

Duodenum: first, shortest & widest part of small intestine

→ extends from pylorus to duodenojejunal flexure

→ 10 inches long

→ retroperitoneal except the proximal 2.5 cm which is suspended above by lesser omentum & below by greater omentum

→ main function = digestion

Shape: C-shaped loop

↳ concavity of duodenum encloses head of pancreas

Location: opposite to L1, L2, L3 (above umbilicus)

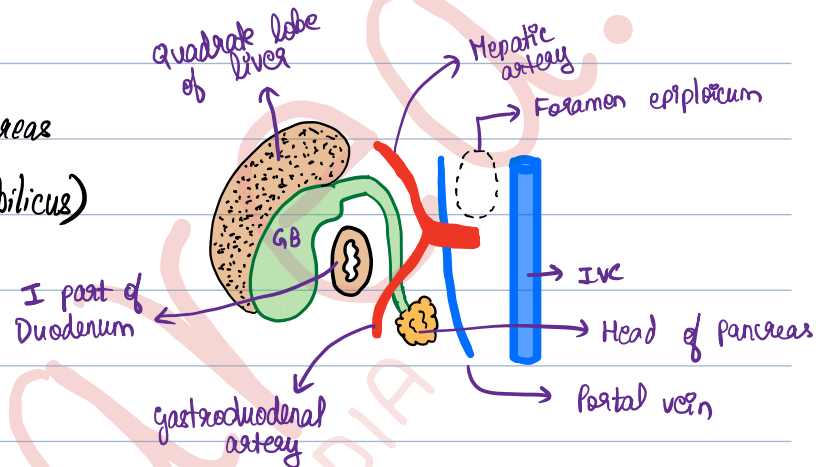
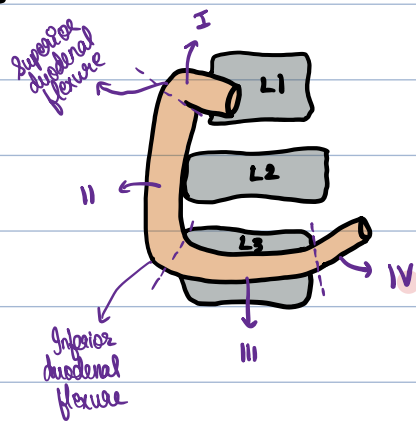
Parts & Relations:

(i) Superior (1st) part = 2 inch

(ii) Descending (2nd) part = 3 inch

(iii) Horizontal (3rd) part = 4 inch

(iv) Ascending (4th) part = 1 inch



1st Part: begins at pylorus



passes upward, backward, laterally to reach neck of gall bladder



curves downward (superior duodenal flexure)

Features: - develops from foregut

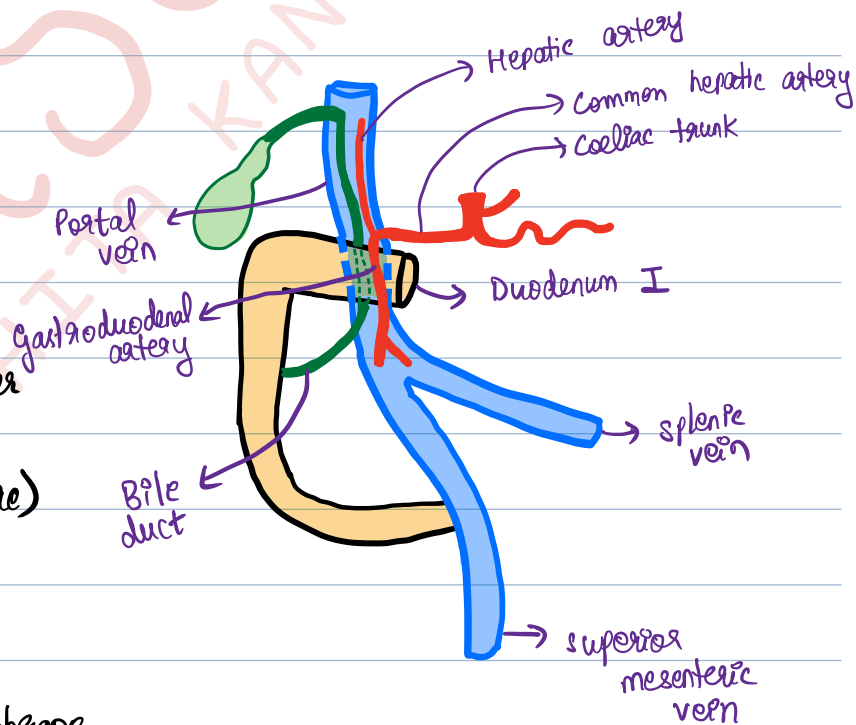
↳ only retroperitoneal part

→ no circular folds in mucous membrane

→ seen as duodenal cap in barium meal

→ site for duodenal ulcers

→ supplied by branches of coeliac trunk/artery



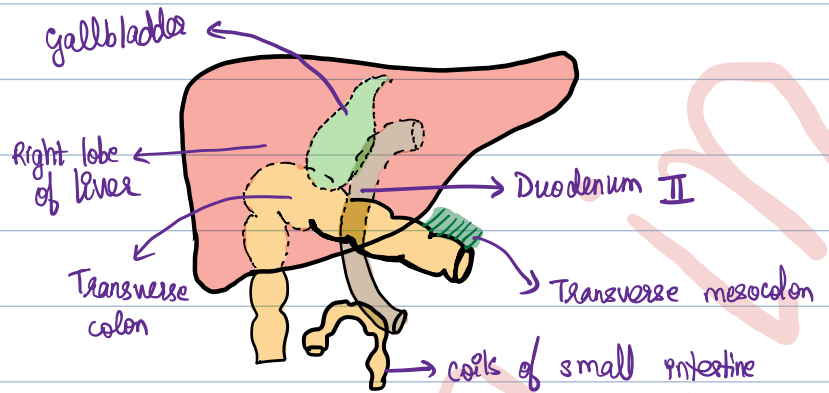
Relations:

Anteriorly $\Rightarrow$ quadrate lobe of liver, gall bladder

Posteriorly $\Rightarrow$ portal vein, gastroduodenal artery,
common bile duct (CBD)

Superiorly: Epiploic foramen separated from it
by portal vein $\rightarrow$ bile duct

Inferiorly: head & neck of pancreas



Second part: passes downward in front of medial

part of right kidney till lower border of L3



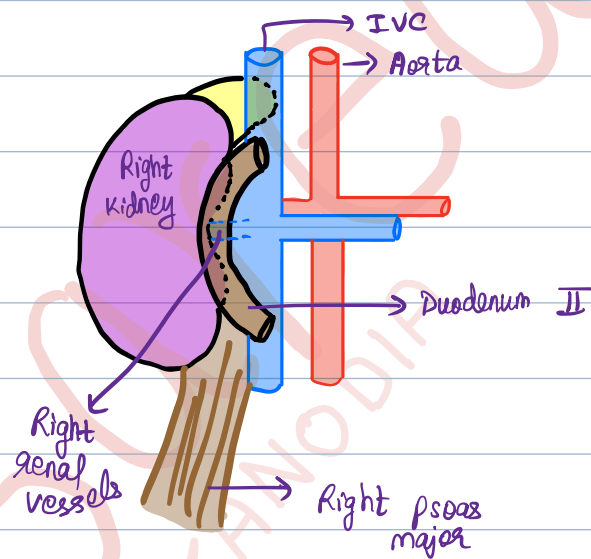
inferior duodenal flexure

$\rightarrow$ its upper half develops from foregut
& lower half develops from midgut.

