WITH NOTES

Anatomy and Development of Pancreas and Adrenal Glands

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تسلم أيد اللي بعتت النوتس ألف ومليون مرة ❤

Intended Learning Outcomes (ILOs)

1. Identify the site and different parts of pancreas.
2. Recognize the relations of each part of pancreas.
3. Outlines the development of pancreas.
4. Enumerate the congenital anomalies of pancreas.
5. Explain the structure,positions,coverings,and relations of each suprarenal (adrenal))glands.

Agenda

1. What are position of the pancreas?
2. What are different parts of the pancreas?
3. What are development and congenital anomalies of pancreas?
4. What are relations of the supra-renal glands?

الدكتور شرح المحاضرة كلها عادي .. والنوتس اللي مكتوبة دي أهم الحاجات اللي أكد عليها

Anatomy of the Pancreas

PANCREAS :

- **SITE:** lies across the upper part of the posterior abdominal wall behind the peritoneum of the lesser sac.
- It crosses from the concavity of the DUODENUM to the hilum of the spleen.

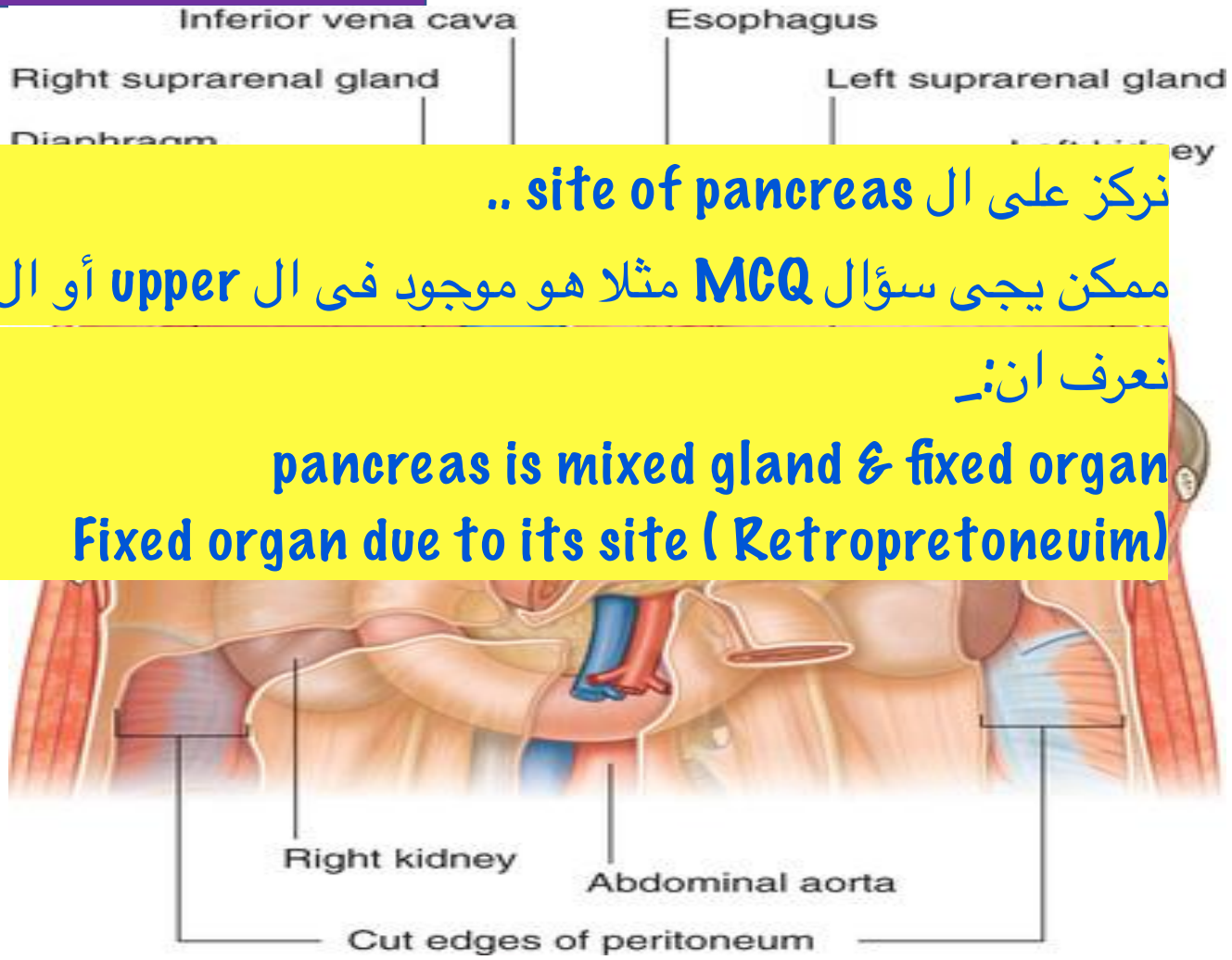
نركز على ال site of pancreas ..

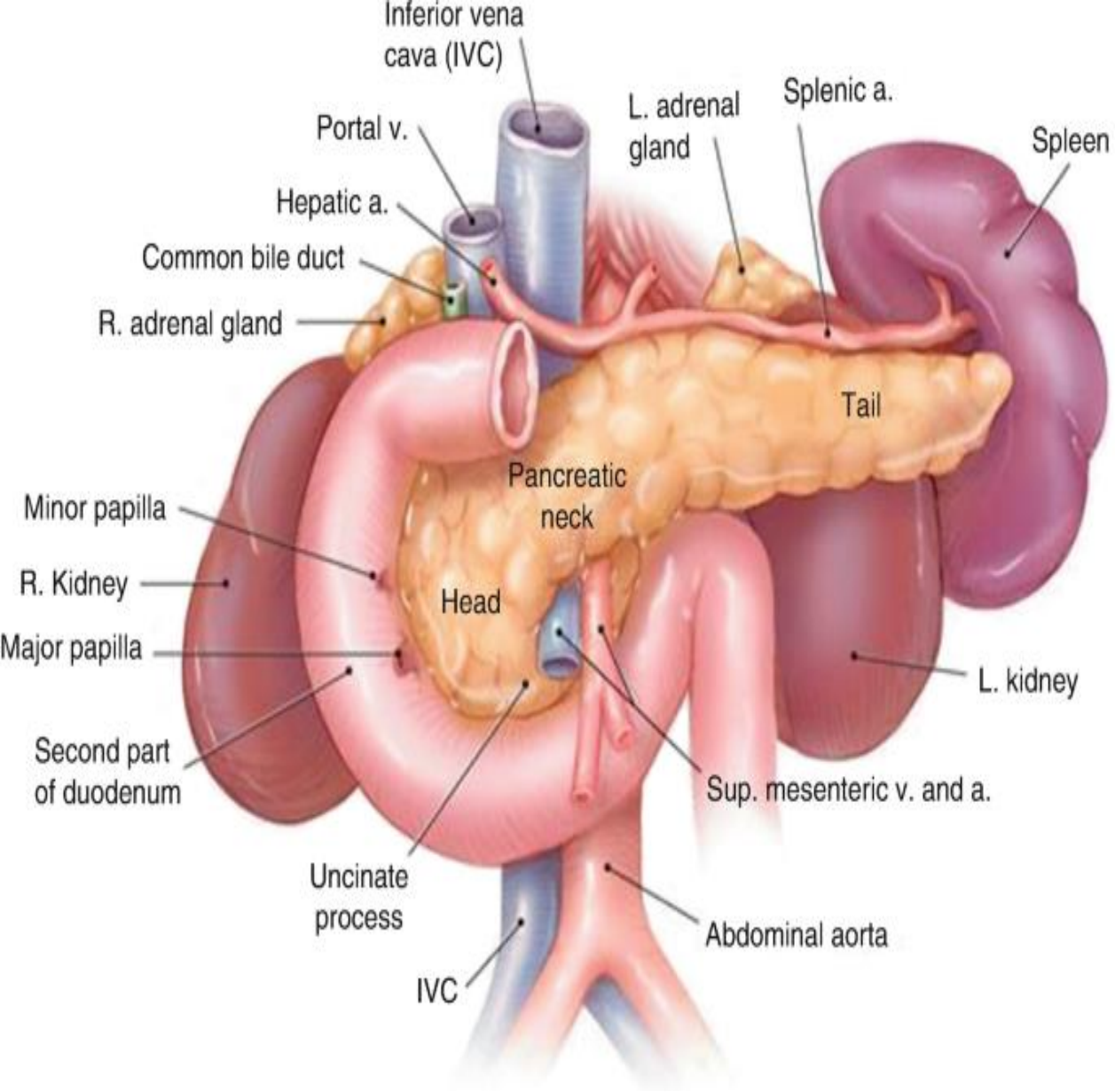
ممكن يجى سؤال MCQ مثلا هو موجود فى ال upper أو ال lower.

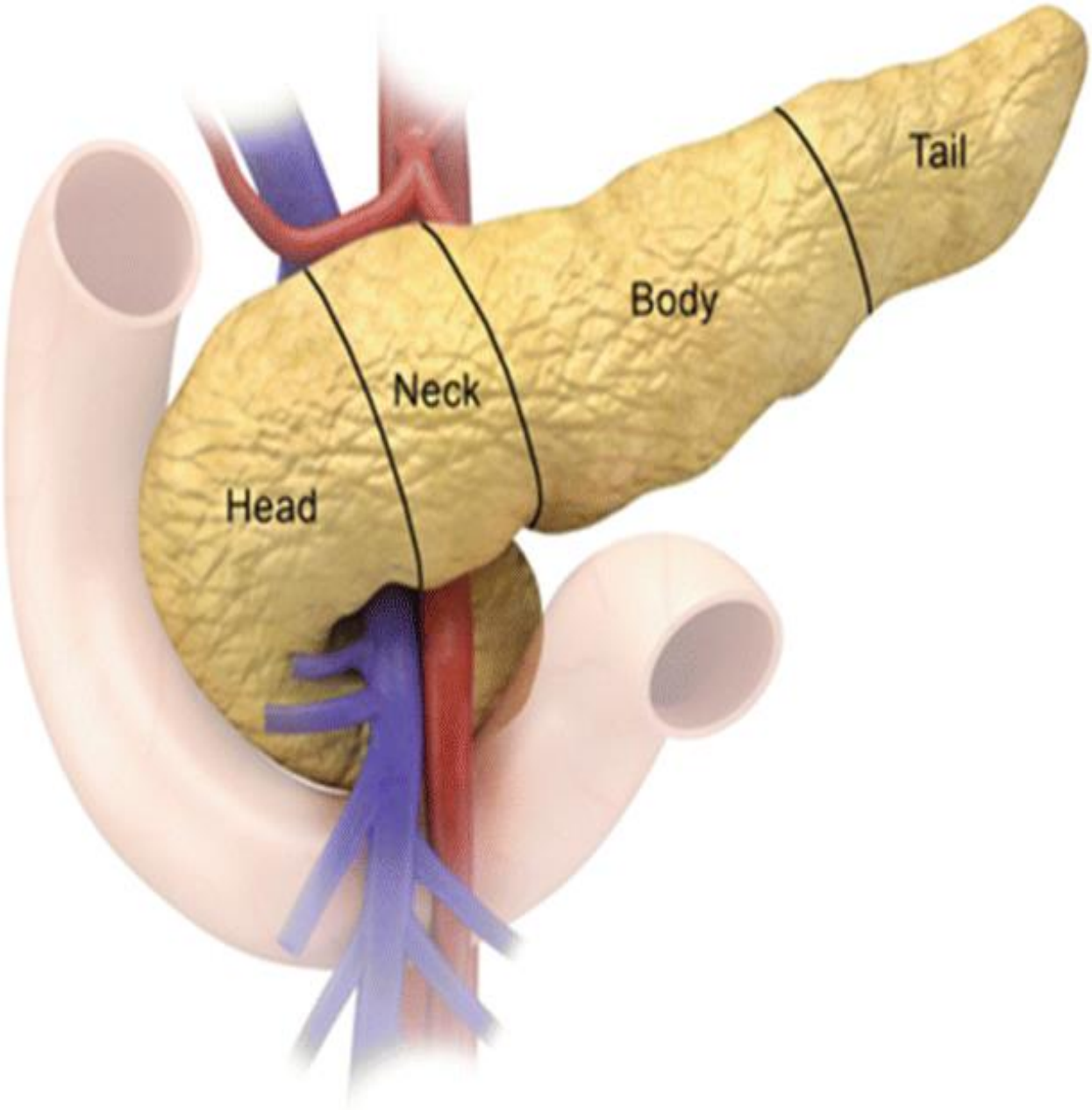
نعرف ان:ـ

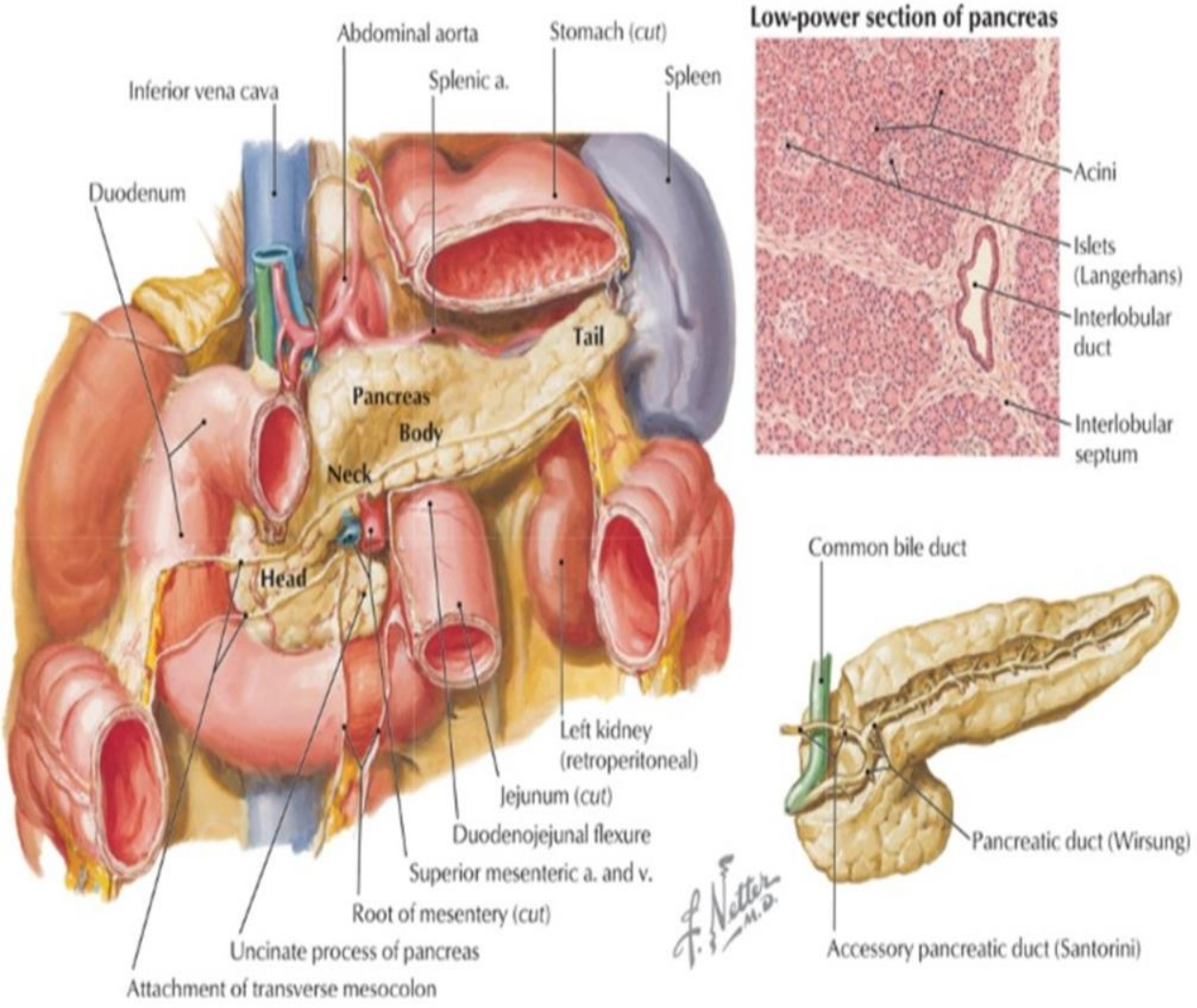
pancreas is mixed gland & fixed organ

Fixed organ due to its site (Retropretoneuim)



