

Liver

Last time we talked about the liver and the doctor started by revising some information about it:

- It has **five** surfaces.
- It reaches the **5th intercostal space** ; some books write that it reaches the 4th intercostal space and that is also correct due to variation ; but in most cases it ascends above the 5th space so logically the 5th space is the best answer since it's rare for it to reach the 4th space.
- The physiological function of the liver lobes :
 - a. The **right lobe** receives blood from the right hepatic artery and give rise to right hepatic vein.
 - b. The **left lobe** along with **caudate and quadrate** lobes acts as a **one physiological unit**.
- The **free edge of lesser omentum** carries all the blood that's going to the liver:
 - a. Portal: Constitutes **(70-80) %** of the blood that reaches the liver.
 - b. Hepatic: Constitutes **(20-30) %**.

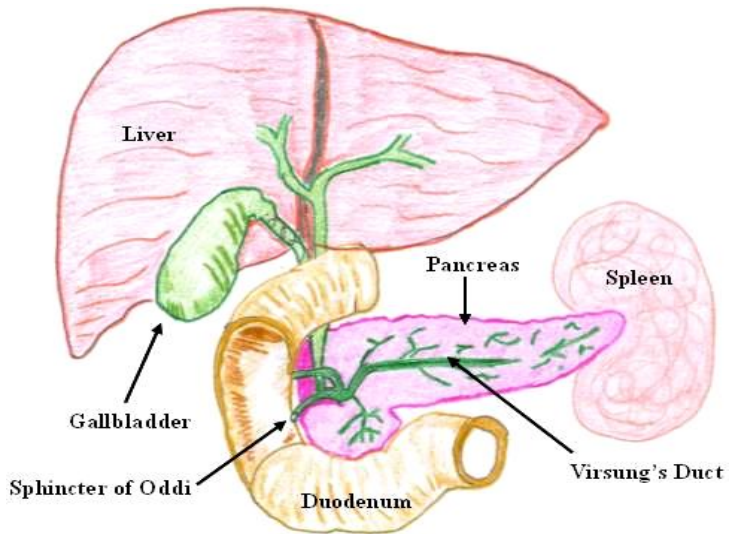
So by clamping the free edge of the lesser omentum we can **stop the bleeding** in the liver. The bleeding can be due to car accidents that result in a trauma of the liver and the clamping is only **temporary** till we clean the wound and find where the trauma formed laceration in the liver and stitch it and stop the bleeding.

Common Bile Duct (CBD)

- The **cystic** duct its **4 cm** long, it's the duct of the gallbladder and it joins the **common hepatic duct** to form the **CBD**.
- The **CBD** its **10 cm** long, about **3 inches** (The "4 cm" in the slide refers to the upper part that's above the duodenum).
- Its divided into 3 parts:
 - a. Supra duodenal: Above duodenum, about 4 cm.
 - b. Retro duodenal: Behind the **1st part** of duodenum.

c. Retro pancreatic or infra duodenal:
below the
duodenum.

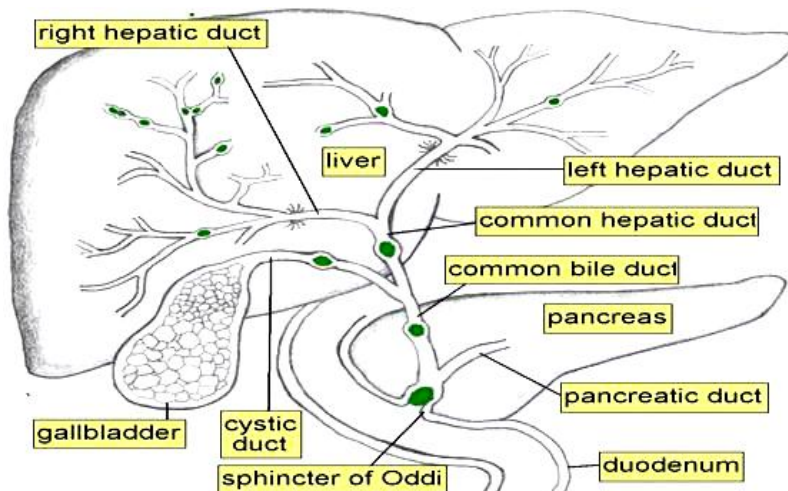
- It **descends** in the free edge of lesser omentum (1st part) then it passes behind duodenum (2nd part) and end in its retro pancreatic position (3rd part).



