

بسم الله الرحمن الرحيم

## GI Anatomy sheet #5

In this lecture we will complete our previous lecture about " male sexual anatomy" then we will start with a new topic " The peritoneum "...

### Male sexual anatomy :

#### **1-Scrotum:**

~It is an **outpouching** of the lower part of the anterior abdominal wall >> which means that it's outside the body because it contains the testis which are responsible for sperm production and they require 2-3 degrees below the normal body temperature " if the temperature increases above that's required for testis,it will cause death of sperms and lead to infertility as in Varicocele " ...

~It's the site of the testis

~ the scrotum is divided by septum into 2 compartments; each compartment contains:

1) **testis** 2) **epididymis** " each one has : head ,body and tail "

3) Vas deferens (ductus deferens); which is part of the spermatic cord ,that extends from the tail of epididymis

#### **\*\* Layers of scrotum:**

1) **skin:** it's **thin, wrinkled** "due to the presence of dartos muscle which causes wrinkling of the scrotum and the skin appears wrinkled "and **pigmented** " dark brown color "

**2) superficial fascia** " which is continuous with the **fatty layer** of the anterior abdominal wall in which this fatty layer will form a smooth muscle called **dartos muscle** in the scrotum as well as the **membranous layer** which will give **Colle's fascia** in the scrotum "

~both layers of superficial fascia contribute to a median partition that crosses the scrotum and separates the testis from each other.

**3) external spermatic fascia** that derived from the external oblique muscle .

**4) cremasteric fascia and muscle** " derived from the internal oblique ..

~ Cremasteric muscle is innervated by the genital branch of the genitofemoral nerve ...

~Cremasteric reflex which is stimulation on the upper medial side of the thigh causes contraction to the muscle and pulls the testis upward.

**5)internal spermatic fascia** " derived from the fascia transversalis "

**6) tunica vaginalis :** -formed by the processus vaginalis after obliteration around the testis "

obliteration starts from the deep inguinal ring and extend to the testis"

- tunica vaginalis has two layers : **parietal** and **visceral** which is adherent to the testis ..

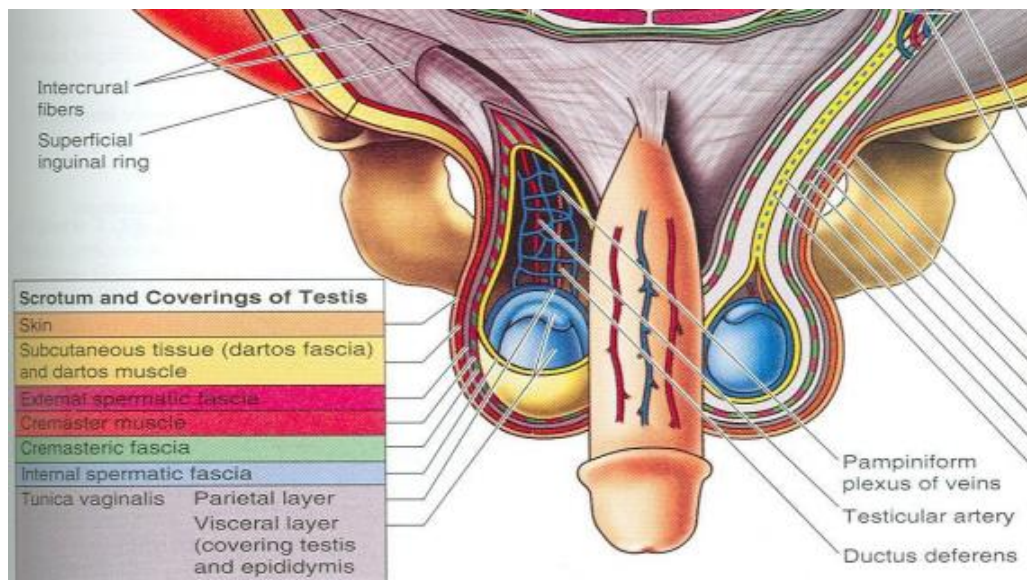
**\*\*NOTE :** hydrocele is the accumulation of fluid within the tunica vaginalis between the parietal and visceral layers ...

