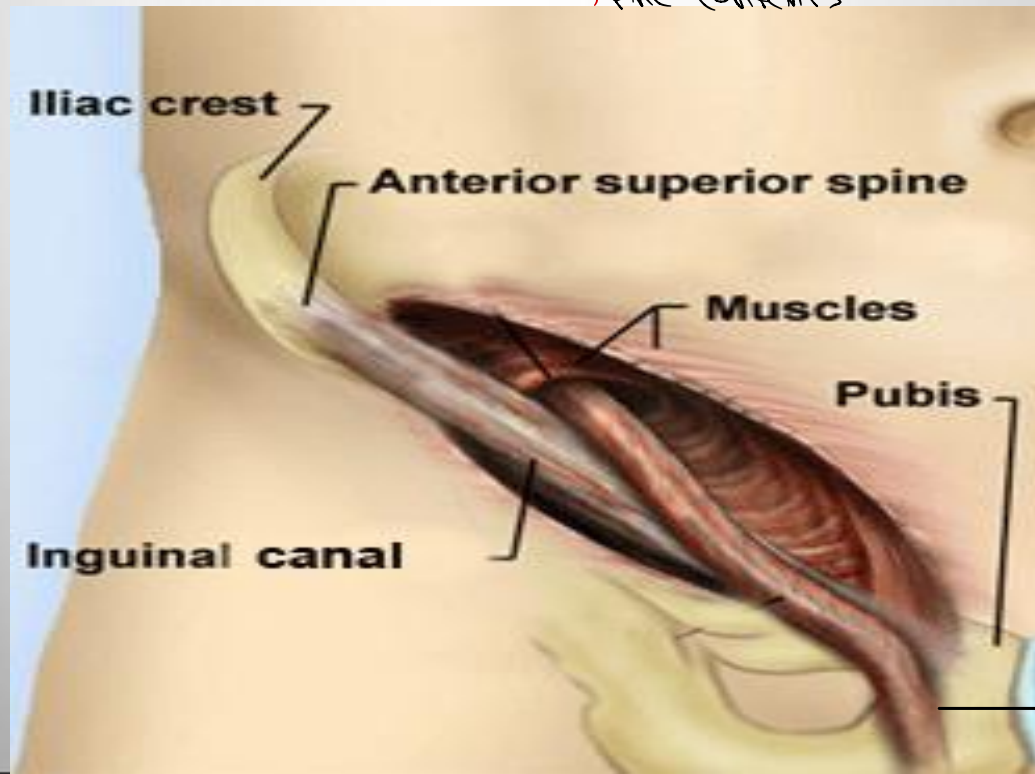


Inguinal canal

Important outcomes from this lecture =>

- 1) what is the inguinal canal?
- 2) its boundaries
- 3) type of hernia
- 4) the contents



Inguinal Canal

- It is an oblique passage through the lower part of the anterior abdominal wall *above the medial part of the inguinal ligament*

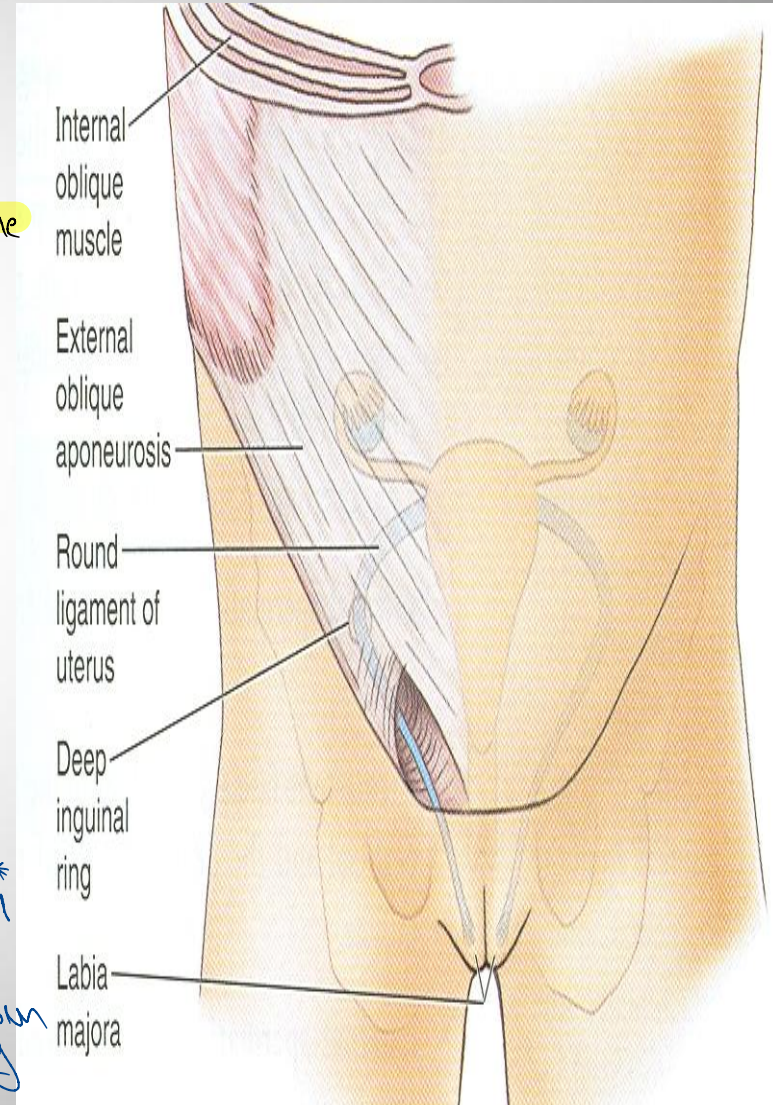
- Present in both sexes

- It allows *spermathe cord = sperm* structures to pass to and from the testis to the abdomen in males

- In females it permits the passage of the round ligament of the uterus from the uterus to the labium majus

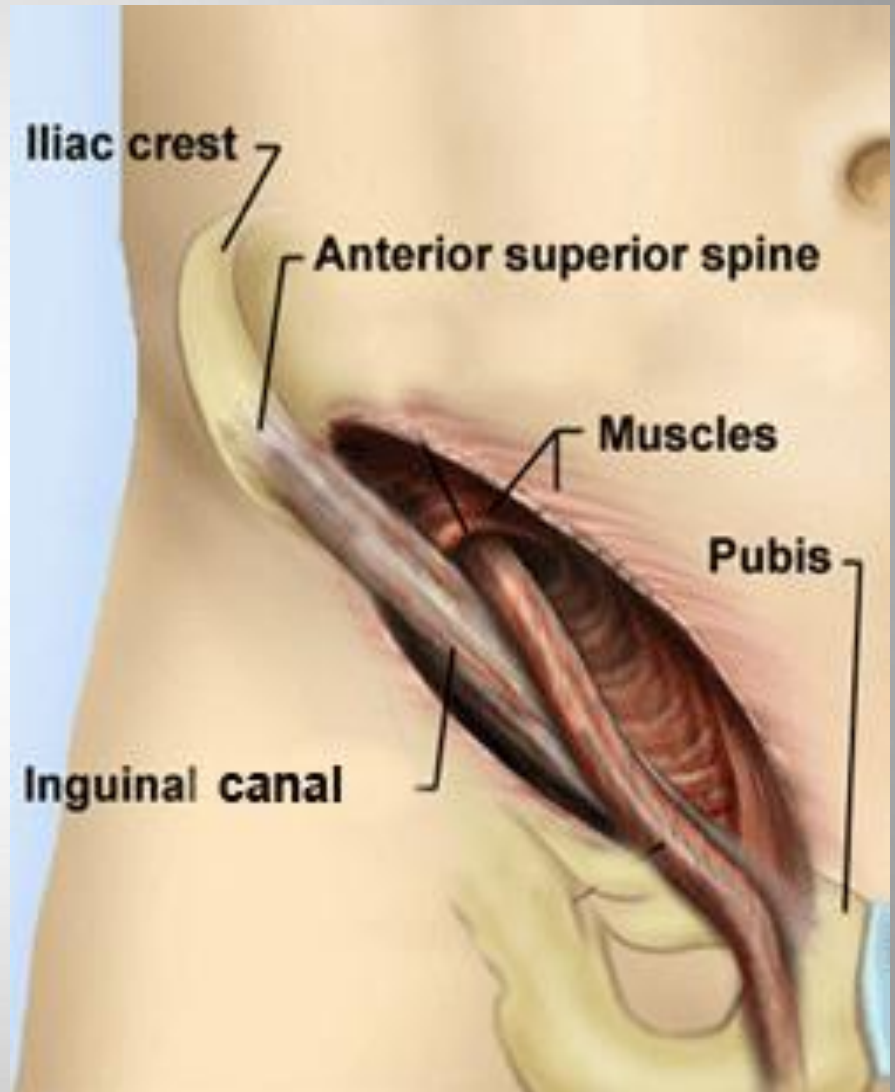
- Transmits ilioinguinal nerve in both sexes

- other structures than this in start from the deep ring through the superficial ring*
- other structures pass through it ⇒ genital branch of genito femoral nerve



Inguinal Canal

- It is about 1 ½ inches or 4cm long in the adults
- Extends from the deep inguinal ring downward and medially to the superficial inguinal ring
- Lies parallel to and immediately above the inguinal ligament
- In the newborn child, the deep ring lies almost directly posterior to the superficial ring



→
شمال ← اليمين
عقب opposite الجناح → No rings at
very short ← → (inguinal canal)