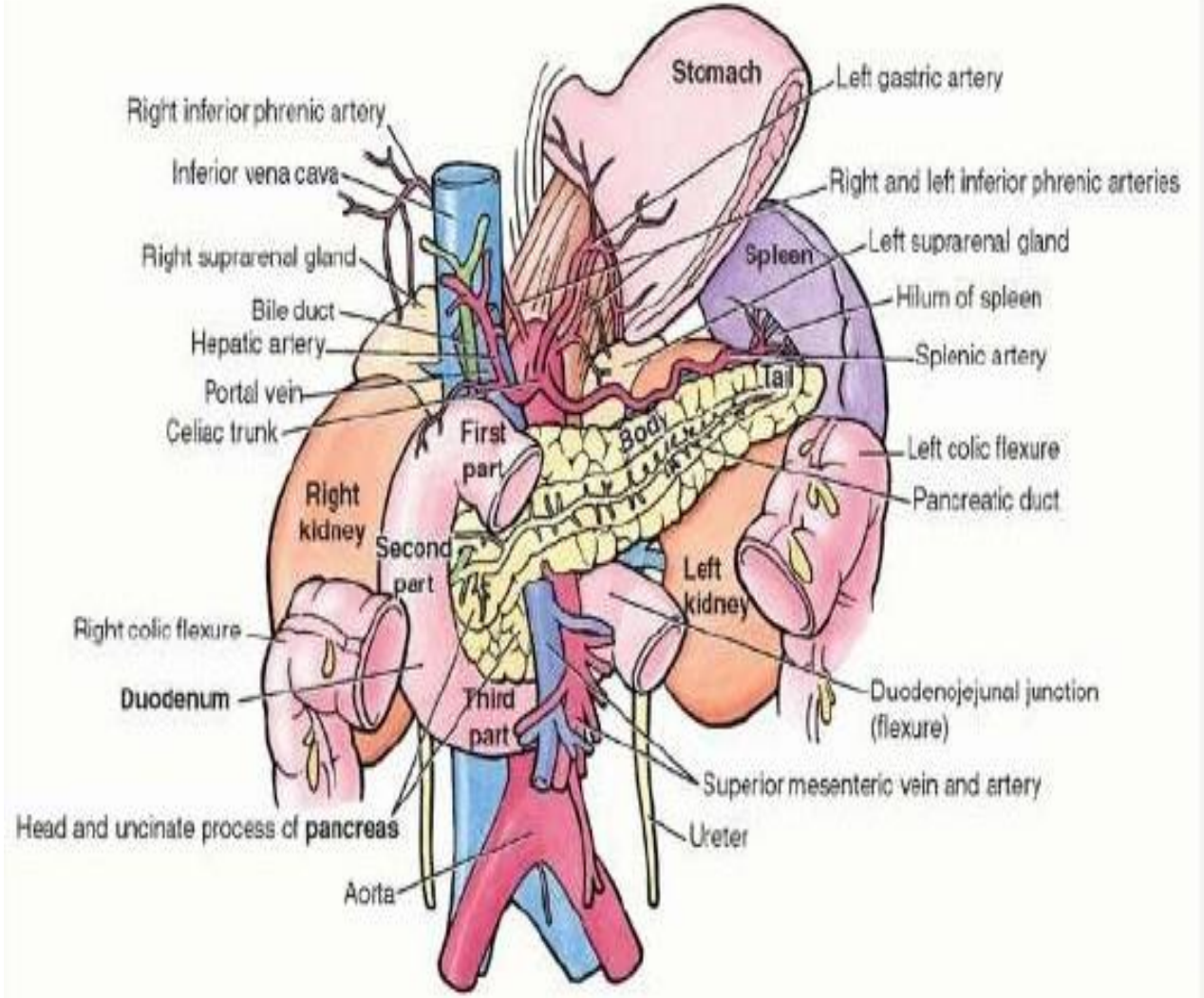

Inferior vena cava (IVC)
Portal v.
Hepatic a.
Common bile duct
R. adrenal gland
L. adrenal gland
Splenic a.
Spleen
Tail
Pancreatic neck
Minor papilla
R. Kidney
Head
Major papilla
L. kidney
Second part of duodenum
Sup. mesenteric v. and a.
Uncinate process
Abdominal aorta
IVC


Tail
Body
Neck
Head


Abdominal aorta
Stomach (cut)
Inferior vena cava
Splenic a.
Spleen
Duodenum
Tail
Pancreas
Body
Neck
Head
Left kidney
(retroperitoneal)
Jejunum (cut)
Duodenojejunal flexure
Superior mesenteric a. and v.
Root of mesentery (cut)
Uncinate process of pancreas
Attachment of transverse mesocolon

Low-power section of pancreas
Acini
Islets
(Langerhans)
Interlobular
duct
Interlobular
septum

Common bile duct
Pancreatic duct (Wirsung)
Accessory pancreatic duct (Santorini)


Stomach
Left gastric artery
Right inferior phrenic artery
Inferior vena cava
Right and left inferior phrenic arteries
Right suprarenal gland
Spleen
Left suprarenal gland
Bile duct
Hilum of spleen
Hepatic artery
Splenic artery
Portal vein
Tail
Celiac trunk
First
part
Body
Left colic flexure
Right
kidney
Pancreatic duct
Second
part
Left
kidney
Right colic flexure
Duodenum
Third
part
Duodenojejunal junction
(flexure)
Superior mesenteric vein and artery
Head and uncinate process of pancreas
Ureter
Aorta

Parts and Relations of pancreas: MCQ & SAQ

it is divided into four parts:

1- Head of the Pancreas:

❑ Lies in the concavity of the duodenum, separated from it by groove containing the pancreaticoduodenal vessels.

❑ **Uncinate process:** projects upwards and to the left.

❑ **Anterior relations:**

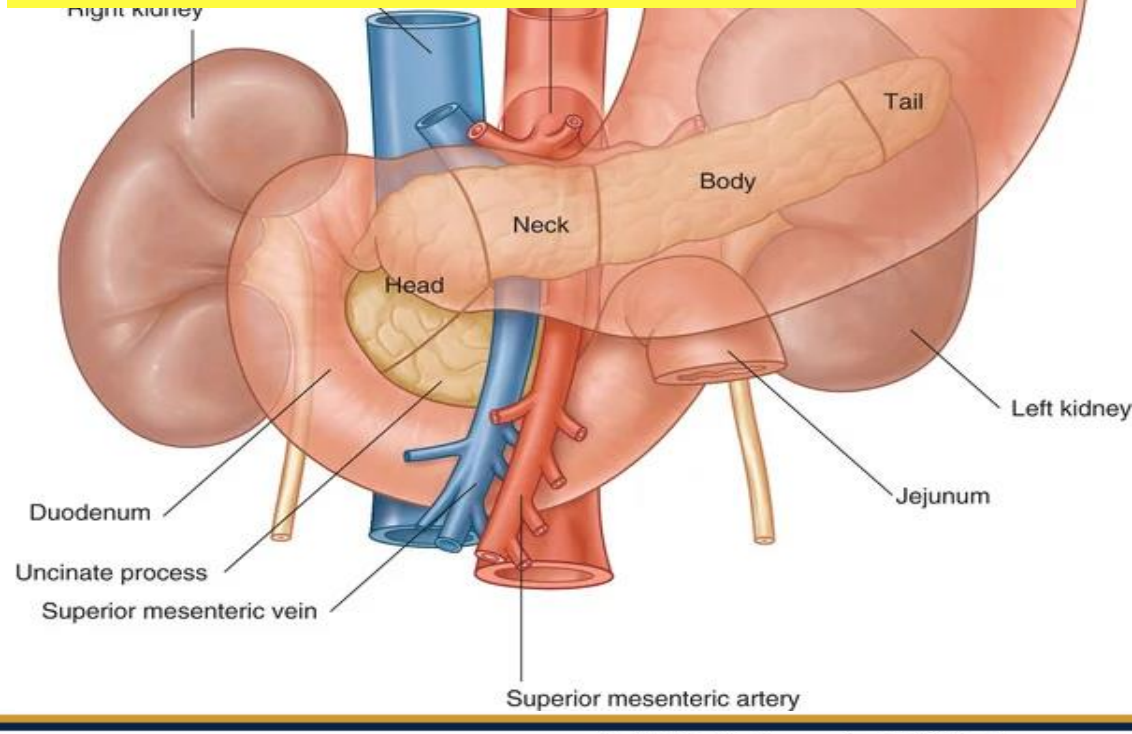
1. The transverse colon. 2. The coils of the jejunum
3. The superior mesenteric vessels: in front of the uncinate process.

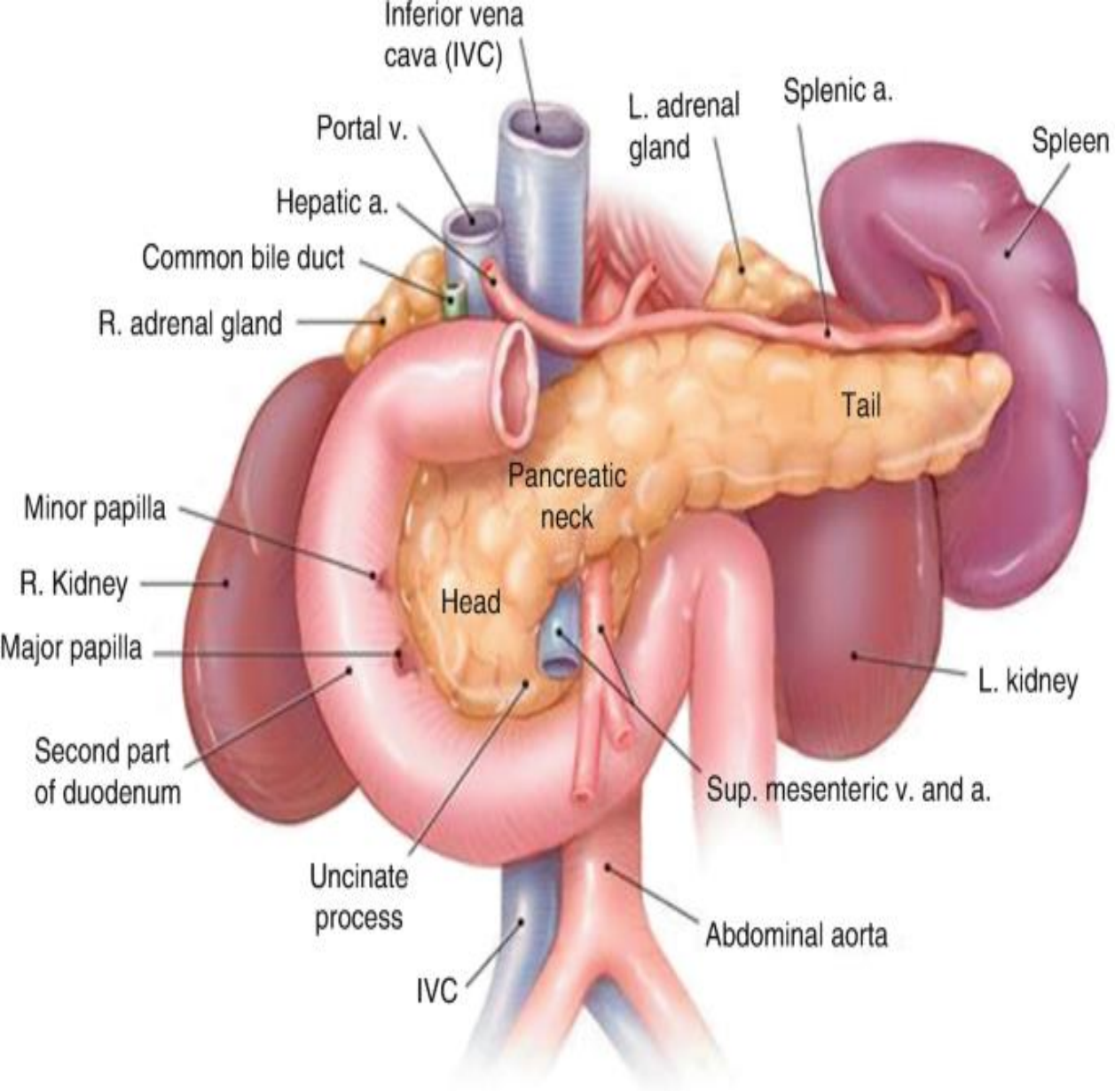
❑ **Posterior relations:**

1. The I.V.C. 2. The common bile duct.
3. The aorta: behind the uncinate process.

معلومة صغنطوطه نركز عليها:ـ

MCQ : the Head of pancreas is separated from Deudneum by the cavity which contains.... pancreaticoduodenal vessels

