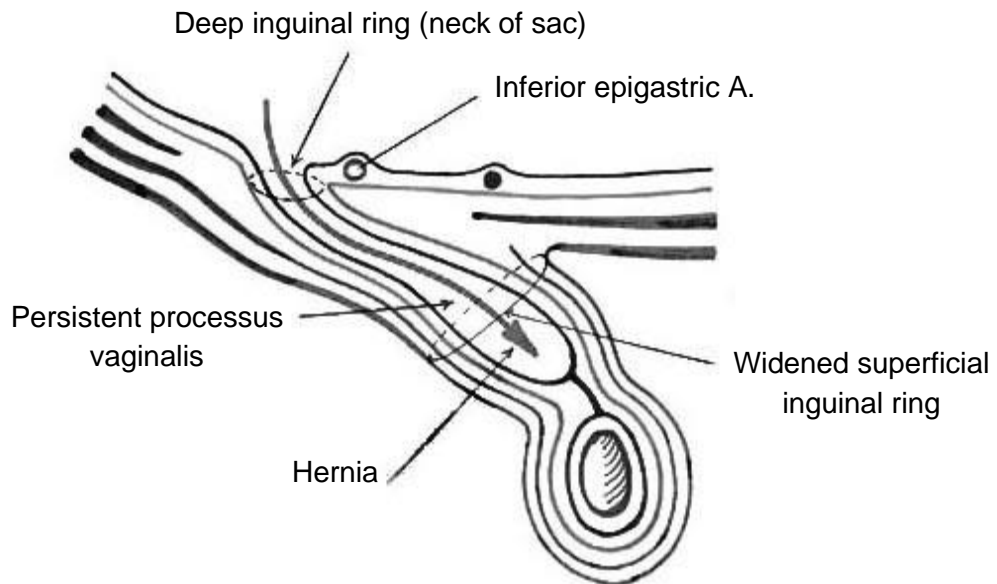


**\* Normal inguinal canal**



**\* Oblique inguinal hernia \***

## INGUINAL HERNIA

\* A hernia which pass in the inguinal canal, it may be one of the followings:

### I) Indirect Or Oblique Inguinal Hernia

★ **Definition:** It is an inguinal hernia which **enters** the inguinal canal through the **internal inguinal ring**.

★ **Aetiology:**

- A. ***Congenital due*** to failure of intrauterine closure of the processurs vaginalis.
- B. ***Aquired*** (pulsion) sac due to raised abdominal pressure & weak muscles.

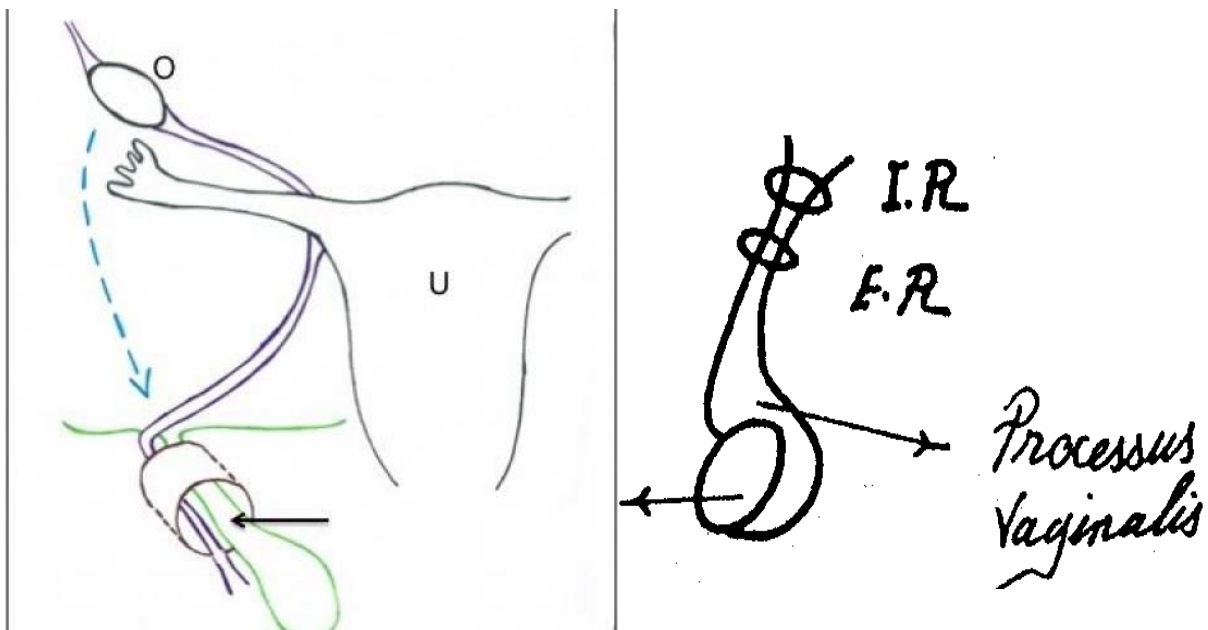
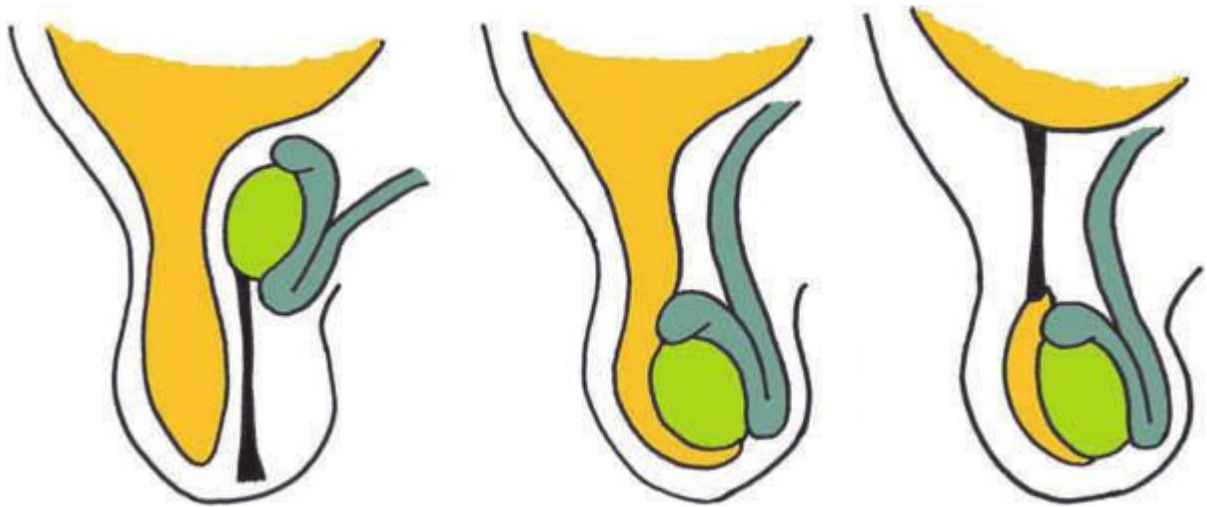
★ **Incidence:** It is the ***commonest hernia*** as it represents about **80%** of external abdominal hernias , much more common in ***males*** and more frequent on the ***right side*** ( delay descend of right testis ).

★ **Pathology:**

**A. Anatomical types:**

1. **Congenital type:** It is due to persistence of the whole processus vaginalis ( canal of Nuck in female ) → hernia reaches rapidly to the bottom of the scrotum → the ***testis bulges within the lower posterior part of the sac and cannot be separated from the sac.***

➤ Although it is congenital , it appears at **any age** of life.



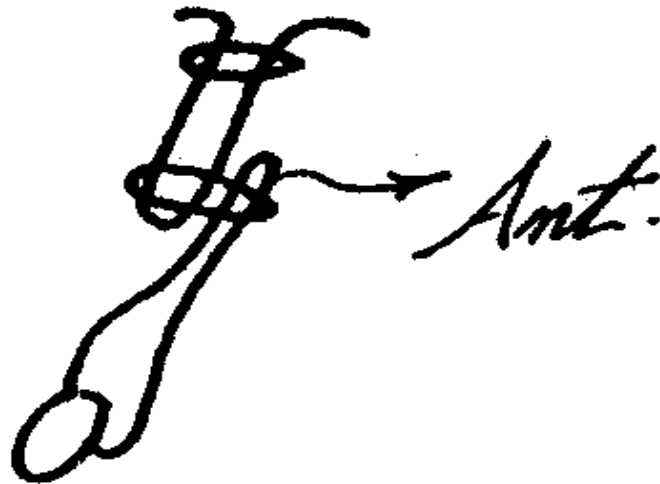
### Canal of Nuck in female

#### 2. Infantile type: (Operative finding)

- The tunica vaginalis extends upwards through the external ring , as a double layer of serous sac in front of the hernial sac.
- At operation, the tunica vaginalis is liable to be opened in mistake

for the true sac.

**Infantile type**

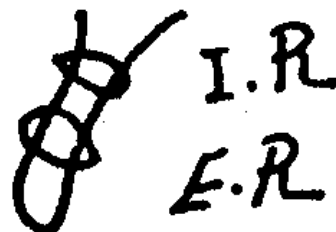


**3. Adult type:** (acquired or pulsion type )

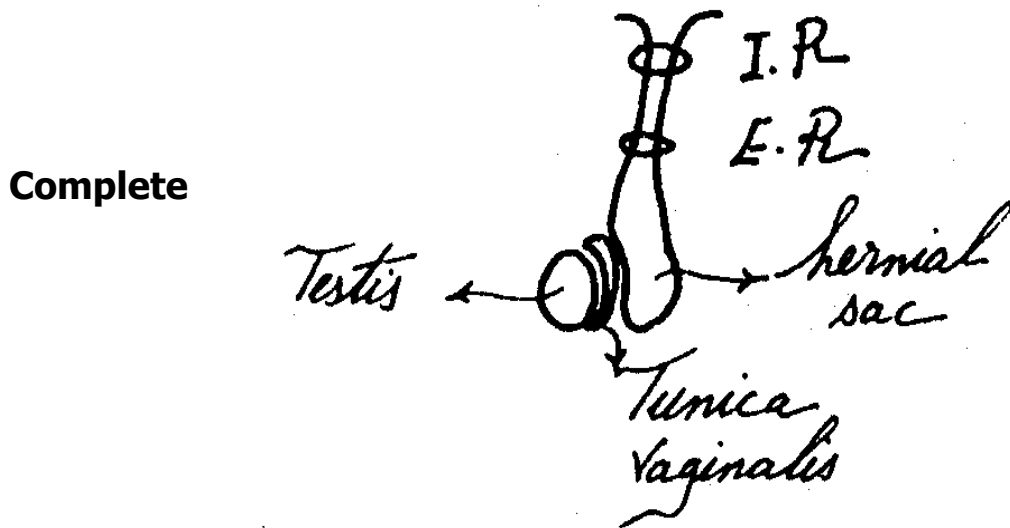
1. **Bubonocele:** The hernia passes through the internal ring and stop in the inguinal canal (N.B.: Bubon = groin). The Processus vaginalis is obliterated normally .
2. **Funicular type:** The hernial sac reaches the scrotum and stop just above the testis . The contents of the sac can be felt with the spermatic cord (funicular = cord) above the testis.