Deep Inguinal Ring

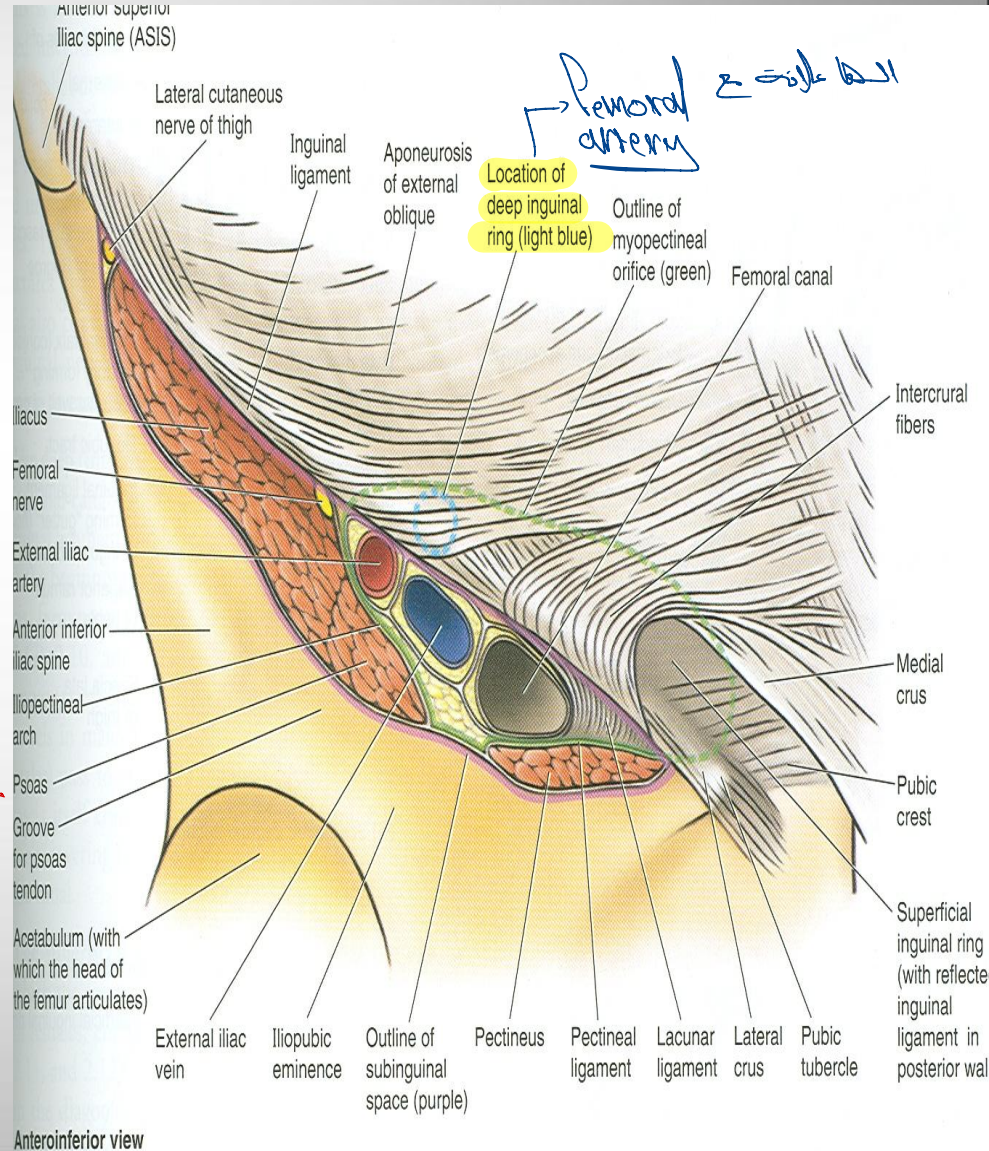
- Is an oval opening in the fascia transversalis

الطبقة = fascia
muscle = fascia transversalis

- Lies about ½ inch (1.3cm) above the inguinal ligament midway between the anterosuperior iliac spine and the symphysis pubis

* المسافة = 1.3 cm
عن طرف ال inguinal ligament
Pectoral D. = 1.3 cm
من طرف ال inguinal ligament

- Margins of the ring give attachment to the internal spermatic fascia



◦◦ Spermatic cord 3 layers lie \rightarrow ? internal spermatic fascia \rightarrow *
◦◦

1) Internal spermatic fascia $\circ\circ$ from the edge of deep ring

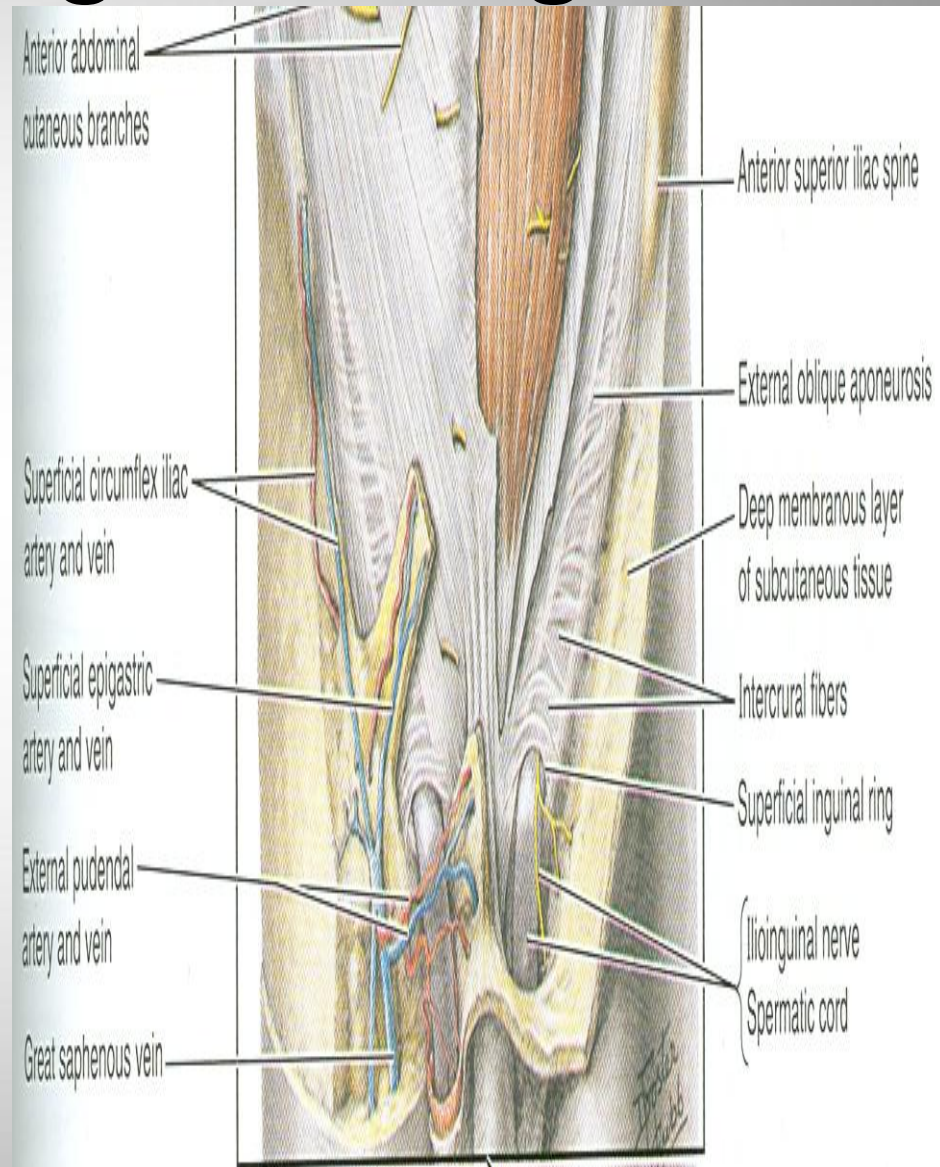
2) Cremasteric muscle and fascia $\circ\circ$ from the inguinal canal.

3) External spermatic fascia $\circ\circ$ from the edge of superficial ring

* السلامة $\circ\circ$ بجز انكم ما واصلتوا فاد الجزء الثاني الحافرة الاولى والـ GI نتمسك بالجزء
فاحسنوا حالكم لو $\circ\circ$ تلك عسات توخينا اجر وانتم تبرسوا والـ ببارك وقتكم
ومسلككم وادعوا بطلبتكم

Superficial Inguinal Ring *has 2 crura*

- **Triangular in shape**
- **Defect in the aponeurosis of the external oblique muscle**
- **Lies immediately above and medial to the pubic tubercle**
- **Its margins some times called crura (Med & lat crus), give attachment to the external spermatic fascia**



Its floor is the inguinal ligament

Anterior Wall of Inguinal Canal

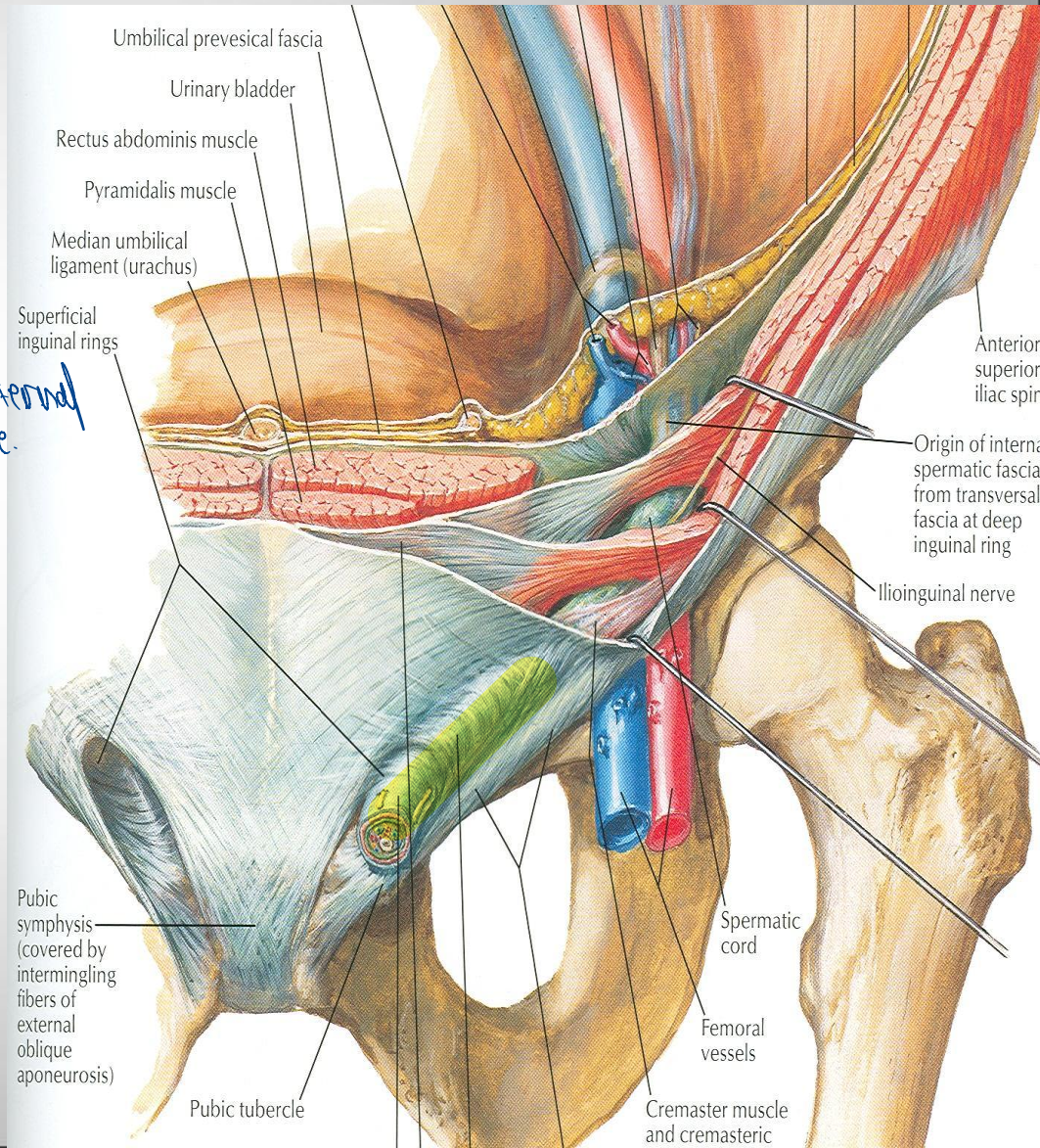
- It is formed along its entire length by **aponeurosis of the external oblique muscle**

* laterally anterior ⇒ fleshy fibers of internal oblique.

