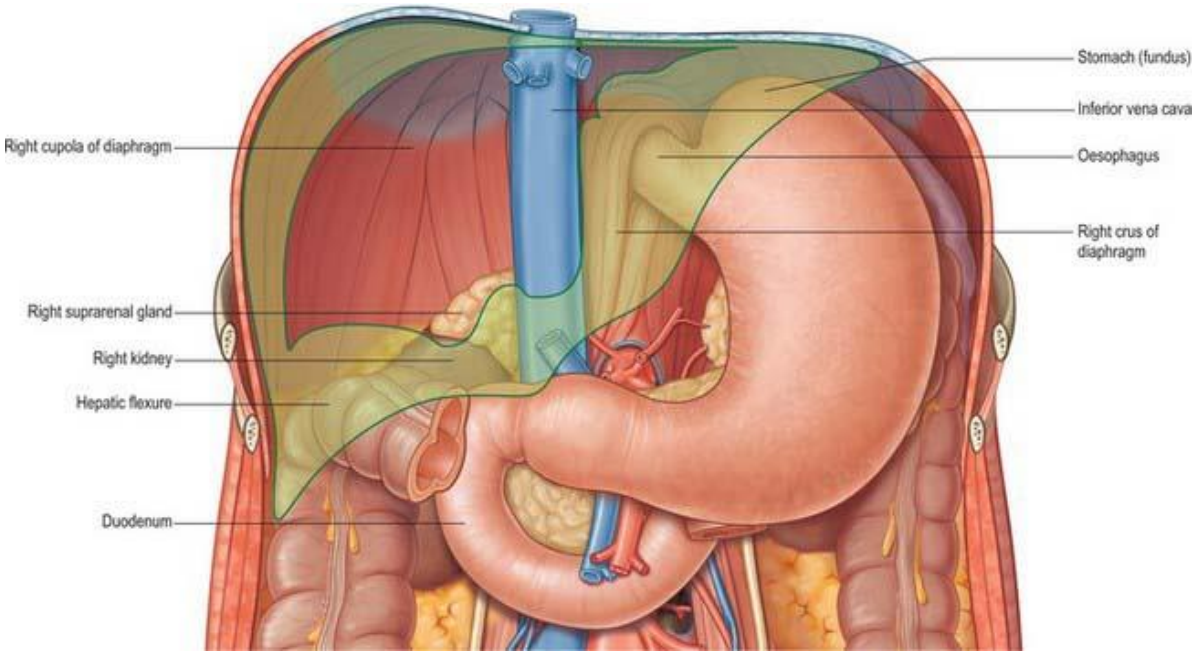
I) Anterior : From below upwards.