**Bubonocele**

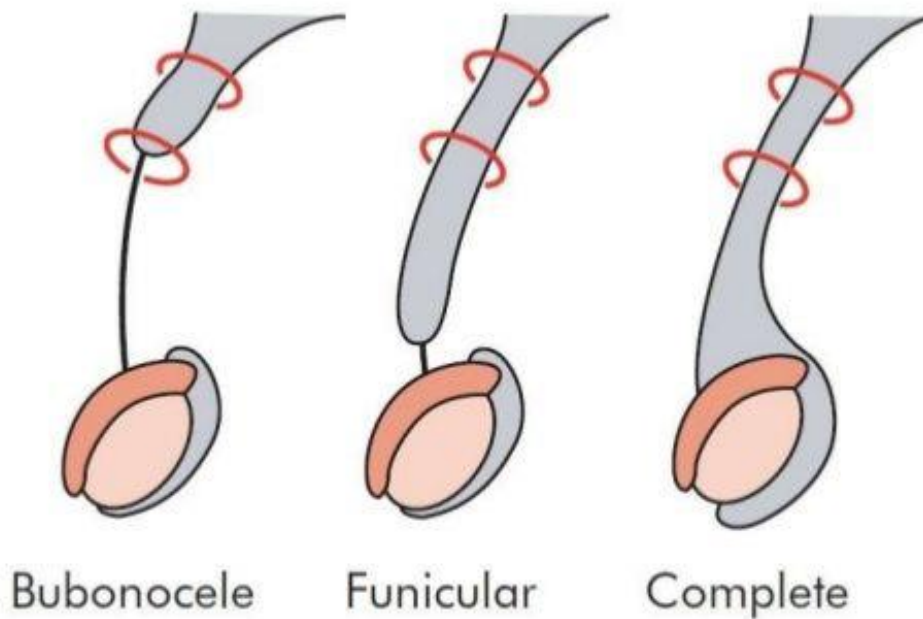
**Funicular type**



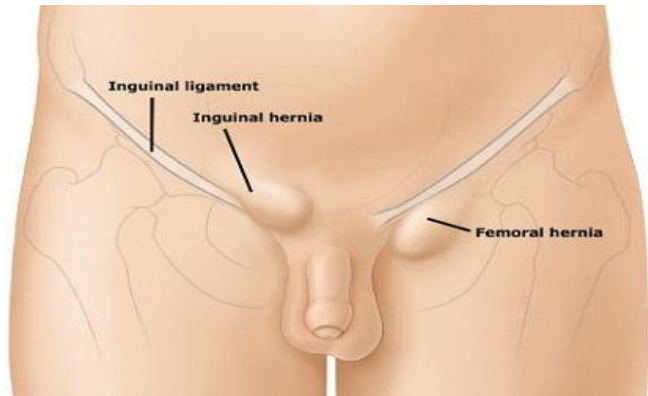
- 3. **Complete:** (scrotal) the hernia passes down to the bottom of the scrotum. The testis is separated from the sac by normal tunica vaginalis.



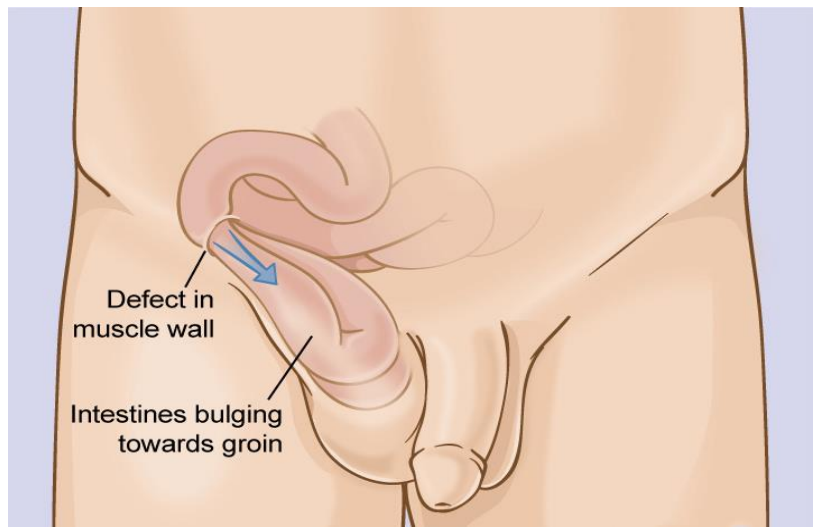
## Types of Indirect Inguinal Hernia



**Right bubonocele  
type**



**Right funicular  
type**

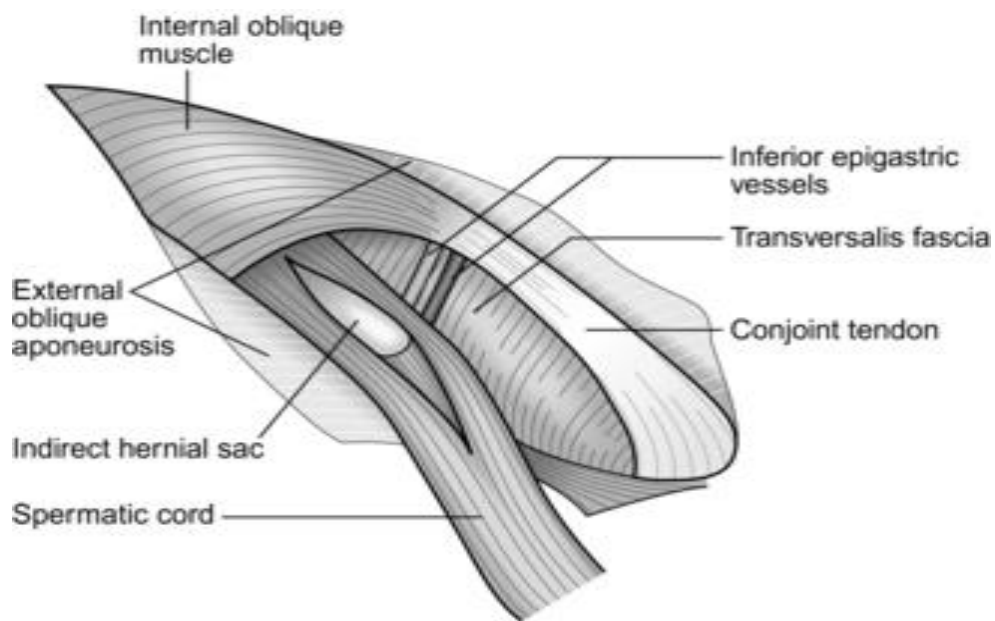


**Right complete  
Scrotal type**



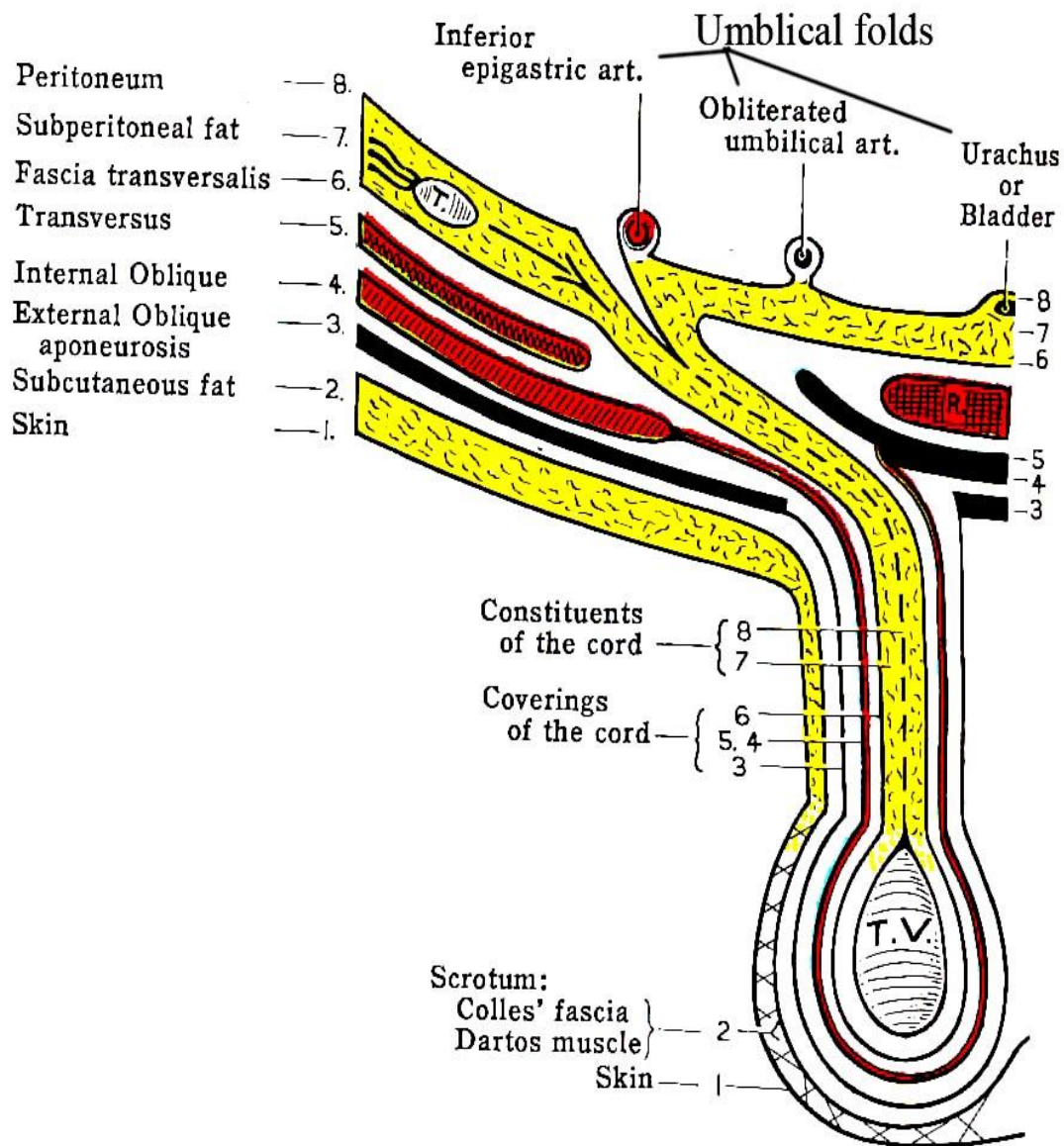
## B. Structures:

1. **The defect** is stretched internal inguinal ring.
2. **Sac:** Passes through the **internal ring** and lies always in **antero-lateral** to the **structures** of the spermatic cord **within its coverings**.