$\rightarrow$ lies behind transverse mesocolon

$\rightarrow$ receives bile duct, chief & accessory pancreatic ducts

$\rightarrow$ supplied by double rows of vasa recta arising from
anterior & posterior pancreaticoduodenal arterial arcades.



Relations:

Anteriorly $\Rightarrow$ gall bladder, right lobe of liver,
transverse mesocolon & coils of jejunum

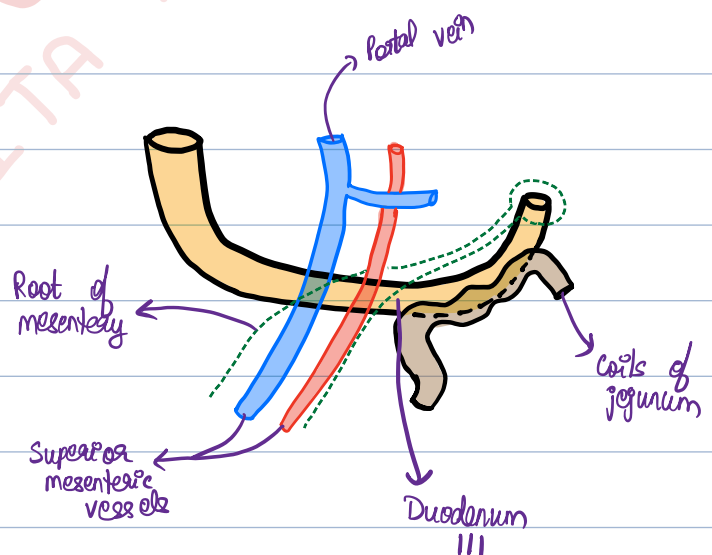
Posteriorly: Right kidney, right renal vessels, IVC,
right psoas major

Medially: head of pancreas

Laterally: from below upward - ascending colon

- right colic flexure

- right lobe of liver



Third Part: runs horizontally to the left



crosses in front of IVC

Relations:

Anteriorly $\Rightarrow$ root of mesentery, superior mesenteric vessels & coils of jejunum.

Posteriorly $\Rightarrow$ right psoas major, right ureter, IVC, abdominal aorta, right gonadal vessels

Superiorly $\Rightarrow$ head of pancreas & uncinate process

Inferiorly $\Rightarrow$ coils of jejunum.

4th Part: runs obliquely upward immediately to left of abdominal aorta till upper border of L2 till duodenojejunal flexure.

Relations:

Anteriorly $\Rightarrow$ transverse colon & mesocolon

Posteriorly $\Rightarrow$ left psoas major, left sympathetic chain, left gonadal vessels, inferior mesenteric vein.

Superiorly $\Rightarrow$ body of pancreas

On the left $\Rightarrow$ left kidney, left ureter

On the right $\Rightarrow$ upper part of root of mesentery

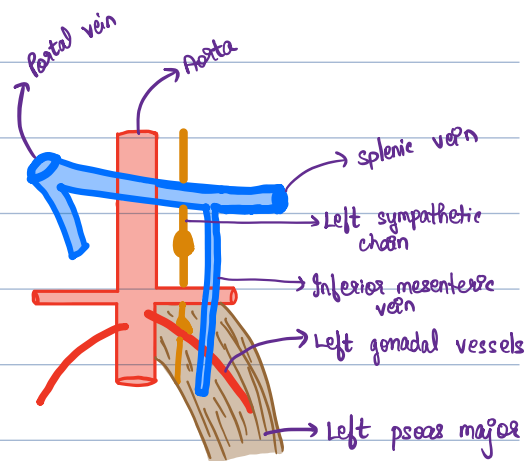
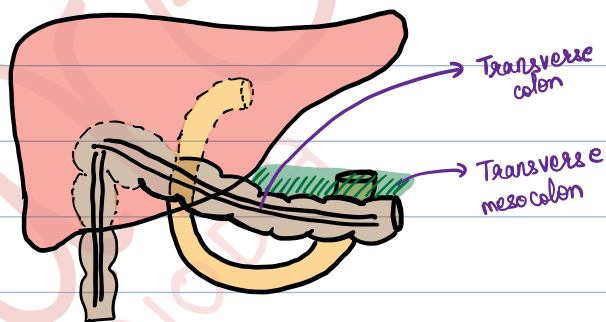
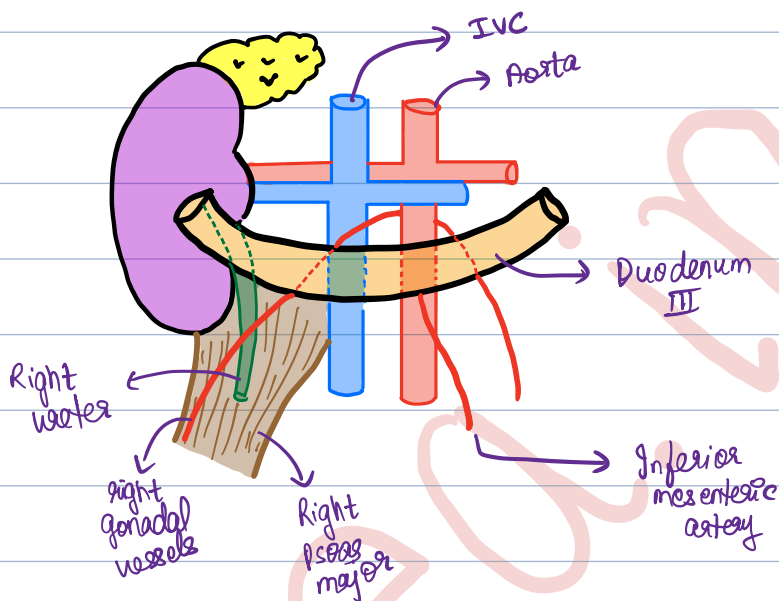
Interior of Duodenum: mucous membrane has circular folds $\Rightarrow$ valves of Kerckring which begin in the 2nd part of duodenum

Other features of 2nd part -

Major duodenal papilla: conical projection on posteromedial wall

$\hookrightarrow$ 1cm distal to pylorus

$\rightarrow$ opening of common hepatopancreatic duct (bile duct + main pancreatic duct)



Minor duodenal papilla: small conical projection

↳ 2cm proximal to major duodenal papilla

→ accessory pancreatic duct opening

Arch of Plica semicircularis: plica semicircularis forms an arch above major duodenal papilla ⇒ Monk's hood.