Treatment: aspiration of the fluid by needle

\*\*in case of tapping a hydrocele, when we insert the needle in order to draw the accumulated fluid it will traverse all the layers mentioned above ;starting from skin to the parietal layer of tunica vaginalis EXCEPT the **visceral layer** of tunica vaginalis.

why? because the fluid accumulates between the parietal and visceral layers and the visceral layer is adherent to the testis after the accumulated fluid

~ tunica vaginalis surrounds the testis from all sides except **posteriorly** >> so as written in slides tunica vaginalis covers the anterior ,medial and lateral surfaces of each testis " not covering the posterior surface "



## **2- testis:**

~it's a firm, mobile organ, lies within the scrotum.

~the interior of the organ is divided by fibrous septa into **lobules** " about 250 lobules" >> each lobule contains one to three coiled **seminiferous tubules**>> inside these tubules the **sperms**...

~seminiferous tubules accumulate " or open " in a network of channels called the **rete testis**...

~ **small efferent ductules** connect the rete testis to the upper end of epididymis " which is the head of the epididymis" ...

\*\* **NOTE** : left testis lies at lower level than the right ...

~testis is surrounded by a tough fibrous capsule, the **tunica albuginea** ...

## **\*\* Structures inside the testis:**

**1-seminiferous tubules** : thin ,highly coiled structures , responsible for sperm production.

**2- interstitial cells "cell of Leydig "** : secrete testosterone >> testosterone stimulates the somniferous tubules to form sperms.

**3- epididymis** : it's the site of sperm maturation " period of sperm maturation is 10-14 days " .

~it runs along back of testis.

**4- Vas deferens** :

~it's the sperm carrying tube , it's length is 45 cm

~starts from the tail of epididymis, it ascends in the spermatic cord >>then passes through the inguinal canal to the deep inguinal ring >> from the deep ring it passes to the pelvis behind the urinary bladder>> ends as ampulla of the vas, the sperms accumulate in the seminal vesicles and undergo more maturation and nourishment >> from these vesicles the right and left ejaculatory ducts start >> the ducts will end in the prostatic urethra then membranous then the penile urethra then finally to outside the body .

So **ejaculation** means contraction of the seminal vesicles and evacuation of sperms through the penile urethra to outside the body ...

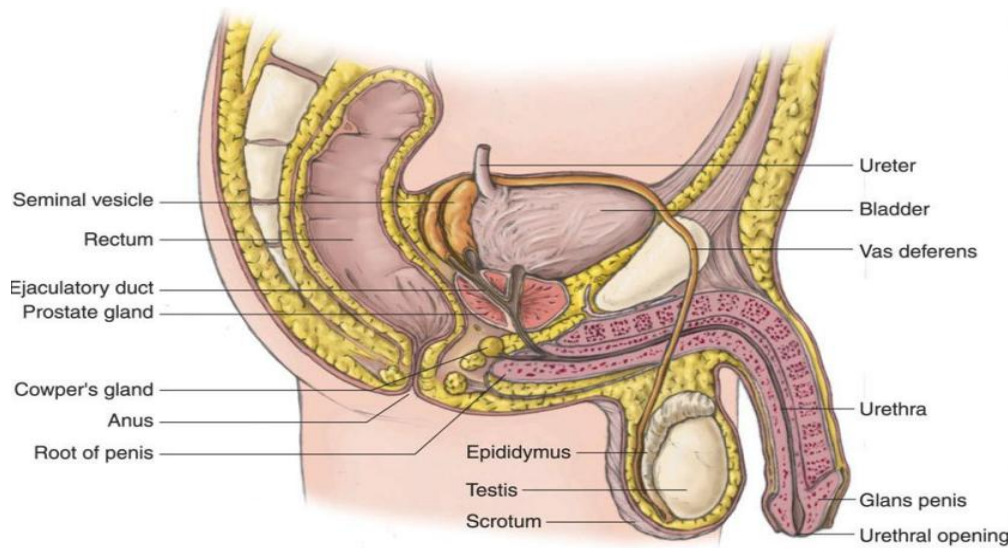
\* The histology of these structures will be in studied in more details in the 3<sup>rd</sup> year ... إن شاء الله

\*About infertility:

Partners don't need to visit the doctor concerning this issue before 2 years of marriage; because in these two years the fertilization and pregnancy might happen, but after 2 years they have to visit the doctor and the first test we ask the male to do is Semin test, because the semen contains the sperms so the lab will take a specimen from the ejaculated semen and the normal number of sperms is usually 100 million to 200-300 million, if the number is less than 40 million → sterile (oligospermia)

no sperms → asospermia

Nowadays, the wall of the testis is examined by surgical microscope and only one sperm is taken, the sperm fertilizes the egg outside the body in a tube, and doctors implant it into the woman's uterus.