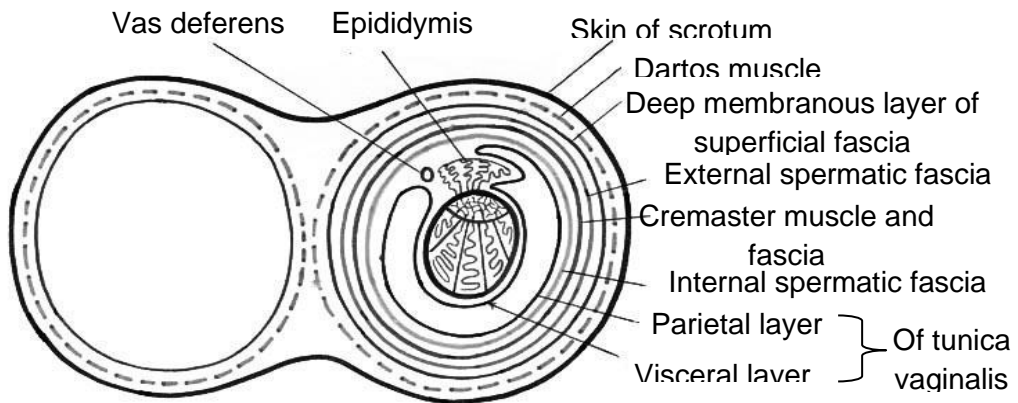
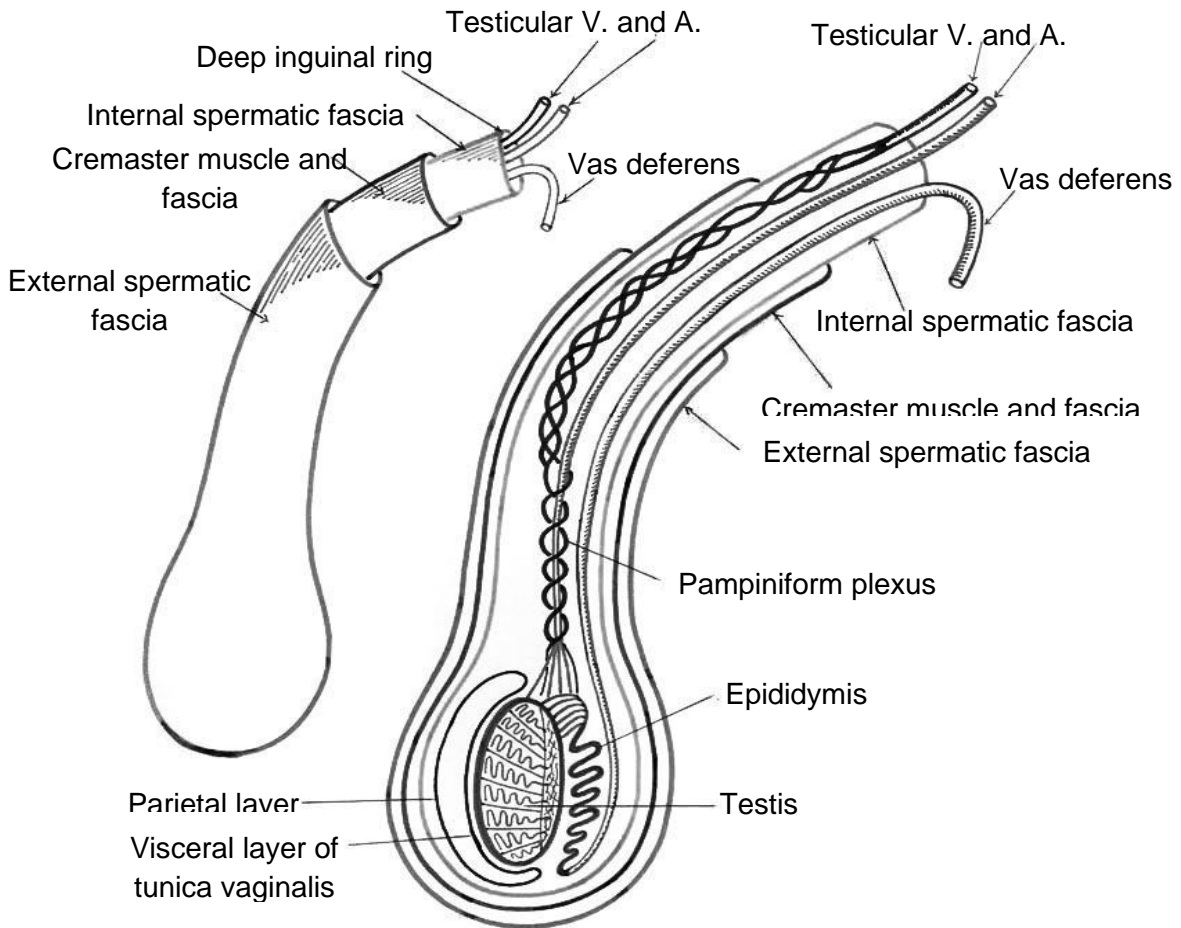
3. **Contents:** Usually small intestine, omentum or both.
4. **Coverings:**
  - a. **In inguinal region:** Skin, superficial fascia, external oblique aponeurosis, 2 coverings of the cord in this region (cremasteric muscle and fascia, internal spermatic fascia).
  - b. **In scrotum:** Skin, non-fatty superficial fascia containing Dartos muscle, Colle's fascia & coverings of the cord in this region (external spermatic fascia, cremasteric muscle and fascia, internal spermatic fascia).





**\* Layers of anterior abdominal wall & scrotum\***

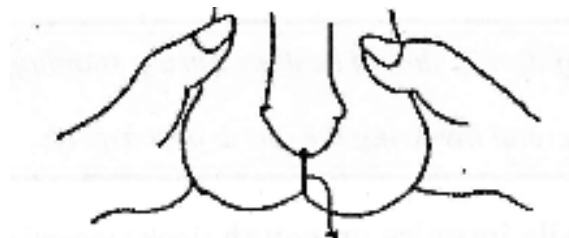
**\* Spermatic cord \***



**\* Section of scrotum showing its wall and layers \***

★ **Clinical picture:** (As general)+

- 1) The hernia is painless except in early cases the patient complains of **mild pain** in the groin or pain referred to the testis ( stretch of internal ring & tissue dissection )but **sever pain** is a sign of complications .
- 2) There is **reducible** inguinal or inguinoscrotal swelling with **expansile impulse on cough** .
- 3) **Palpate the neck of scrotum:**
  - If the **cord is only** felt → inguinal swelling which may be bubonocoele or direct inguinal hernia.
  - If the swelling is felt **between the fingers** → indirect inguinoscrotal swelling ( funicular or complete types ).



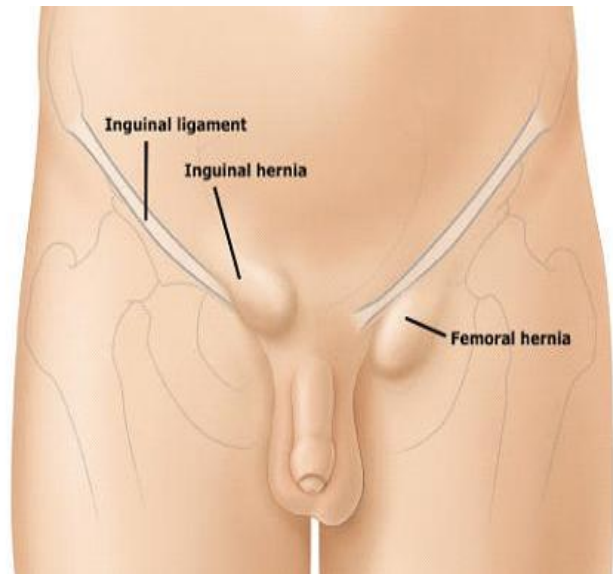
*Median raphe*

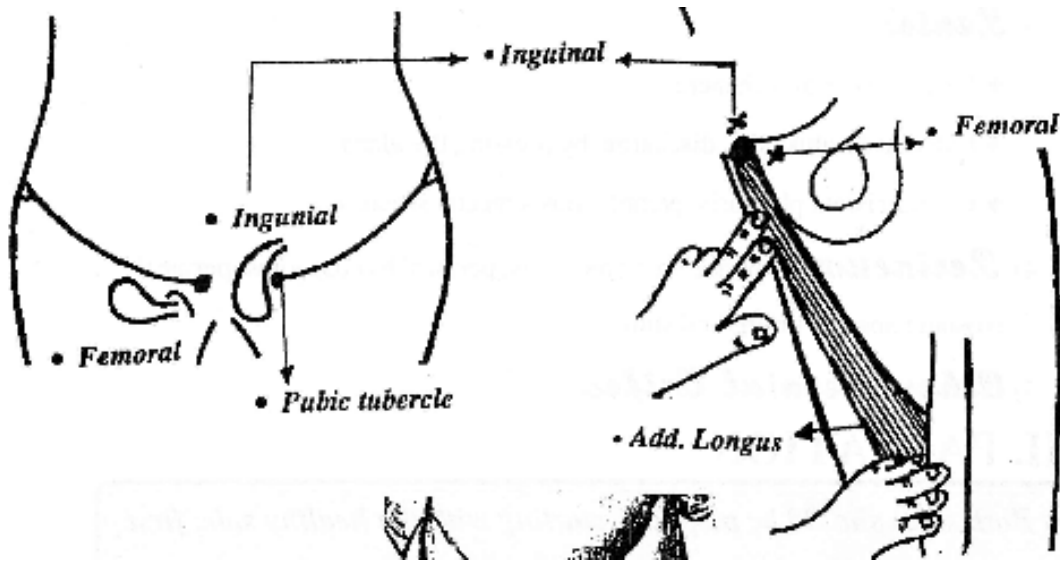
★ Exam. of scrotal neck ★

- 2) Indirect hernia is **Pyriform in shape** with narrow neck & wide fundus.
- 3) **Direction of descent:** forwards, medially & downwards.
- 4) **Direction of reduction:** Upwards, laterally & backwards.

5) **Relations:**

- a. Oblique inguinal hernia is above & medial to **inguinal ligament & pubic tubercle.**
- b. **The testis** is related to the lower posterior part of the swelling in case of complete & congenital type.
- c. **The testis can be separated** from the sac in acquired complete type but not in congenital type .





6) **Special tests:** (Not needed in inguino-scrotal hernia as it is sure to be O.I.H).

**I. Internal ring test:**

◆ This test differentiates between direct, indirect and femoral hernia.

◆ **Method:** With the patient lying down, reduces the hernia obliterate the internal ring (1/2 inch above the mid-inguina point) by the thumb then ask the patient to stand and cough.

◆ **Results:**

a) If hernia does **not appear** → **indirect hernia** (i.e. the test is +ve)

b) If hernia **descends above** the inguinal ligament → **direct inguinal hernia.**

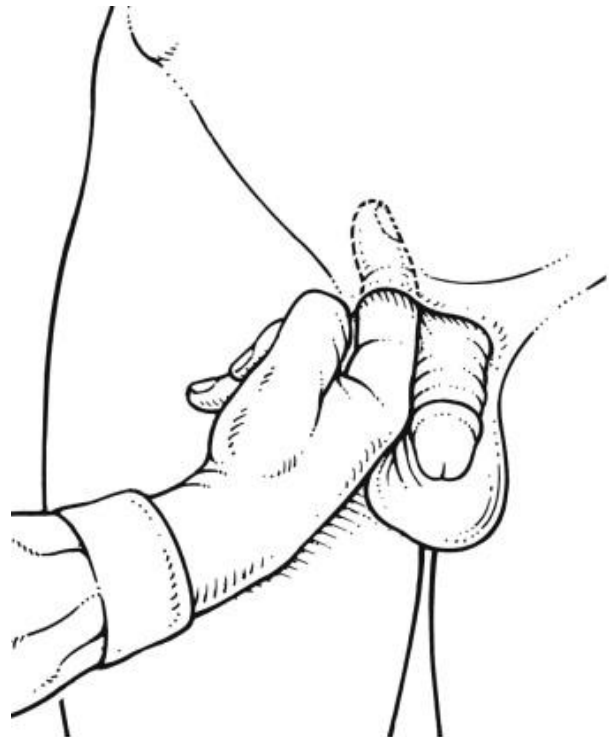
c) If hernia **descends below** the inguinal ligament → **femoral**

## **hernia.**

### ***II. External ring test:*** ( do not mention in the exam.)

- ◆ **Not desirable** as it is painful and widens the external ring.
- ◆ This test differentiates between direct and indirect hernia.
- ◆ **Method:** With the patient lying down, reduce the hernia and invaginate the skin of the scrotum with the tip of the little finger to enter the external ring and assess the width of the ring then ask the patient to stand and cough.
- ◆ **Results:**
  - a) If the external ring is ***not wide*** → **direct or indirect** hernia.
  - b) If the external ring is ***wide*** → **indirect** hernia.
  - c) If the swelling impulse ***on the tip*** of finger → **indirect** hernia.
  - d) If the swelling impulse on ***posterior aspect*** of the finger → **direct** hernia.