Plica longitudinalis: vertical tortuous fold of mucous membrane extending downward from major duodenal papilla.

Suspensory Muscle of Duodenum (Ligament of Treitz):

→ fibromuscular band which suspends duodenojejunal flexure from right crus of diaphragm

→ band contains - striated muscle fibres in upper part

- Elastic fibres in middle part

- Non-striated muscle fibres in lower part

→ this ligament prevents the duodenojejunal flexure from being dragged down by weight of loops of small intestine.

→ serves as an important landmark in radiological diagnosis of incomplete or malrotation of small intestine.

Duodenal Recesses / Fossae: small pocket like pouches of peritoneum.

↳ responsible for strangulated retroperitoneal hernia

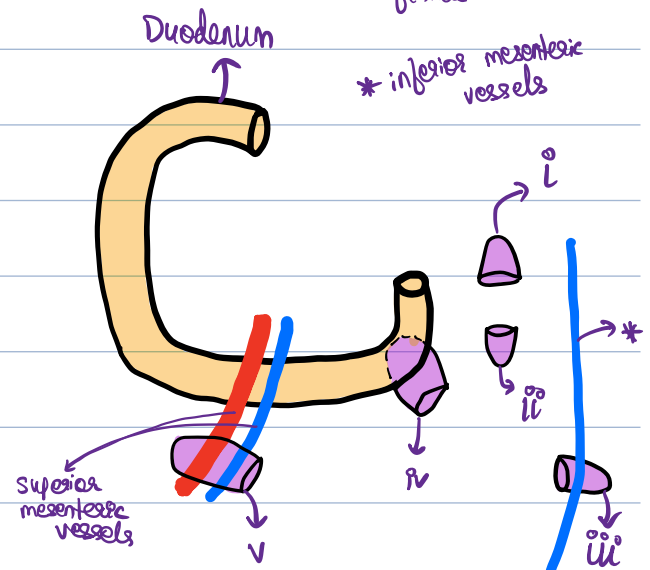
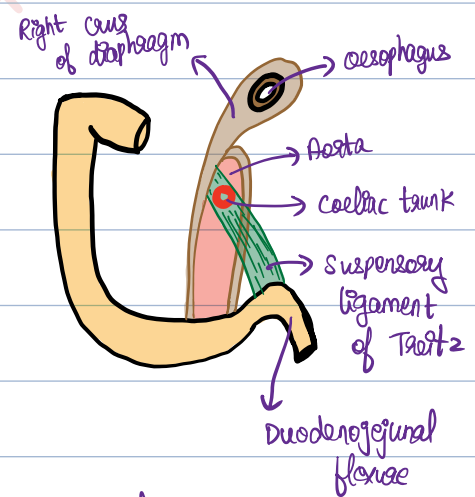
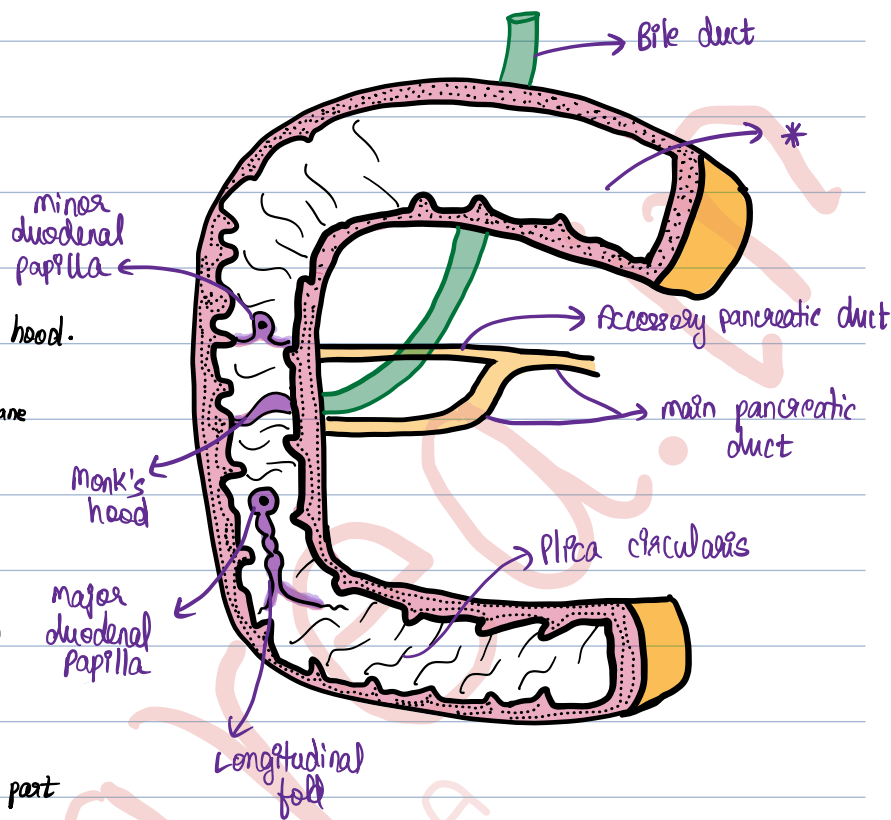
(i) Superior duodenal recess: left upper part of 4th part of duodenum with its mouth looking downward

(ii) Inferior duodenal recess: little below superior recess with its mouth looking upward.

(iii) Paraduodenal recess: lowest when present

→ contains inferior mesenteric vein in its free border

→ self free faces medially



✓ Retroduodenal recess: largest (but rarely present)