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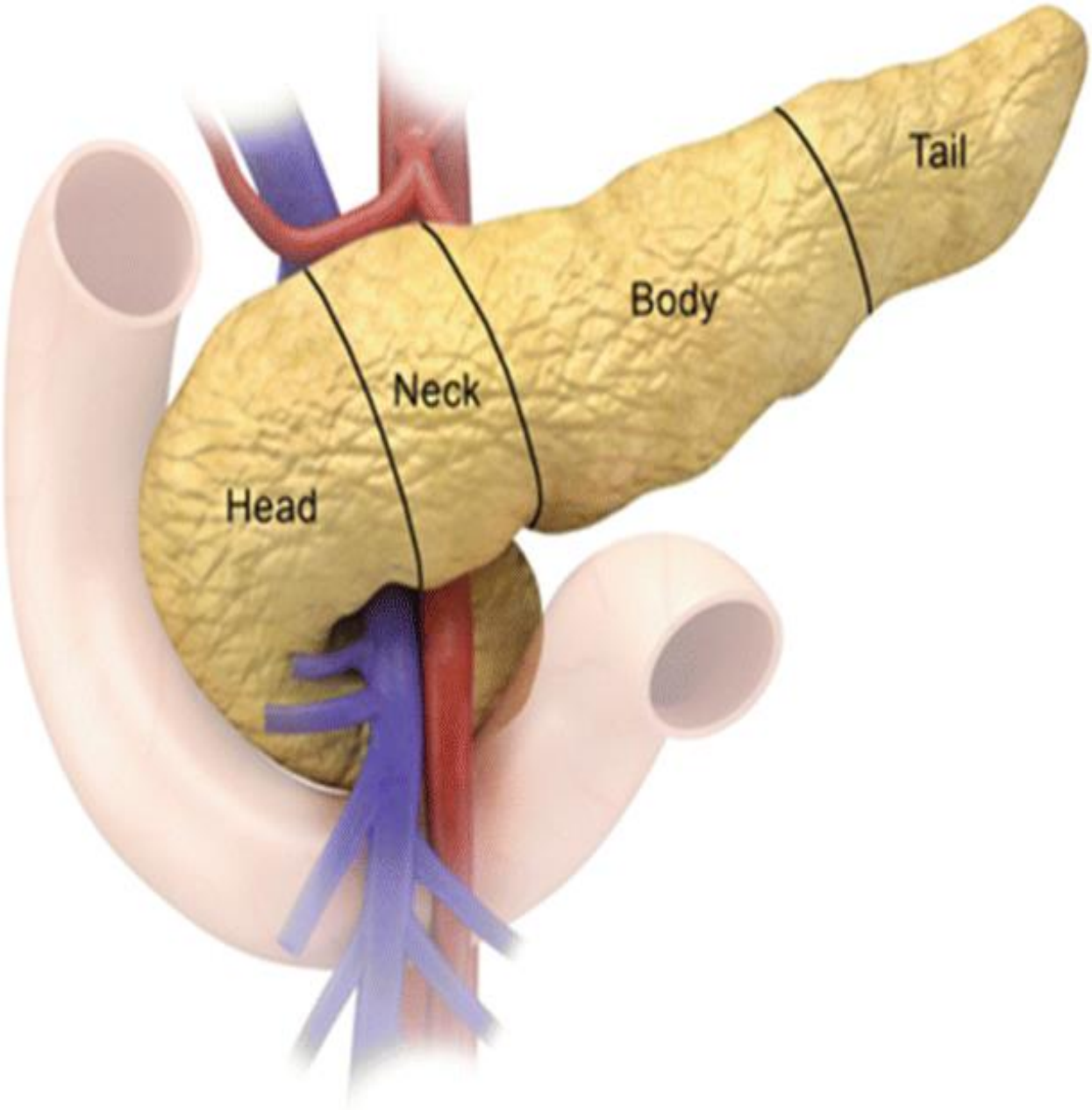
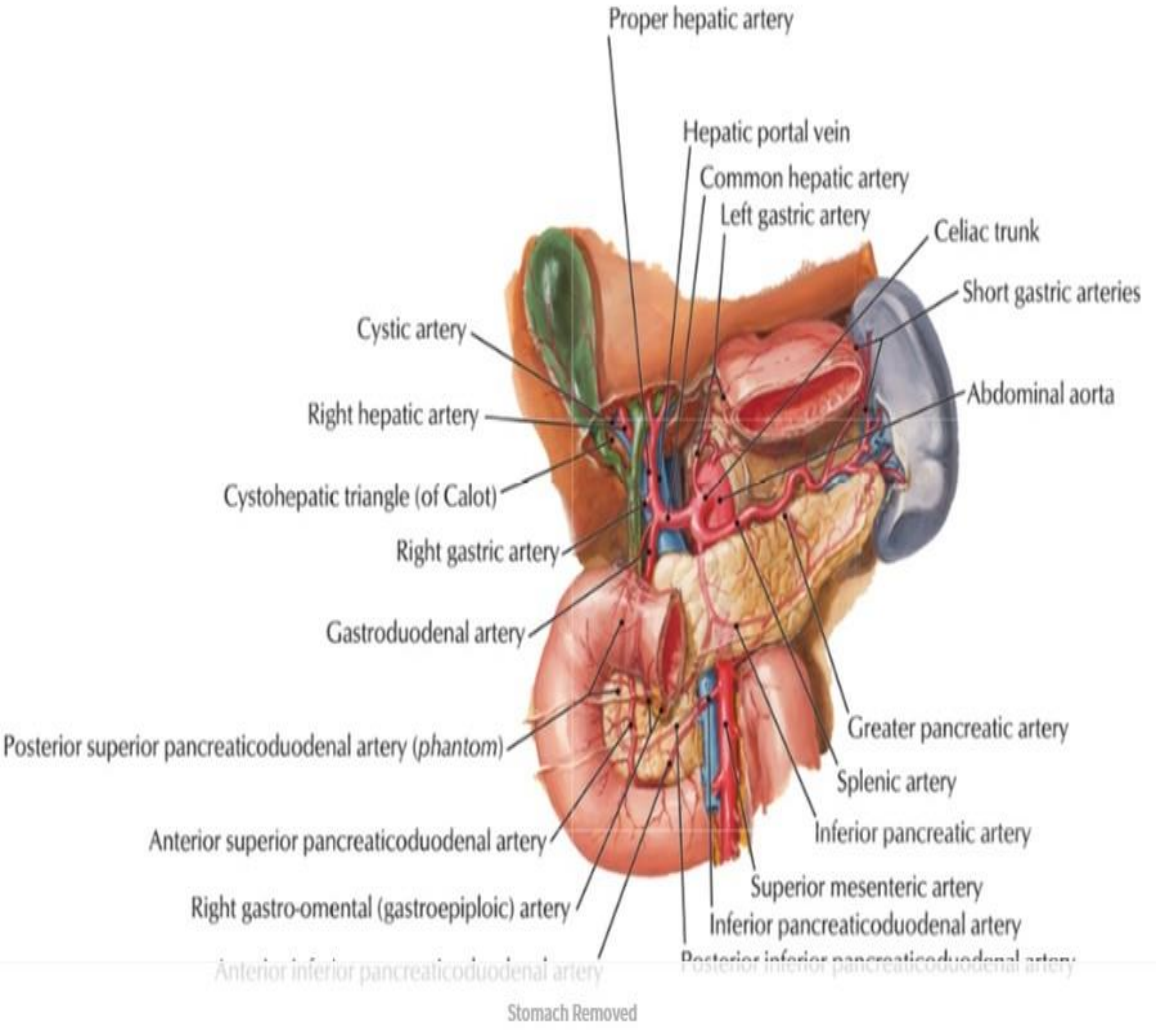
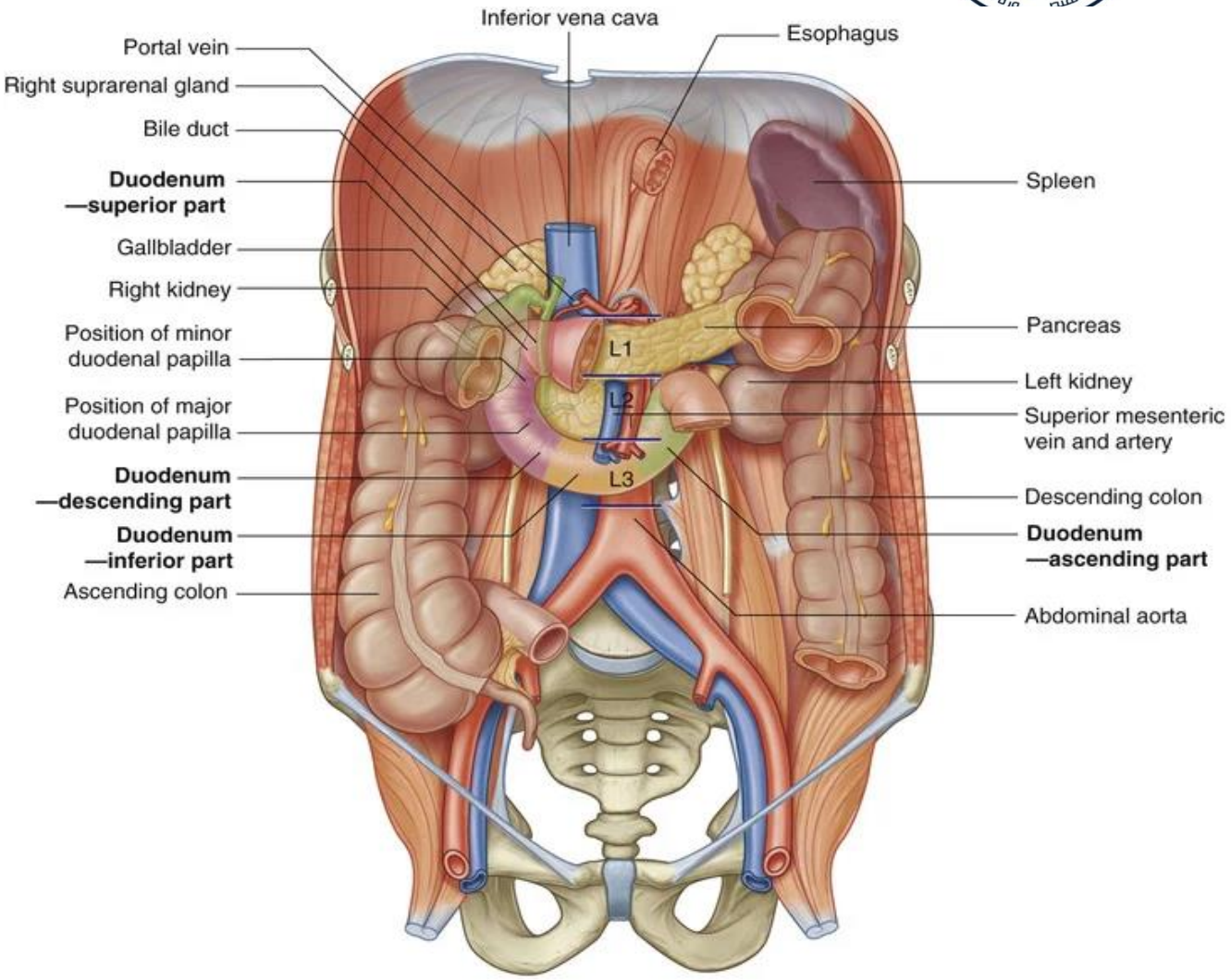

Tail
Body
Neck
Head


Proper hepatic artery
Hepatic portal vein
Common hepatic artery
Left gastric artery
Celiac trunk
Short gastric arteries
Cystic artery
Abdominal aorta
Right hepatic artery
Cystohepatic triangle (of Calot)
Right gastric artery
Gastroduodenal artery
Posterior superior pancreaticoduodenal artery (phantom)
Greater pancreatic artery
Splenic artery
Anterior superior pancreaticoduodenal artery
Inferior pancreatic artery
Superior mesenteric artery
Right gastro-omental (gastroepiploic) artery
Inferior pancreaticoduodenal artery
Anterior inferior pancreaticoduodenal artery
Posterior inferior pancreaticoduodenal artery
Stomach Removed


Inferior vena cava
Esophagus
Portal vein
Right suprarenal gland
Bile duct
Duodenum —superior part
Spleen
Gallbladder
Right kidney
Pancreas
Position of minor duodenal papilla
L1
Left kidney
L2
Position of major duodenal papilla
Superior mesenteric vein and artery
L3
Duodenum —descending part
Descending colon
Duodenum —inferior part
Duodenum —ascending part
Ascending colon
Abdominal aorta

Neck of the Pancreas: MCQ & SAQ

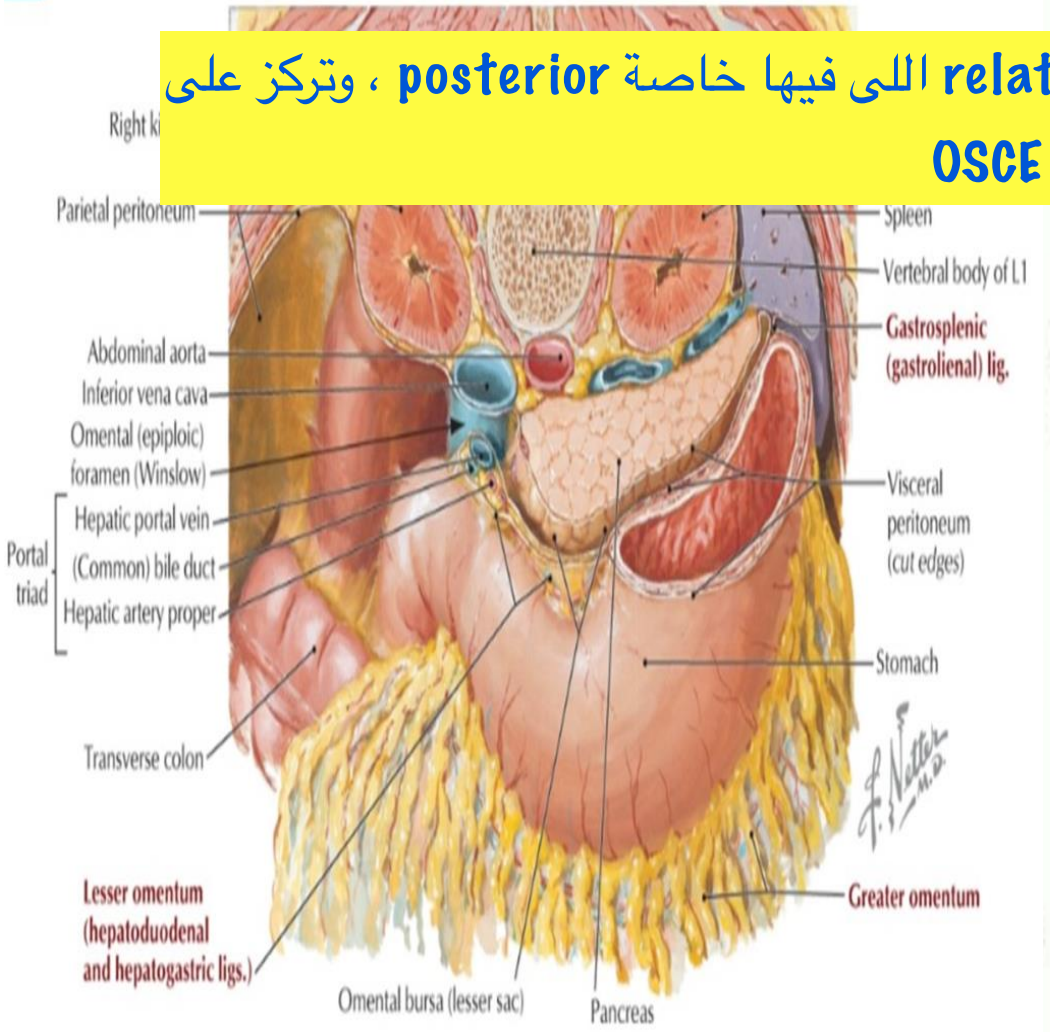
الNeck ⬅️ بردو نركز على ال relations اللى فيها خاصة posterior ، وتركز على رسومات ال CT لأنها موضع اسئله ل OSCE

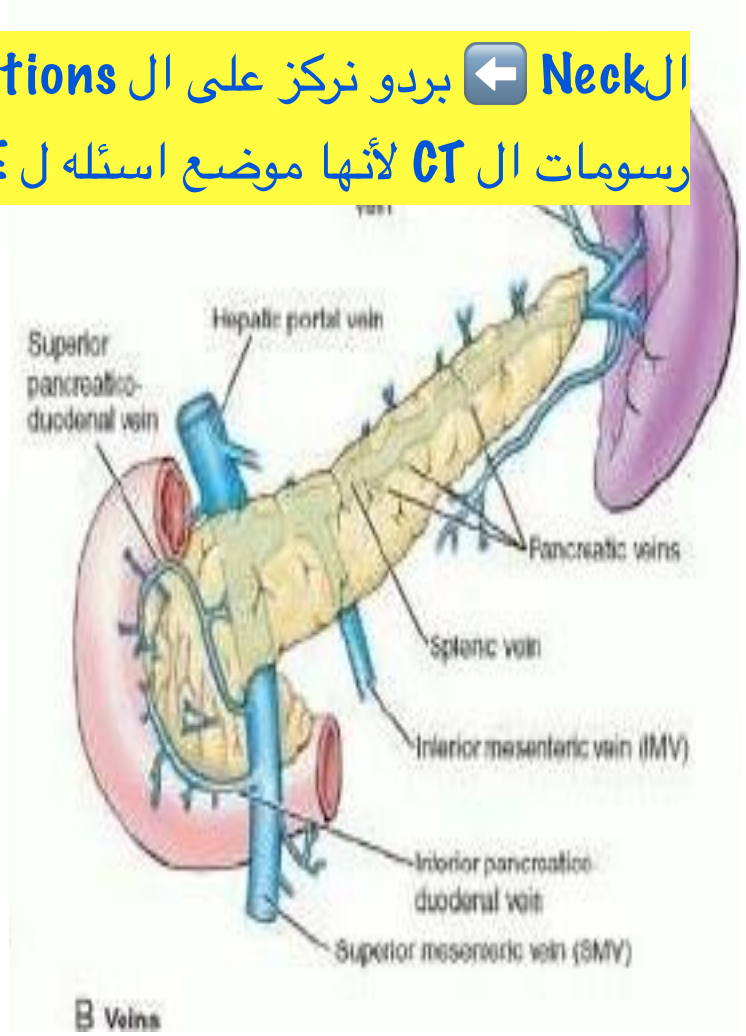
❑ Anterior relations:

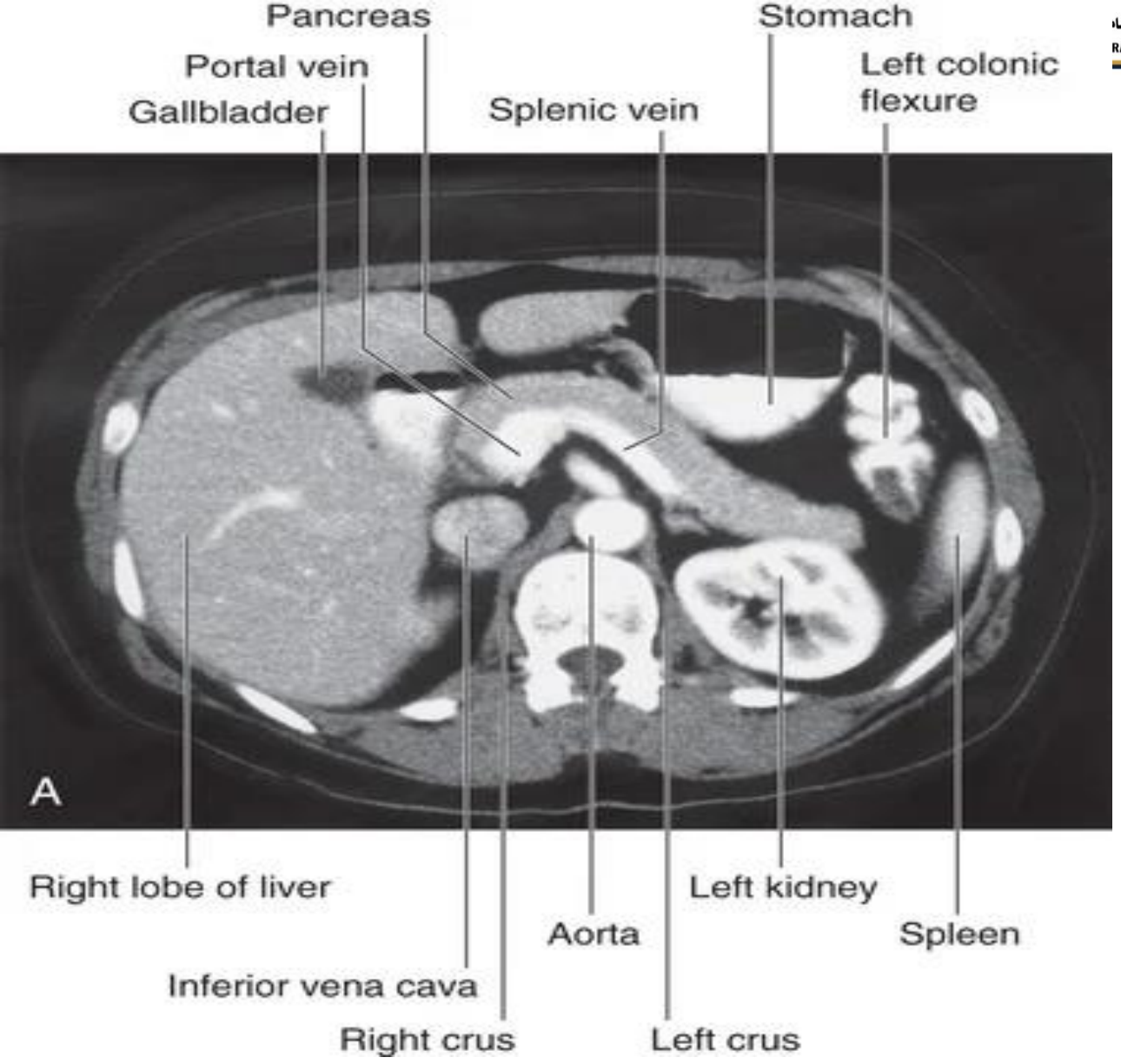
1. The pylorus and the first part of the duodenum.
2. The peritoneum of the lesser sac.