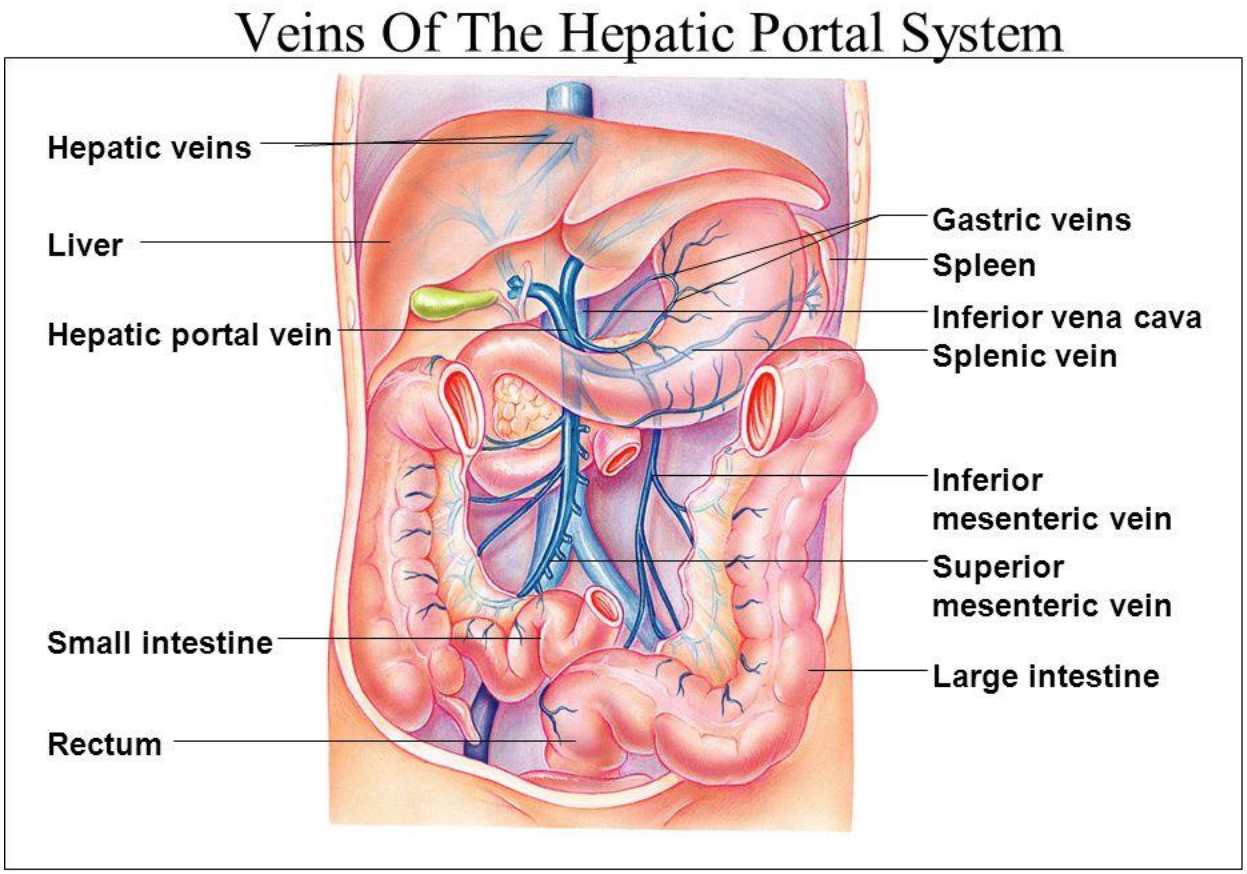
1) **Right common iliac artery** cross in front of the termination of left common iliac vein & IVC → varicose veins are more common in the left lower limb .
2) Parietal peritoneum of the posterior abdominal wall.
3) **Root of mesentery** containing superior mesenteric vessels with loops of small intestine .
4) **Right Gonadal artery** separating IVC from **3rd part of the duodenum**.
5) **Head of pancreas**, separated from IVC by the **common bile duct** on its deep surface.
6) **Portal vein**, **common bile duct** and **gastroduodenal artery** separating it from the **1st. part of the duodenum**.
7) **Epiploic foramen** separating it from the **free border of lesser omentum** containing portal vein, bile duct and hepatic artery.
8) I.V.C. groove in the posterior surface of the right lobe of the **liver**.