Male sexual anatomy: A cross-section side view of male reproductive organs.

## **Blood supply of testis and epididymis**

**Artery :** Testicular arteries>> which are from the abdominal aorta at level of L2 .

**Vein :** pampiniform plexus >>which will be reduced to a single vein >>the single V ascends through the inguinal canal >> at level of the deep ring it forms the testicular vein :

1- Right testicular vein drains into the inferior vena cava

2- Left testicular vein drains into the left renal vein ( the left testis is more descended and the vein is longer so varicocele is more common on the left side)

## **Lymphatic drainage of testis :**

-Lymphatic drainage from testis and epididymis ends into the para aortic lymph nodes at level of L1.

-lymphatic drainage from scrotum and skin ends into the superficial inguinal lymph nodes which are in the femoral triangle ...

## **Nerve supply to testis :**

### **1) Autonomic nerves :**

A- Sympathetic fibers> > around the testicular artery from the renal or aortic sympathetic plexuses ...

B- afferent sensory nerve ; from the scrotum

**2) Genital branch of the genitofemoral nerve :** which supplies the cremasteric muscle and it's responsible for reflexion ...

## **Clinical conditions involving the scrotum and testis :**

### **1)Varicocele :**

means dilatation and tortuous of the veins of pampiniform plexus as a result of standing for long time which might cause stagnation of the blood followed by dilatation and tortuous of the veins such as the policeman and barber and anyone who stands for long time ...

~More common on the left side because the left testicular vein drains into the left renal vein so the venous pressure is higher on the left side ...

~causes infertility in males, but after doing surgery to the male he will back fertile

**vasectomy** :surgical procedure for males done by bilateral ligation and cut of the vas deferens preventing the ejaculation of sperms a and leading to infertility in males, more common in western countries.

**\*\*NOTE** : ligation of fallopian tube in females will prevent the transmission of sperms to the ovum ,so no pregnancy and this will cause infertility in females .

**Processus vaginalis** : - its upper part obliterated just before birth while the lower part will give the tunica vaginalis.

Normally obliterated in the deep inguinal ring.

## **Congenital anomalies of Processus vaginalis : \*\***

1-if it's not obliterated and remain open >> it will cause **congenital indirect inguinal hernia** which is bilateral.

2- if it was obliterated in the middle ( closes in the deep ring and in tunica vaginalis and remains open in the middle) >>causes **congenital hydrocele**

3-if it's obliterated on the upper and lower parts but in the middle there is a cyst >>causes **encysted hydrocele of the cord**

## **2- Hydrocele :**

~ Accumulation of fluid within the tunica vaginalis of the testis,

~ it might be: a- inflammatory, after trauma or inflammation      b- idiopathic, without cause

~treatment: aspiration

## **Congenital anomalies of the testis**

### **Cryptorchidism :**

mal-descending or incomplete descent of the testis although it's traveling **down normal pathway** .

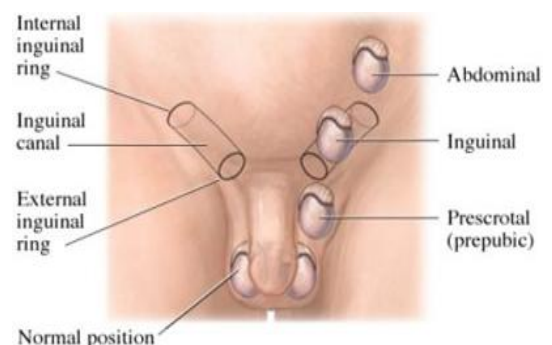
We know that the testis is formed at the level of L1 at the posterior abdominal wall then it descends downward by gubernaculum and processus vaginalis and at the 8<sup>th</sup> month the testis reach the scrotum, but it might stop during its travelling; in this case the testis might be found in :

- 1) abdominal cavity
- 3) superficial inguinal ring
- 4) prescrotal " in the upper part of scrotum but not inside "

~if the testis is not returned to its normal site it might lead to malignancy, and if it was bilateral it leads to infertility

**\*\*NOTE**: males are observed after birth directly to insure that the testis are inside the scrotum in their normal site .