- Parts of **CBD:**

- First part is found in the *free edge of the lesser omentum*. It's related to **hepatic artery and portal vein**, it's found to the **right side** of the artery and **posterior** to it we find the portal vein.
- Second part is found **behind** the 1st part of duodenum at the **right to the gastroduodenal artery**.
- Third part lies at the **posterior surface of the head of pancreas** and here the CBD meets the **main pancreatic duct**. In this part the duct is related to **IVC**, at on its **left** we find the **gastroduodenal artery and portal vein**.

- The CBD **ends in the middle of the 2nd part** of duodenum and it's closed by the **sphincter of Oddi** which opens **inside** the duodenum. Its location in the duodenum is called the *major duodenal papilla or ampulla of Vater* (Can be noticed in the ERCP picture below).



- The meeting of the CBD and the pancreatic duct has variations and these variations must be considered while performing ERCP.
 - Sometimes a common sphincter can't be found but we find **two separate openings**, one for the common bile duct and another for the main pancreatic duct; each duct has **its own sphincter**.
 - Sometimes they meet **before** the sphincter and have **one duct**; in this case they have **one sphincter**, we deal with it as the **normal** case.

The blood supply of the CBD arises from the **cystic artery** which is usually a branch from the **right hepatic artery** and sometimes it can take a branch from the **superior pancreaticoduodenal artery** which also comes from the celiac trunk, so it follows the **foregut**.

In the **past** the CBD was very important clinically because a **stone** can descend and **block the duct**; resulting in **jaundice** (الاصفرار) and sometimes **pancreatitis**. So they used to remove it with an open surgery, and after removing the stone, they had to do radiography to make sure that there are no other stones.

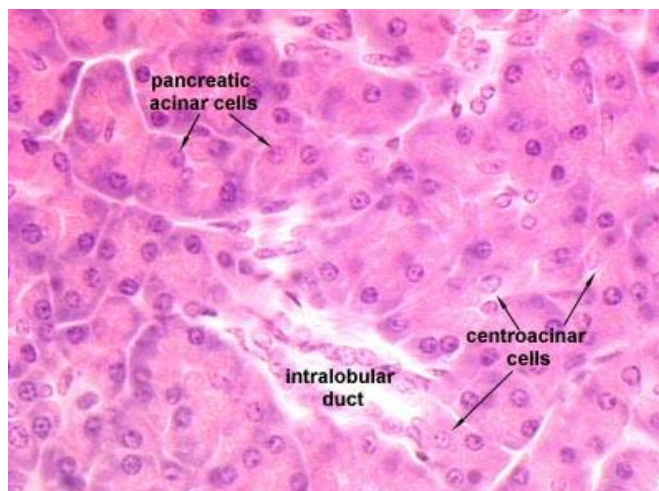
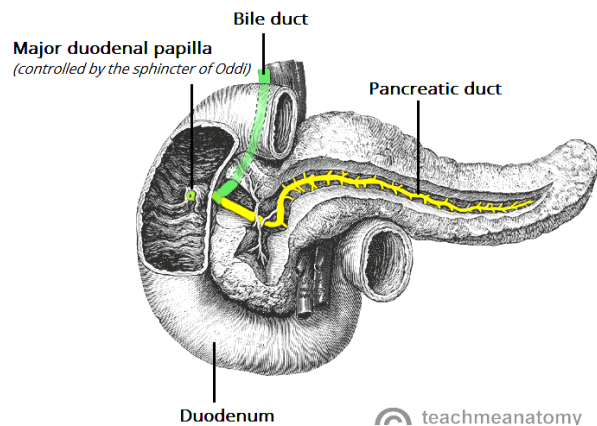
Nowadays they perform a procedure called **ERCP** where they enter through the mouth by a scope and clean the stone via a **small basket** and pull it to the duodenum or by **irrigation by saline** which is mostly used *in case of mud* since the saline will dissolve the mud and open the duct; the patient will recover in 6 hours.

- Gall stones have different sizes and shapes, they look like mosaic. The doctor once found 120 small stones in a single patient but it can occur as a single big stone that fills Hartman's pouch.
- **Cholelithiasis**: means stones in the gallbladder.
- **Cholecystitis**: mean inflammation.
- **Cholecystectomy**: means an operation.
- **Gangrene** (cut of blood supply) happens in appendicitis but **not** in cholecystitis.
- **Obstructive jaundice**: the closure of the CBD by a stone or more, or mud (Thickening of the secretion) and results in obstruction. **Most** common in **Ramadan** due to **dehydration**.