- It is reinforced in its lateral third by the origin of the internal oblique from the inguinal ligament

lateral →
fibers →
Roof →
↳

- This wall is strongest where it lies opposite the weakest part of posterior wall, that is deep inguinal ring

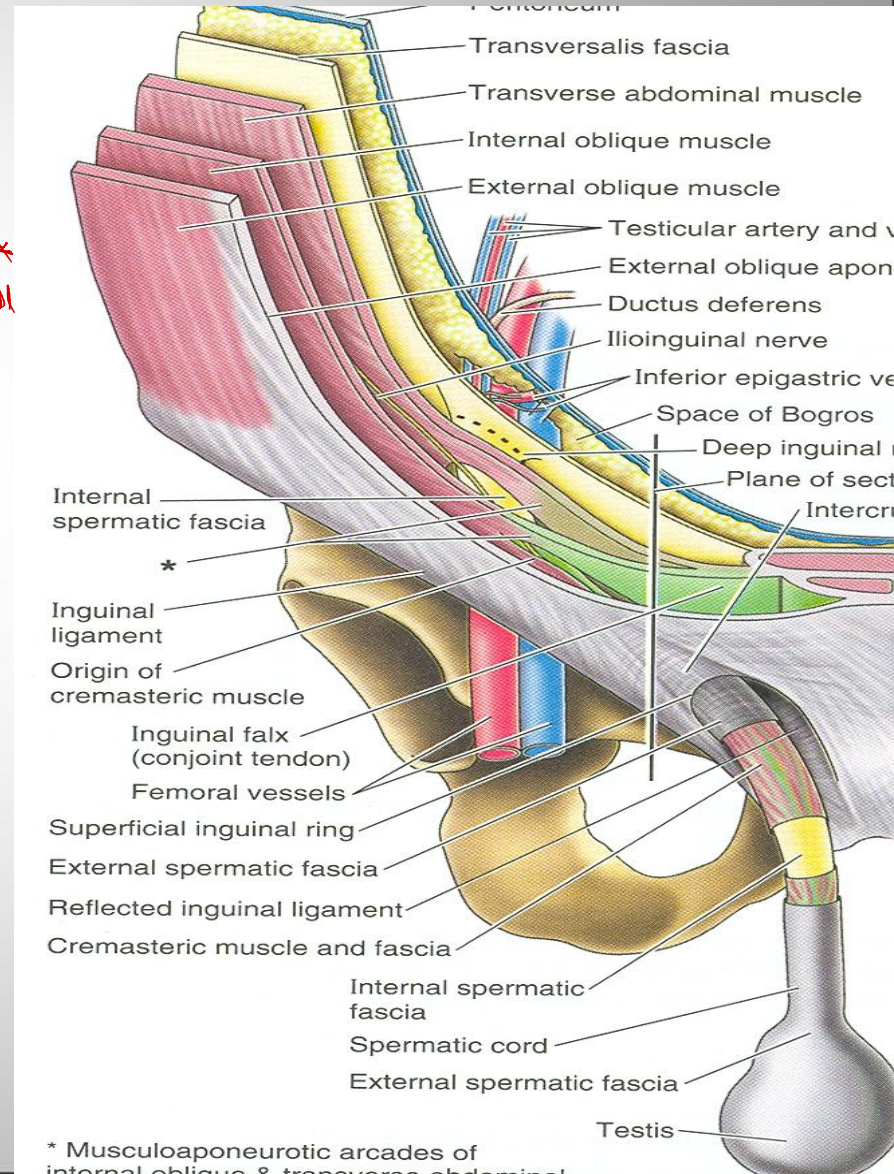


Posterior Wall of Inguinal Canal

- It is formed along its entire length by the fascia transversalis
- It is reinforced in its medial third by conjoint tendon, the common tendon of insertion of internal oblique and transversus, attached to the pubic crest and pectineal line
- This wall is strongest where it lies opposite the weakest part of the anterior wall, that is superficial inguinal ring

*قناة الخصية هي التي تدعمها جدار القناة
 → Walls also support testis*

*opposit
 to the
 superficial
 ring*



* Musculoaponeurotic arcades of internal oblique & transversus abdominis

Inferior Wall of Inguinal Canal = floor

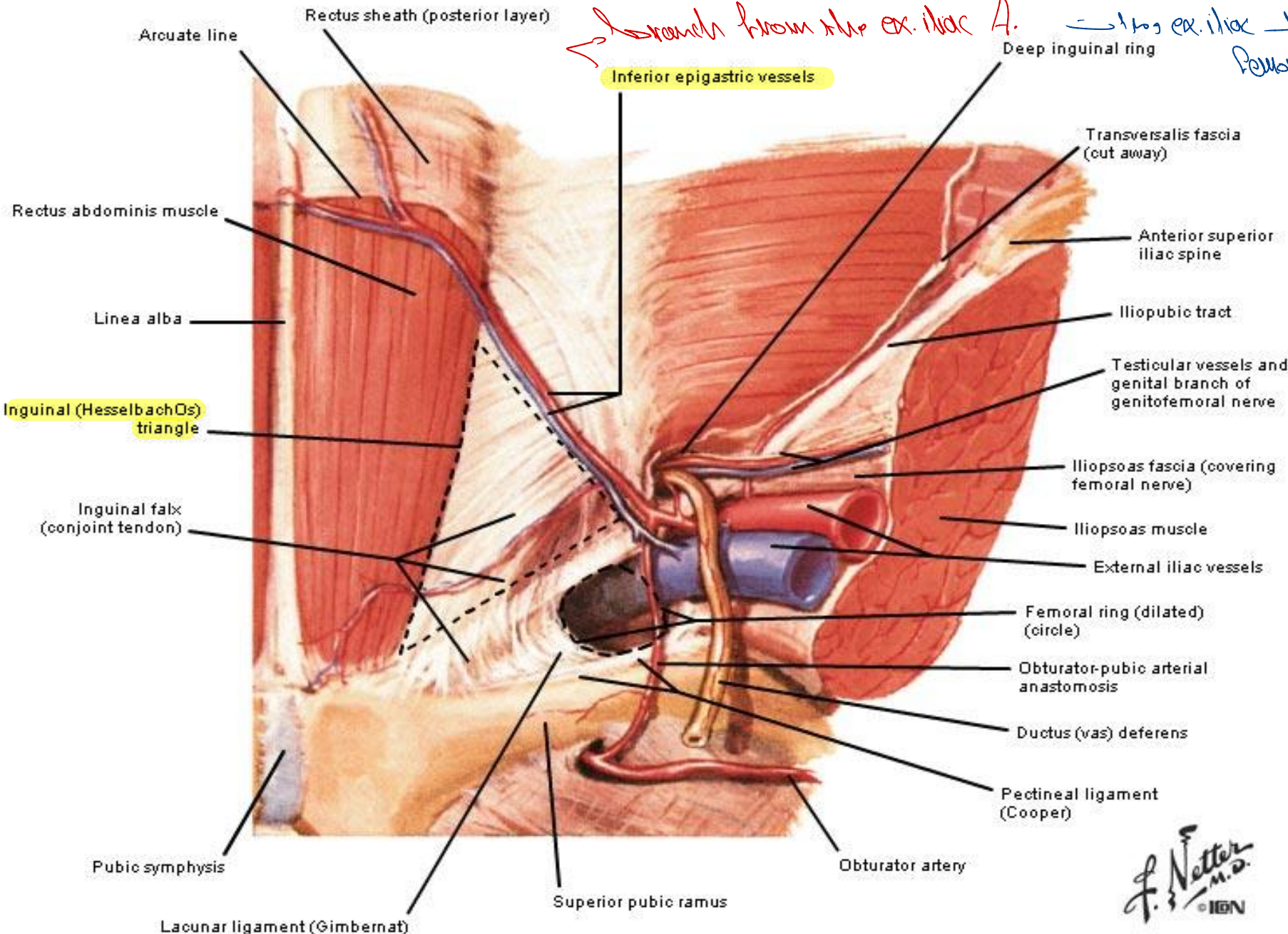
- It is formed by the rolled-under inferior edge of the aponeurosis of the external oblique muscle called inguinal ligament and at its medial end, the lacunar ligament *which support the inguinal ligament.*
- Superior Wall of Inguinal Canal = Roof
- It is formed by the arching lowest fibers of the internal oblique and transversus abdominis muscles

Inguinal Region

Dissection - Posterior (Internal) View

* بالسنه
 Superior epigastric A. →
 all tributaries →
 ex. iliac →
 Femoral →

Branch from the ex. iliac A.