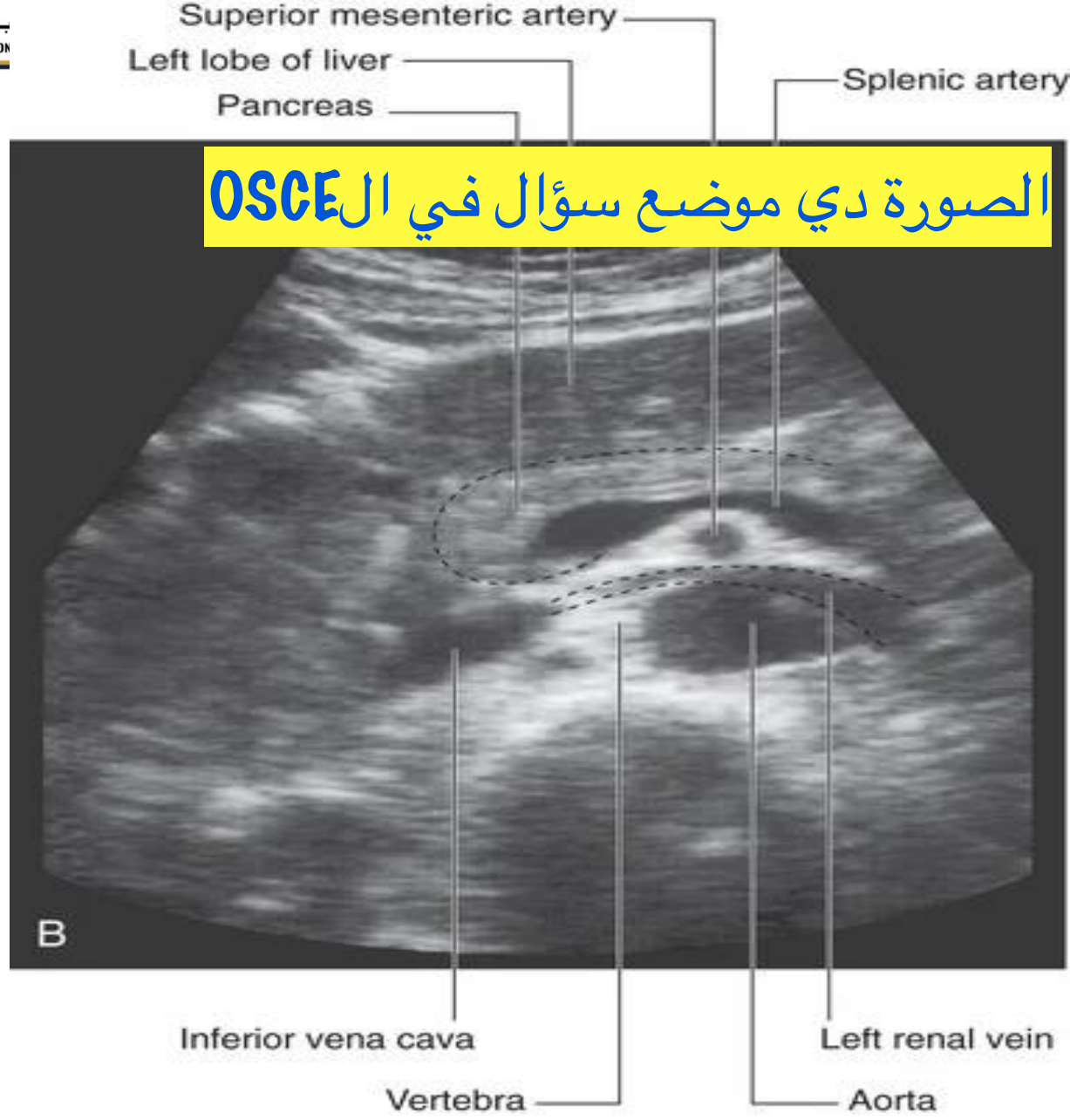
❑ Posteriorly:

It is related to the beginning of the portal vein and the termination of the superior mesenteric and splenic veins.









الصورة دي موضع سؤال في الOSCE

Body of the Pancreas: MCQ & SAQ

- It extends to the left behind the lesser sac.
- It is triangular in cross section.

It has three surfaces and three borders.

- 3 Surfaces:

1. The anterior surface:

➢ Is covered by the peritoneum of the lesser sac.

➢ Is separated from the posterior surface of the stomach by the cavity of the lesser sac.

2. The inferior surface:

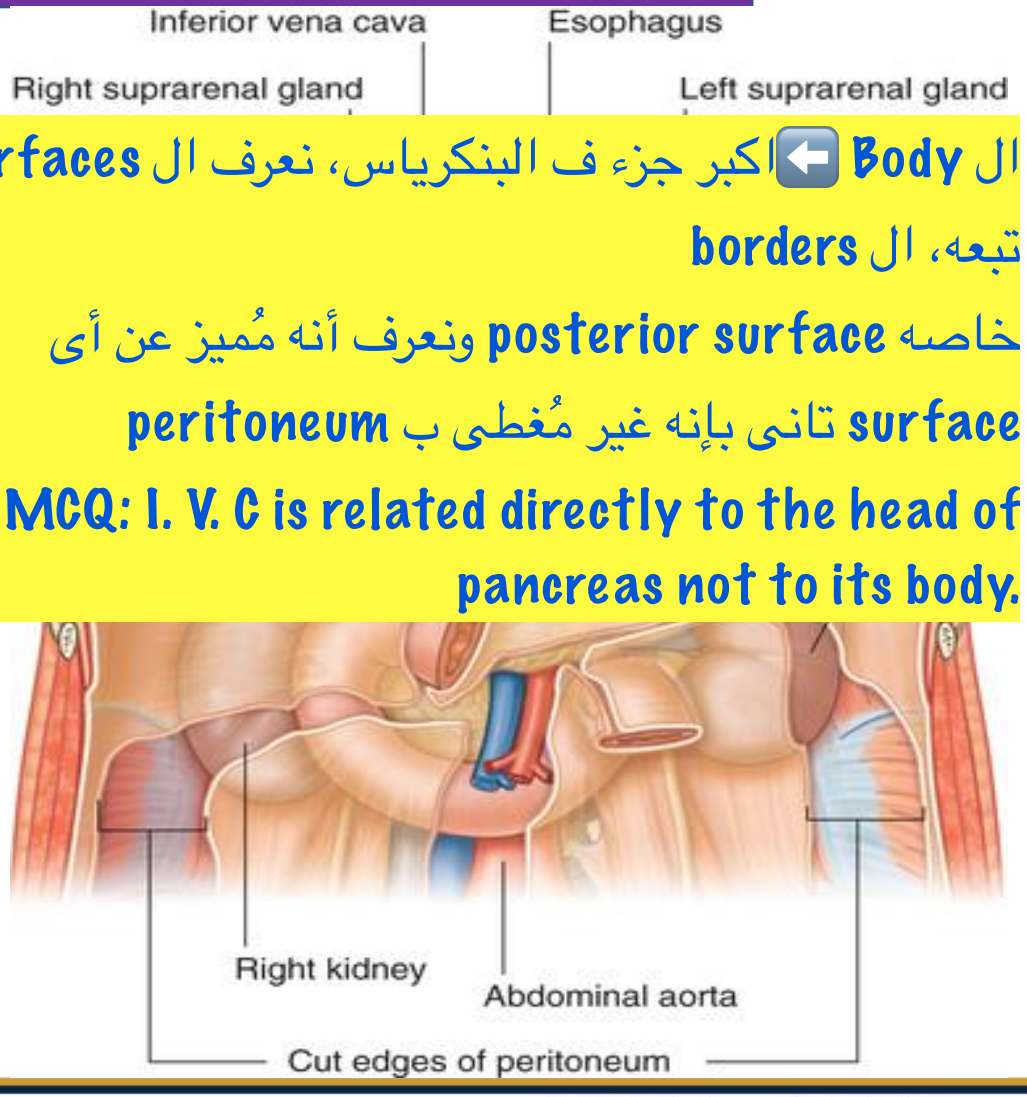
➢ Is covered by the peritoneum of the greater sac.

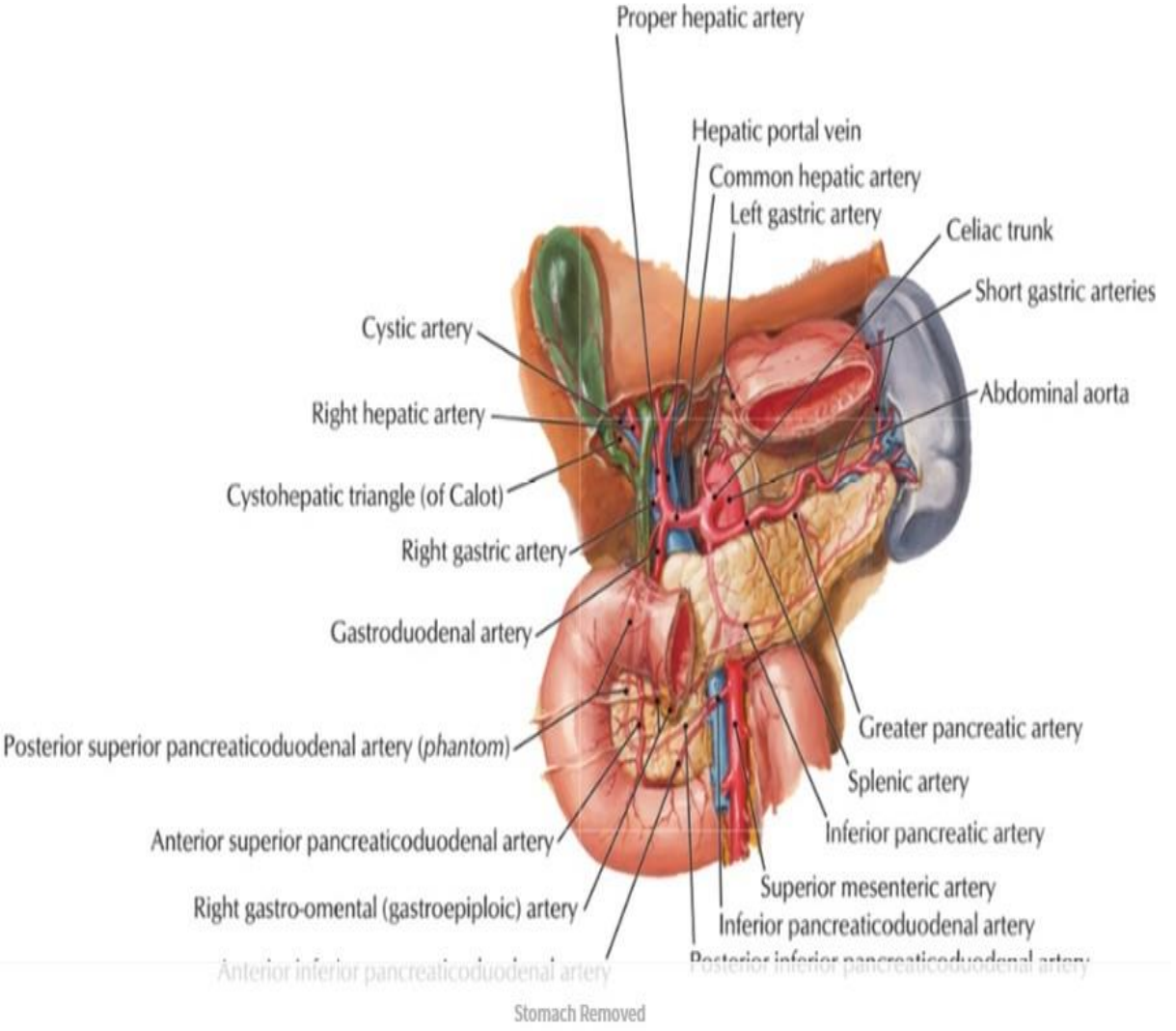
➢ It is related to: The duodenojejunal flexure and left colic flexure.

ال Body ⬅️ اكبر جزء ف البنكرياس، نعرف ال surfaces تبعه، ال borders

خاصه posterior surface ونعرف أنه مُميز عن أى surface تانى بإنه غير مُغطى ب peritoneum

MCQ: I. V. C is related directly to the head of pancreas not to its body.

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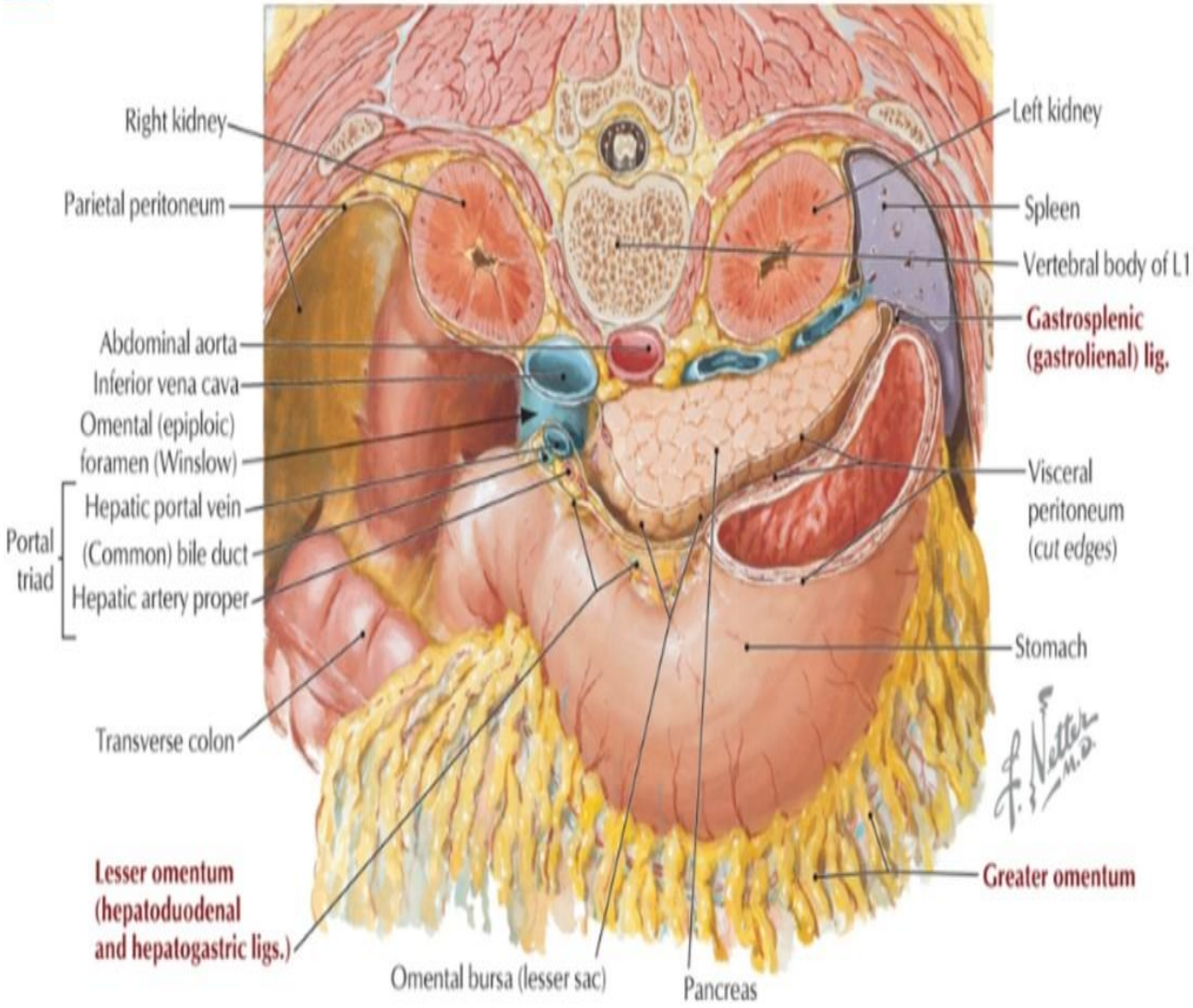

Right kidney
Left kidney
Parietal peritoneum
Spleen
Vertebral body of L1
Gastrosplenic (gastrolienal) lig.
Abdominal aorta
Inferior vena cava
Omental (epiploic) foramen (Winslow)
Portal triad
Hepatic portal vein
(Common) bile duct
Hepatic artery proper
Visceral peritoneum (cut edges)
Stomach
Transverse colon
Lesser omentum (hepatoduodenal and hepatogastric ligs.)
Greater omentum
Omental bursa (lesser sac)
Pancreas

Body of the Pancreas:

3. The Posterior Surface:

o It is not covered by peritoneum, and it is related directly to:

1. The abdominal aorta.

2. The splenic vein: above the superior mesenteric artery.

3. The left renal vein: below the superior mesenteric artery.

❑ **3 Borders:**

A. The upper border: Related to the splenic artery.

B. The anterior border: Gives attachment to transverse mesocolon.

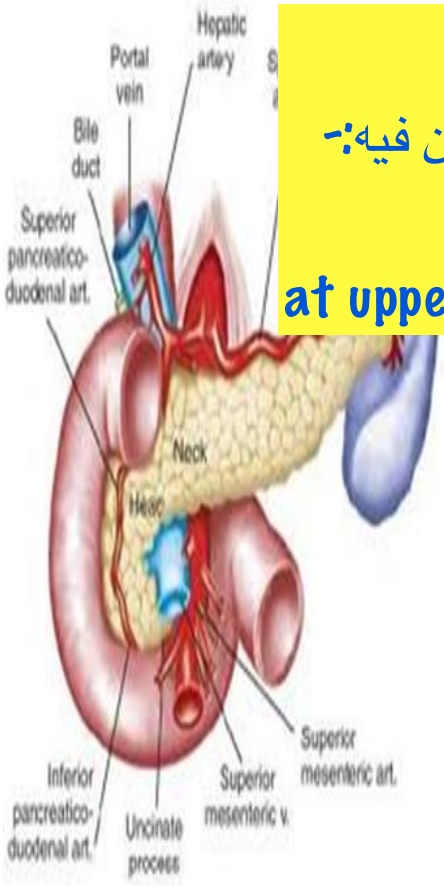
C. The posterior border: the same relations as posterior surface.