### ***External ring test***

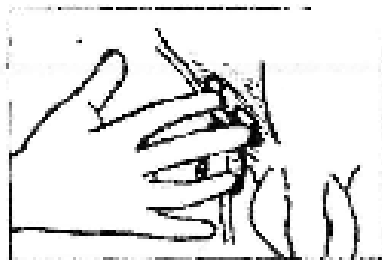


### **III . Zieman's test :**

◆ This test **differentiates between** direct ,indirect & femoral hernia.

◆ **Method:**

- While the patient is **standing** & the hernia is **reduced** .
- Put the index finger over the internal inguinal ring ( ½ inch above midinguinal point ) , the middle finger over the Hasselbach's triangle ( just medial to internal ring ) and the ring finger over the saphenous opening ( 4 cm. below & lateral to pubic tubercle ) .
- Ask the patient to **cough** .



★ **Zieman's technique:** The Index finger lies over the indirect, the middle finger over the direct, and the ring finger over the femoral site.

★ **Treatment: *Surgical treatment*** is the only curative line of treatment

**a) Herniotomy:(or herniectomy)**

◆ **Indications:** Should be done in all cases but done ***alone in:***

- a) No widening of internal inguinal ring with no weakness or bulge in the posterior wall of the inguinal canal ( fascia transversalis )
- b) Usually in infants or children (below 8 years) to excise congenital

sac.

◆ **Method:**

- Transfixation excision of the sac at the proper neck.
- If hernias reaching scrotum, it is enough to divide the sac in the inguinal canal, leave the distal part undisturbed and the proximal part is dealt with by transfixation excision at its proper neck.

**b) Herniorrhaphy:** ( totally **replaced** nowadays by hernioplasty )

◆ **Aim:** Repair of the defect with strengthening of the posterior wall of the inguinal canal by the local surrounding tissues .

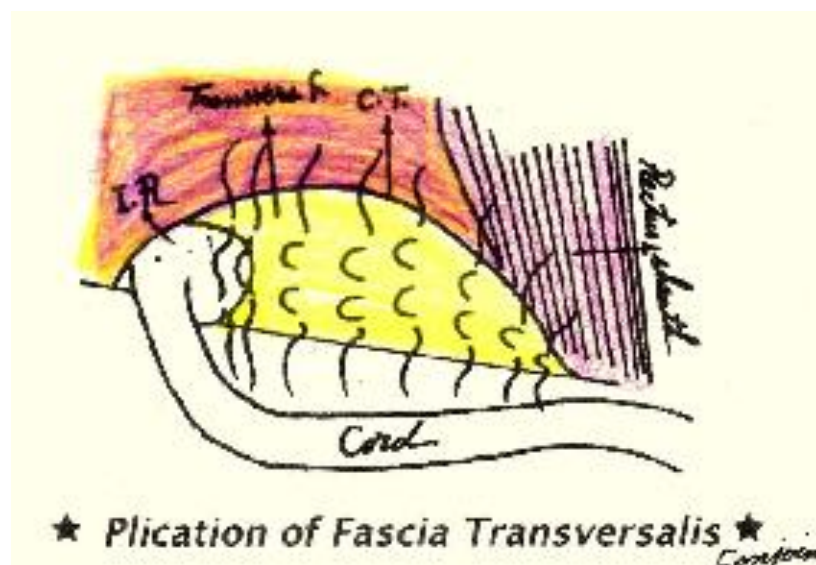
◆ **Indications:**

1. Wide internal inguinal ring with no weakness or bulge fascia transversalis .
2. Small hernia localized to inguinal canal in young adult patients .

◆ **Methods:** After herniotomy one of the following is done:

**1. Plications of transversalis fascia:**

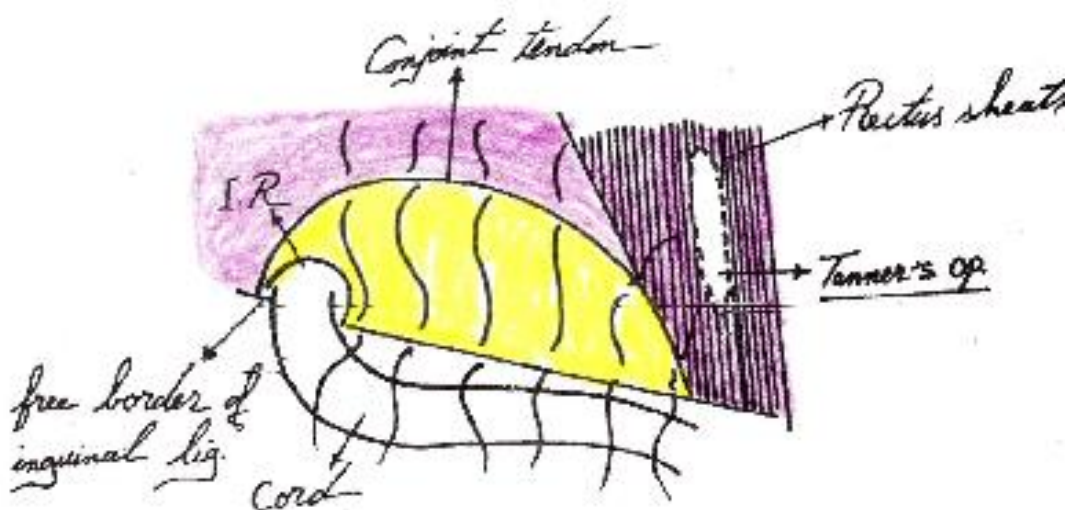
- The transversalis fascia is plicated by few interrupted non-absorbable polypropylene sutures.





2. **Bassini's repair:** (The standard method). The **conjoint tendon** is sutured to the free border of the **inguinal ligament** behind the spermatic cord.

- **Indication:** It is the most popular method. To be successful, the gap between the 2 structures should not be wide & the conjoint tendon should be strong.
- **Disadvantage:** It interferes with **shutter mechanism**.
- **Tanner's incision:** After Bassini's repair a release incision is done in the **anterior wall of rectus sheath** to prevent tension on the suture line if there is large defect.

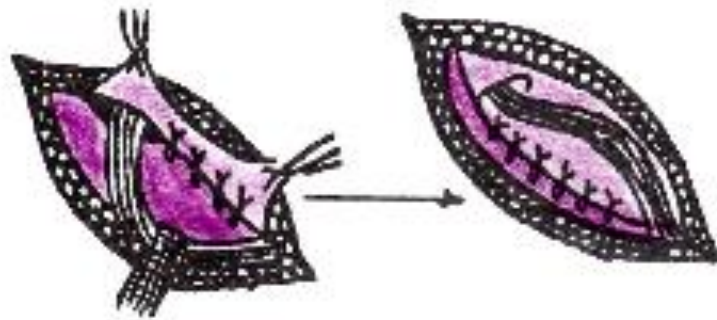


★ **Bassini's Repair** ★

3. **Halsted's repair:** After Bassini's repair, **anterior transposition of the cord** with repair of ext. oblique aponeurosis behind the cord which is left S.C.

- **Disadvantage :** The inguinal canal is no longer oblique & losses its

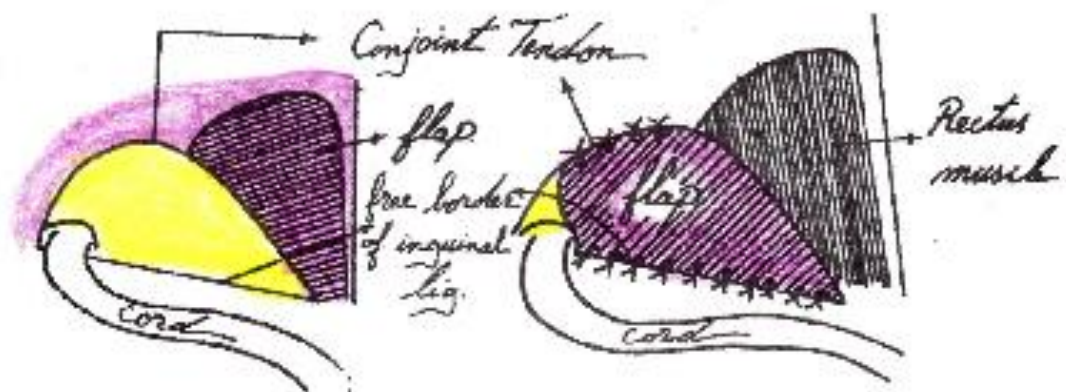
valvular mechanism.



★ *Halsted's Repair* ★

**4. Bloodgood's repair:** A triangular flap from the anterior wall of rectus sheath is sutured to the conjoint tendon & free border of the inguinal ligament behind the spermatic cord.

➤ **Advantage:** It *preserves* both the shutter & valvular mechanisms.

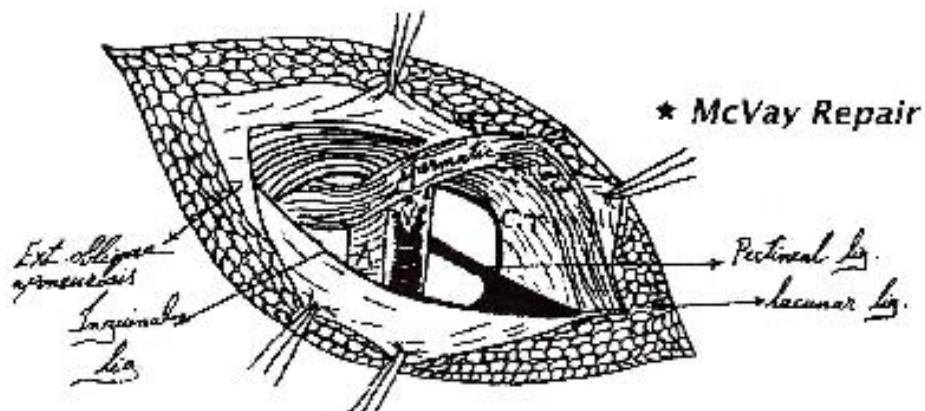


★ *Bloodgood's Repair* ★

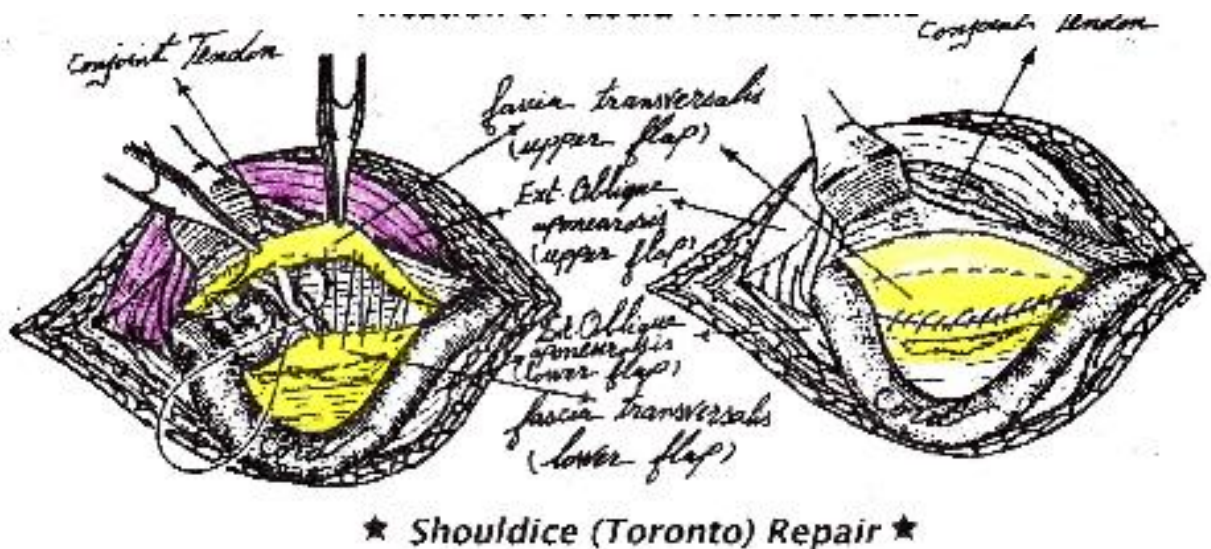
**5. McVay Repair:** (Cooper's ligament repair) the conjoint tendon is sutured to pectineal ligament .