F. Netter
 M.D.
 © IGM

Spermatic Cord \Rightarrow "2 تاخورد بالانفصال" مع الـ "Fellus"

- It is a collection of structures that pass through the inguinal canal to and from the testis



- It is covered with three concentric layers of fascia derived from the layers of anterior abdominal wall
- It begins at the deep inguinal ring lateral to the inferior epigastric artery and ends at the testis

← " حكاية الـ سبور انهم
للحرفه "

Structures of Spermatic Cord

Posterior abdominal wall at the level of L1 → ovaries and testis

• Vas deferens

بجانب في السبور المراجع عن الحبل ← الحبل PUS ودم

• Testicular artery and vein

حبل الحبل gubernaculum ومع رجز سبور

• Testicular lymph vessels

ما سبب الـ testis وسبب الـ وجز الـ من الـ

• Autonomic nerves

حتى يكون الـ Superficial or Deep ring

• Processus vaginalis

وهو الـ testis - نزل - الـ الـ الـ

سبور الحبل الحبل → PUS

الـ testis الـ الـ الـ

• Cremasteric artery

وهو الـ الـ الـ الـ

• Artery of the vas deference

في حال الـ الـ الـ

• Genital branch of genitofemoral nerve

* حبل الـ الـ الـ الـ الـ الـ

cremasteric muscle → الـ الـ

alcohol الـ الـ الـ الـ

Covering of the Spermatic Cord

* حسیله فوق الازار سے تلبا دے

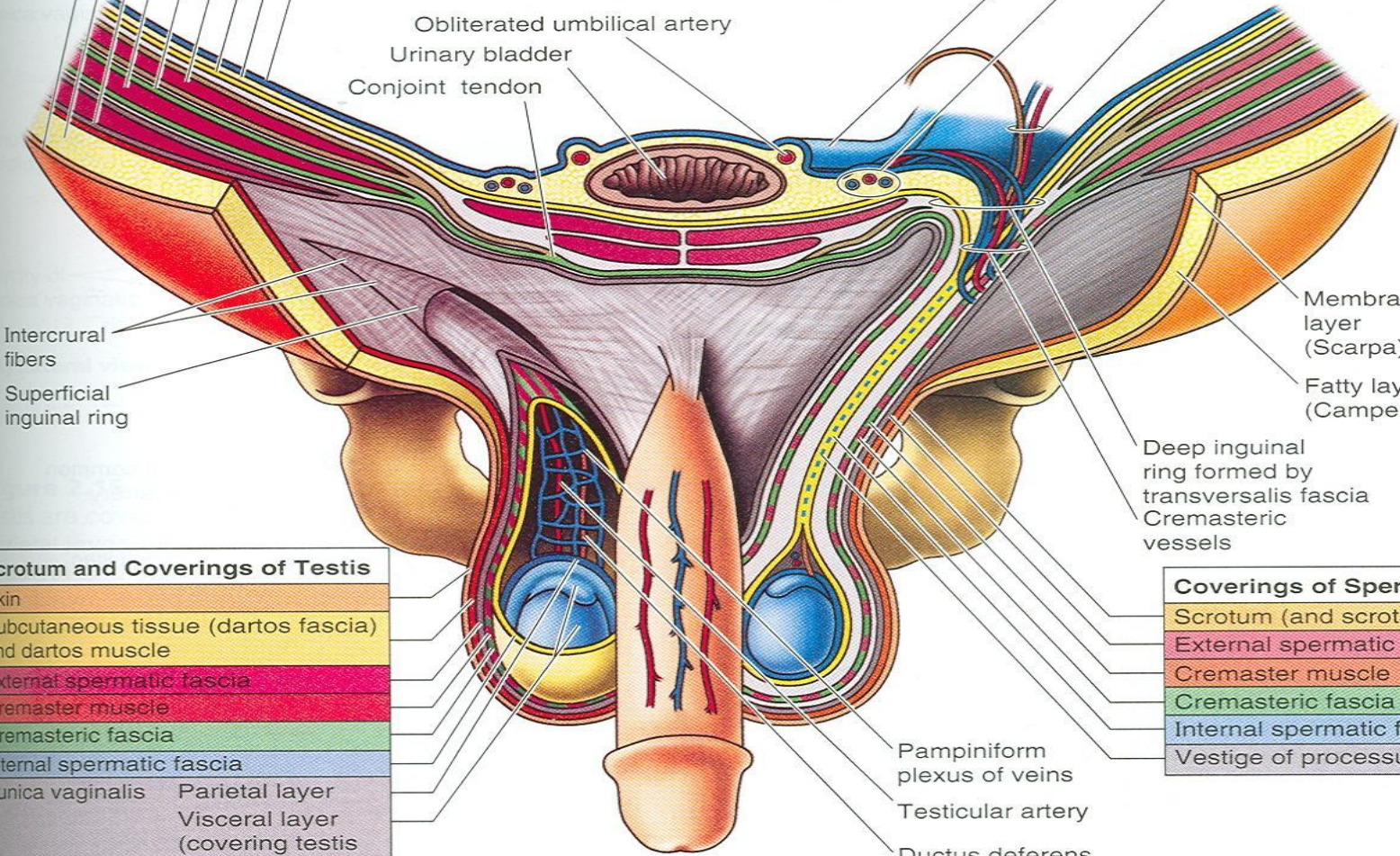
- The covering of the spermatic cord are three concentric layers of fascia derived from the layers of the anterior abdominal wall
- Each covering is acquired as the processus vaginalis descends into the scrotum through the layers of the abdominal wall
- External Spermatic fascia: Is derived from the external oblique aponeurosis and attached to the margins of the superficial inguinal ring
- Cremasteric Fascia: Is derived from the internal oblique muscle
- Internal Spermatic Fascia: Is derived from the fascia transversalis and attached to the margins of deep inguinal ring

Corresponding Layers of the Anterior Abdominal Wall, Scrotum, and Spermatic Cord

Layers of Anterior Abdominal Wall	
Skin	
Subcutaneous tissue or superficial fascia	
External oblique muscle	
Internal oblique muscle	
Fascia of both superficial and deep surfaces of the internal oblique muscle	
Transverse abdominal muscle	
Transversalis fascia	
Extraperitoneal fat	
Peritoneum	

Obliterated umbilical artery
 Urinary bladder
 Conjoint tendon

Medial umbilical fold
 Inferior epigastric vessels
 Testicular artery and vein and ductus deferens



Intercrural fibers
 Superficial inguinal ring

Membranous layer (Scarpa)
 Fatty layer (Camper)
 Subcutaneous tissue (dartos fascia)

Deep inguinal ring formed by transversalis fascia
 Cremasteric vessels

Scrotum and Coverings of Testis	
Skin	
Subcutaneous tissue (dartos fascia) and dartos muscle	
External spermatic fascia	
Cremaster muscle	
Cremasteric fascia	
Internal spermatic fascia	
Tunica vaginalis	
Parietal layer	
Visceral layer (covering testis and epididymis)	

Coverings of Spermatic Cord	
Scrotum (and scrotal septum)	
External spermatic fascia	
Cremaster muscle	
Cremasteric fascia	
Internal spermatic fascia	
Vestige of processus vaginalis	

Pampiniform plexus of veins
 Testicular artery
 Ductus deferens

Vas Deferens

- It is a cord like structure
- Can be palpated between finger and thumb in the upper part of the scrotum
- It is a thick walled muscular duct that transport spermatozoa from the epididymis to the prostatic urethra *testis → epididymis*

Testicular Artery

- It is a branch of abdominal aorta at level of L2
- It is long and slender
- Descends on the posterior abdominal wall
- It traverses the inguinal canal and supplies the testis and the epididymis

Testicular Veins

* Varicocele ال
Left ال
وانا
Sperms ال

- These are the extensive venous plexus, the pampiniform plexus
- Leaves the posterior border of the testis
- As the plexus ascends, it becomes reduced in size so that at about the level of **deep inguinal ring, a single testicular vein is formed**
كفون يتكون
- Drains into left renal vein on left side and inferior vena cava on right side

* ليست - دبا خلقا - Testis in scrotum خارج الكيس -

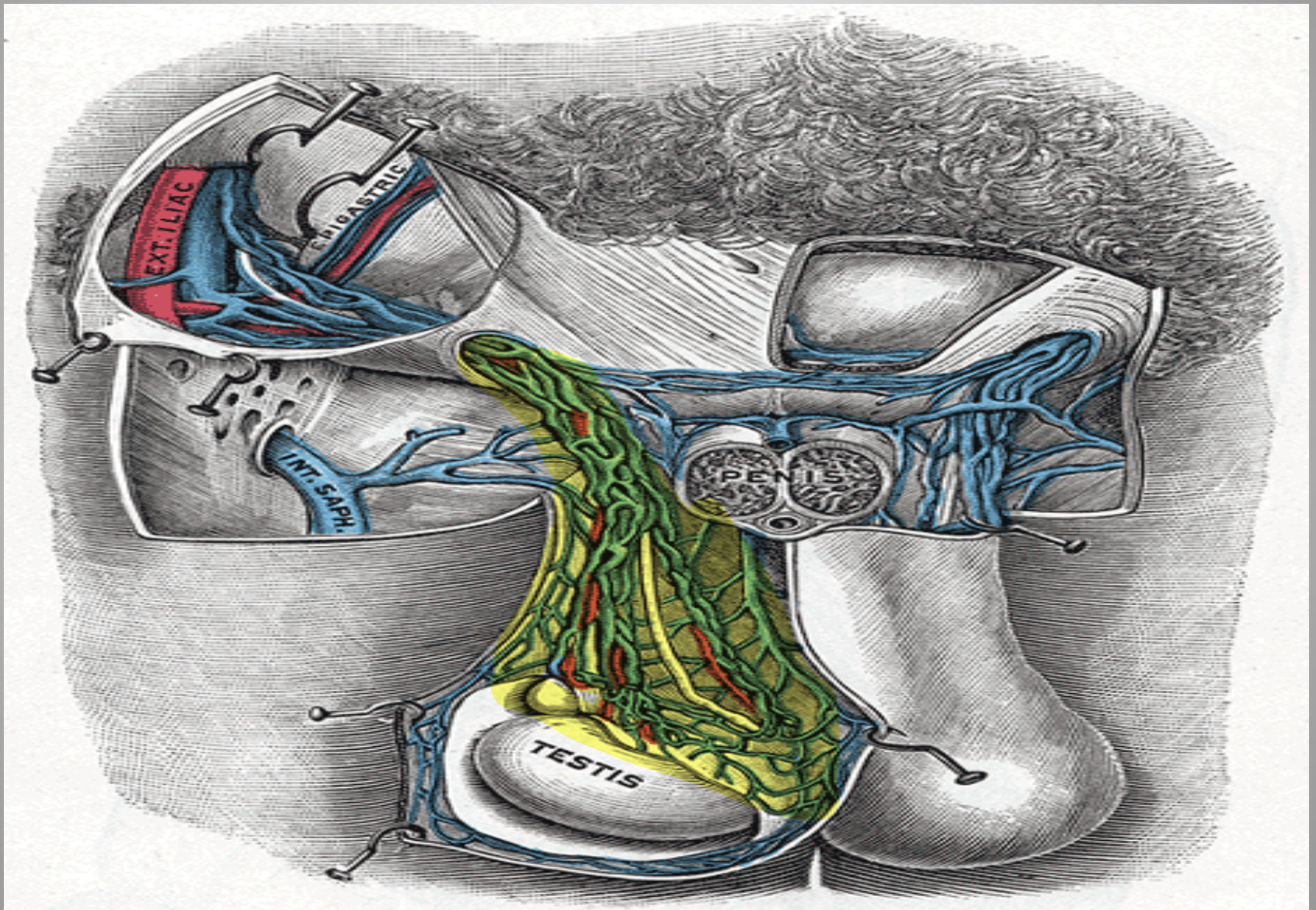
عنتان formation of sperm تكون خارج الكيس لان spermus لم يولدوا عن طريق الرحم لدرجة حرارة الكيس
لذلك لم ينجوا بها الكيس عنتان يظلوا في قبة الحياة، حيث اذا زادت درجة الحرارة لم يولدوا (لهذا - حكمة دبا).