↳ lies behind 3rd & 4th parts

→ orifice faces downward & to the left

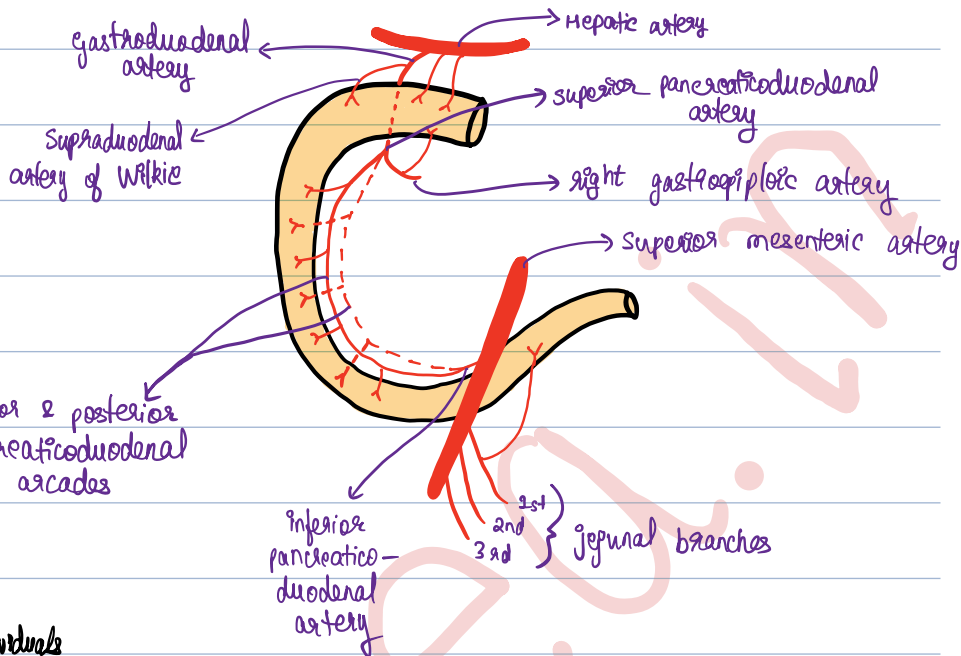
Incidence of duodenal recesses (vide supra):

superior $\Rightarrow$ 50%

inferior $\Rightarrow$ 75%

paraduodenal $\Rightarrow$ 20%

retroduodenal $\Rightarrow$ occasional.



✓ Mesenteroparietal Recess: found in 1% individuals

↳ below duodenum, behind upper part of mesentery

→ superior mesenteric vessels lie in its anterior wall.

Arterial Supply: upper half develops from foregut & lower half from midgut

∴ arterial supply of upper half is derived from coeliac trunk (artery of foregut)

& that of lower half from superior mesenteric artery (artery of midgut)

(i) Superior pancreaticoduodenal artery } anastomose to form anterior & posterior pancreaticoduodenal arterial arcades.
(ii) Inferior pancreaticoduodenal artery }

→ Arterial arcade gives off a row of vasa recta.

(iii) Supraduodenal artery of Wilkie

(iv) Retroduodenal branches of gastroduodenal artery

(v) Loop of branches of hepatic artery

(vi) Branches from right gastroepiploic artery

(vii) artery from the first jejunal branch of superior mesenteric artery

} Supply only 1st part.

Venous Drainage: correspond to arteries but are superficial to them

↳ drain into splenic, superior mesenteric & portal veins.

Lymphatic Drainage: lymph vessels follow the arteries

↳ drain into pancreaticoduodenal nodes

Nerve Supply:

Sympathetic: T6-T9

Parasympathetic: both vagi through coeliac & superior mesenteric plexuses

Applied Aspect:

Duodenal ulcers: inflammatory erosions of duodenal mucosa

- commonly occur in 1st part of duodenum because it receives acidic chyme from the stomach.
- when ulcers are present, duodenal cap is deformed in barium meal radiograph.
- bleeding from duodenal ulcers is common due to continuous erosion.

Duodenal injuries: 2nd part is most protected from external injuries because it lies within the periaortic gutter

- 3rd part is most vulnerable because it gets crushed between vertebral column & AAW

Duodenal diverticula: congenital

- almost always occur in the medial wall of 2nd part
- thought to be caused by herniation of duodenal lining through gaps in muscle coat, where arteries & ducts pierce the wall.

Referred pain: referred to central epigastrium.

Pancreas: exoendocrine gland

Location: on posterior abdominal wall

- ↳ epigastric & left hypochondriac regions
- lies obliquely from concavity of duodenum to hilum of spleen
- opposite T12 - L3
- mostly retroperitoneal (tail lies in lienorenal ligament)

Size & shape: J shaped / testis shaped

- bowl of testis $\Rightarrow$ head
- Stem of testis $\Rightarrow$ neck, body, tail

Length: 12-15 cm

Width: 3-4 cm

Thickness: 1.5-2 cm

Weight: 80-90 g.

Parts & Relations: • Head (with uncinate process)

- Neck
- Body (with tuber omentale)
- Tail.

Head: lies in concavity of duodenum

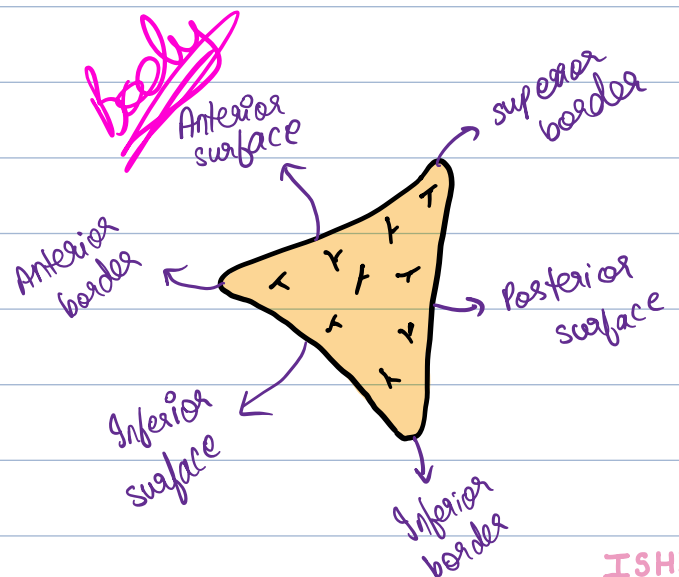
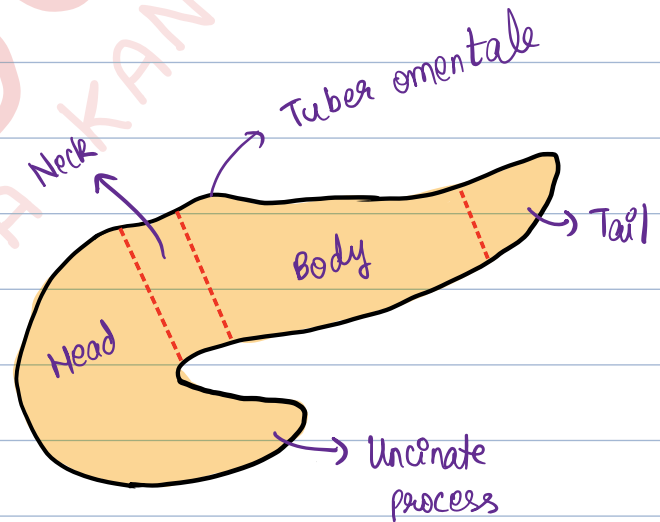
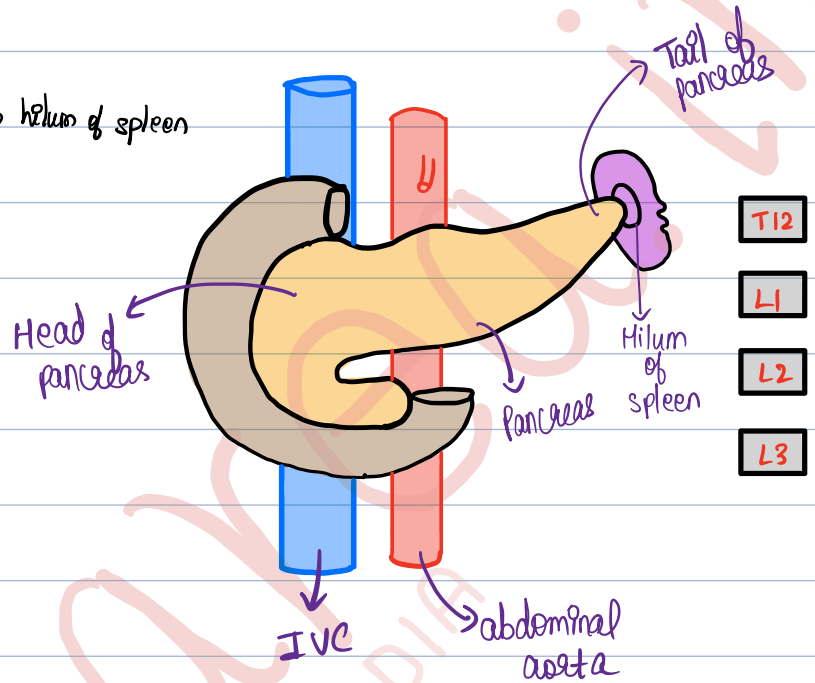
↳ in front of L2