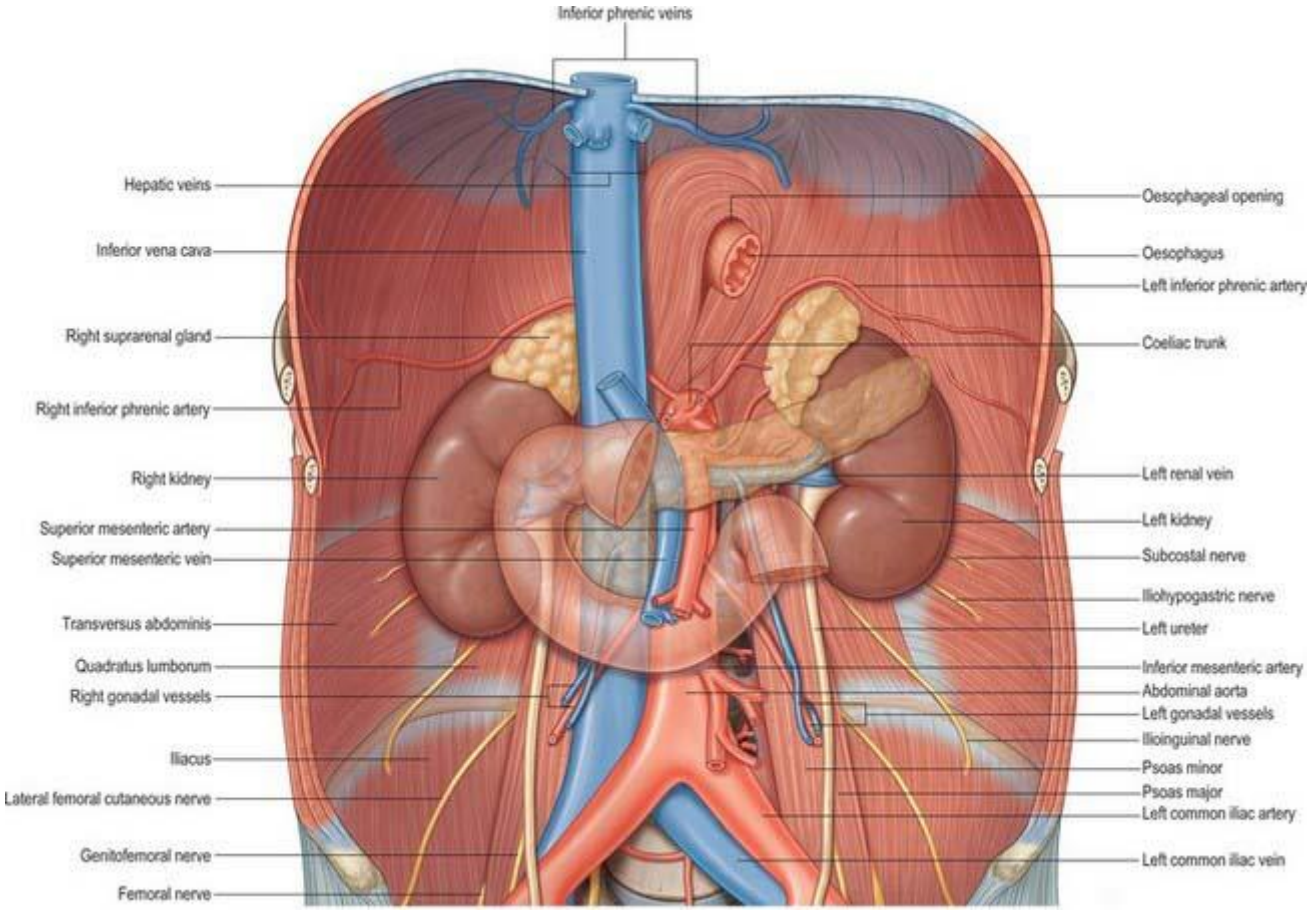




* Relations of Aorta & I.V.C.*




Veins Of The Hepatic Portal System
Hepatic veins
Liver
Hepatic portal vein
Small intestine
Rectum
Gastric veins
Spleen
Inferior vena cava
Splenic vein
Inferior mesenteric vein
Superior mesenteric vein
Large intestine


Inferior phrenic veins
Hepatic veins
Inferior vena cava
Right suprarenal gland
Right inferior phrenic artery
Right kidney
Superior mesenteric artery
Superior mesenteric vein
Transversus abdominis
Quadratus lumborum
Right gonadal vessels
Iliacus
Lateral femoral cutaneous nerve
Genitofemoral nerve
Femoral nerve
Oesophageal opening
Oesophagus
Left inferior phrenic artery
Coeliac trunk
Left renal vein
Left kidney
Subcostal nerve
Iliohypogastric nerve
Left ureter
Inferior mesenteric artery
Abdominal aorta
Left gonadal vessels
Ilioinguinal nerve
Psoas minor
Psoas major
Left common iliac artery
Left common iliac vein

★ **Posterior Relations: (1 gland , 2 muscles , 2 nerves , 3 bones & 4 right branches of aorta)**

1) Right sympathetic trunk.
2) The medial margin of the right psoas major muscle.
3) The bodies of the lower 3 lumbar vertebrae with the anterior longitudinal ligament.
4) The 3rd & 4th lumbar arteries.
5) Right renal artery.
6) Diaphragm
7) Right middle suprarenal artery and medial part of right suprarenal gland.
8) Right inferior phrenic artery.
9) Right coeliac ganglion.