Treatment: surgical procedure as soon as possible



### **Maldescent :**

~testis travel down in an **abnormal pathway**, they might be found in:

- 1) superficial fascia
- 2) root of penis

3) perineum

4) between the two thighs or in the upper thigh .

**\*\*NOTE :** Cryptorchidism is easier in operations of returning the testis to scrotum than maldescent because the testis in the first type is in its normal root " normal pathway of descending of testis but it's not completed " so it's easier to return the testis to its normal place inside the scrotum ,, but in case of maldescent it's difficult to return the testis to its normal site because it travels in an abnormal pathway to an abnormal site.

In maldescent mostly there is atrophy and it might convert to carcinogenic.

تم الجزء الأول بحمد الله والآن نترككم مع الجزء الثاني نتمنى لكم متابعة شيقة ٨٨

Now we will start with a new topic☺

# The peritoneum

\*\*It's an important and difficult subject as our doctor said, you have to study it well because many sawbones don't understand the anatomy of peritoneum which is an important part that they deal with in their job ..

## **General features:**

~ a thin serous membrane.

~~ in order to understand it you have to remember that the abdomen is a large cavity that has an anterior and posterior abdominal walls , superiorly the diaphragm , inferiorly the inlet of pelvis(pelvic viscera) ,, the peritoneum is like a rounded blown balloon inside the abdomen , the wall of this balloon will line the anterior abdominal wall and cover the posterior abdominal wall below the diaphragm and above the pelvic viscera , this outer lining part of the balloon resembles the **parietal peritoneum** in the abdomen and when we open the abdomen it's the last layer that will be found , it lines the anterior abdominal wall and cover the posterior abdominal wall.

Some organs in the abdomen will be invaginated through the balloon "the sac of peritoneum" such as the **stomach** , the balloon will surround the stomach completely and it will become **intraperitoneal** while the peritoneum that is surrounding it is called the **visceral peritoneum**... also **jejunum** and **Ileum** of small intestine "6m in length " will be surrounded completely with the visceral peritoneum ,so they are

**intraperitoneal** organs in which the visceral peritoneum will form an extension to the posterior abdominal wall and this extension is called the **mesentery(two layers of peritoneum-visceral peritoneum attached to posterior abdominal wall)**

~ the **transverse colon(is the only one that has mesentery)** is intraperitoneal and the surrounding visceral peritoneum extend to the post. Abdominal wall of the colon " the extended part is called the **mesocolon(mesentery)** which attach to the post. abdominal wall"

~while the **ascending** and **descending colons** are not invaginated through the peritoneum " not surrounded completely by visceral peritoneum " the peritoneum is found **only anterior** to the organ while posteriorly the organ is not surrounded by the peritoneum ,it lies on the post. Abdominal wall ,, such organs are called **retroperitoneal** organs " also **pancreas, duodenum** , **kidneys ,abdominal aorta** and **inferior vena cava** are retroperitoneal. " ...

\*\* as we said that **pancreas** is a retroperitoneal organ ,so there is no visceral peritoneum posterior to it but the peritoneum that's posterior to it is the parietal peritoneum which is lining the post. Abdominal wall of the abdominal cavity posterior to pancreas ...

~ the peritoneum is found only anterior to the **rectum(which is retroperitoneal)** forming a pouch(space done by peritoneum between the organs) called the **douglas pouch** " which is a space between rectum and uterus ">> upper 3<sup>rd</sup> or rectum is retroperitoneal ...

-small intestines are intraperitoneal and have mesentery

~relation of peritoneum with the **liver** : peritoneum is found anterior and posterior to the liver but there is an area that's not surrounded by peritoneum which is called the **bare area** that's located immediately under the diaphragm >> so liver is an **interperitoneal** organ "we will study them in the end of the sheet " then it ends at porta hepatis(blood vessels that enter the liver)

~Lateral to the liver is the **spleen** ,,peritoneum is surrounding the spleen from all sides except the hilum which is the entrance of the splenic vessels " so spleen is an **intraperitoneal** organ that attaches to the kidney through two layers of peritoneum that are thickened to form the **lienorenal or splenorenal ligament** which contains blood vessels,, while the ligament between the stomach and spleen which is derived from the peritoneum is the **gastrosplenic ligament** ,, so the ligament here is two layers of peritoneum that are thickening to form the ligament which contains blood vessels ...