➤ This is also effective for repair of *femoral hernia*.

➤ It requires a *Tanner's incision* in the ant. wall of rectus sheath (to relieve tension).



6. **Shouldice (Toronto) Repair:** The internal ring and fascia transversalis are divided then repair is done by **double breasting** the fascia transversalis.



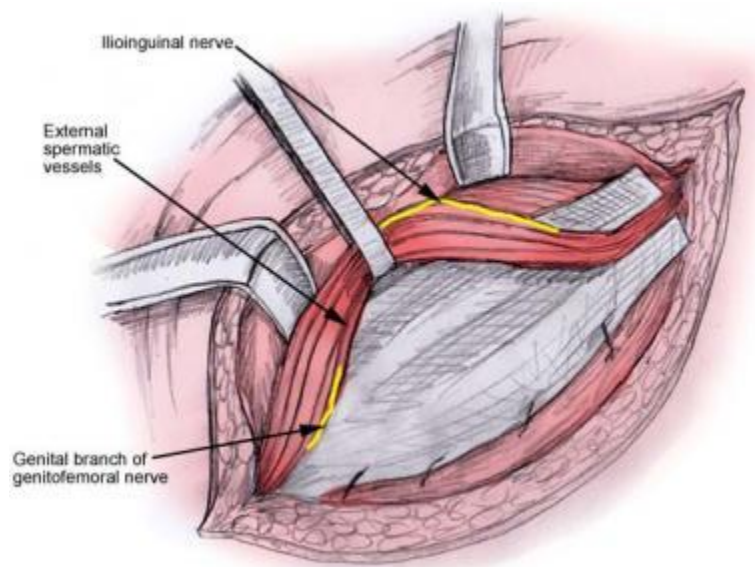
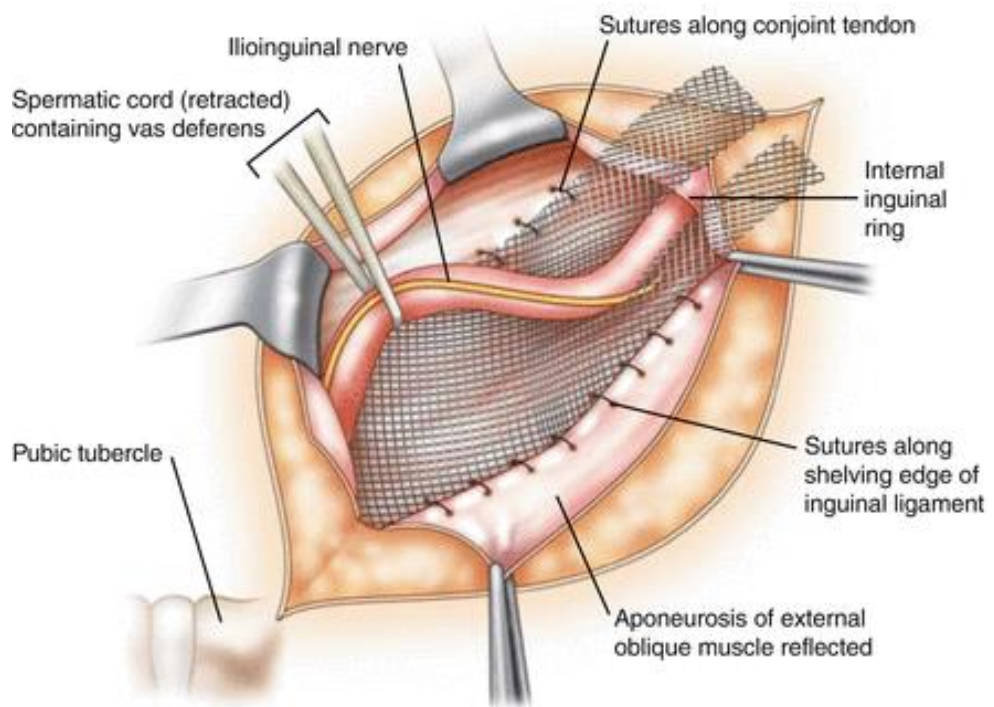
**C) Hernioplasty:** After herniotomy , a synthetic tissue is added to strengthen the posterior wall of inguinal canal.

- ◆ **Indications: Nowadays** it replace herniorrhaphy and **performed for all hernias in adults or elderly** specially if the internal inguinal ring is wide with weak bulging fascia transversalis or recurrent hernia .

◆ **Methods:**

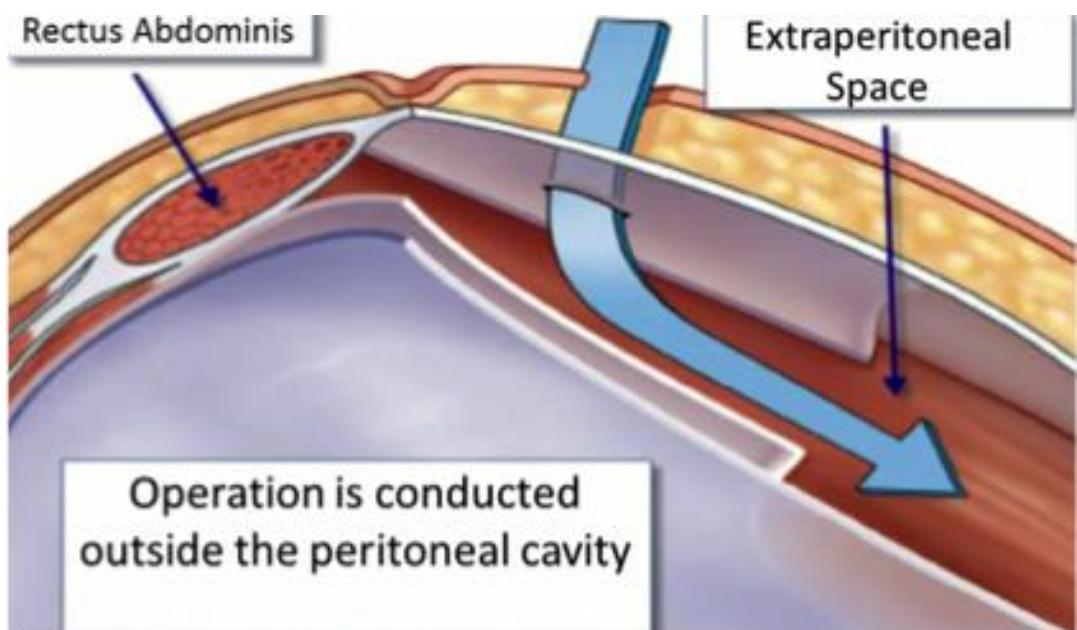
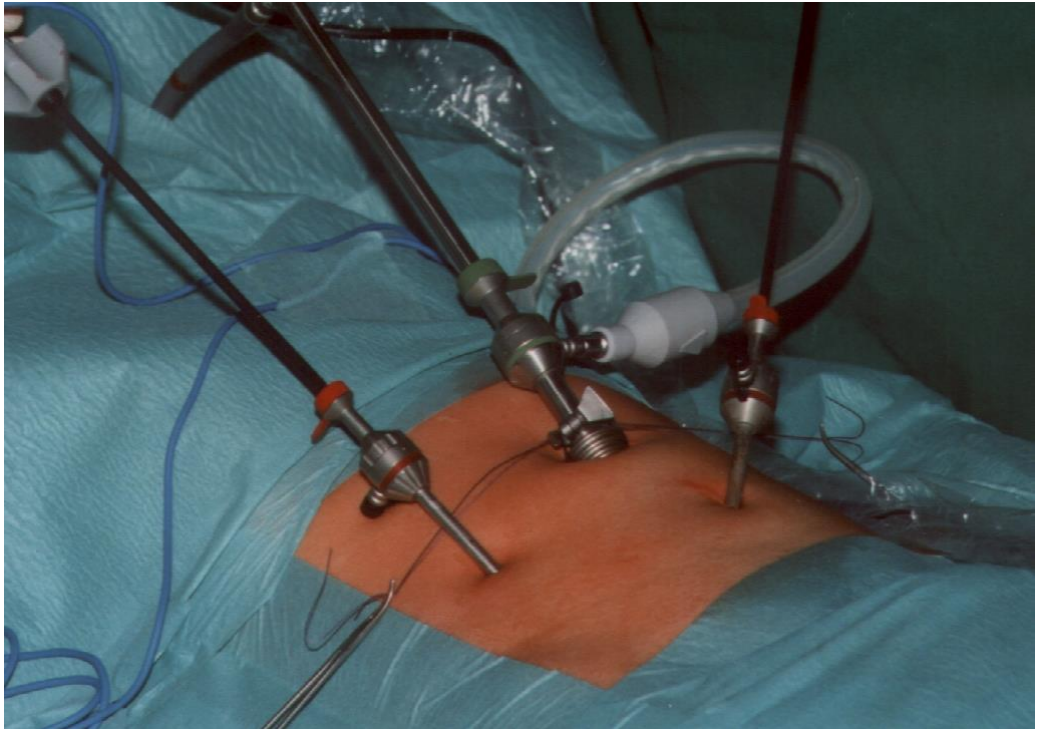
1. ***On lay mesh hernioplasty*** : ( **Lichtenstein tension free mesh repair** )

- Filling the space between the conjoined tendon and the inguinal ligament with ***synthetic*** polypropylene ***meshes*** .
- The interstices of the mesh is invaded by dense F.T.