- 3 borders - superior, inferior, right lateral
- 2 surfaces - anterior, posterior
- 1 process - uncinate process (extends to the left, behind superior mesenteric vessels)

Relations:

Superior border: 1st part of duodenum

- superior pancreaticoduodenal artery.



Inferior border: 3rd part of duodenum
 - inferior pancreaticoduodenal artery

Right Lateral Border: 2nd part of duodenum

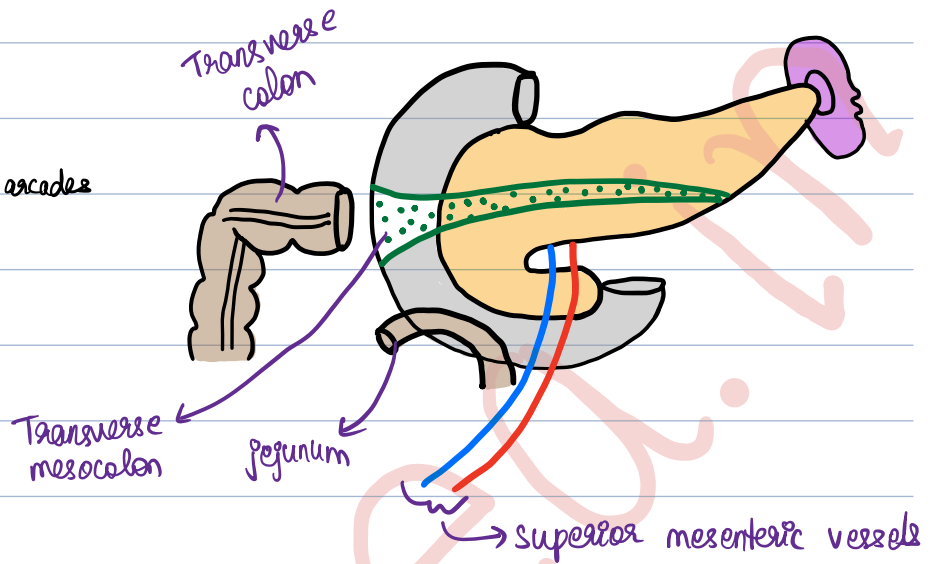
↳ anterior & posterior pancreaticoduodenal arterial arcades

Anterior surface: gastroduodenal artery

→ transverse colon

→ root of transverse mesocolon

→ jejunum



Posterior surface: IVC

→ left renal vein

→ bile duct

→ right crus of diaphragm

Uncinate process: anteriorly ⇒ superior mesenteric vessels

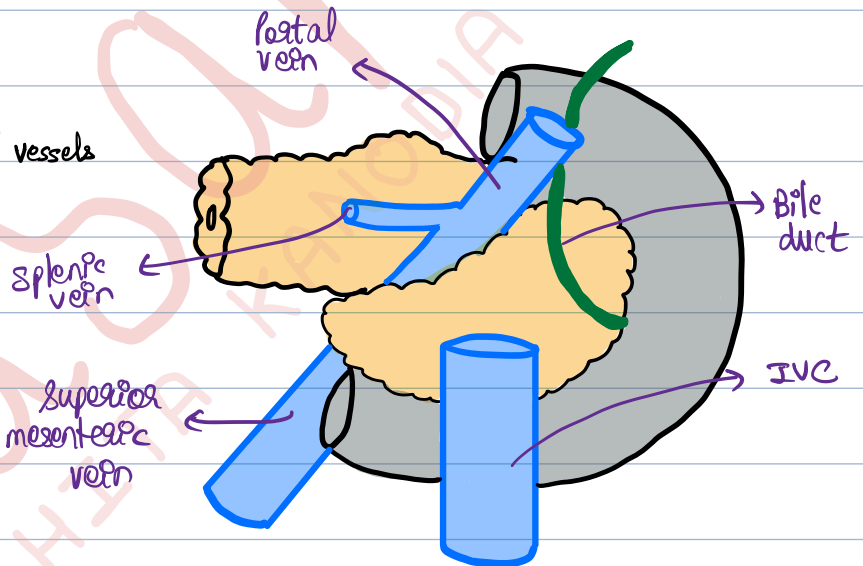
posteriorly ⇒ abdominal aorta.

Neck: slightly constricted part

↳ connects head with body

→ 2 surfaces - anterior, posterior

2 borders - upper, lower.