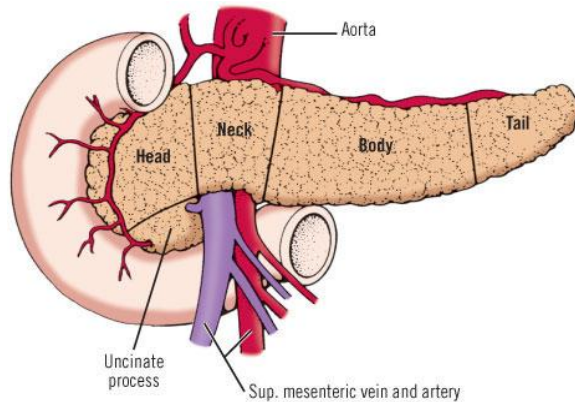
- The bacteria are present as part of the normal flora but they are not pathogenic, Dehydration will decrease the immunity making them more active (Similar to the H. Pylori activation in stomach).

Pancreas

- Extends from the **hilum of the spleen** to the **concavity of duodenum**.
- Retroperitoneal organ.
- Present in the **epigastric** region, behind the stomach.
- We have a **main pancreatic duct** and an **accessory duct**, the main one open at the **major duodenal papilla**, the accessory open at the **minor papilla** which opens **1inch** above the major papilla.
- Considered an exocrine and endocrine gland
 - **Exocrine** consists of pancreatic acini “looks like the parotid gland under the microscope “. The acinus consists of a group of pyramidal cells and at the center we have a lumen, what distinguishes the pancreas is the centroacinar cells and intercalated duct **but there is no striated duct**



- The pancreas is divided into head, body, neck and tail
- The part of the head that's directed medially to the left side of the head is the uncinate process.



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- The tail of pancreas reaches the hilum of the spleen “ it extends to the left hypochondriac region “

- **Anterior relation of pancreas**

1. Transverse colon and mesocolon
2. Stomach and lesser sac

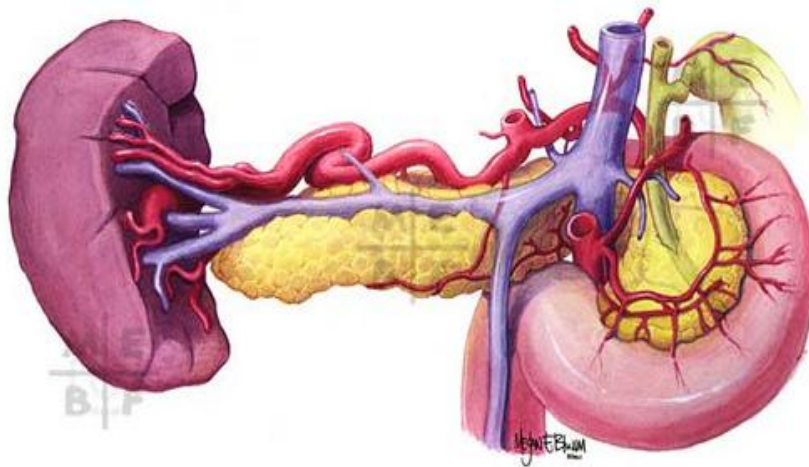
(The transverse colon, mesocolon, pancreas and lesser sac are parts of the stomach bed especially if the mesocolon is very short, but if it was a long mesocolon it won't be behind the stomach and it will descend downwards)

- **Posterior relation:**

1. Bile duct
2. Portal vein....formed behind the neck from splenic and superior mesenteric arteries and behind them IVC.
3. Splenic vein....behind the body of pancreas while the splenic artery found at the upper border and considered a part of the stomach bed.
4. IVC.
5. Aortaat the left side of the IVC.

6. The Origin of superior mesenteric artery...behind the body of pancreas.
7. The left psoas major muscle.
8. The left kidney and left suprarenal gland.
9. Hilum of the spleen is found behind the tail, the tail of pancreas forms an impression at the visceral surface of spleen.

The doctor said that we can consider the tail of pancreas intra peritoneal because it's found between the two layers of splenorenal ligament, and add to the tail the splenic vessels (in the ligament).