## 2. *Preperitoneal hernioplasty* :

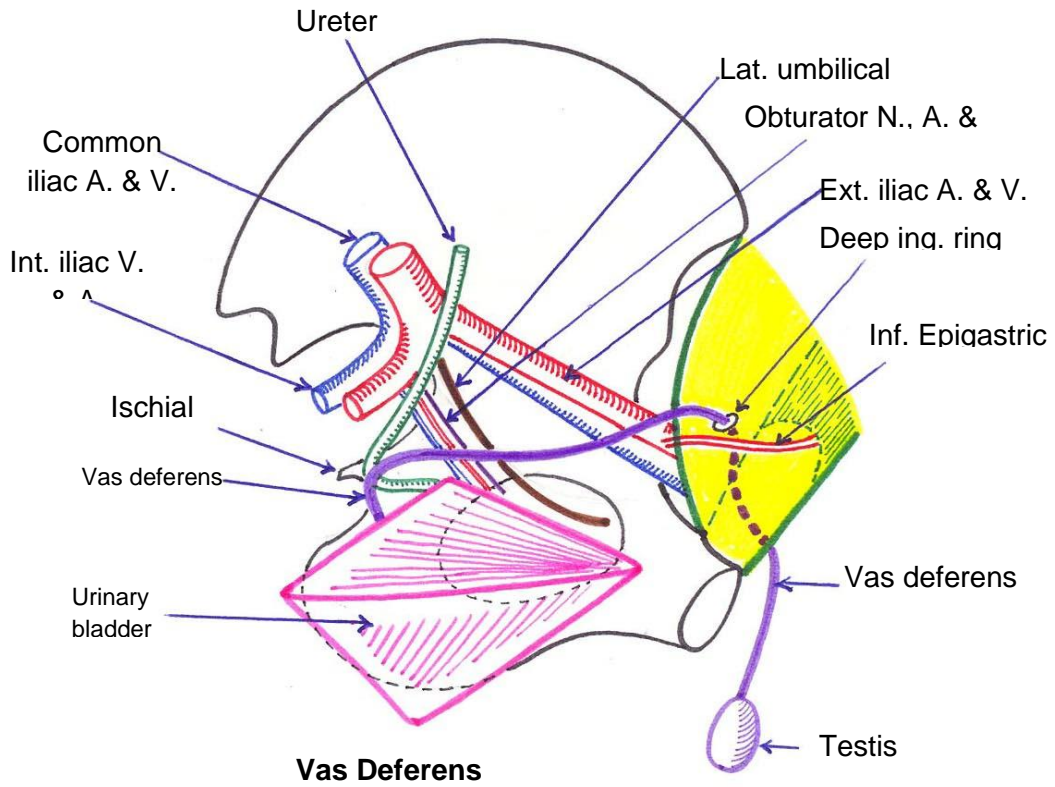
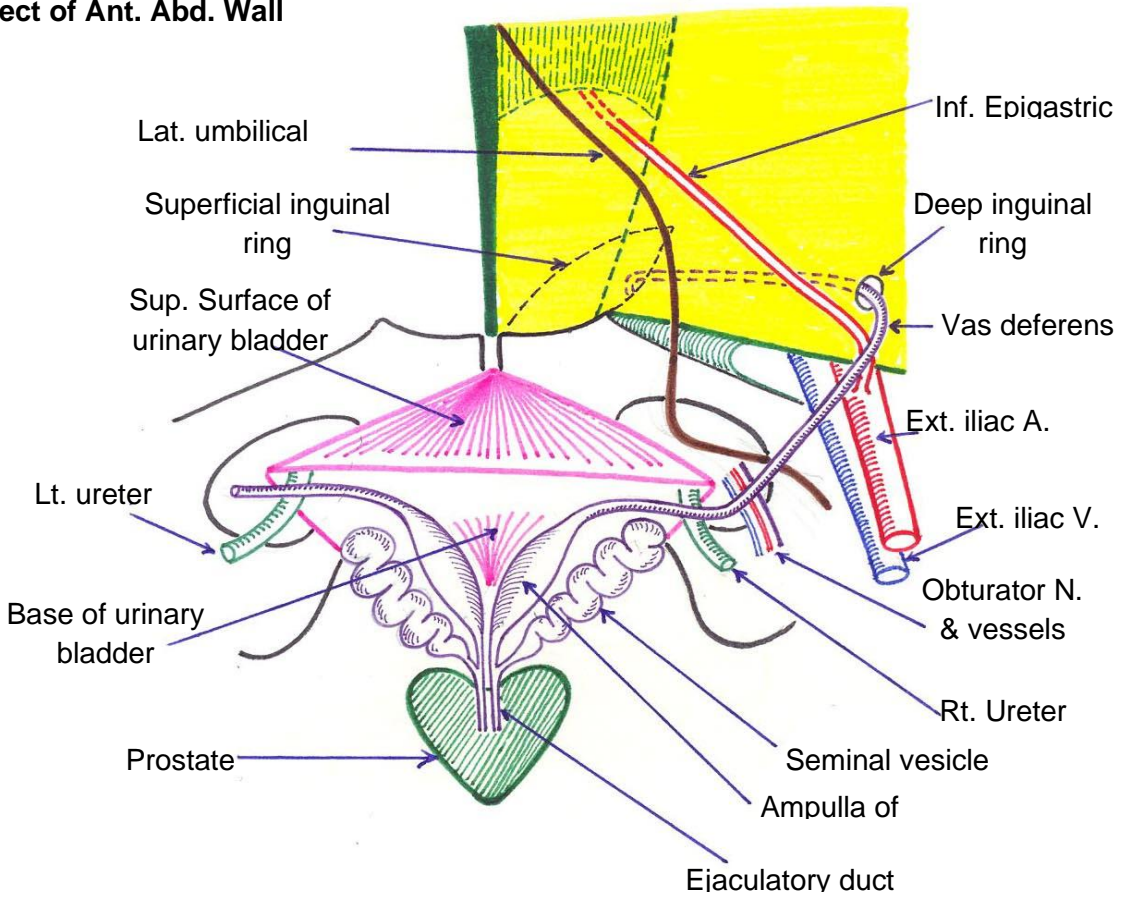
- The mesh is placed between the peritoneum and fascia transversalis , **usually nowadays by laparoscopic surgery** or less popular open surgery .

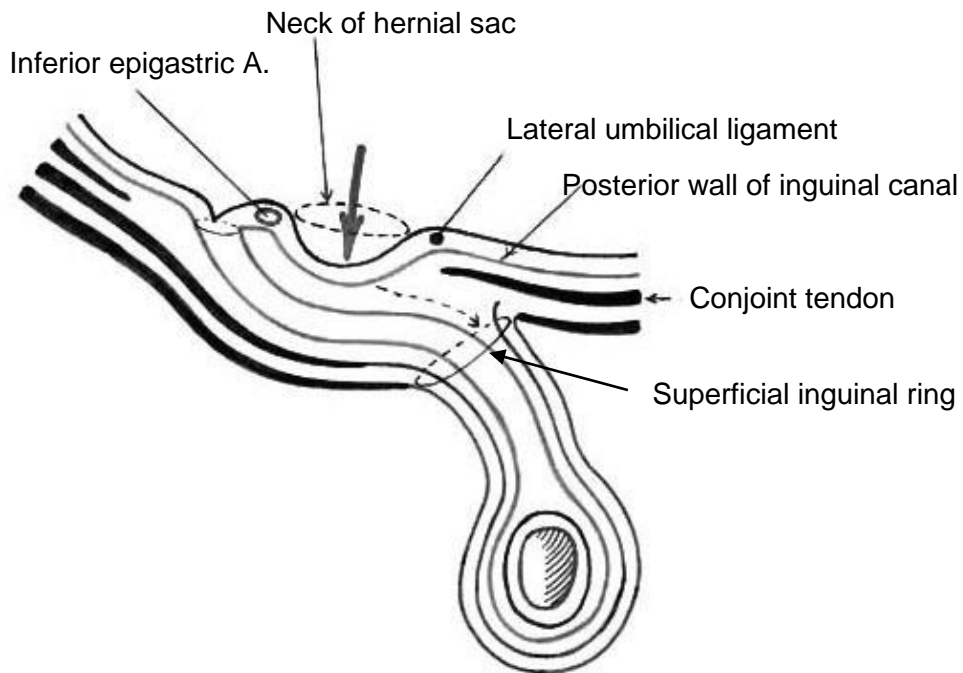


★ **Treatment of oblique inguinal hernia in infants:**

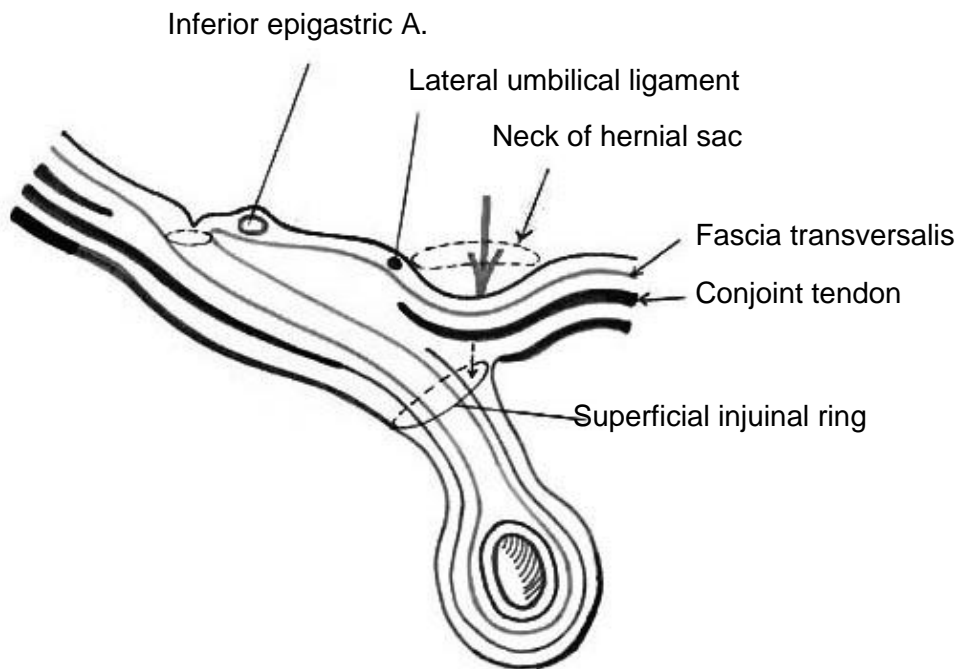
- ♣ Always congenital ***indirect type*** due to congenital sac.
- ♣ The parents are advised to wait when the infant is ***at least 3 months***.
- ♣ The operation is done through the external inguinal ring ***without opening the canal*** as the 2 inguinal rings are opposite each other (the obliquity of the inguinal canal develops at the age of 11-12 years).
- ♣ **Direct** inguinal hernia **never** occur as there is no posterior wall of inguinal canal
- ♣ ***Herniotomy*** is only performed to excise the congenital sac .
- ♣ ***Recurrence*** is rare due to failure of ligation of the sac at the proper neck .
- ♣ **Strangulation** may occur in the first day of appearance of the hernia
- ♣ If ***strangulation*** is neglected **testicular atrophy** may occur .

**Inner Aspect of Ant. Abd. Wall**





**\* Lateral direct hernia \***



**\* Medial direct hernia \***



## II- Direct Inguinal Hernia

★ **Incidence:** Much less common than oblique hernia, usually in old males.

★ **Aetiology:**

- 1) The most important is **atrophy of conjoint tendon** due to chronic straining or cough in old age .
- 2) Paralysis of conjoint tendon due to injury of **ilio-inguinal nerve** during appendicectomy operation.