*** Relation to the Right Side:**

1- Right ureter and medial border of right kidney.

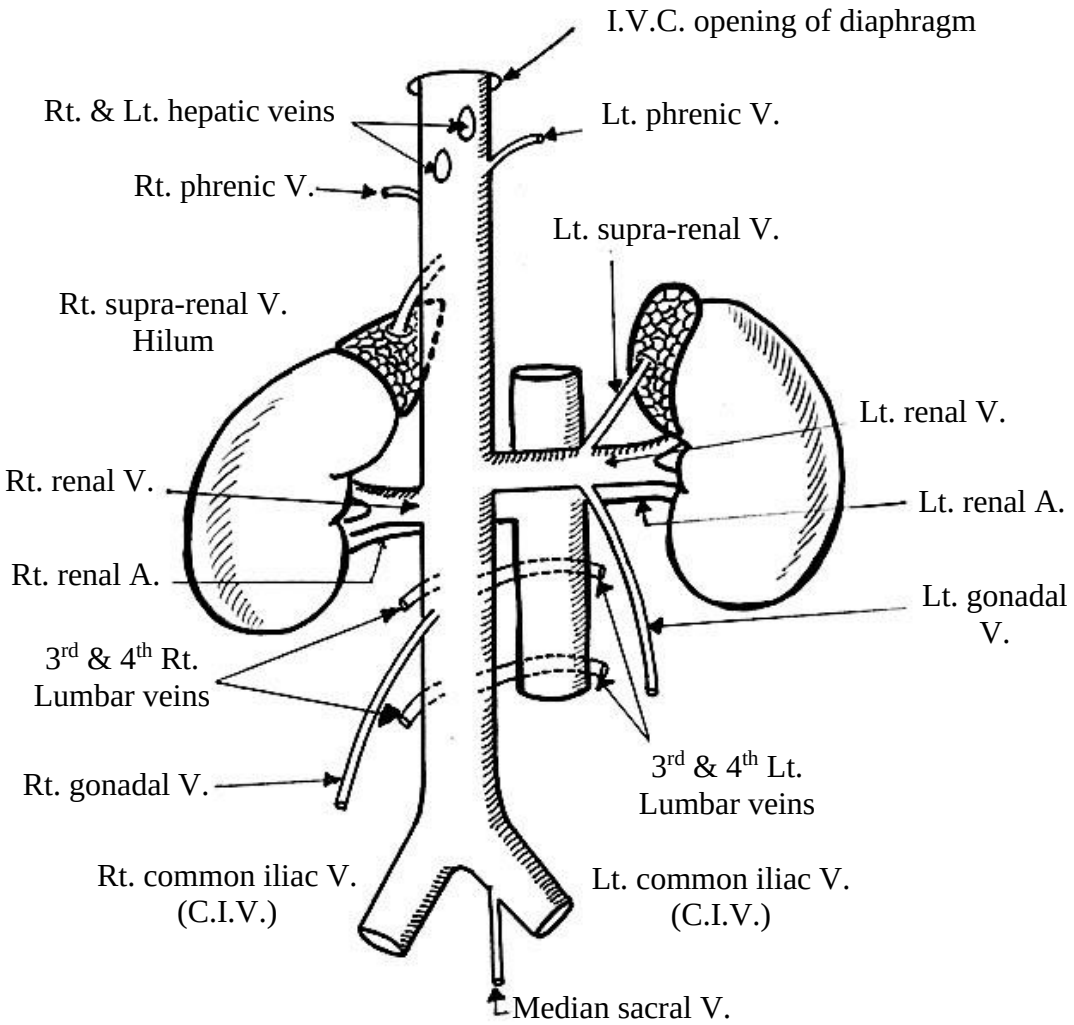
2- The 2nd part of the duodenum.

3- Right lobe of the liver.