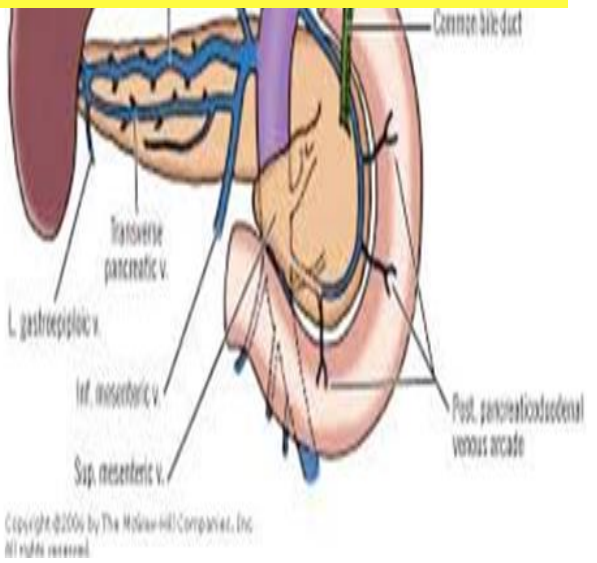
ملحوظه ثوغنطوطه :ـ

ورا ال body مفيش peritoneum ولكن فيه:ـ

(2 splenic veins)

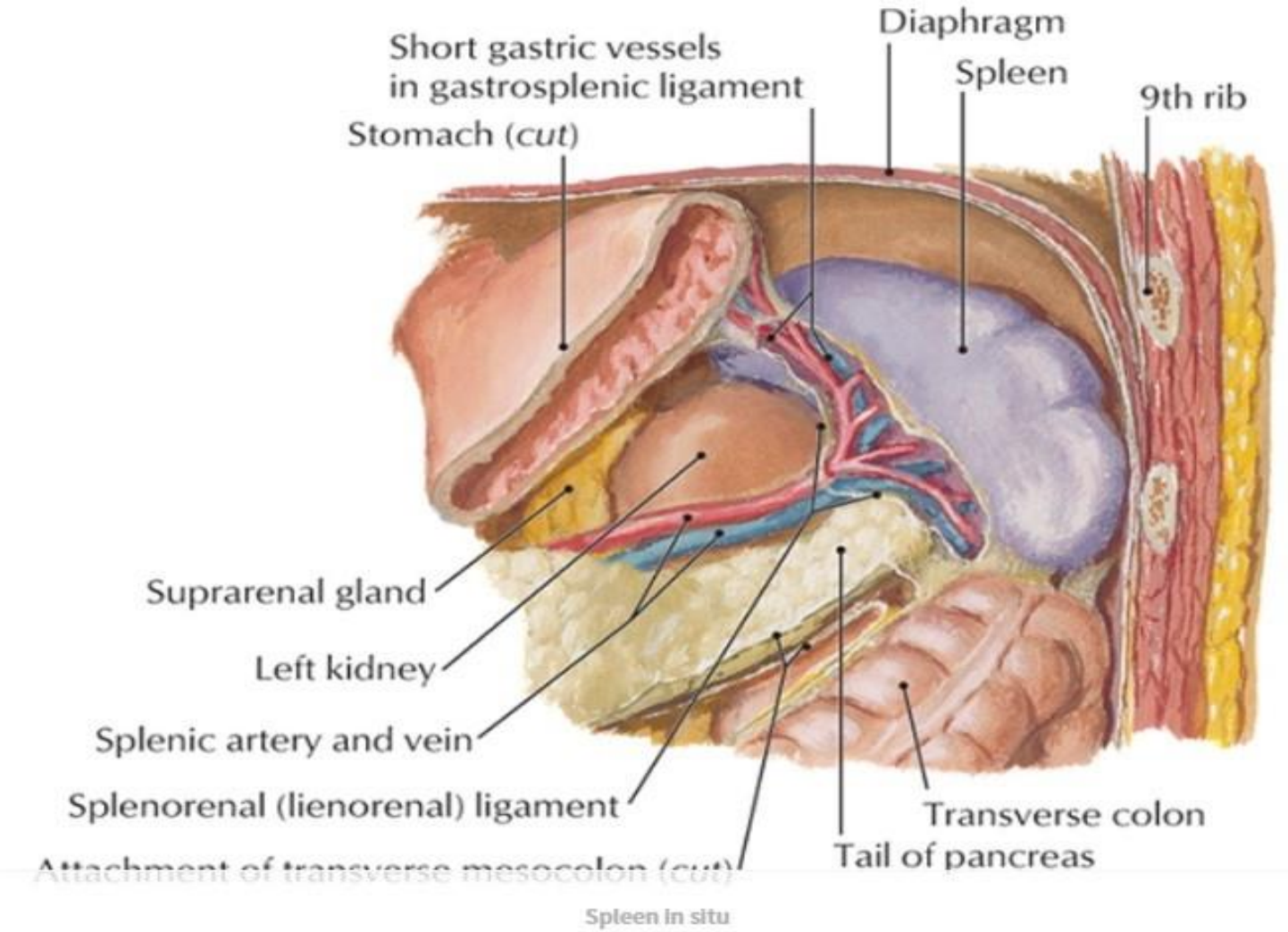
at upper border there is splenic artery.





Tail of the Pancreas:

- ❑ **Is thick and blunt.**
- ❑ **It lies between the two layers of the lienorenal ligament.**
- ❑ **It is related to the terminal parts of the splenic vessels.**
- ❑ **It comes into direct relation with visceral surface of spleen close to its hilum.**



Pancreatic ducts:

1. The main pancreatic duct:

It passes through tail, body and lower part of head.

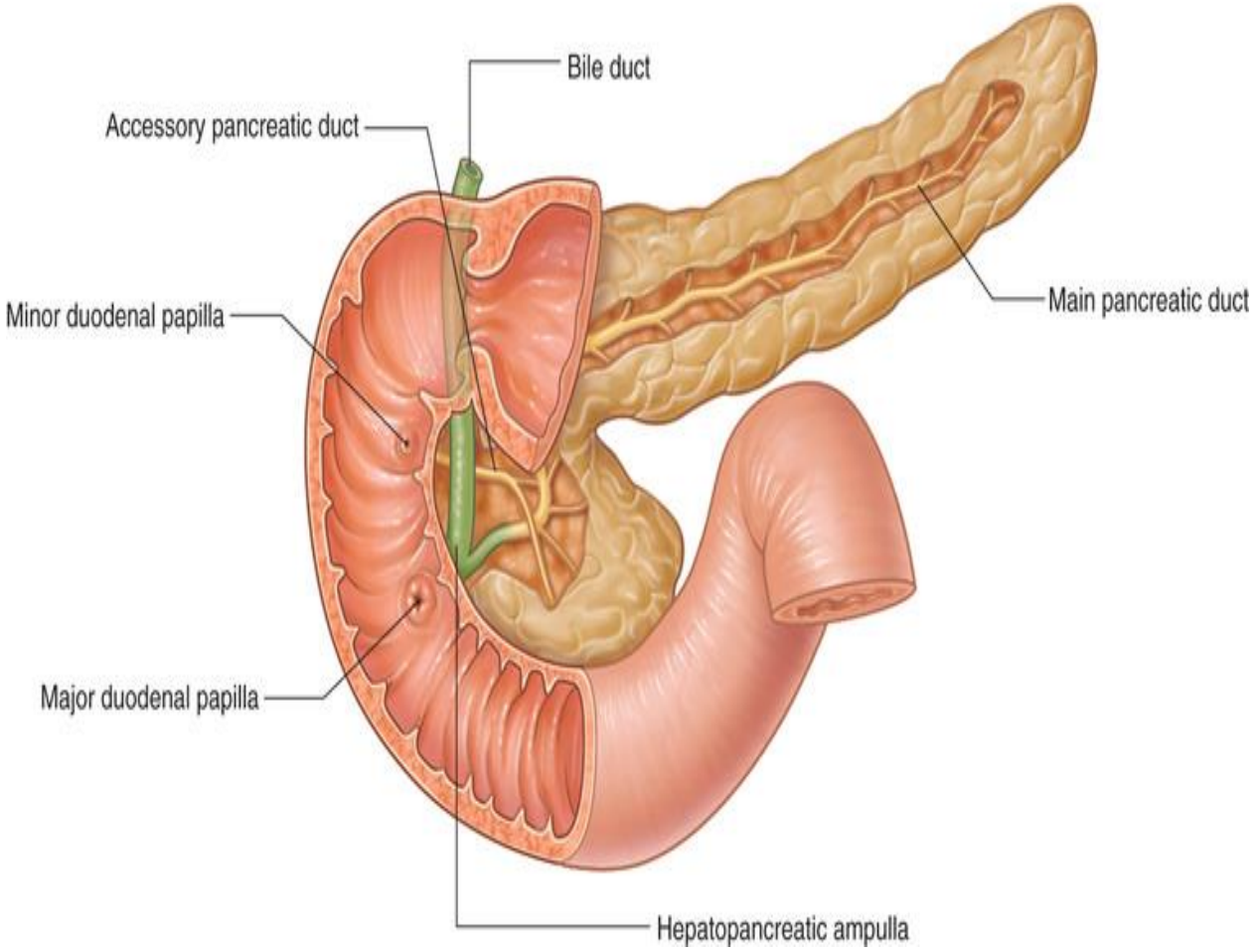
❑ In the lower part of the head of pancreas, the pancreatic duct joins the bile duct.

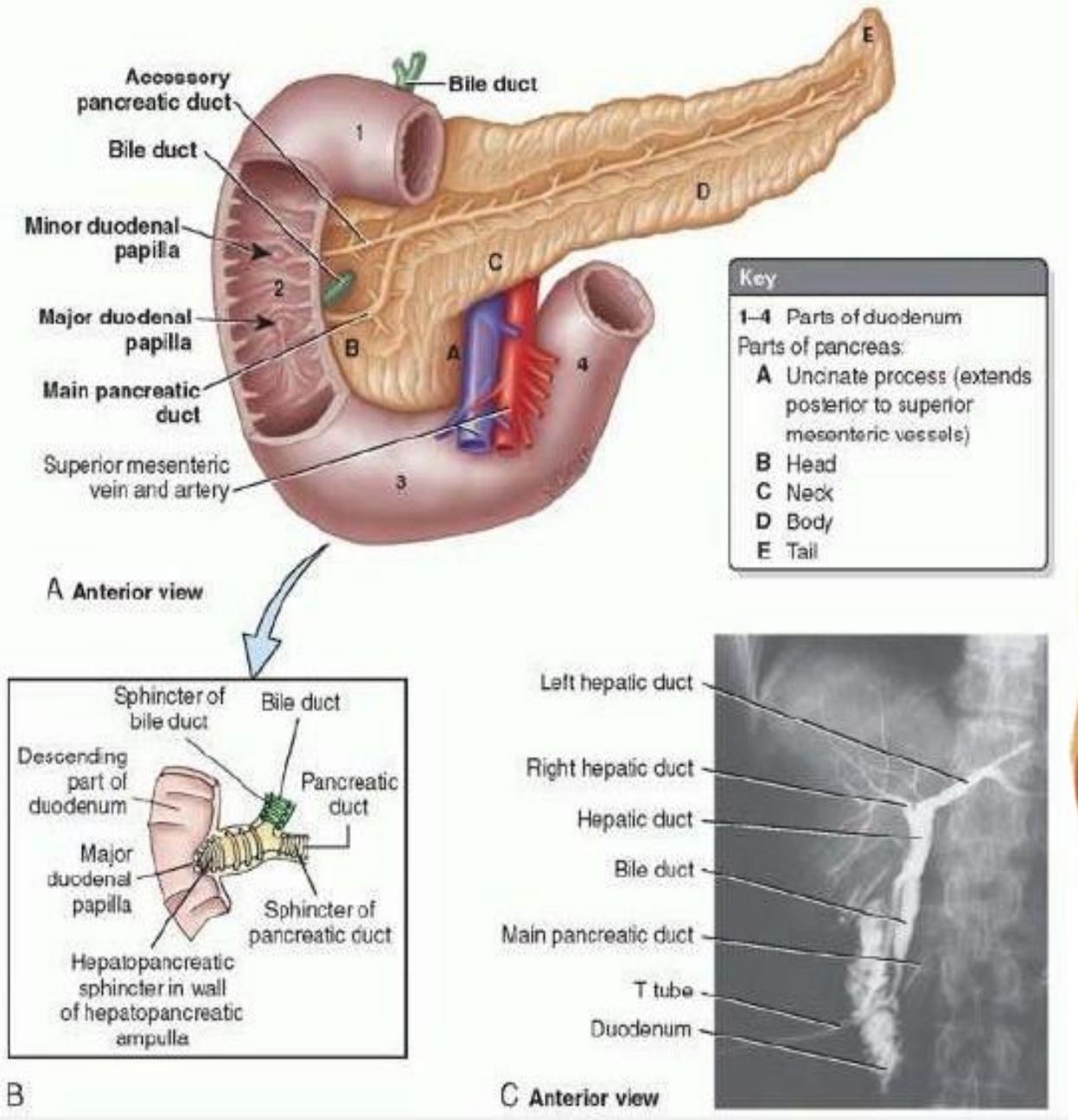
The joining of these two structures forms the hepatopancreatic ampulla (ampulla of Vater), which enters the 2nd part of the duodenum at the major duodenal papilla.

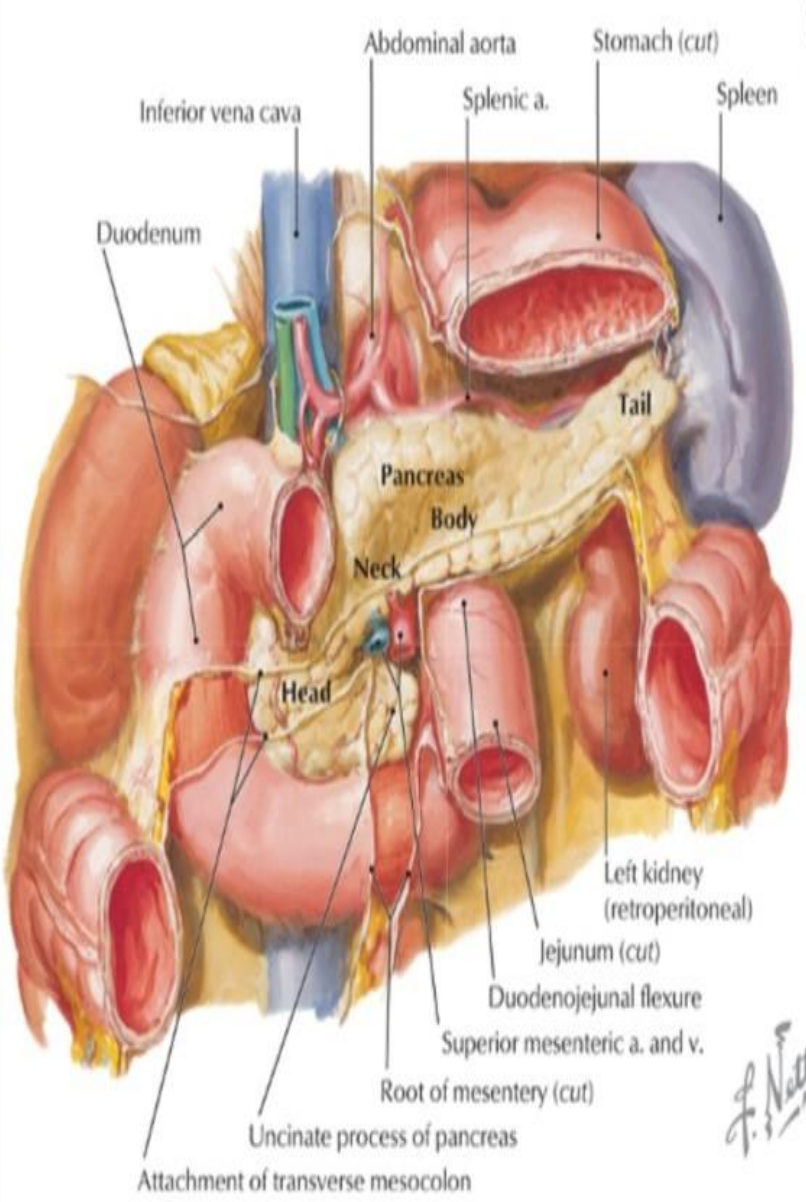
❑ Surrounding the ampulla is the sphincter of ampulla (sphincter of Oddi), which is a collection of smooth muscle

2. The accessory pancreatic duct:

❑ It is small duct, which begins in the upper part of the head. ❑ It opens into the second part of the duodenum on the summit of the minor duodenal papilla, one inch ABOVE the major duodenal papilla.