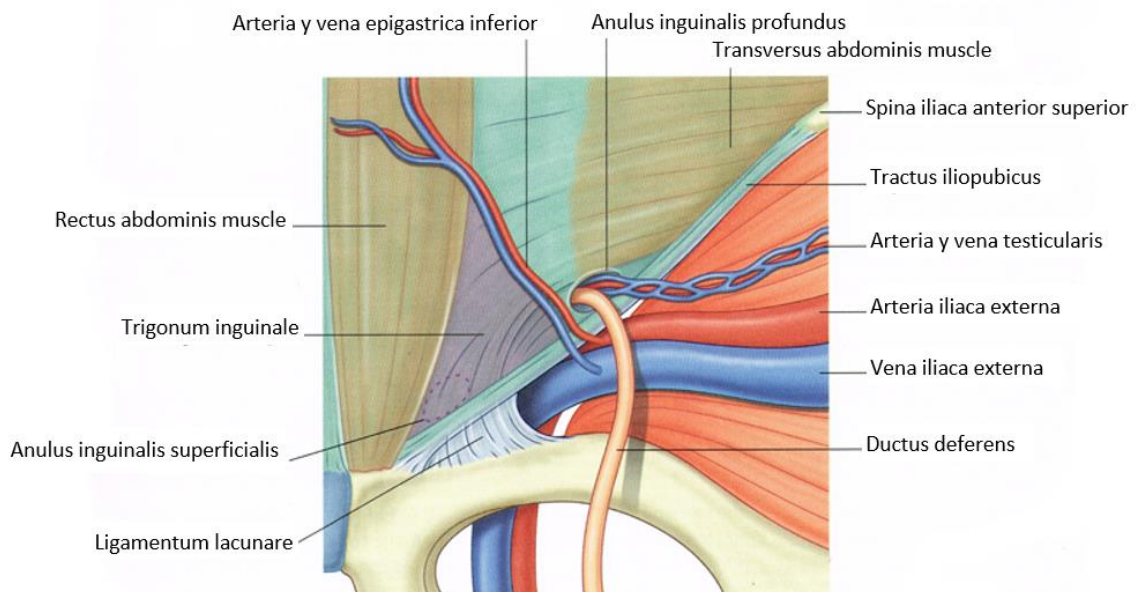
★ **Pathology:**

**I) Types :**

- 1- **Medial type** : Bulges medial to the medial umbilical ligament .
- 2- **Lateral type** : Bulges lateral to the medial umbilical ligament .
- 3- **Funicular type of direct inguinal hernia** : very rare , a very narrow necked hernia ,pass through a small defect in the medial part of conjoint tendon just above the pubic tubercle

**II) Structures :**

**1. Defect:** Hasselbach's triangle.



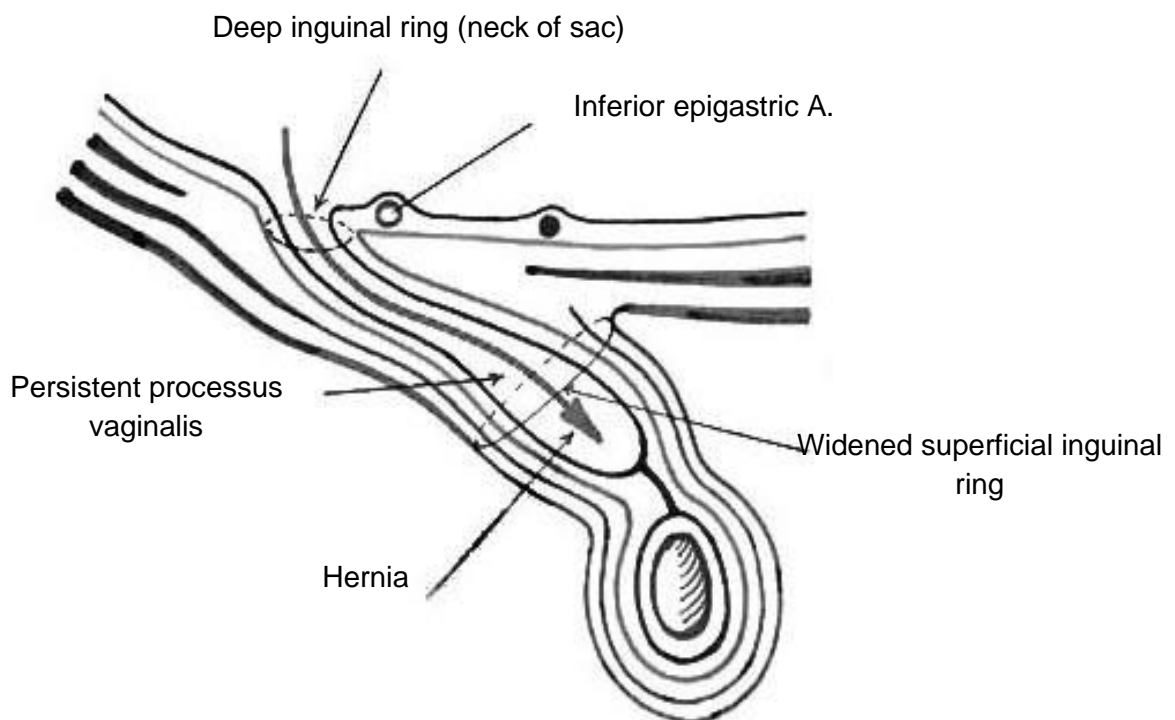
## 2. **Sac:**

- The sac lies behind the cord & medial to the inferior epigastric vessels.
- Usually has a wide neck (except fanicular type) → complications are rare .

3. **Contents:** Any viscus.

4. **Coverings:** skin , superficial fascia , external oblique aponeurosis , spermatic cord , conjoint tendon transversalis fascia & extra-peritoneal tissue .

★ **Complications:** Rare because it has a wide neck. (except fanicular type)



**\* Oblique inguinal hernia \***

★ **Clinical picture &D.D:**

	<i>Indirect inguinal hernia</i>	<i>Direct inguinal hernia</i>
<b>1. Incidence</b>	◆ The commonest hernia	◆ Rare
<b>2.Age:</b>	◆ Any age	◆ Usually old, never in children (Straight canal)
<b>3. Sex:</b>	◆ Males are more affected	◆ Only in male.
<b>4.Side:</b>	◆ Unilateral or bilateral	◆ Usually bilateral
<b>5. Shape:</b>	◆ Pyriform	◆ Hemispherical.
<b>6.Descent:</b>	◆ Forewards, medially and downwards.	◆ Directly forewards.
<b>7. Reduction:</b>	◆ Upwards, laterally and backwards.	◆ Directly backwards. It disappears by lying flat.
<b>8. Site &amp; size :</b>	◆ Inguinal or inguino-scrotal & may attain large size .	◆ Only small inguinal swelling except in funicular type which rich the neck of scrotum.
<b>9. Internal ring test:</b>	◆ Hernia does not descent	◆ Hernia will descend above the inguinal ligament
<b>10. External ring test:</b>	◆ Wide ring & impulse on the tip of finger.	◆ Normal ring & impulse on posterior aspect of the finger.
<b>11. Defect ( at operation) is the most important</b>	◆ Deep ring, lateral to inferior epigastric vessels	◆ Hasselbach's triangle, medial to inferior epigastric vessels.
<b>12. Complications:</b>	◆ Common	◆ Rare except in funicular type

\* **Treatment:**

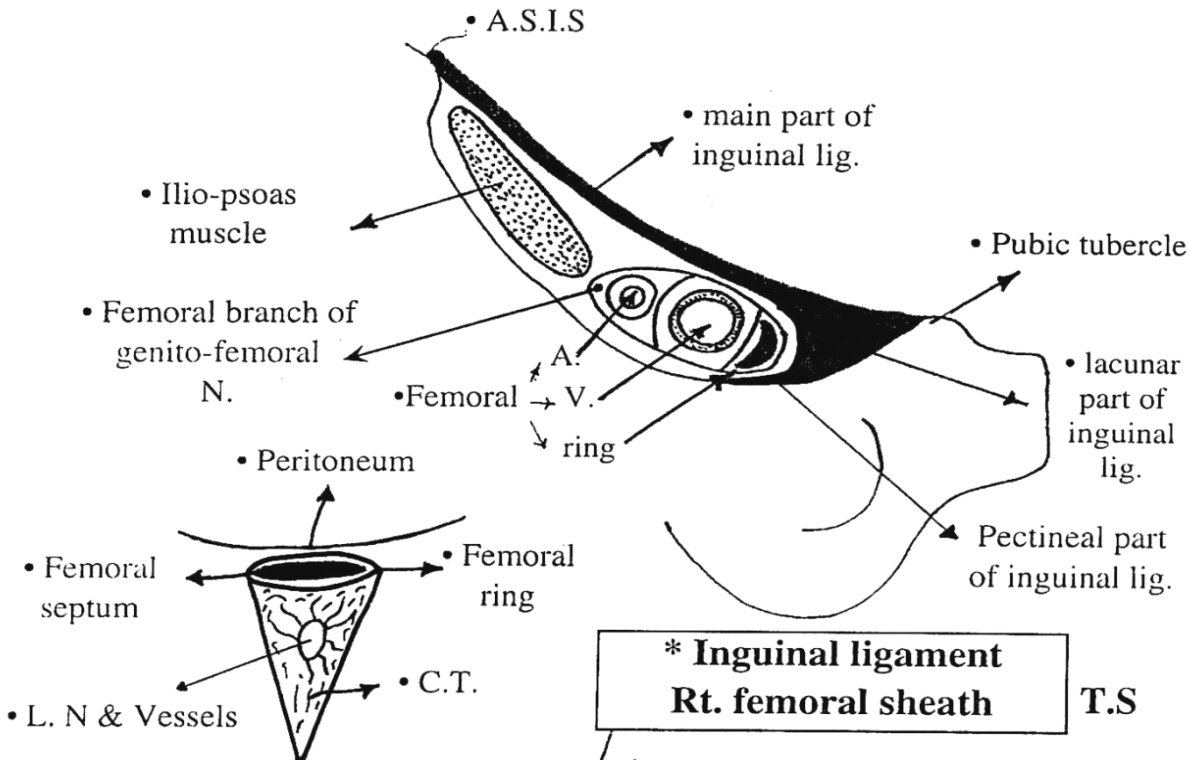
**A. Palliative:** Small hernias in elderly people unfit for surgery are best treated by truss.

**B. Surgical:** For a large hernia, young patient or narrow neck.

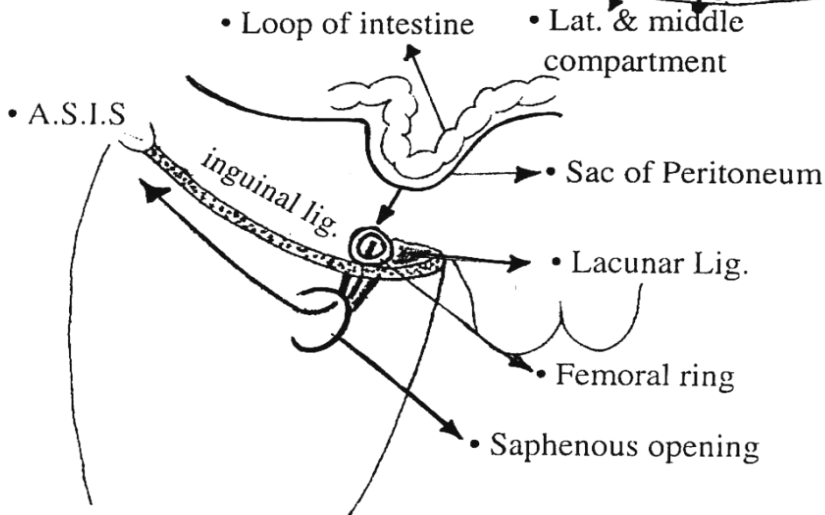
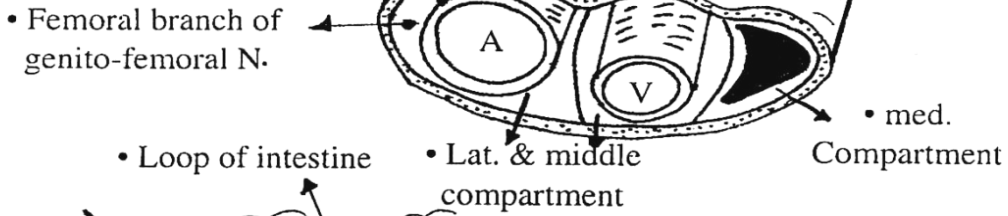
a. **Herniotomy** Differ from that for indirect hernia in:

1. The sac lies **behind the cord** and does not pass within its coverings.
2. The sac is always **medial to inferior epigastric** vessels.
3. The neck of the sac is wide → **transfixation cannot be done**, therefore the sac is not opened & invaginated into the abdomen.