* مع العرق، دوالي - الكيس حكيما يمتلئ قبل ان يمتلئ الكيس - spermus كيف ؟

عن طريق ادخالها بترتيب درجة حرارة scrotum ويقتل sperm.

* عن اجراء عنتان - bambusini pleaus - جمع الاسمى خاد - Penitization

Testicular artery & vein



Autonomic nerve & Genitofemoral nerve

Autonomic nerves

sympathetic
parasympathetic

- Sympathetic fibers run with testicular artery from renal or aortic sympathetic plexuses
- Afferent sensory nerve

Genital branch of the genitofemoral nerve

- Its root L1 & L2
- Supply the cremasteric muscle

Testicular lymphatic vessels

lymphatic drainage إلى الـ جدار *
الـ جدار *

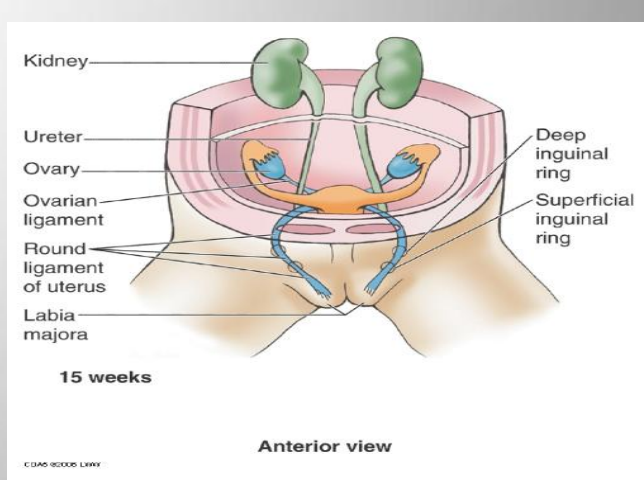
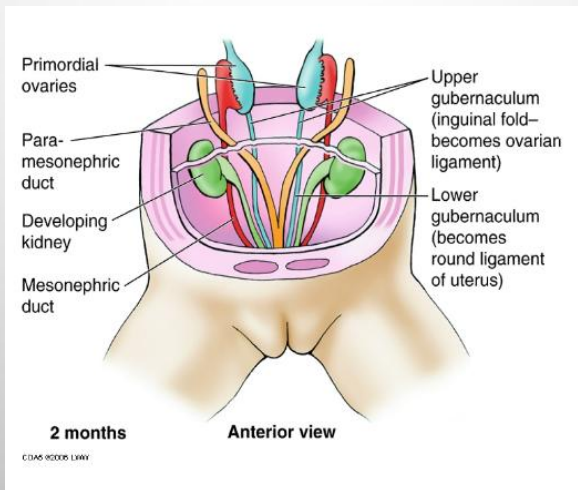
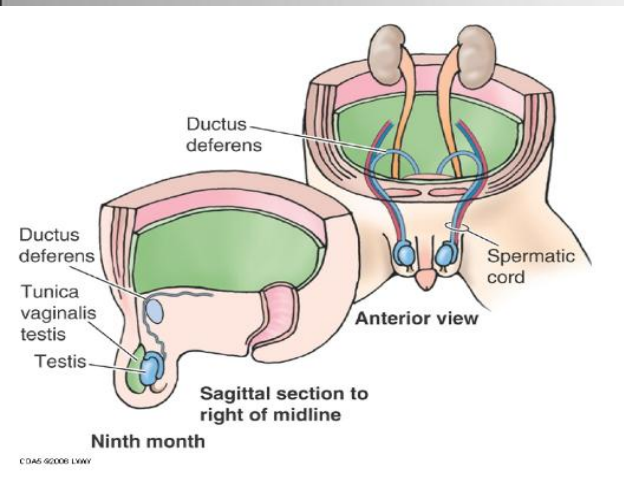
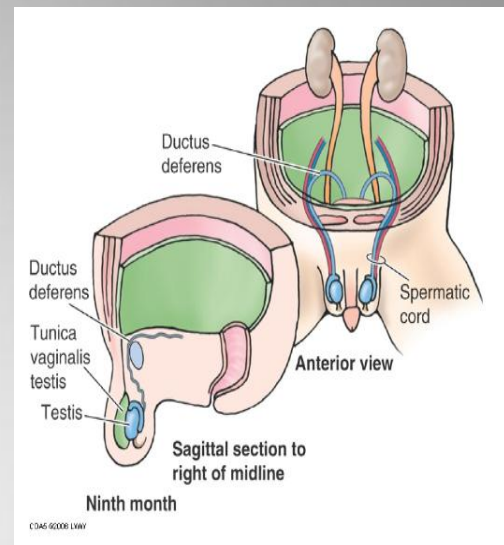
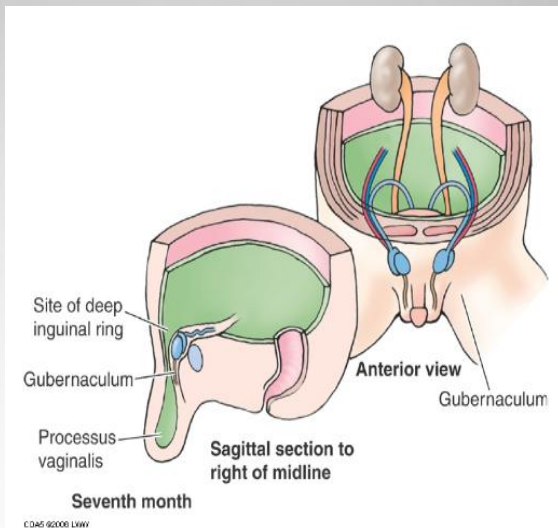
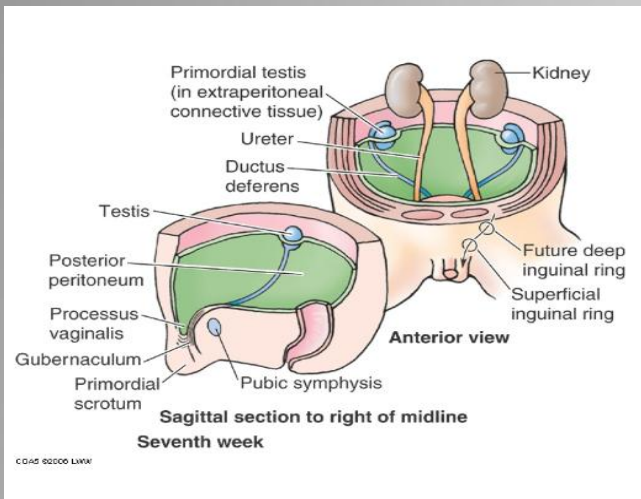
- Ascend through the inguinal canal
- Passes up over the post. Abdominal wall
- Reach the lumbar (Para-aortic) lymph nodes on each side of the aorta at level L1

Processus vaginalis ⇒ لحمية من جدار البطن

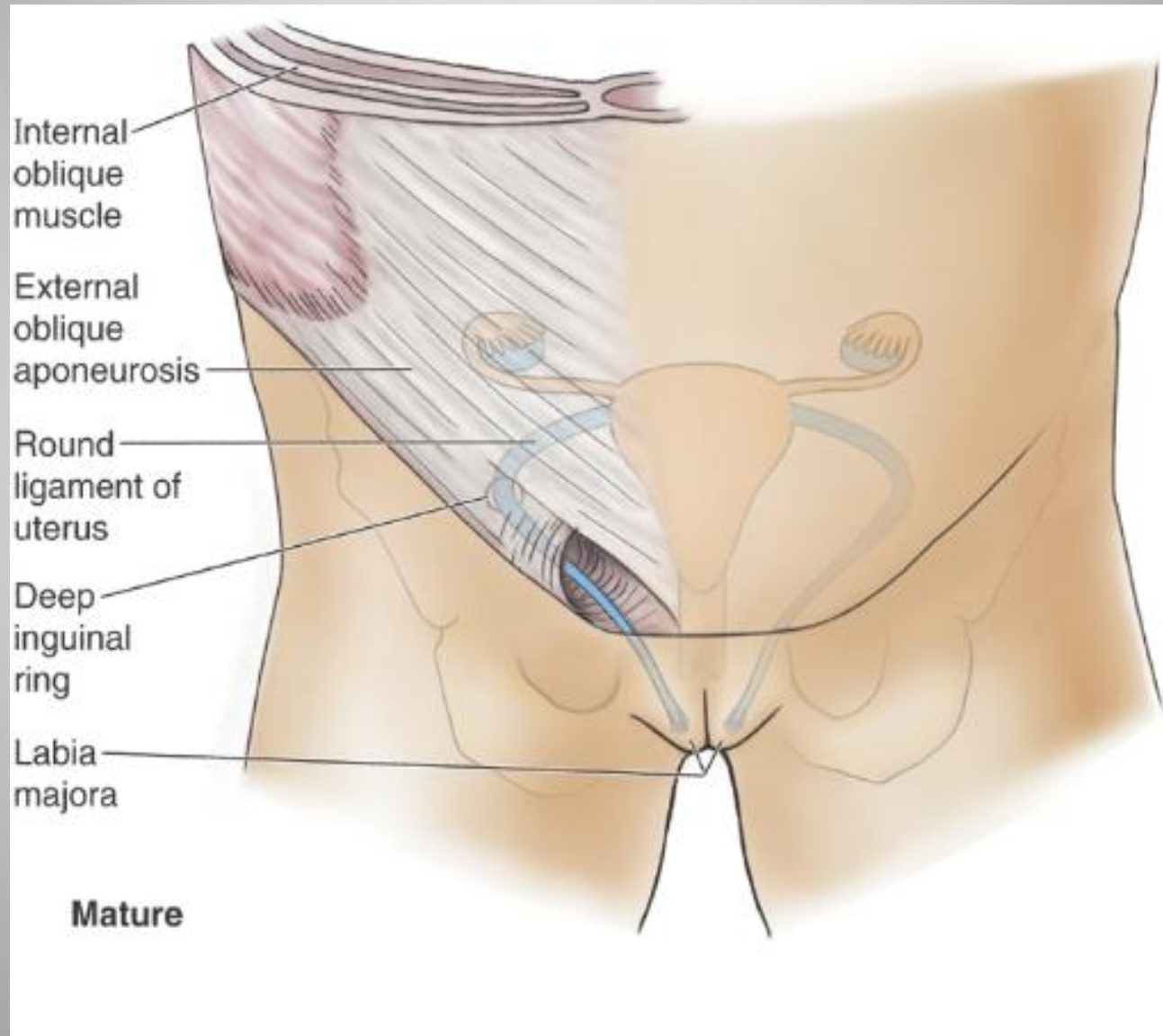
- An out pouching of peritoneum that in the fetus is responsible for the formation of the inguinal canal
- The remains of the processus vaginalis causes the indirect hernia