### \*\* summary :

the peritoneum starts under the diaphragm, lining the anterior abdominal wall >> then it reaches the pelvis above the urinary bladder and uterus >> then passes anterior to the rectum forming the **douglas pouch** >> then it reaches the posterior Abdominal wall close to the abdominal aorta and I.V.C which are retroperitoneal organs >> then it passes anterior to duodenum "but not posterior because duodenum is a retroperitoneal organ " >> then anterior to pancreas >> then moves upward and posterior to the liver below the diaphragm and backs again to the liver where it ends in the **porta hepatis** of the liver "all the liver is surrounded by peritoneum( anteriorly and posteriorly) except the bare area " ...

\*\* so the peritoneum consists of :

### 1)parietal peritoneum :

lines the ant. And post. Abdominal walls.

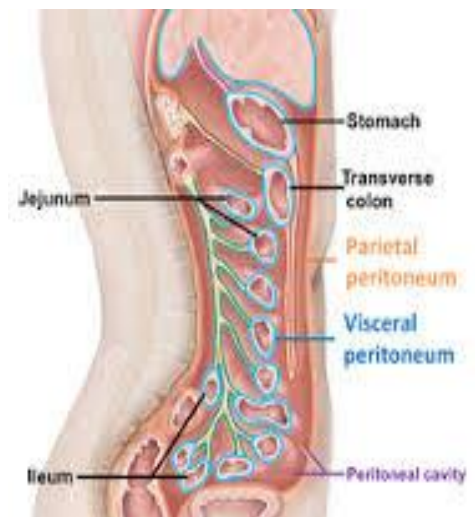
\*\***NOTE** : Peritoneum is continuous below with the parietal peritoneum that lining the pelvis .

### 2) visceral peritoneum :covers the viscera.

### 3) peritoneal cavity :

~ the potential space between the parietal and visceral peritoneum, this space is filled with serous for labrication.

~~ in males this cavity is a closed sac because there is no opening to the outside ,, but in females it's open because there is an opening that communicates the abdominal cavity with the utrine cavity then





finally to outside the body " this opening is formed by the fallopian tube which communicates the abdominal cavity with the uterus and then to the vagina to the outside"

**\*\* NOTE :** In the heart there is parietal and visceral pericardium between them a potential space that causes lubrication .

**\*\*\* Peritoneal cavity in the abdomen is divided into two sacs:**

## **( 1 ) Greater sac :**

~deep to the ant. Abdominal wall " between the anterior and the posterior abdominal walls " , below the diaphragm and above the pelvic viscera" .

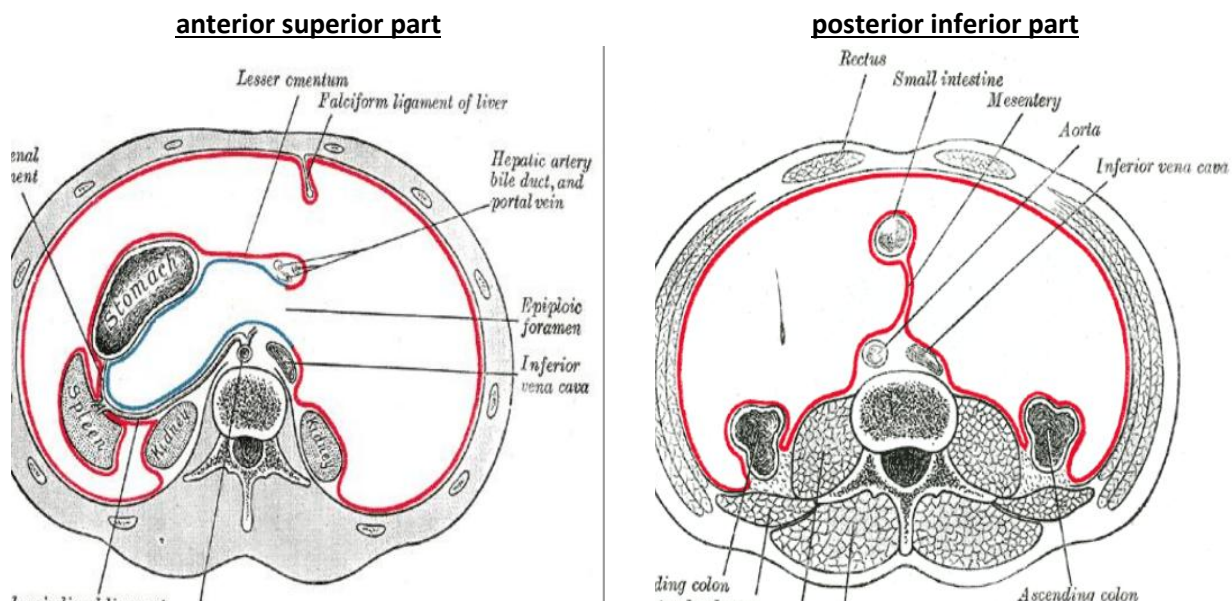
~it's surrounding all the anterior of the liver, also the space between the stomach and the anterior abdominal wall ,, it's anterior to the intestine