Accessory pancreatic duct
Bile duct
Minor duodenal papilla
Major duodenal papilla
Main pancreatic duct
Superior mesenteric vein and artery
Bile duct
1
2
3
4
A
B
C
D
E
Key
1–4 Parts of duodenum
Parts of pancreas:
A Uncinate process (extends posterior to superior mesenteric vessels)
B Head
C Neck
D Body
E Tail
A Anterior view
Sphincter of bile duct
Bile duct
Descending part of duodenum
Pancreatic duct
Major duodenal papilla
Sphincter of pancreatic duct
Hepatopancreatic sphincter in wall of hepatopancreatic ampulla
B
Left hepatic duct
Right hepatic duct
Hepatic duct
Bile duct
Main pancreatic duct
T tube
Duodenum
C Anterior view


Abdominal aorta
Stomach (cut)
Inferior vena cava
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Duodenum
Tail
Pancreas
Body
Neck
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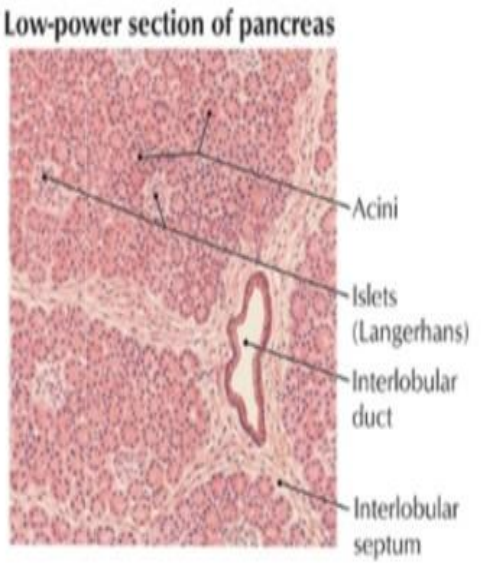
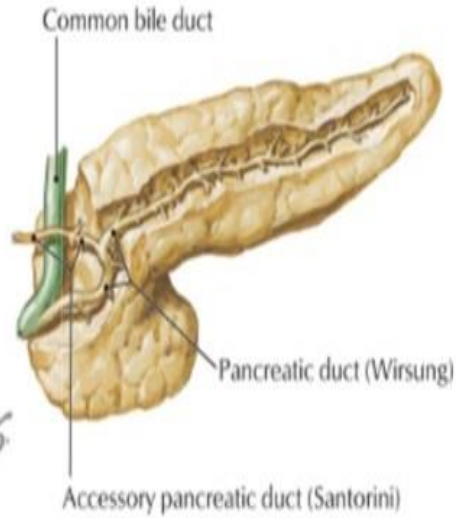
Uncinate process of pancreas
Attachment of transverse mesocolon
F. Netter M.D.


Low-power section of pancreas
Acini
Islets (Langerhans)
Interlobular duct
Interlobular septum


Common bile duct
Pancreatic duct (Wirsung)
Accessory pancreatic duct (Santorini)

Development of the pancreas

ال development هنقرأها ونحفظ الصورتين اللى موجودين لأن فيهم كل حاجه واى حاجه مكتوبه عليهم موضع سؤال

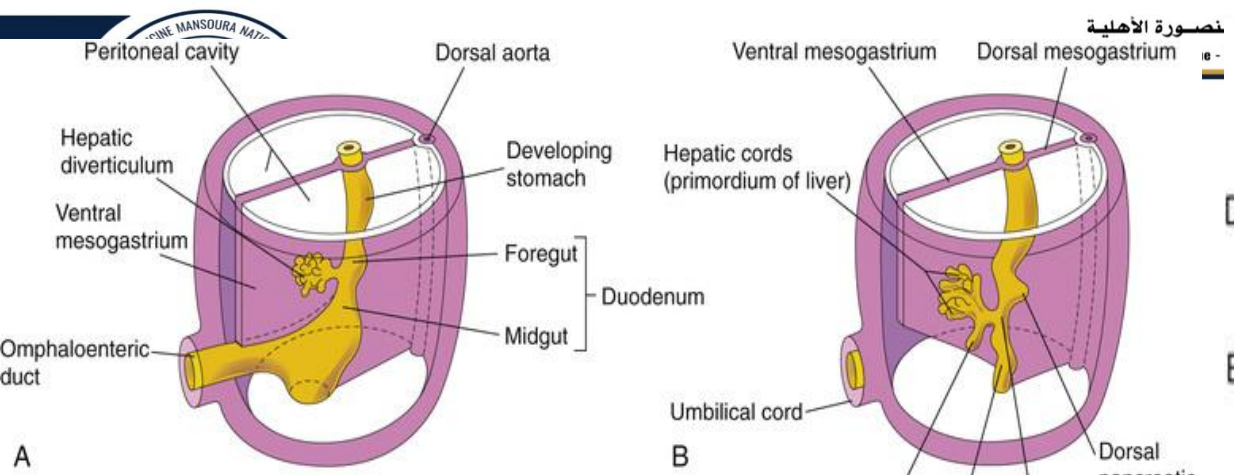
- **Development:** The pancreas develops from the duodenum by 2 buds:
- **Dorsal pancreatic bud:** arises from the dorsal wall of the duodenum slightly above the hepatic bud. It extends dorsally and upwards in the mesoduodenum.
- **Ventral pancreatic bud:** arises from the ventral wall of the duodenum in conjunction with the hepatic bud.
- The ventral pancreas comes to lie below & behind the dorsal pancreas as a result of:

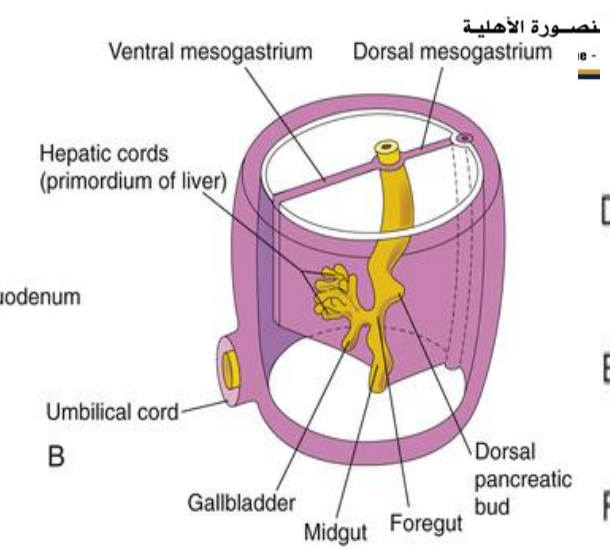
1. Differential growth of the duodenal wall.
2. Axial rotation of the duodenum to right side.

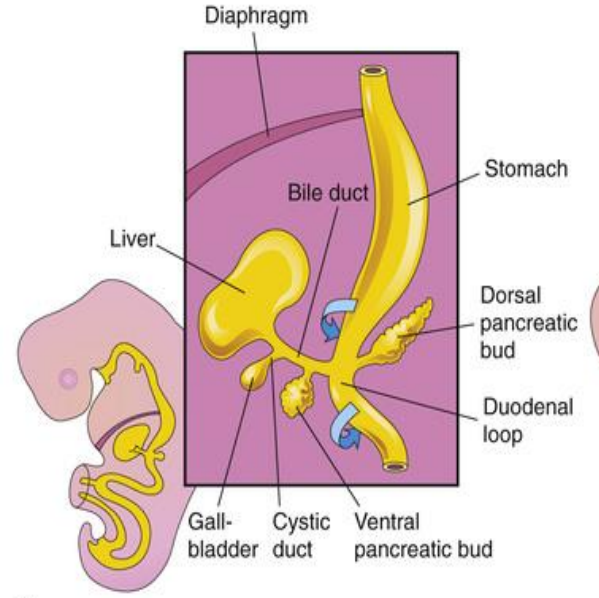
o Later the parenchyma as well as the duct systems of the two buds fuse together so that:

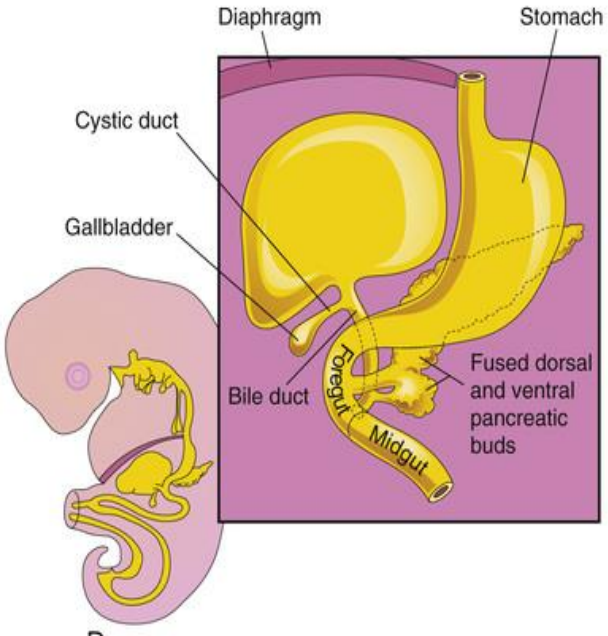
✓ The ventral bud forms the uncinate process & the inferior part of the head of the pancreas.

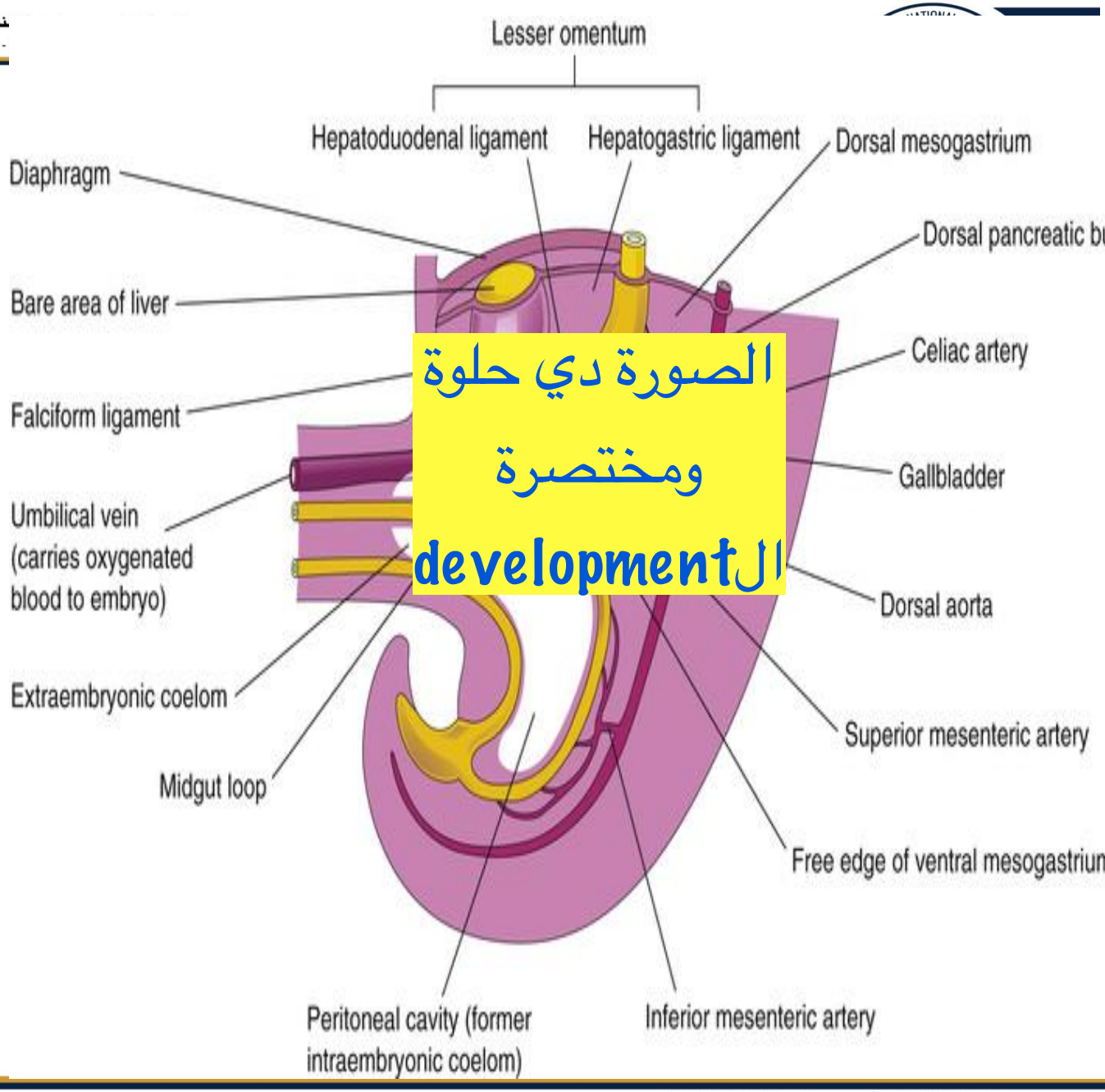
✓ The remaining part of pancreas is derived from the dorsal bud.











الصورة دي حلوة ومختصرة ال**development**

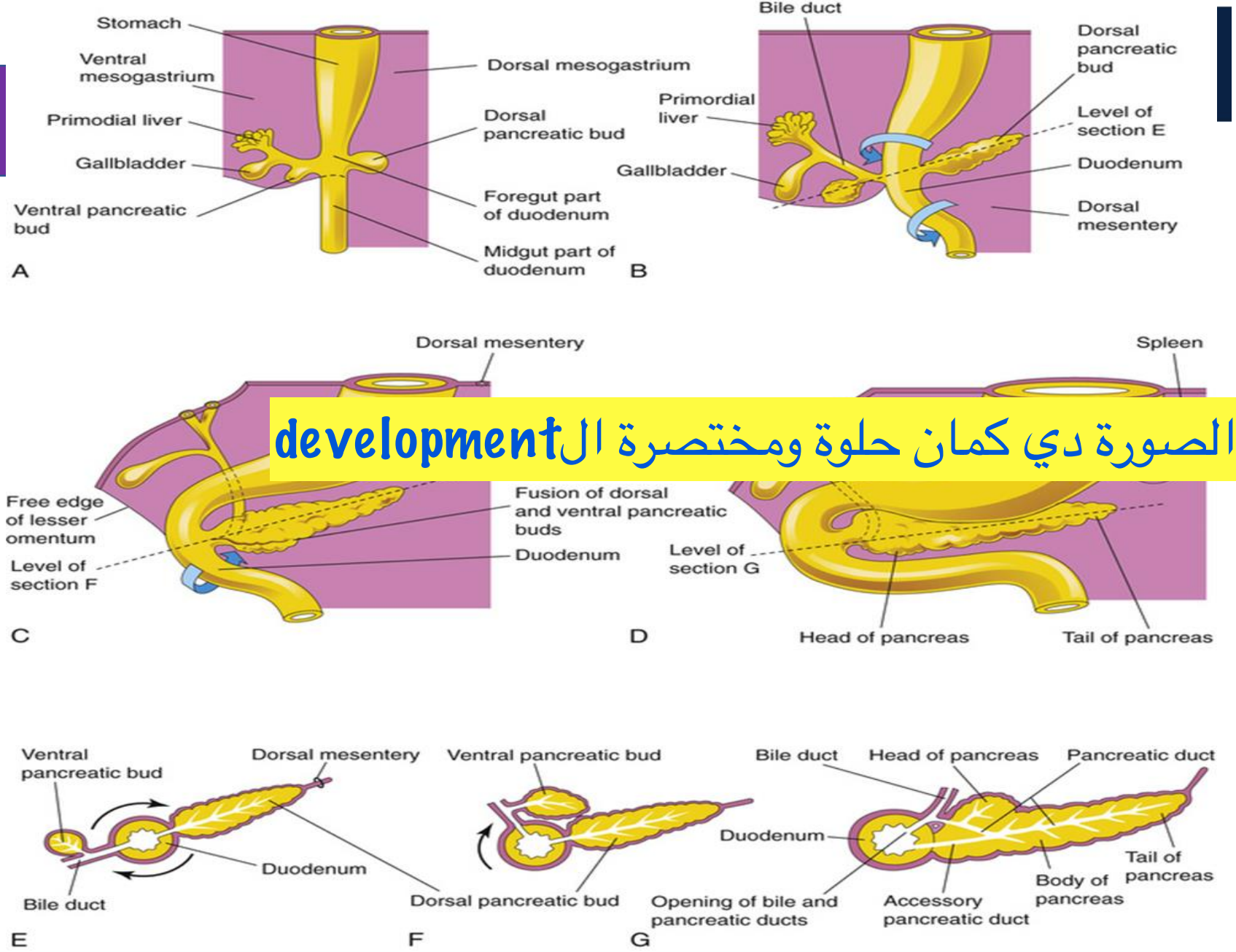
ال development هنقرأها ونحفظ الصورتين اللى موجودين
لأن فيهم كل حاجه واى حاجه مكتوبه عليهم موضع سؤال

Development of Pancreas

- The pancreas develops between the layers of the mesenteries from dorsal and ventral pancreatic buds, which arise from the caudal part of the foregut .
- Most of the pancreas is derived from the larger dorsal pancreatic bud, which appears first.
- The smaller ventral pancreatic bud develops near the entry of the bile duct into the duodenum .
- As the duodenum rotates to the right and becomes C-shaped, the ventral bud is carried dorsally with the bile duct .
- It soon lies posterior to the dorsal pancreatic bud and later fuses with it .
- As the pancreatic buds fuse, their ducts anastomose (link).
- The ventral pancreatic bud forms the uncinate process and part of the head of the pancreas.
- As the stomach, duodenum, and ventral mesentery rotate, the pancreas comes to lie along the dorsal abdominal wall (retroperitoneal)

A to D, Successive stages in the development of the pancreas from the fifth to the eighth weeks.