حكة المفروضه في
الغشاء
↓

Developing of process vaginalis



Developing of process vaginalis.....cont



Inguinal Hernia

⇒ البقا sac (وهو كيس) و
neck والـ peritoneum
والـ hernia
* في الفم في الفم

- A hernia is the protrusion of part of the abdominal contents beyond the normal confines of the abdominal wall
- Consists of three parts: the sac, contents of the sac, covering of the sac
- Hernial coverings are formed from the layers of the abdominal wall through which the hernial sac passes

Neck of hernial sac

Inferior epigastric vessels

Origin of internal spermatic fascia from transversalis fascia at deep inguinal ring

Periton

Extraperito
fascia

Transversalis fa

Hook retracting transver
abdominis muscle

Hook retracting intern
oblique muscle

Hook retracting exte
oblique aponeurosis

External spermatic fascia

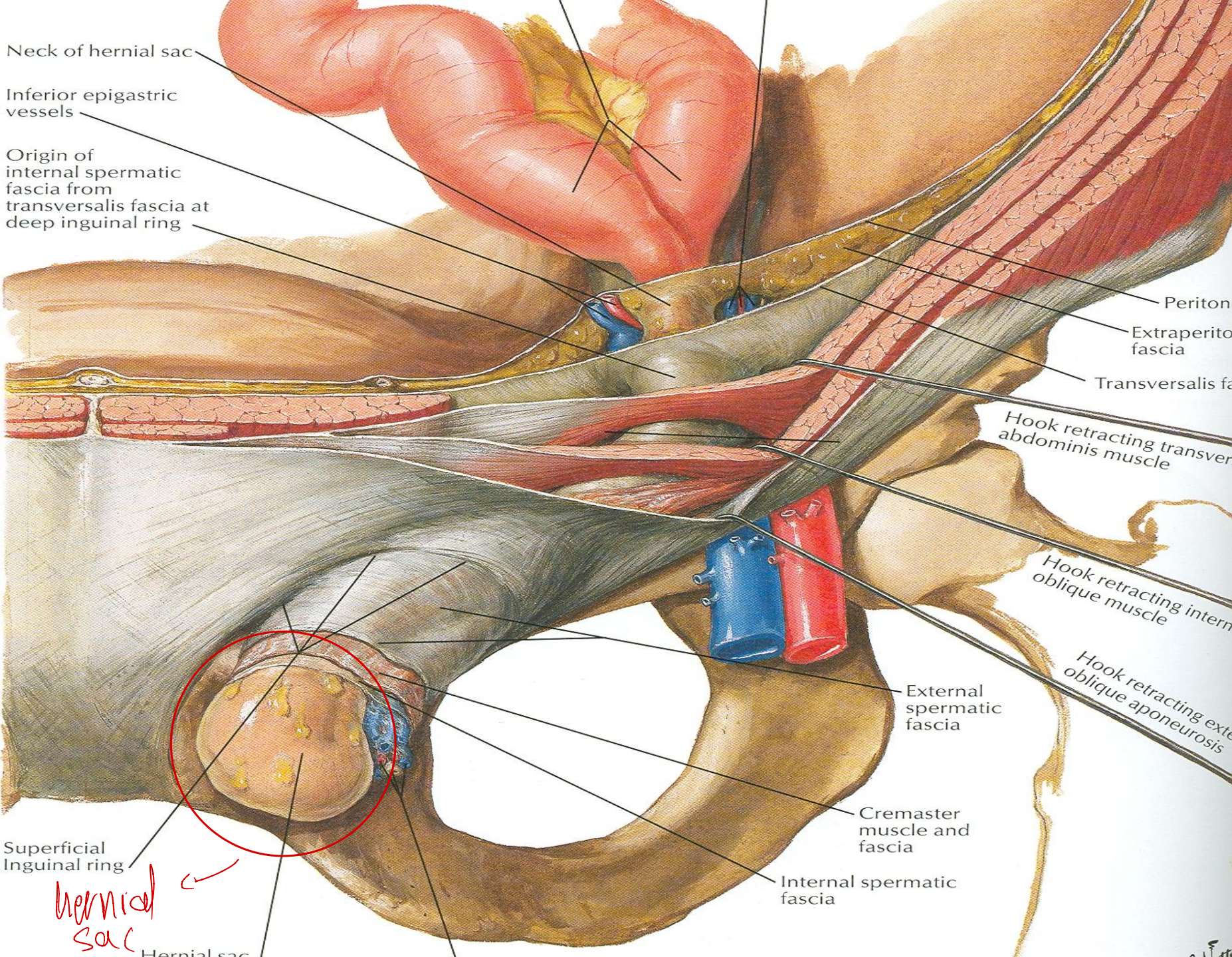
Cremaster muscle and fascia

Internal spermatic fascia

Superficial Inguinal ring

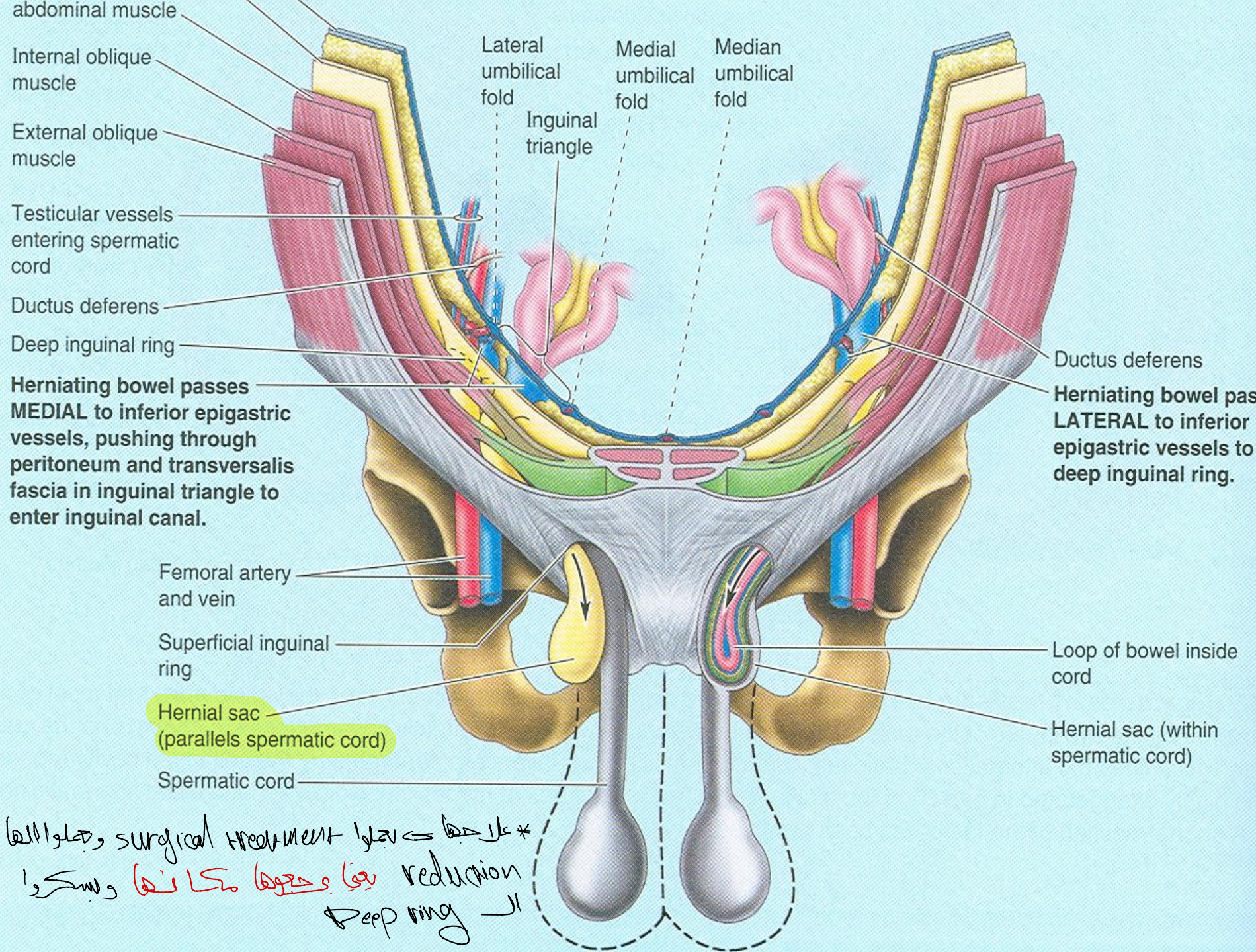
hernial sac

Hernial sac



Indirect Inguinal Hernia

- It is the most common form of hernia
- Is believed to be congenital in origin
- The hernial sac is remains of processus vaginalis
- Enters the inguinal canal through the deep inguinal ring lateral to the inferior epigastric vessels
- It may extend part of the way along the canal or as far as the superficial inguinal ring