*** Relation to the Left Side:**

1. The aorta.
2. Right crus of diaphragm.
3. Caudate lobe of the liver.

Tributaries: 3rd. & 4th lumbar veins , right gonadal vein , 2 renal veins , right suprarenal vein , 2 inferior phrenic veins & 3 hepatic veins.



Veins of the Abdomen

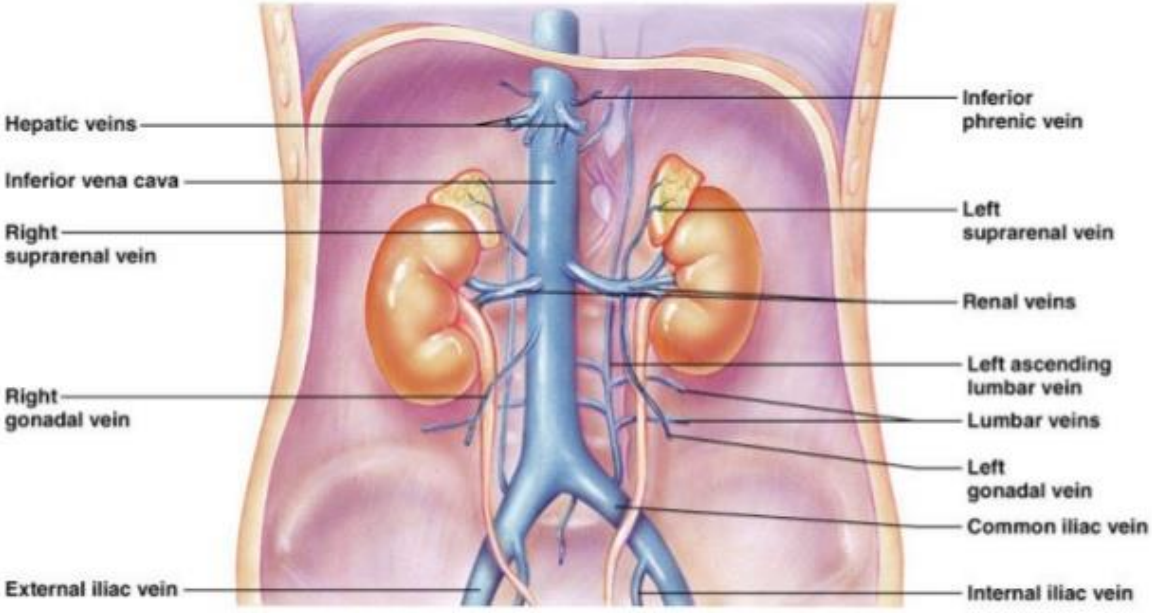
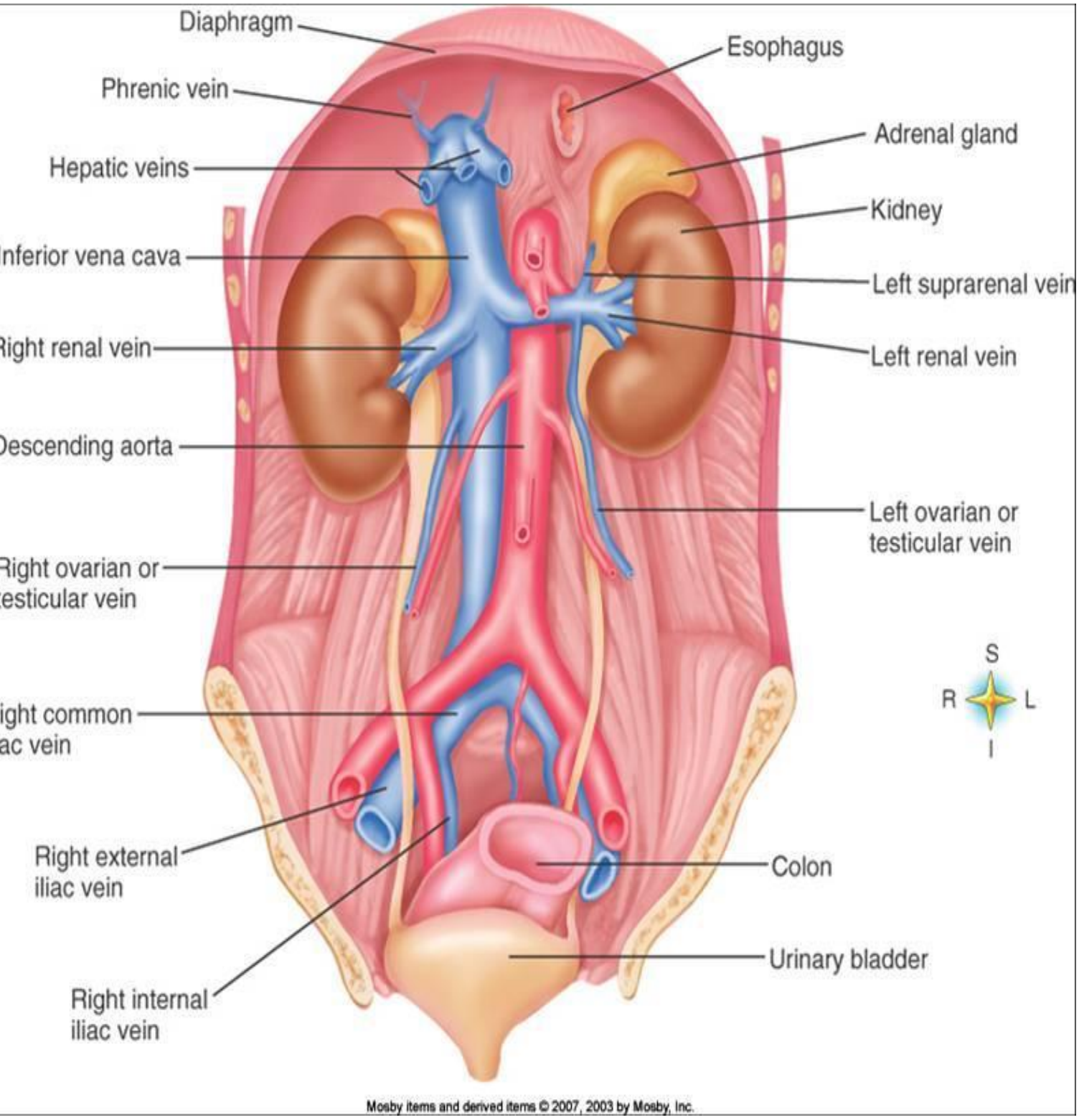