E to G, Transverse sections through the duodenum and developing pancreas. Growth and rotation (arrows) of the duodenum bring the ventral pancreatic bud toward the dorsal bud, where the two buds subsequently fuse.



الصورة دي كمان حلوة ومختصرة الdevelopment

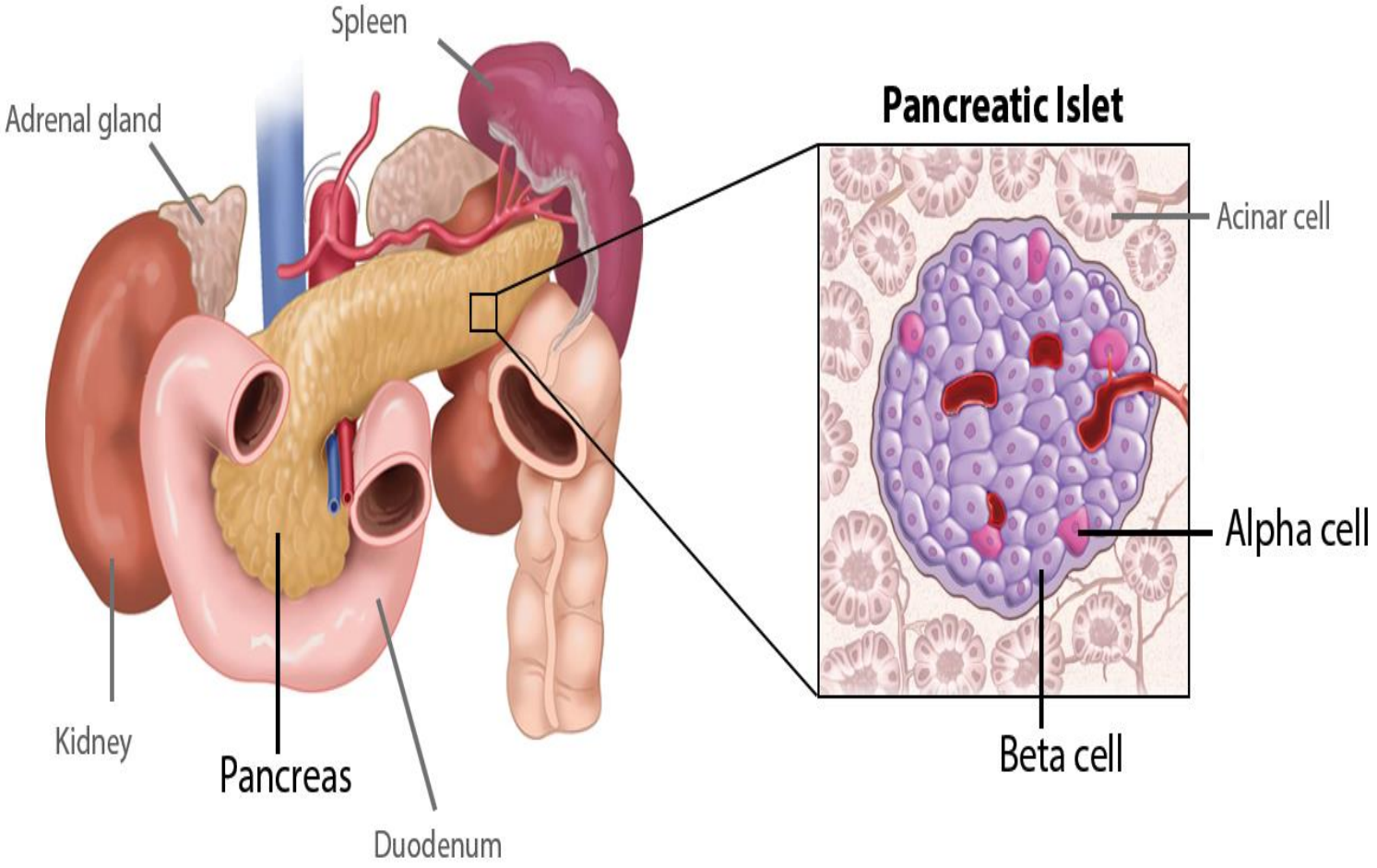
Development of The Pancreas

✓ The main pancreatic duct is formed by the distal part of the dorsal pancreatic duct & the whole ventral pancreatic duct.

✓ The proximal part of the dorsal pancreatic duct is either obliterated or persists as the accessory pancreatic duct. ✓ In 10% of the cases the duct system fails to fuse(Pancreatic divisum) .

✓The connective tissue sheath and interlobular septa of the pancreas develop from the surrounding splanchnic mesenchyme. Isolated clumps of endodermal cells bud from the tubules and accumulate within the mesoderm to form islet cells (i.e., endocrine pancreas).

✓The glucagon- and somatostatin-containing cells develop before differentiation of the insulin-secreting cells occurs. With increasing fetal age, total pancreatic insulin and glucagon content also increases. The islets of Langerhans: develop from the parenchymatous tissue in the 3rd month, but they start insulin secretion during the 5th month.


Spleen
Adrenal gland
Kidney
Pancreas
Duodenum
Pancreatic Islet
Acinar cell
Alpha cell
Beta cell

Congenital anomalies of Pancreas

1-Annular pancreas is an uncommon birth defect, but it warrants attention because it may cause duodenal obstruction .

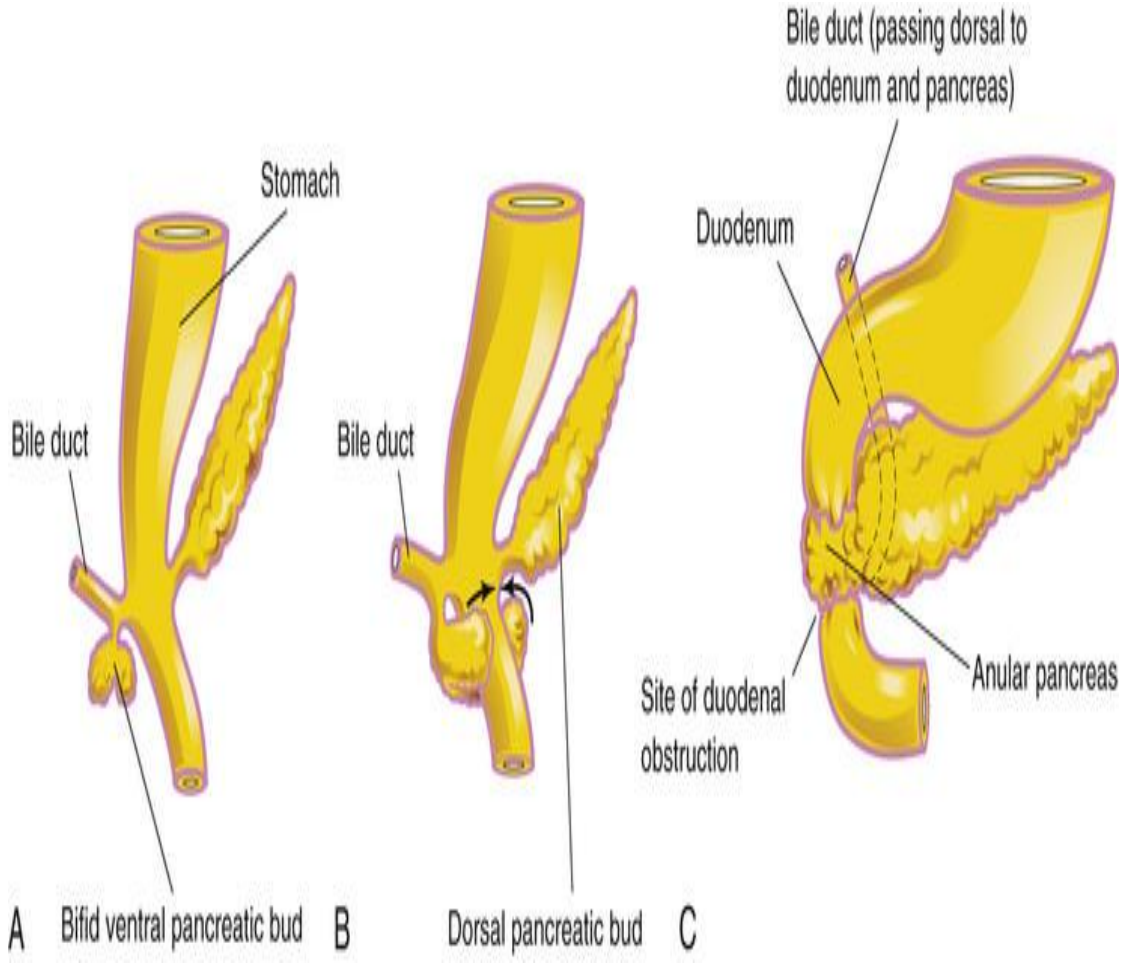
This defect probably results from the growth of a bifid ventral pancreatic bud around the duodenum .

The parts of the bifid ventral bud then fuse with the dorsal bud, forming a pancreatic ring.

The ring-like, annular part of the pancreas consists of a thin, flat band of pancreatic tissue surrounding the descending or second part of the duodenum.

An annular pancreas may cause obstruction of the duodenum shortly after birth, but many cases are not diagnosed until adulthood.

Newborns and infants are intolerant of oral feeding and often have bilious vomiting.



Congenital anomalies of Pancreas:

2. Accessory pancreatic tissue: may be found in the wall of stomach or duodenum.

3-Hyperplasia of pancreatic islets occurs when fetal islets are exposed to high blood glucose levels, as frequently happens in infants of diabetic mothers. Glucose freely crosses the placenta and stimulates fetal islet hyperplasia and insulin secretion, which causes increased fat and glycogen deposition in fetal tissues.
This results in increased birth weight of infants at term (i.e., macrosomia) and serious episodes of hypoglycemia in the postnatal period.

THE SUPRARENAL (ADRENAL) GLANDS

❖ **STRUCTURE** consists of an **outer cortex** and an **inner medulla**

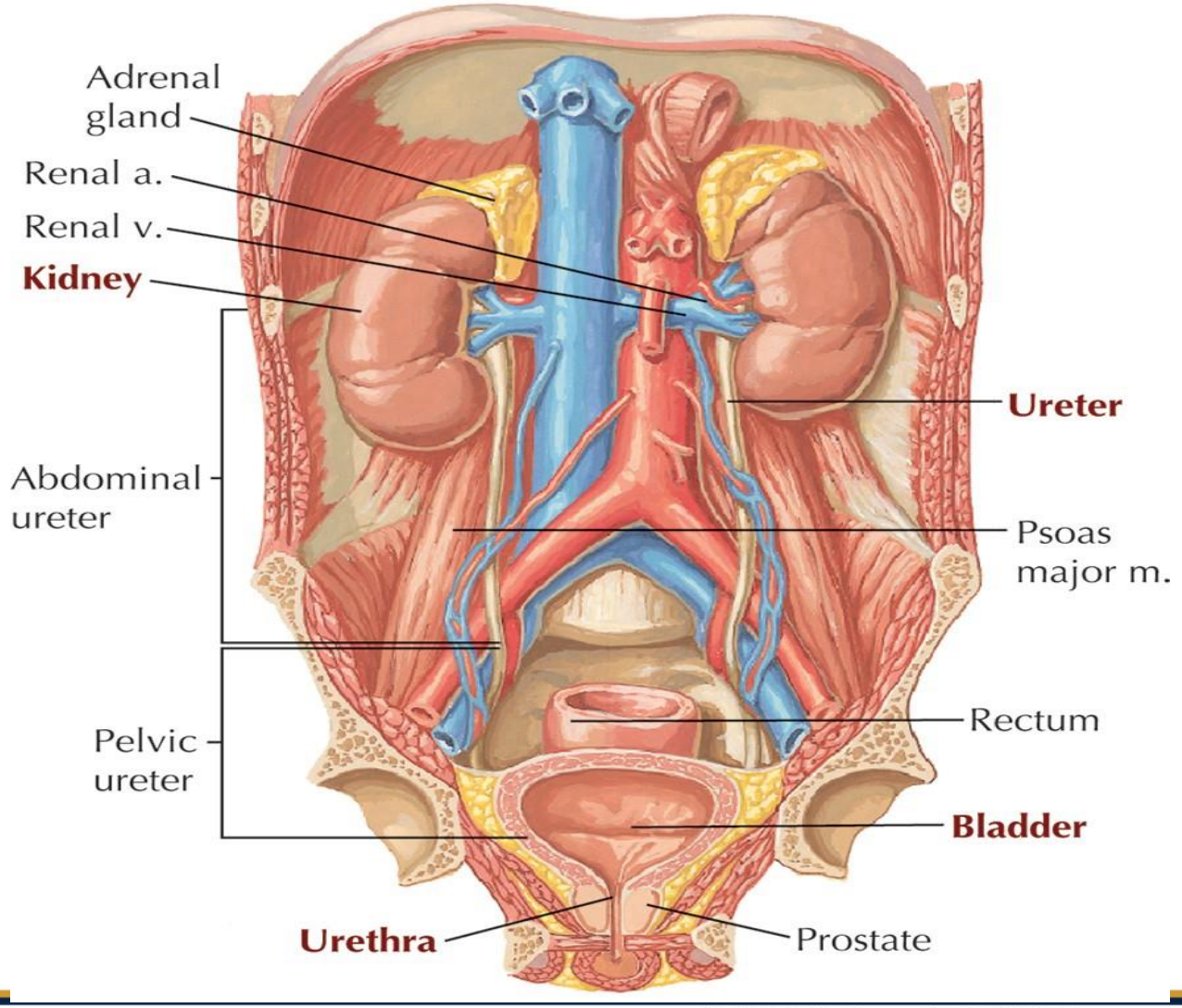
❖ **POSITION:** over the **upper pole** of the kidney one on each side of the midline.

❖ **COVERINGS:** enclosed together with the kidney in the **renal fascia and perirenal fat**, separated from the kidney by a septum of **fibro-areolar tissue.**