Indirect Inguinal Hernia

- If the processus vaginalis has undergone no obliteration, the hernia is complete and extends through the superficial inguinal ring down into the scrotum or labium majus
- Under these circumstances the neck of the hernial sac lies at the deep inguinal ring
- It is 20 times more common in young males than females
- Is more common on the right side(the Rt. testis descends later than the Lt. testis)

Direct Inguinal Hernia

- It composes about 15% of all inguinal hernias
- Common in old men with weak abdominal muscles and rare in women
- Hernial sac bulges forward through the posterior wall of the inguinal canal medial to the inferior epigastric artery
- The neck of the hernial sac is wide

Inguinal Hernia

	Direct	Indirect
Age	Common on old	young
Bilaterally	Usually bilateral	unilateral
Shape	Hemispherical	Oval
Reaches scrotum	never	Can reach the scrotum
Direction of descent	Forwards	Downwards , forwards medially
Reduction <i>abdomen ↓ hernia ← (ص)</i>	backward	Upward, backward laterally
Relation to inf. epigastric art.	Medially	Laterally
Superficial inguinal ring test *	Feel impulse on the side finger	Feel an impulse on the tip of the finger <i>(upward and lateral)</i>
Deep ring test * <i>ص ↓ (ص)</i> Reduction of hernia, put thumb over deep ring, ask patient to cough	Hernia appears	Hernia does not appear
Coverings	1- Lat. To lat. Umbilical lig Same as indirection 2- Med. To lat	Skin, superficial fascia, Ex.sp.fascia, cremastic muscle & fascia Int spermatic fascia

* **Deep test** \Leftarrow يقي الكريش بالكافة لو سمعت رجع ال hernia في hand
 وانه ممكن يرجع هو الكريش ليد، خا برجعها بسك Deep ring عن طريق ال hand
 \Leftarrow ال hand مع Deep ring هو Reduction جزا لو ال Reduction جزا من الكريش جزا **Coughing** وهو ال
 ال hand مع Deep ring، ال hand ال hernia كان ال Direct جزا ال hand مع Deep ring
 ال hand مع Deep ring \Leftarrow indirect جزا ال hand \rightarrow ال hand

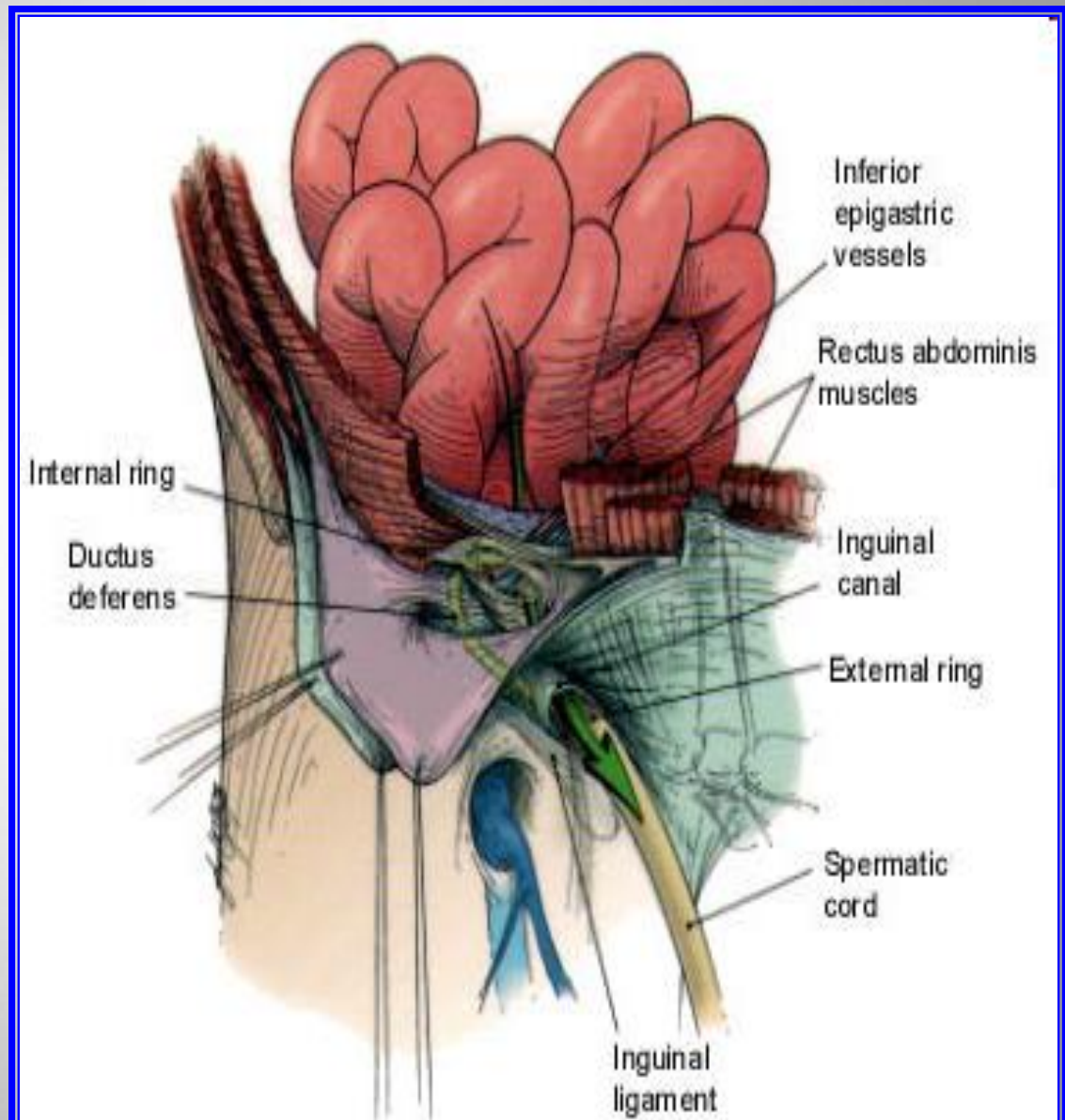
* **superficial test** \Leftarrow Direction of Reductions جزا ال indirect لو رجع ال hernia
 \Leftarrow ال hand جزا ال **inferior epigastric A** جزا ال **hip of finger** مع pulsation ال hand جزا ال
 upward & lateral

\Leftarrow Direct لو ال hand جزا ال **reduction** جزا ال **backward** جزا ال **pulsation** ال hand
 edge of finger

Direct Hernia Route

Note:

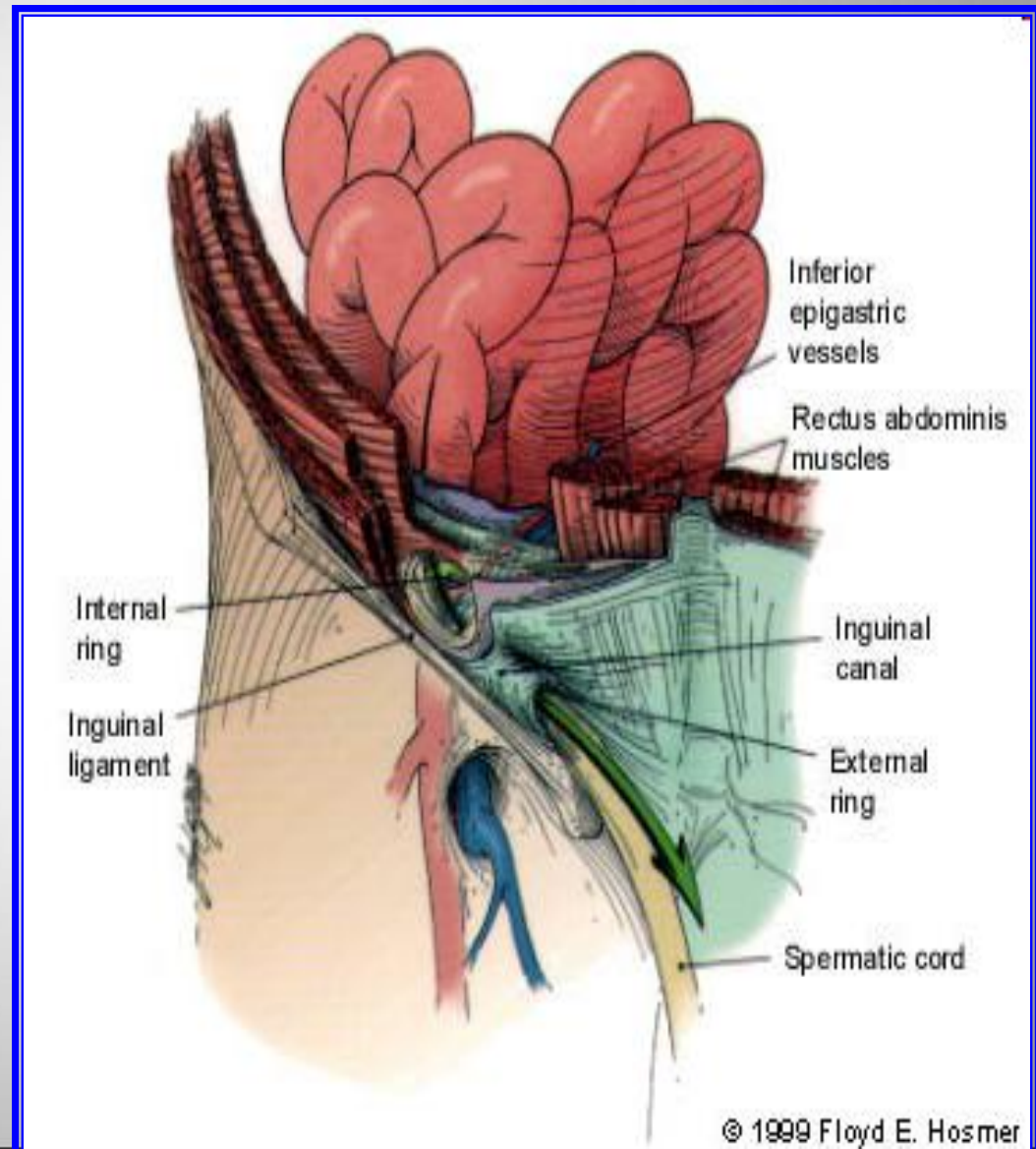
The hernia sac passes directly through inguinal triangle and may disrupt the floor of the inguinal canal.