Posterior view

- At this picture we should notice the following :
 1. We can see the 2nd, 3rd, 4th parts of duodenum.
 2. The **CBD** passes behind the 1st part of duodenum then behind the head of pancreas.
 3. The portal vein is formed behind the neck of pancreas.
 4. Lymph nodes (pancreatic lymph nodes) then it will be called pancreatico-duodenal lymph nodes and it's also found in the ligaments; gastrosplenic and splenorenal ligament.
- Pancreatico-duodenal lymph node take the venous drainage from the splenic vein and end in the celiac lymph nodes
- In a cross section in pancreas we find
 1. **Islet of langerhans**; endocrine part it consist of alpha , beta, Gama and delta cells, alpha and beta are the most important and

we can distinguish between them under the light microscope; the alpha cells produce glucagon, and beta cells give insulin

2. **Pancreatic Acini**; the cells of pancreas have polarity in which the cell has a basophilic base and acidophilic apex (contains granules for secretion) , exocrine part

Glucagon is produced when glucose level in blood drops below the normal “normal level (70-90) mg/dL, although some books state the normal level is up to 100 and it’s also true” during the exam the glucose level drops because the brain cells consume a lot of energy and as a result, the glucagon is produced to breakdown glycogen and rise the glucose level in the blood to normal ; in contrast if you eat mansaf the glucose level will rise to 200-300 so the beta cells will produce insulin that will decrease the glucose level by forming glycogen or consuming it as energy.

*any defect in the beta cells will result in abnormality in insulin producing (diabetes mellitus)

- There is a balance between the weight and the efficiency of the pancreas
- A person height is 170cm the perfect weight is 70kg, so the pancreas will work well at 70kg, if he was overweight this will create pressure at the beta cells to produce more insulin, and after a while this will result in diabetes mellitus, because the cells can’t work enough in a person with extra weight. (The organs are prepared to work in an ideal wt.)
- The superior mesenteric vessels are found in front of the uncinata process, but they originate behind the body of pancreas from the abdominal aorta.
- Superior mesenteric vessels pass between the head and uncinata process, and pass in front of the horizontal part of duodenum.
- Uncinate process is an extension of the head to the left.

Neck of pancreas:

1. Portal vein form behind the neck from splenic and the superior mesenteric.
2. The neck is between the head and the body.

3. Pancreatic duct and CBD open into the major duodenal papilla.

Body of pancreas:

Cross section of the body of the pancreas shows 3 surfaces and 3 borders:

Surfaces

- **Anterior surface**: Looks oblique in cross section so it's sometimes called superior surface. For the purpose of this sheet, we'll refer to its location as anterosuperior surface. It is covered by peritoneum of the posterior wall of the lesser sac. It is located behind the stomach and related to the lesser sac and the peritoneum that covers the posterior wall of the lesser sac.
- **Posterior surface** has no peritoneum, adheres to the post. Abdominal wall.
- **Inferior surface** covered by peritoneum from the greater sac.

Borders

- **Anterior border** which is attached to the mesocolon, it is located between the anterosuperior and inferior surfaces.
- **Posterior border** comes between posterior surface and anterosuperior surface
- **Inferior border**

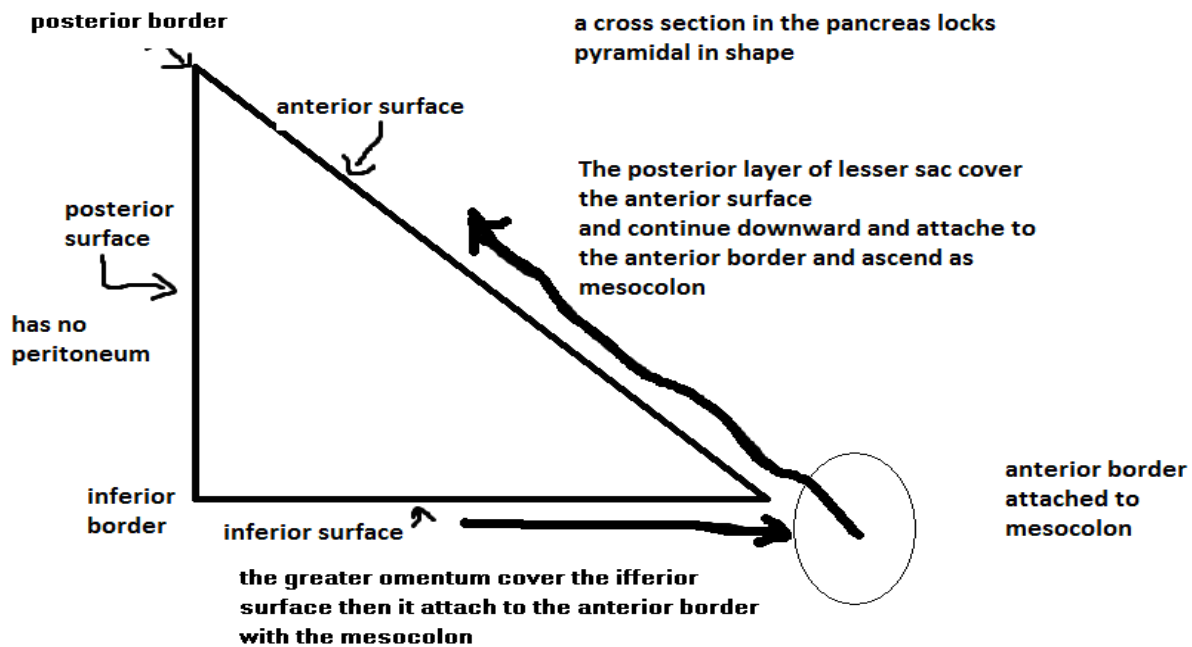
Important Notes about the pancreas surfaces and borders:

- ❖ The anterior surface is covered by peritoneum from the posterior layer of the lesser sac
- ❖ The anterior surface is related to the lesser sac and the peritoneum that cover the lesser sac, the posterior wall, that's going upward.
- ❖ Tuber omental is where the anterior surface joins the neck, a name for the anterior surface in that area.

- ❖ The posterior surface is attached to the posterior abdominal wall, its devoid of peritoneum, posterior relation :
 1. Aorta
 2. Splenic vein
 3. Left kidney and left suprarenal gland

4. The origin of Superior mesenteric artery
5. The crura of the diaphragm

- ❖ The **inferior surface** is narrow on the right but broader on the left, this surface is covered by peritoneum from the greater omentum; when the greater omentum descends as two layers and then ascends as two layers, it attaches to the inferior surface and to the anterior border (as mesocolon), which means that the anterior border separates the inferior surface from the anterior surface.
- ❖ The anterior border separates the antero-superior surface from the inferior surface.
- ❖ To conclude things...the anterior surface covered by posterior layer of the lesser sac and the inferior surface covered by peritoneum from the greater omentum (الدكتور عاد هادي المعلومة مليون مرة)
- ❖ We have two surfaces that are covered by peritoneum antero-superior and inferior surface, Anterior border separate the anterior surface from the inferior surface, and its attached to mesocolon, the greater omentum covers the inferior surface and then it attaches to the anterior border with the mesocolon.



- ❖ The **superior border** is blunt and flat at the right but narrow and sharp to the left

- ❖ It commences on the right in the omental tuberosity.
- ❖ The celiac artery is found above the pancreas so it's related to the superior surface, the hepatic artery is the same since it is a branch from the celiac, the splenic artery runs tortuous on the upper border (superior surface) going towards the hilum of the spleen, at the end of its course it's related to the inferior border.
- ❖ The anterior border separate the anterior surface from the inferior, and along this border the two layers of mesocolon diverge from one another; passing upward to the anterior surface and the other downward to cover the inferior surface.
- ❖ The inferior border separates the inferior surface from the posterior.
- ❖ The superior mesenteric vessels emerge under the right extremity and end its course related to the inferior border.

Tail of pancreas

- It's one of the contents of the splenicorenal ligament.
- **The splenicorenal ligament:** two layers of peritoneums that contain the tail of pancreas and the splenic vessels.
- It forms an impression on the lower part of the hilum of the spleen
- In spleen-ectomy we ligate the splenic vessels and we should be careful not to injure the tail of pancreas, in case of injury the secretion will go to the abdomen and it causes peritonitis

Pancreatic duct

We have **the main pancreatic** and **accessory duct**, the accessory opens 1 inch above the main pancreatic duct and both of them open in the middle of the 2nd part of duodenum,

Pancreas blood supply

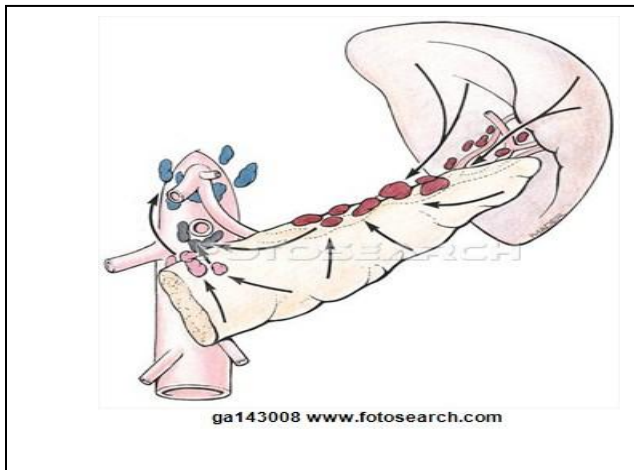
It takes blood from the **splenic artery** and from the **superior and inferior pancreatico-duodenal artery**, the pancreas follow the foregut and midgut because it's supplied by both branches from the celiac and from the superior mesenteric artery