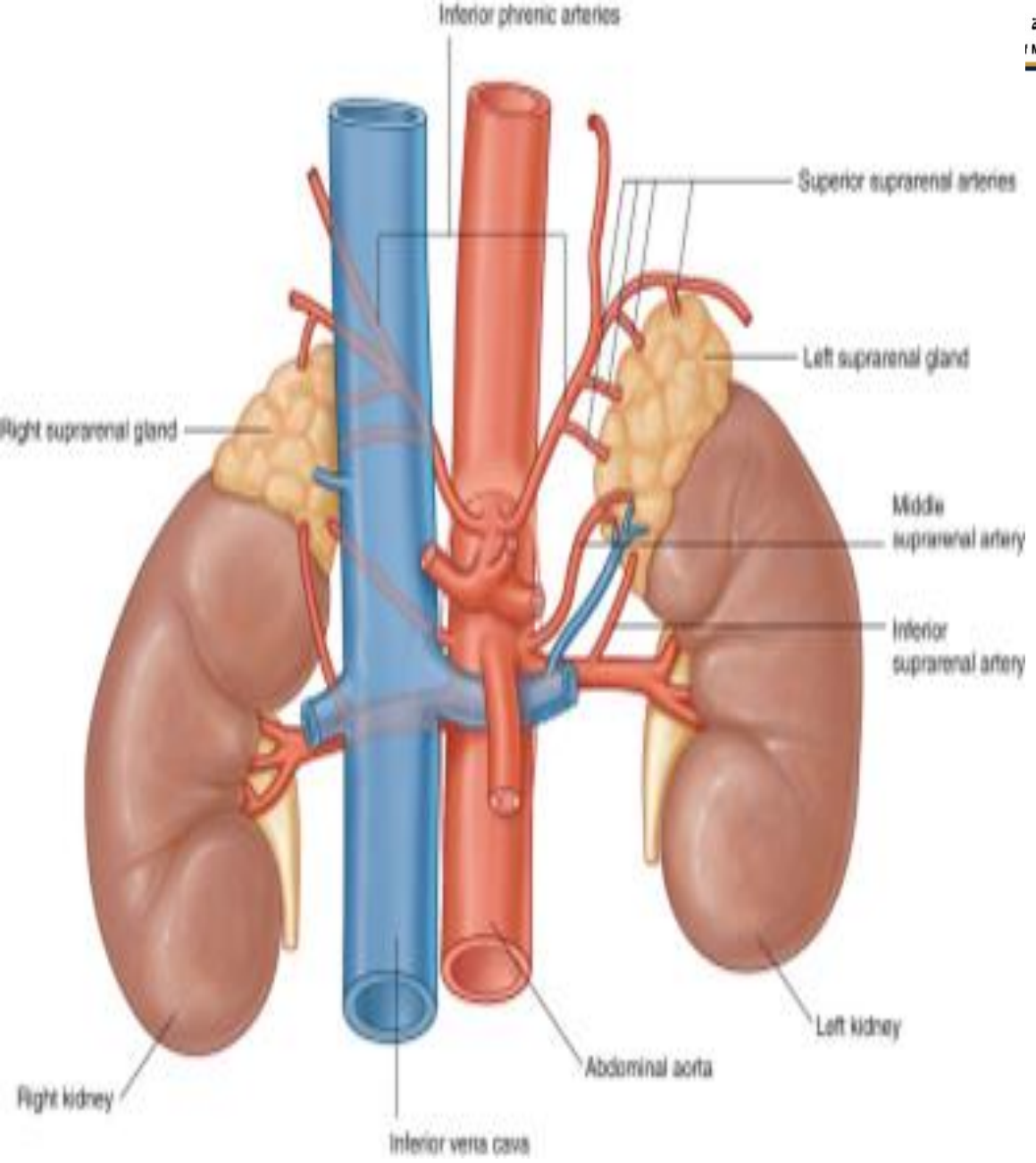
❖ **NERVES:**

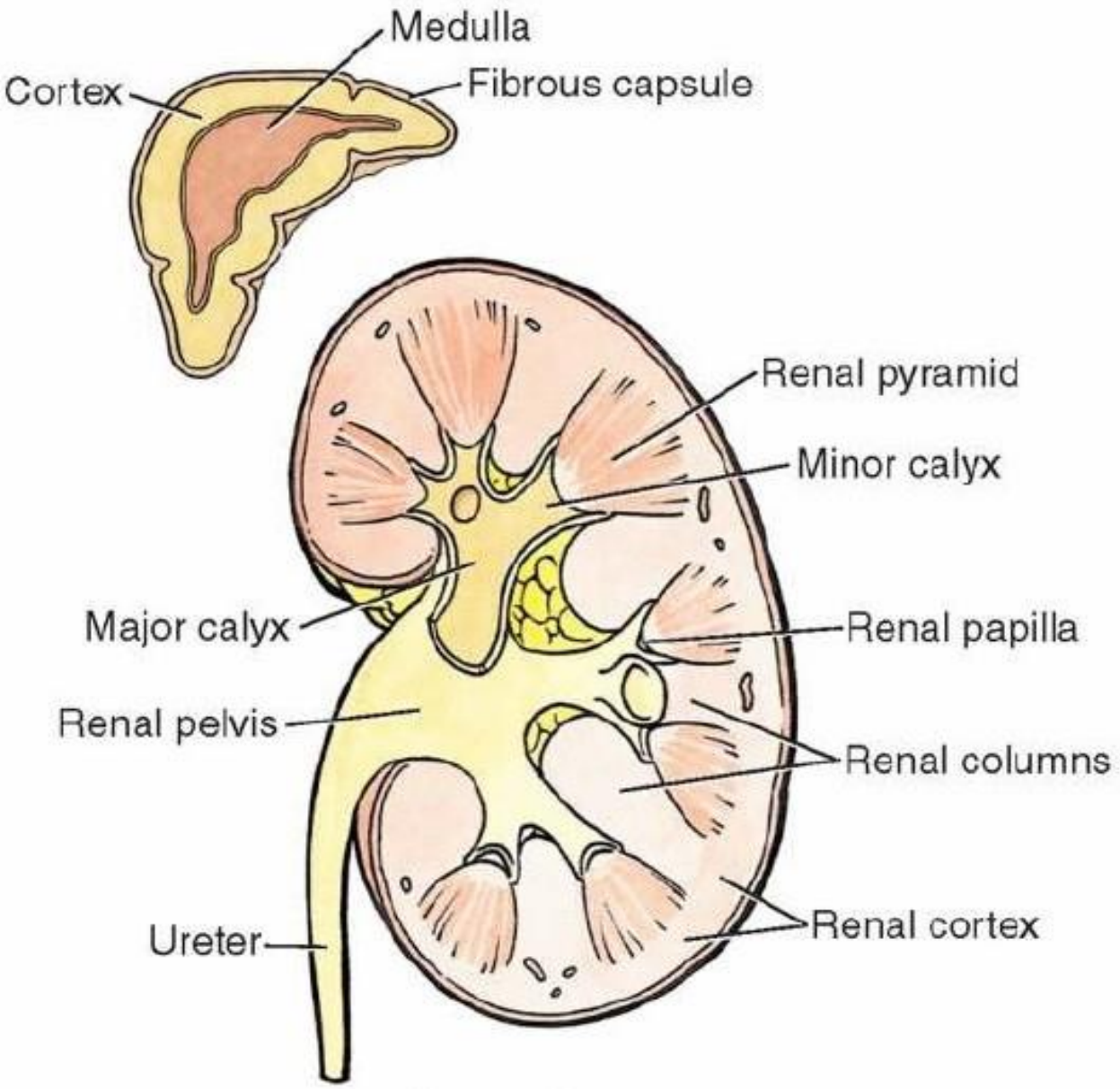
The Medulla: supplied by **preganglionic sympathetic fibers** which end on the chromaffin cells of the medulla.

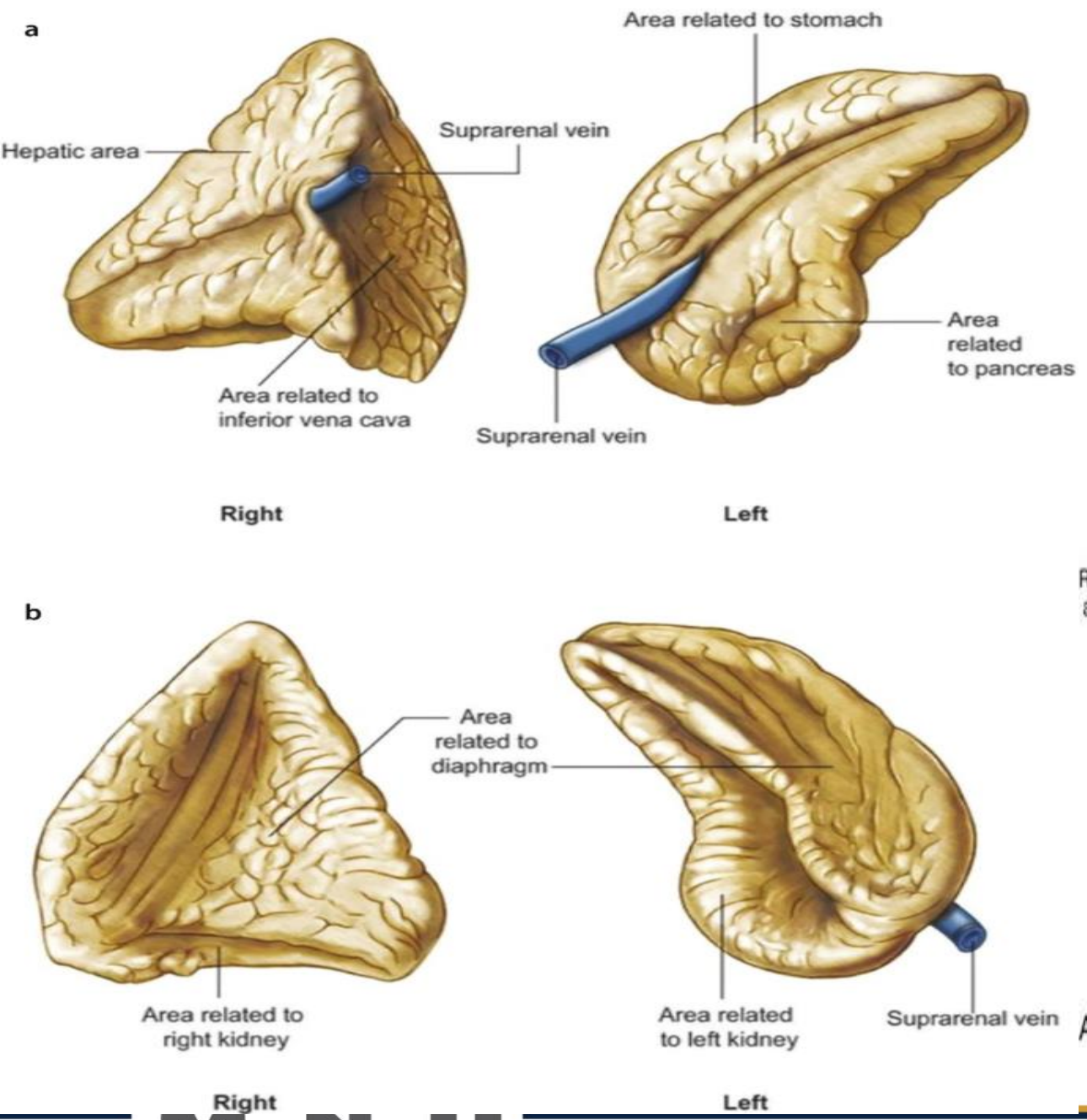
• **The cortex:** under hormonal control of **ACTH.**

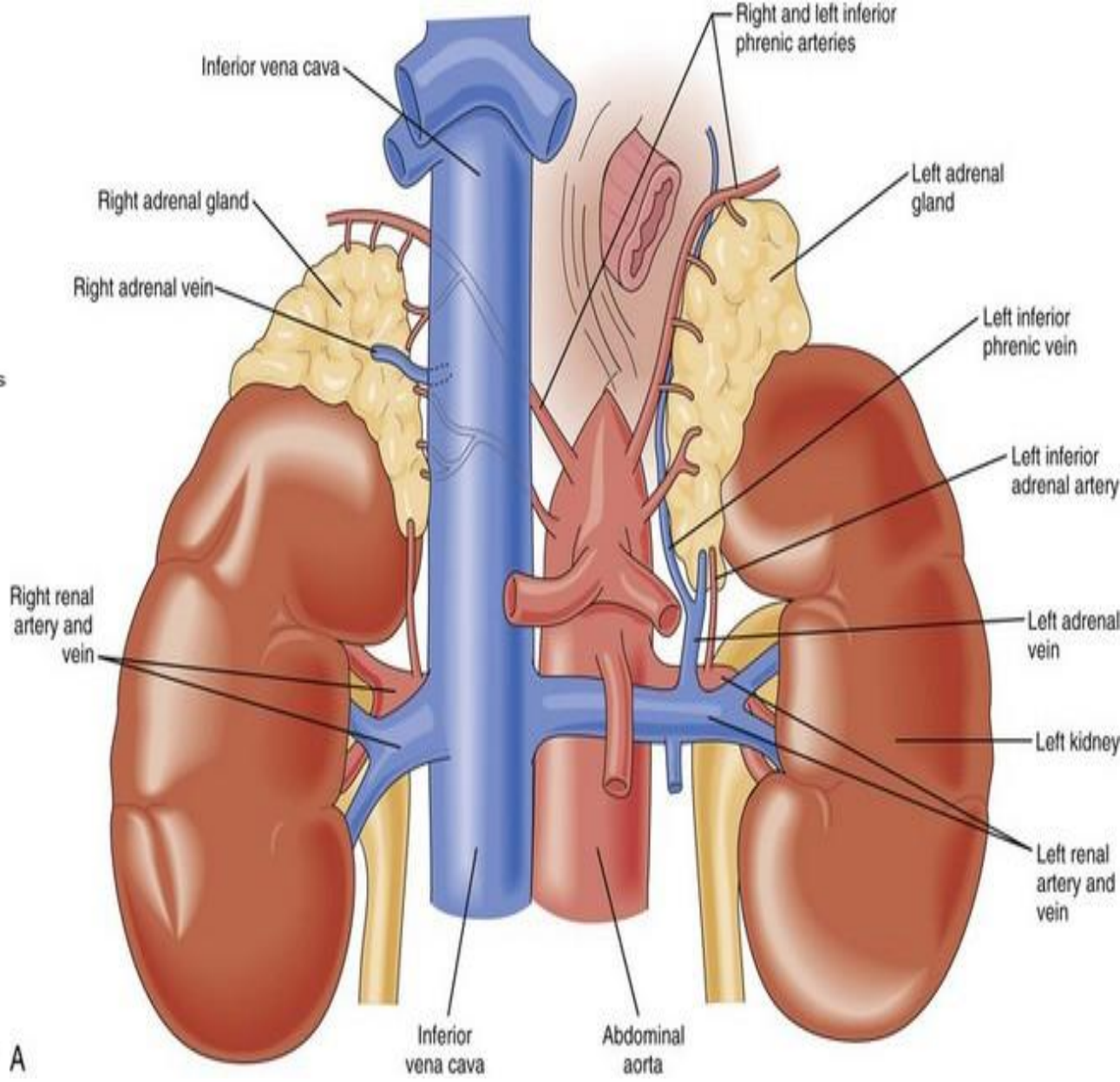


	Right Suprarenal Gland	Left Suprarenal Gland
Shape	Pyramidal	semilunar
Anterior relations	➢ IVC. ➢ Bare area of the liver.	➢ lesser sac (stomach bed) ➢ stomach.
Posterior relations	➢ Right crus of diaphragm ➢ Right kidney.	➢ Left crus of diaphragm ➢ Left kidney.
Hilum	Directed **upwards**	Directed **downwards**
Supra-renal arteries	**1. Superior suprarenal artery:** from inferior phrenic artery. **2. Middle suprarenal artery:** from abdominal aorta **3. Inferior suprarenal artery:** from the renal artery.	
Supra-renal veins	ends in **the inferior vena cava.**	ends in **the left renal vein**.


Inferior phrenic arteries
Superior suprarenal arteries
Left suprarenal gland
Right suprarenal gland
Middle suprarenal artery
Inferior suprarenal artery
Left kidney
Abdominal aorta
Right kidney
Inferior vena cava


Medulla
Cortex
Fibrous capsule
Renal pyramid
Minor calyx
Major calyx
Renal papilla
Renal pelvis
Renal columns
Ureter
Renal cortex


a
Hepatic area
Suprarenal vein
Area related to stomach
Area related to inferior vena cava
Suprarenal vein
Area related to pancreas
Right
Left
b
Area related to diaphragm
Area related to right kidney
Area related to left kidney
Suprarenal vein
Right
Left


Right and left inferior phrenic arteries
Inferior vena cava
Right adrenal gland
Left adrenal gland
Right adrenal vein
Left inferior phrenic vein
Left inferior adrenal artery
Right renal artery and vein
Left adrenal vein
Left kidney
Left renal artery and vein
Inferior vena cava
Abdominal aorta
A

Quiz

Which of the following related to pancreas?

A. **lies across the lower part of the posterior abdominal wall behind the peritoneum of the greater sac.**

B. The neck related posteriorly to pylorus and the first part of the duodenum and peritoneum of the lesser sac.

C. The neck related anteriorly to pylorus and the first part of the duodenum and peritoneum of the lesser sac

D. The uncinate process of its head projects downwards and to the left

E. The cross sections of its body has 3 borders and 2 surfaces

Answer: **C**

Quiz

Which of the following related to adrenal glands?

A. It **consists of an outer medulla and an inner cortex**

B. The left suprarenal vein ends in the inferior vena cava.

C. The right adrenal gland related anteriorly Left crus of diaphragm Left kidney.

D. The left adrenal gland related anteriorly to IVC and Bare area of the liver.

E. The right adrenal gland related anteriorly to IVC and Bare area of the liver.

Answer: E

Notes Lec pancreas & adrenal gland Dr. Gaballah✨

• نركز على ال site of pancreas ..
ممكن يجى سؤال MCQ مثلا هو موجود فى ال upper أو ال lower.

• نعرف ان :ـ
pancreas is mixed gland & fixed organ

Fixed organ due to its site (Retropretoneuim)

• بالنسبه لاجزاء البنكرياس
* الHead ⬅️ نحفظ ال relations بتاعتها كويس سواء Anterior or posterior لأنها مواضع اسئله MCQ / SAQ.

*معلومه صغنطوطه نركز عليها :ـ
the Head of pancreas is separated from Deudneum by the cavity which contains....
pancreaticoduodenal vessels

*الNeck ⬅️ بردو نركز على ال relations اللى فيها خاصة posterior ، وتركز على رسومات ال CT لأنها موضع اسئله ل OSCE

*ال Body ⬅️اكبر جزء ف البنكرياس، نعرف ال surfaces تبعه، + ال borders
خاصه posterior surface ونعرف أنه مُميز عن أى surface تانى بإنه غير مُغطى ب *peritoneum
MCQ :-
I. V. C is related directly to the head of pancreas not to its body.

*ملحوظه ثوغنطوطة :ـ
*ورا ال body مفيش peritoneum ولكن فيه:-
(2 splenic veins)

at upper border there is splenic artery.

*ركز بعينك كويس على رسومات ال relations عشان هيكون فيها لعب بال اسئله فلازم تكون فاهمين الرسمه كويس

*وأخيراً ال development هنقرأها ونحفظ الصورتين اللى موجودين لأن فيهم كل حاجه واى حاجه مكتوبه عليهم موضع سؤال

بالتوفيق✨🌟


Thank
You!