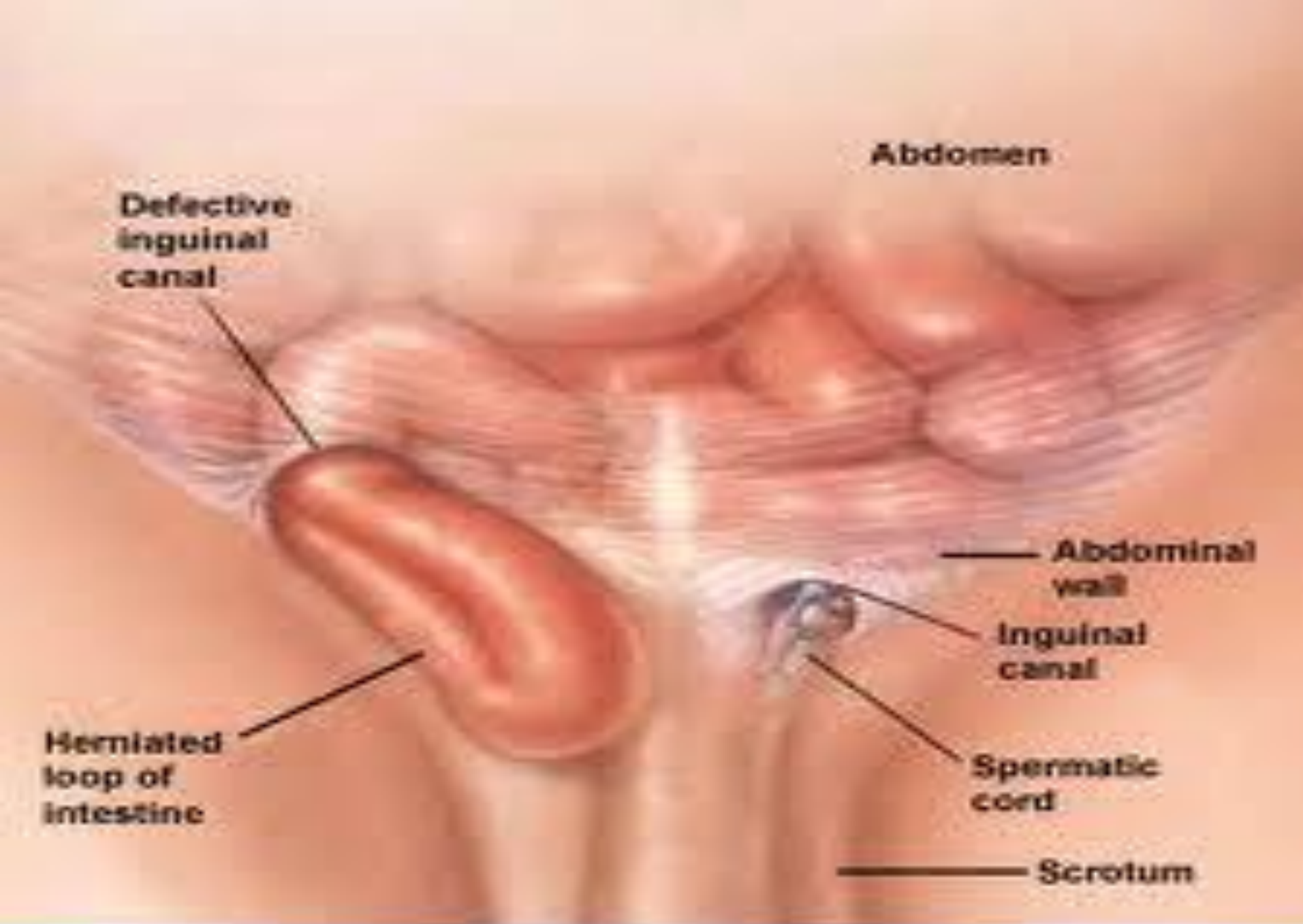
Indirect Hernia Route

Note:

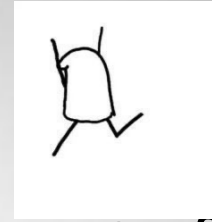
The hernia sac passes outside the boundaries of Hesselbach's triangle(inguinal triangle) and follows the course of the spermatic cord.







Scrotum



- It is an outpouching of the lower part of the anterior abdominal wall
- It contains testes, epididymis, and the lower ends of the spermatic cord
- Its wall has following layers: skin, superficial fascia, external spermatic fascia derived from external oblique, cremasteric fascia derived from internal oblique internal spermatic fascia derived from transversalis, and tunica vaginalis(parietal & visceral layer)

Clinical Notes

***Clinical conditions involving the scrotum
and testes***

Varicocele:

- The veins of the pampiniform plexus elongated & dilated
- Lt side more common → venous pressure is higher
- Common in young & adult

→ ligation of vas ⇒ *vas cut min dev vas*
تتكون

- **Vasectomy** → Infertility *sperm - vas - line*

hydrocele - vas

- **Processus vaginalis** *vas in hydrocele infertility - sperm*

Upper part → obliterated just before birth

Lower part → Tunica vaginalis

Congenital anomalies of processus vaginalis

- 1- persist → indirect inguinal hernia
- 2- Narrowed → congenital hydrocele
- 3- Obliterated upper & lower part → encysted hydrocele of the cord

Abnormality in testis & scrotum.....cont

Hydrocele

- Accumulation of fluid within the tunica vaginalis of the testis
- Causes
 - 1- Inflammatory
 - 2- idiopathic
- Tapping a hydrocele → structures (all layers covering the testis, skin → tunica vaginalis) traversed by the cannula

Congenital anomalies of the testes

Cryptorchidism

- Incomplete descent of testis although traveling down normal pathway
- It may be found in
 - 1- Abdominal cavity
 - 2- In inguinal canal
 - 3- At superficial inguinal ring
 - 4- In upper part of scrotum

Handwritten notes for Cryptorchidism:
Scrotum ← (with arrow pointing left)
Deep ring is inguinal canal → (with arrow pointing right)
superficial is (with arrow pointing right)

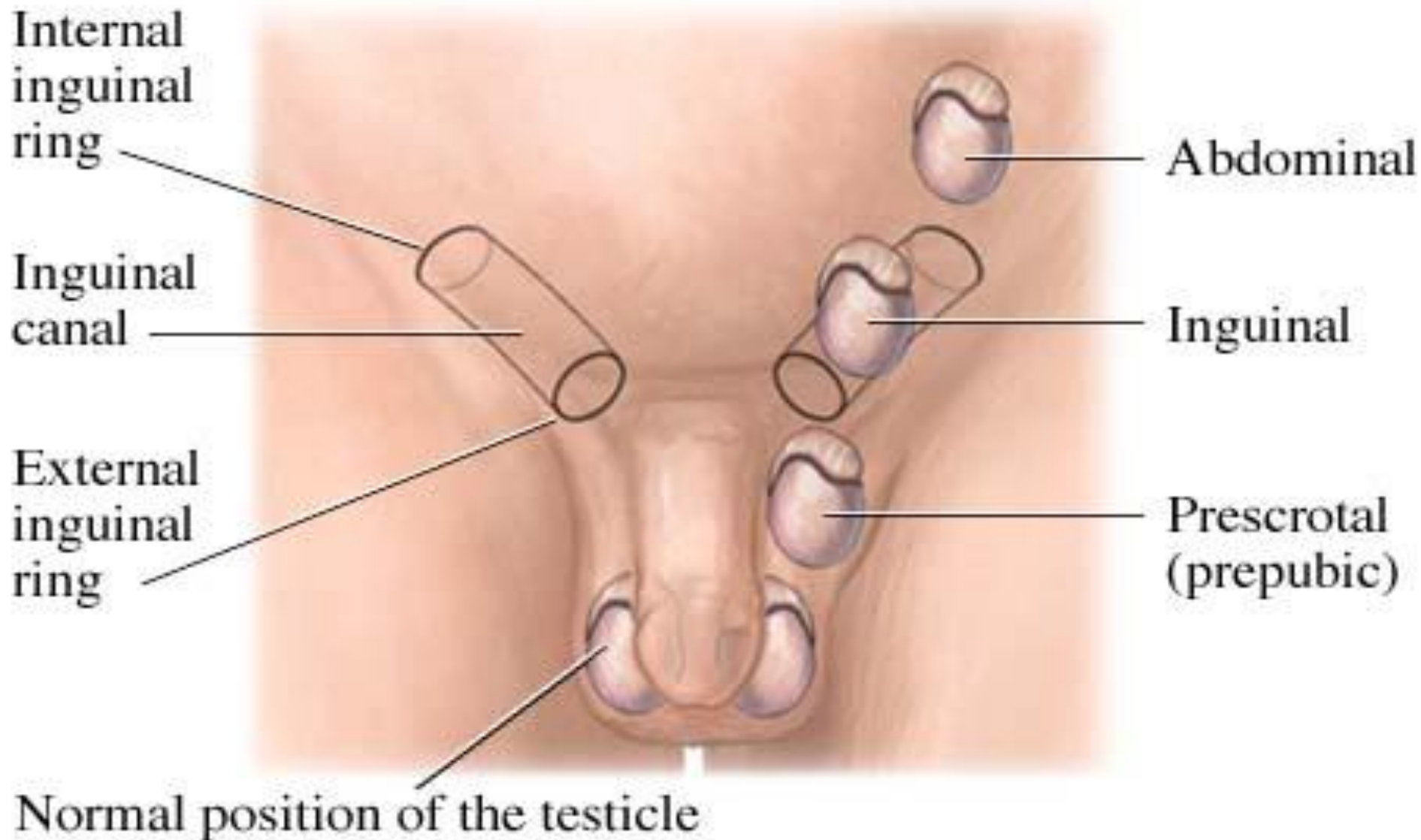
Maldescent

- Testes travel down an abnormal pathway
 - 1- Superficial fascia
 - 2- Root of penis
 - 3- Perineum
 - 4- In the thigh

Handwritten notes for Maldescent:
وہیں ہو سکتا ہے
تھوڑے ← (with arrow pointing left)

Handwritten notes for Maldescent:
* ہاڈی - اکاٹ - ازیم - تھالغ مسرتو
testis مکان - تھوڑے - مسرتو
infertility
Malignant

Cryptorchidism



شكرًا

Thank you

Lydia Ahmad