Figure 19.27b


Diaphragm
Esophagus
Phrenic vein
Adrenal gland
Hepatic veins
Kidney
nferior vena cava
Left suprarenal vein
Right renal vein
Left renal vein
Descending aorta
Left ovarian or testicular vein
Right ovarian or testicular vein
S
R
L
I
ight common ac vein
Right external iliac vein
Colon
Urinary bladder
Right internal iliac vein
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Anastomosis Between S.V.C & I.V.C

A. In the ant. abdominal Wall:

1. Thoraco-epigastric V. in the S.C tissue of antero-lateral part of trunk, connect the ***lat. thoracic*** V. (tributary of axillary V.) & ***superficial epigastric*** V. (tributary of long saphenous).

- **Applied anatomy**: ***Obstruction*** of inferior vena cava or iliofemoral veins, results in opening of this anastomosis with formation of ***dilated veins crossing the groin*** .

2. ***Sup. epigastric V.*** (tributary of internal thoracic vein) anastomoses inside the rectus sheath with ***inf. epigastric V.*** (tributary of ext. iliac V.).

B. In the Post. Abdominal Wall:

1. ***Azygos V.***: arises from back of I.V.C in the abdomen & ends in the back of S.V.C.
2. ***Inf. hemiazygos V.***: arises from back of Lt. renal V. to end in the azygos V. (tributary of S.V.C).
3. ***Vertebral venous plexus*** (inside the vertebral canal & around the vertebral bodies), connects lumbar veins (tributaries of I.V.C) with post. intercostal veins (tributaries of azygos & hemiazygos veins.)