Relations:

Anterior surface: pylorus

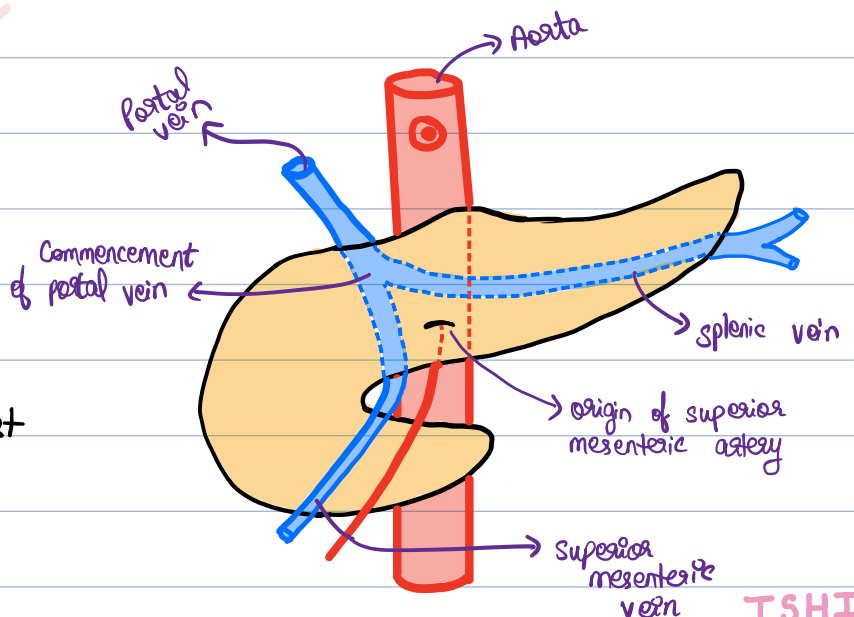
Posterior surface: commencement of portal vein

Upper border: 1st part of duodenum

Lower border: root of transverse mesocolon.

Body: from neck to tail

→ lies in front of vertebral column at or just below transpyloric plane.



→ 3 borders: anterior, superior, inferior

3 surfaces: anterior, posterior, inferior

1 process: tuber omentale

Relations:

Anterior border: provides attachment to root of transverse mesocolon

Superior border: coeliac artery above tuber omentale

→ hepatic artery to the right of tuber omentale

→ splenic artery to the left of tuber omentale

Inferior border: superior mesenteric vessels

Anterior surface: lesser sac & stomach

Posterior surface: aorta & origin of superior mesenteric artery

→ left kidney & left suprarenal glands

→ splenic vein (usually lies in a groove below splenic artery)

Inferior surface: duodenojejunal flexure

→ coils of jejunum

→ left colic flexure

Tail: narrow left extremity

↳ lies in ligament along with splenic vessels

→ mobile part

→ contains largest number of islets of Langerhans per unit tissue.

Relations: visceral surface of spleen between gastric & colic impressions.

Ducts of pancreas:

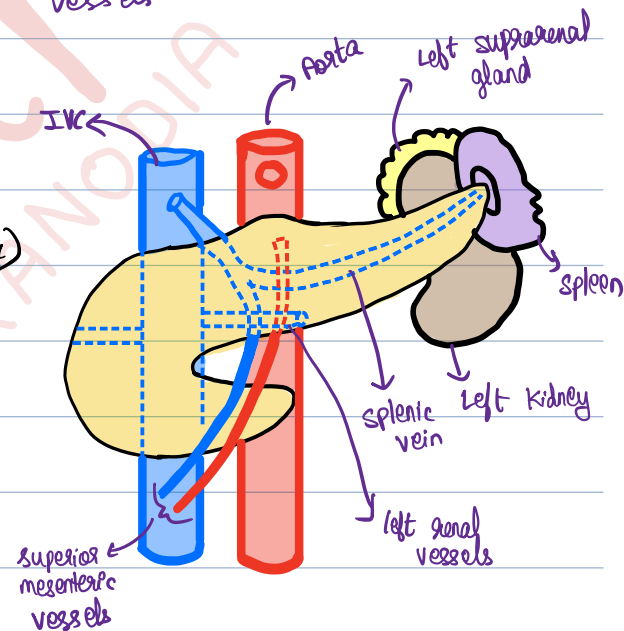
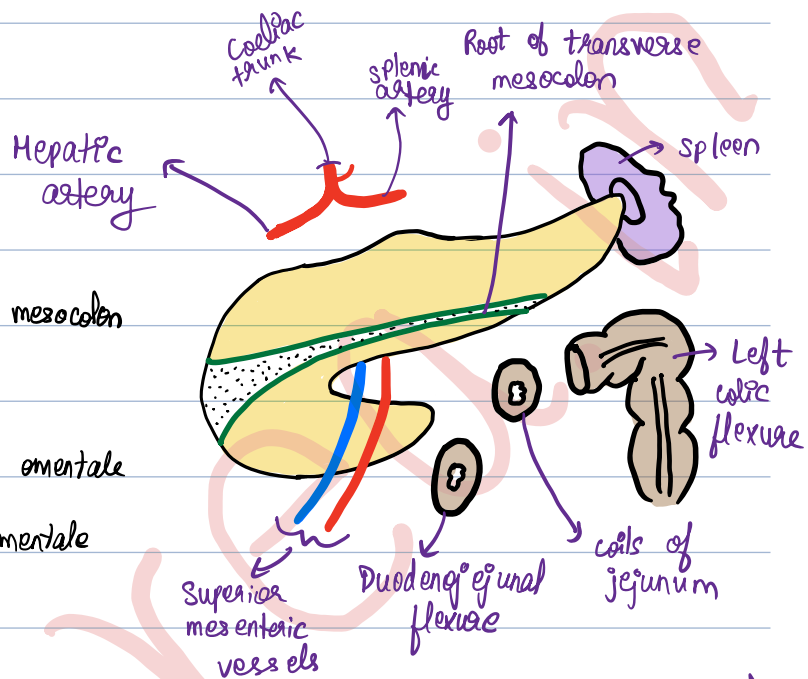
Main pancreatic duct (of Wirsung):

→ begins in the tail & traverses the whole length of the gland

→ at the neck, it turns downwards & then to right to enter into 2nd part of duodenum

→ at duodenal wall, it joins bile duct to form hepatopancreatic ampulla of Vater which opens at major duodenal papilla.

→ receives tributaries throughout in a herringbone pattern.



Accessory Pancreatic Duct (of Langerhans):

- begins in lower part of head of pancreas
- crosses main pancreatic duct to open into minor duodenal papilla in 2nd part of duodenum
- In 40% cases, it communicates with main duct while crossing it.

Development: pancreas develops from 2 separate buds -

ventral & dorsal pancreatic buds

∴ it has 2 ducts.

- smaller ventral pancreatic bud arises in common with hepatic bud for liver
- larger dorsal pancreatic bud arises more proximally, directly from duodenum.
- After rotation of gut, ventral pancreatic bud passes along with bile duct into the position dorsal to dorsal pancreatic bud
- the two buds fuse & their ducts anastomose in such a way that duct of ventral pancreas forms proximal part of main pancreatic duct
- duct of dorsal pancreatic bud forms distal part of main pancreatic duct.
- proximal part of dorsal pancreatic duct forms accessory pancreatic duct.