~it's subdivided by the greater omentum into:

1- **anterior superior part**>> " divided by the falciform ligament into : **right and left parts** " .

2- **posterior inferior part**:>> divided by the mesentery of small intestine into right and left parts .

**\*\*NOTE :** **falciform ligament** is two layers of peritoneum that contain : fat , blood vessels and lymphatics ,, it's between the anterior abdominal wall and the liver ...



## **2) Lesser sac :** ( called the **omental bursa** )

~ posterior or behind the stomach and behind the inferior layer of coronary ligament of the liver,, below the diaphragm and the liver ...

~ deep to the lesser omentum and between the two layers of greater omentum ...

## **\*\* Omentum :**

~it's two layers of peritoneum ,, includes :

**a- lesser omentum** >> starts as two layers of peritoneum (contains blood vessels, nerves, fat) one on the anterior surface and the other on the post. Surface starting from the **porta hepatis** of the liver to the **lesser curvature** of stomach.

~**NOTE** : **porta hepatis** is the entrance or the exit of the vessels to or out from the liver such as the hepatic A and the portal V also the common bile duct which get out from the liver through porta hepatis ...

**b- greater omentum** :~two layers of visceral peritoneum from the **greater curvature** of stomach . first it surrounds the stomach then it descends downward through the abdominal cavity then it ascends upward as two layers to reach the transverse colon ,one layer surrounds the transverse colon anteriorly and the second layer surrounds it posteriorly to meet the mesocolon "mesocolon comes from the post. Abdominal wall" ,, so the transverse colon is an intraperitoneal organ where the greater omentum meets the mesocolon ... and it is surrounded by two layers of peritoneum

**anteriorely**-greater omentum

**posteriorely**-mesocolon

**then it goes to the liver behind the diaphragm**

**\*\*NOTE** : The clinical importance of the lesser sac is in the surgeries that are posterior to stomach which must pass through the lesser sac which has one opening called the **epiploic opening ( or foramen of Winslow)**.

## **\*\*Epiploic opening ( or foramen of Winslow):**

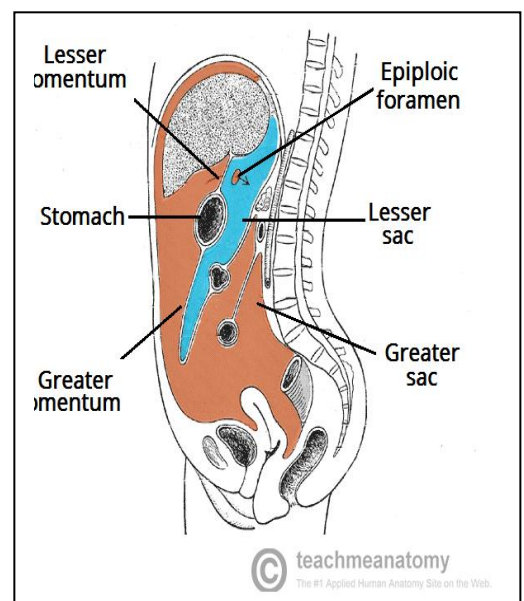
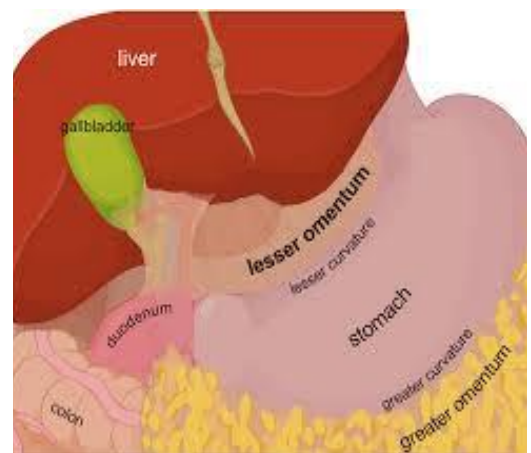
~ it's the opening which connects the greater sac with the lesser sac and leads to the lesser sac ...