Vein

The veins drain to the **splenic vein** and **superior mesenteric** that form the portal vein

The lymphatic drainage

Pancreaticoduodenal lymph nodes that drain to celiac or superior mesenteric lymph nodes and both of them end in the thoracic duct.



Nerve supply

Sympathetic and parasympathetic chain

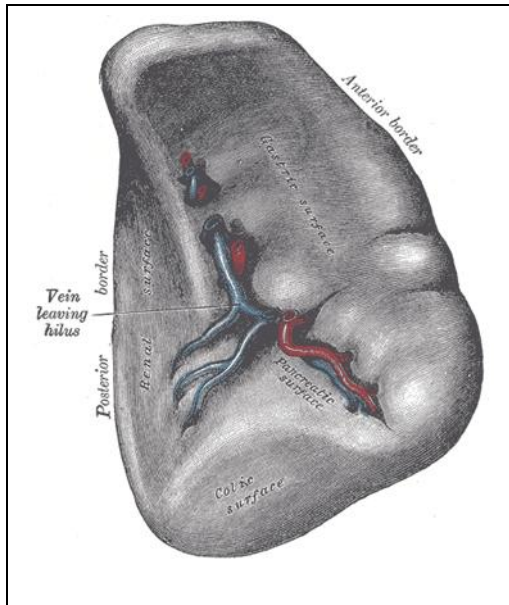
****The congenital defect in pancreas will be discussed in embryology; annular pancreas and ectopic pancreas,**

ectopic mean not in its place in the abdominal cavity, the annular pancreas may result in duodenal obstruction

Clinical cases

- ❖ Cancer head of pancreas : one of the complication is obstructive jaundice because it blocks the common bile duct and the pancreatic duct.
 - ❖ Cancer of the body of pancreas : will form pressure on IVC, that results in congestion of blood especially at the lower part.
 - ❖ Acute pancreatitis: inflammation of the pancreas.
-

Spleen



- The doctor said that we talked about it in practical
- Lymphatic organ, but its considered reservoir of blood
- It has two surfaces two border and two ends

Border

1. Upper border: it has a notch because in the embryo it comes from lobule
2. Lower border: rounded and thick

End

1. Upper end: located 4cm away from the posterior mid line
 2. Lower end: it contacts with the mid axillary line, in the left
- In the left hypochondriac rejoin, related to ribs number 9,10,11 and the longitudinal axis is parallel to the 10th rib (مهم)
 - Any trauma on the left side of the ribs might result in injury to the spleen and this will form internal bleeding and the only treatment is surgery (splenectomy), and we should ligate the splenic vessels.
 - It's completely covered by peritoneum except the hilum that's found between the two layers of splenicorenal and gastrosplenic ligament, but the hilum is very narrow so we consider it completely covered by peritoneum
 - The size (odd numbers)

1 inch thick, 3 inch breadth, 5 inch long, 7 ounce weight

- The splenic vessels give 5-7 branches at the hilum.
- The spleen is related to the stomach, although it's found at the lateral side with greater curvature, considered one of the stomach bed because a part of it is behind the stomach.

Surfaces

1. Diaphragmatic: related to ribs 9,10,11 , and it's also related to left pleura and lung , located above the colicophrenic ligament.
2. Visceral surface : contains gastric impression (above the hilum of spleen) , renal impression (below the hilum) , colic impression (inferiorly) and impression for the tail of pancreas.

- The lower extremity contacts with the mid axillary line

- **Blood supply**

The **splenic artery** (branch from the celiac trunk) that runs tortuous along the upper border of pancreas and at the hilum it gives 5-7 branches

The veins drain to the portal vein

- **The lymphatic drainage at the end will go to the celiac lymph nodes**
- **It take sympathetic and parasympathetic**

“I believe that laughing is the best calorie burner, I believe in kissing, kissing a lot, I believe in being strong when everything seems to be going wrong, I believe that happy girls are the prettiest, I believe that tomorrow is another day, I believe in miracles “