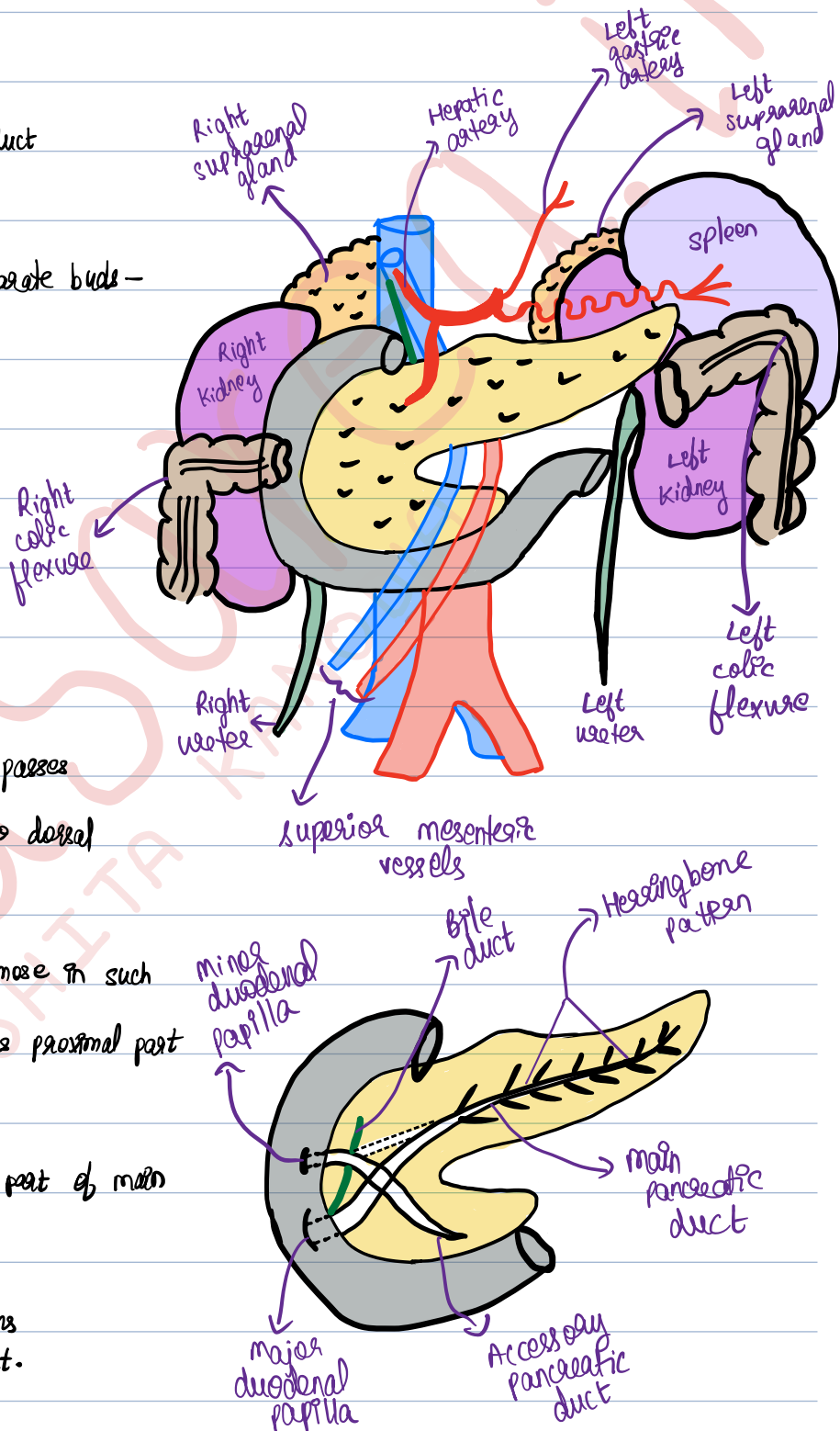
Congenital anomalies:

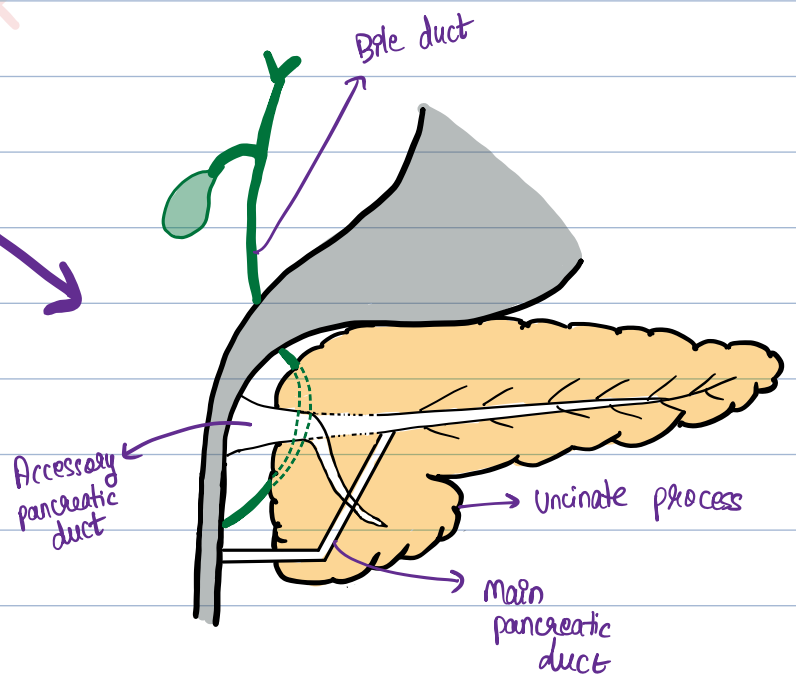
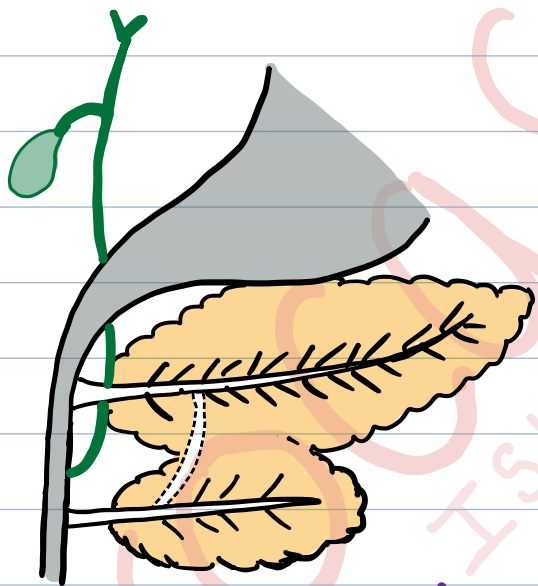
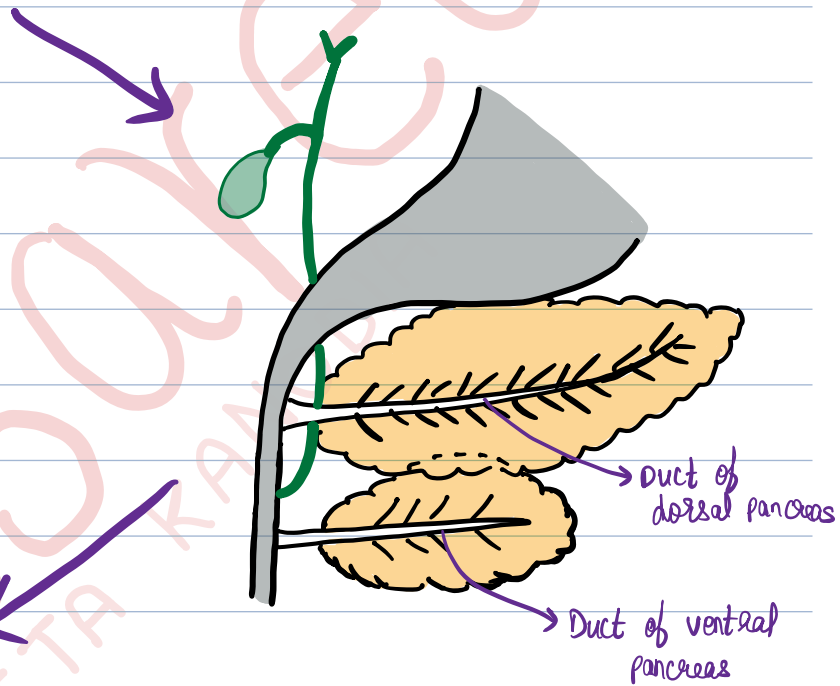
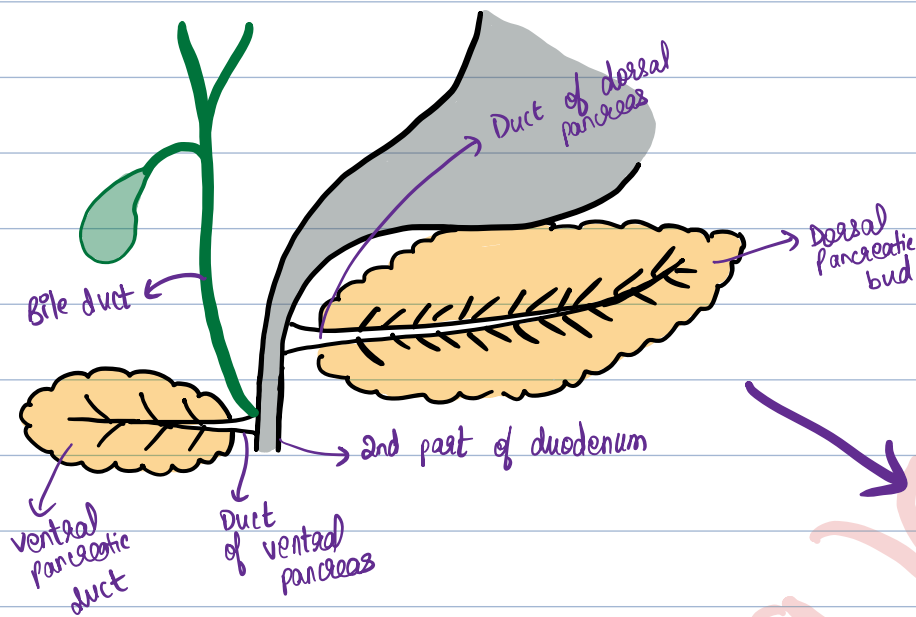
Annular pancreas: ring of pancreatic tissue encircles 2nd part of duodenum

Accessory pancreatic tissue: may be found in - stomach wall

- duodenum
- meckel's diverticulum
- hilum of spleen
- small intestine
- greater omentum

→ yellowish, lobulated appearance.





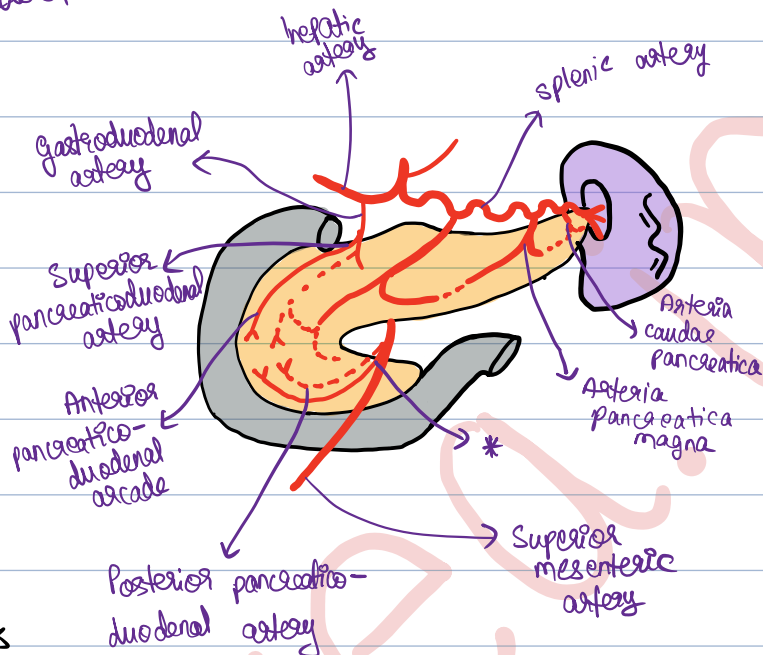
Arterial Supply:

* inferior pancreaticoduodenal artery

- splenic artery: body, tail

↳ branches → arteria pancreatica magna
⇒ arteria cauda pancreatica

- Superior pancreaticoduodenal artery
- Inferior pancreaticoduodenal artery



Venous Drainage: drain into portal vein,
superior mesenteric & splenic veins

Lymphatic drainage: - pancreaticosplenic nodes

- coeliac nodes
- superior mesenteric nodes
- pyloric nodes

Nerve Supply: Sympathetic, parasympathetic fibers

arise from coeliac & superior mesenteric plexuses.

→ Sympathetic = vasomotor

Parasympathetic ⇒ controls pancreatic secretion.

Applied aspect:

Carcinoma of head of pancreas: compresses the bile duct leading to persistent obstructive jaundice

↳ may press the portal vein

→ may involve the stomach due to their close vicinity

Acute pancreatitis: acute inflammation of pancreas

↳ occurs due to obstruction of pancreatic duct, ingestion of alcohol, viral infection (mumps) & trauma

→ serious condition because active pancreatic enzymes leak into the substance of pancreas & initiate autodigestion of pancreas-

→ clinical presentation - severe pain in epigastric region radiating to back, fever, nausea

→ serum amylase level - is raised 4 times.