~it's deep to the lesser omentum , posterior to the stomach and anterior to pancreas ,it's within the lesser sac between the two layers of greater omentum ...

~**Boundaries of the foramen** :

-**Anteriorly** : free edge of lesser omentum which contains :

- 1) common bile duct " right and anterior "
- 2)hepatic A "left and anterior "
- 3)portal V "posteriorly "

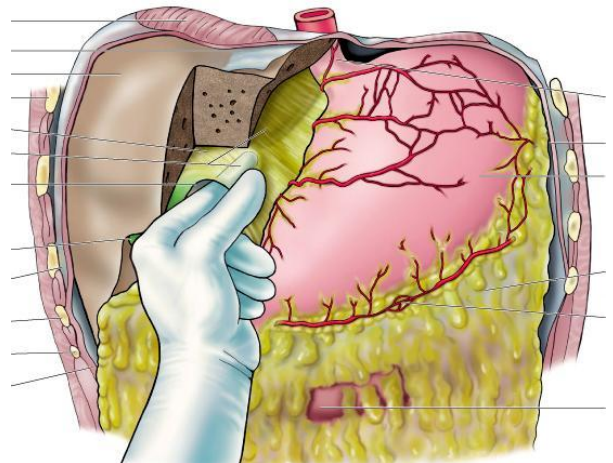


\*\* when the surgeon put his index in the anterior part of the epiploic foramen ,he will reach the free edge of lesser omentum which is important because it contain some important structures ...

- **Posteriorly** : I.V.C

-**Sup.:** caudate process of caudate lobe of the liver

-**Inf.:** the first part (inch) of duodenum .



## **Functions of peritoneum :**

1-secretes a lubricating serous fluid that continuously moistens the associated organs

2- fat storage (between parietal and visceral there is a high amount of fat)

3- defense role : due to the presence of lymphatic vessels and nodes and also large amount of fat

Clinical importance: any infection in any abdominal organ, the infection will be surrounded by greater omentum (helps in localizing the infection)

4-support and protection to the viscera.

## **\*\* Intraperitoneal organs:**

surrounded completely by the visceral peritoneum.

examples: **stomach ,jejunum and ileum ,cecum ,vermiform appendix ,first inch of duodenum ,transverse and sigmoid colons ,spleen and ovary...**

-the duodenum is retroperitoneal except first inch because it is the end of stomach and the last inch because it is the beginning of jejunum

## **\*\* Retroperitoneal organs :**

they are partially covered by peritoneum on their anterior surfaces only ,so these organs are attaching to the post. Abdominal wall posteriorly because there is no peritoneum posteriorly ...

examples : **kidneys , suprarenal glands , pancreas ,ascending and descending colons , upper 3<sup>rd</sup> of rectum ,duodenum** except the first and last inches , **ureter, aorta and I.V.C** ...

## **\*\* Interperitoneal organs :**

they are not completely surrounded by peritoneum in which one surface of the organ is not surrounded by peritoneum and it's attached to the abdominal walls or to other organs ... examples : **liver** which is surrounded by peritoneum anteriorly and posteriorly except the bare area , **urinary bladder** because it's surrounded by peritoneum only on its upper surface forming a pouch ,**gallbladder** and **uterus** ...

Sorry for any mistake ☺

تم بحمد الله وفضله

\*\* لليوم فقط سأعيش فيا ماضٍ اذهب واغرب كشمسك فلن أبكي عليك ،، ولن تراني أفق لحظة لأتذكرك إلا لأستفيد من تجاربك ،، ويا مستقبل أنت في عالم الغيب الذي هو بيد رب السماوات ورب الأرض فلن أقلق عليك وسأستعد لك بإنجاز عملي الحاضر واتقانه بكل ما أملك من قوى .. ولن أسمح لأحد أن يوقفني عن طريقي الذي بدأت به ما دام ربي معي يعينني ويهديني .. قال تعالى : "قل لن يصيبنا إلا ما كتب الله لنا هو مولانا وعلى الله فليتوكل المؤمنين " .. قل يا رب وامض فقط

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