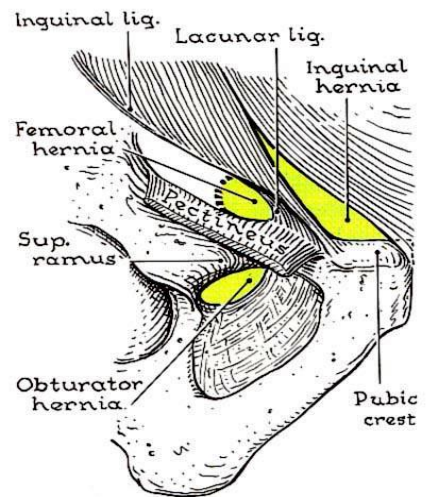
b. **Hernioplasty** is essential to strengthen the posterior wall of inguinal canal.



**Femoral Canal**



**\* Pathway Of Femoral Hernia \***



Three hernial sites

## FEMORAL HERNIA

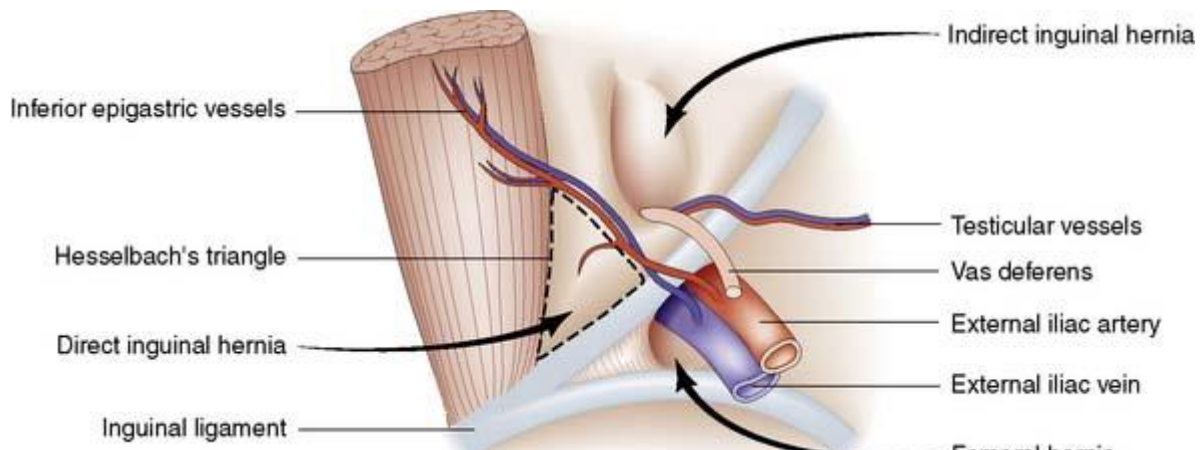
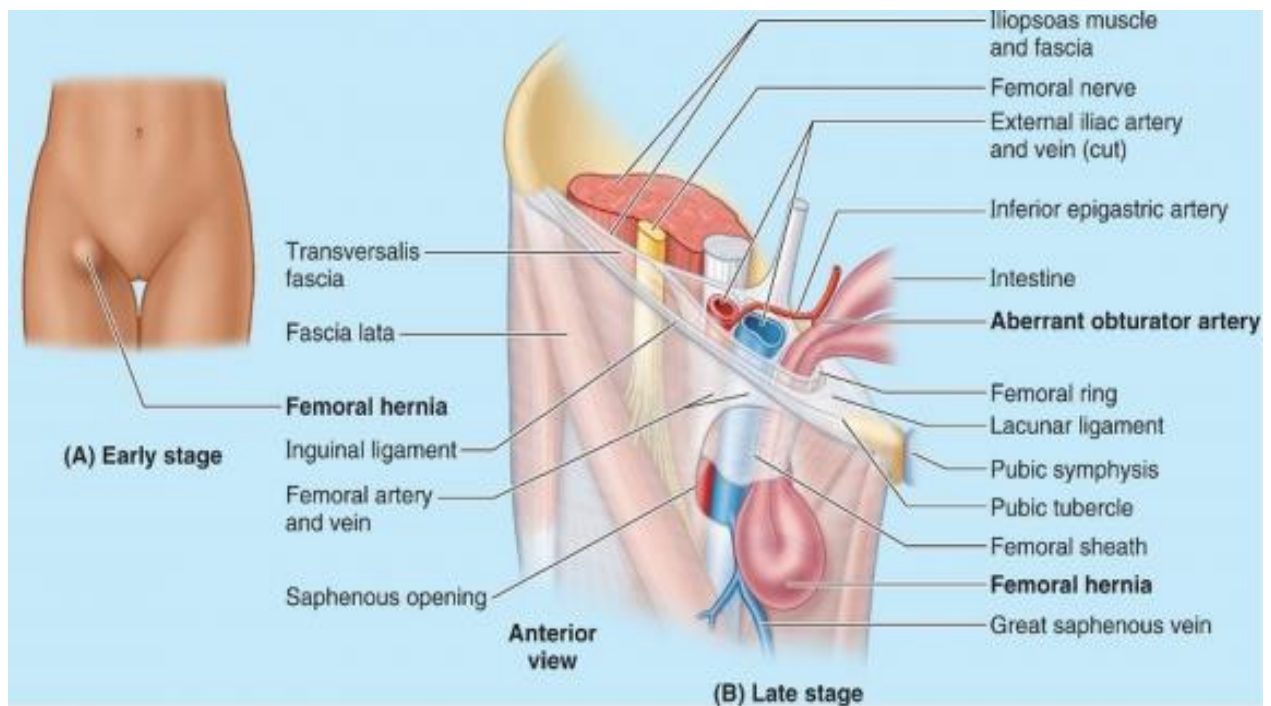
### ★ Incidence:

- Femoral hernia represent **3%** of external abdominal hernia.
- More in **females** because:
  1. Wide pelvis → ***wide femoral ring*** .
  2. Repeated pregnancies & labor and raised ***intra-abdominal pressure***.
  3. ***Weak muscles and ligaments***.

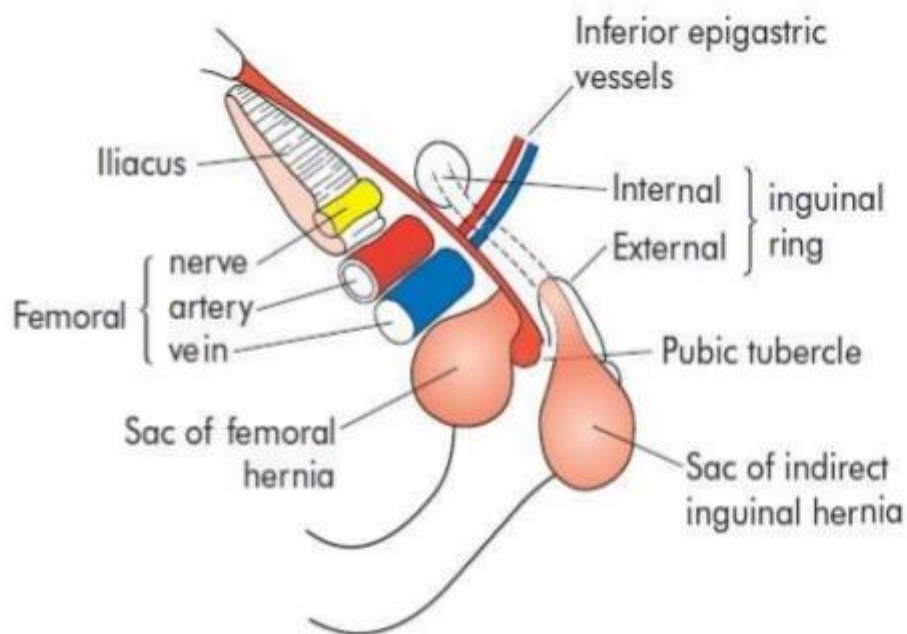
★ **Aetiology:** Always acquired pulsion sac is formed due to raised intra-abdominal pressure & weak abdominal wall .

### ★ Pathology:

1. ***Defect:*** Femoral ring.
2. ***Sac:*** It descends downwards through the femoral ring → femoral canal, then it passes forwards through the saphenous opening. The hernia enlarges upwards & lateral towards the inguinal ligament in the superficial fascia.
3. ***Contents:*** Usually contain omentum , intestine or urinary bladder. Richter's hernia is common.
4. ***Coverings:*** Femoral septum, contents of femoral canal, anterior wall of the femoral canal, cribriform fascia, superficial fascia of the thigh & skin.

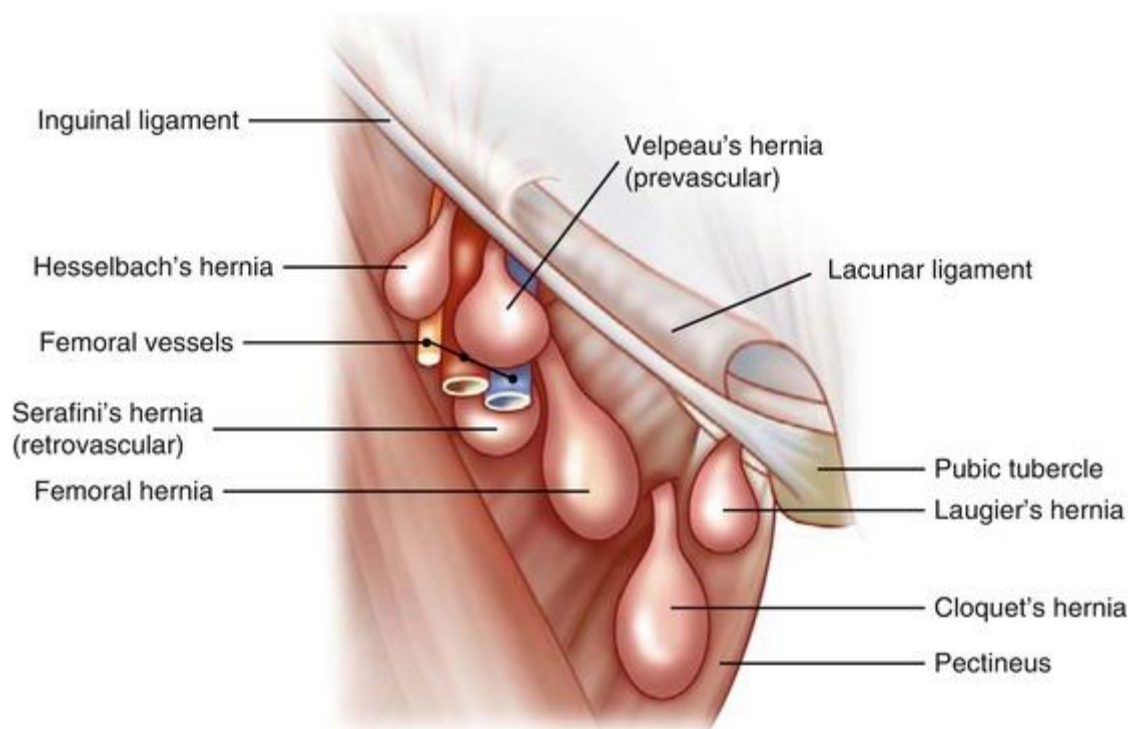


## Groin Hernias



5. Several **rare subtypes** of femoral hernia have been described :

<b>Narath's hernia'</b>	In congenital dislocation of hip joint ,the hernial sac pass within the femoral sheath behind the femoral vessels .
<b>Serafini's hernia (Retrovascular )</b>	The hernial sac emerges behind femoral vessels .
<b>Velpeau hernia (Prevascular)</b>	The hernial sac lies in front of the femoral vessels in the groin .
<b>Hesselbach hernia</b>	The neck of the sac lies lateral to the femoral vessels.
<b>Laugier hernia</b>	The hernial sac transverses the lacunar ligament .
<b>Cloquet's hernia'</b>	The hernial sac descends deep to the pectineal fascia .

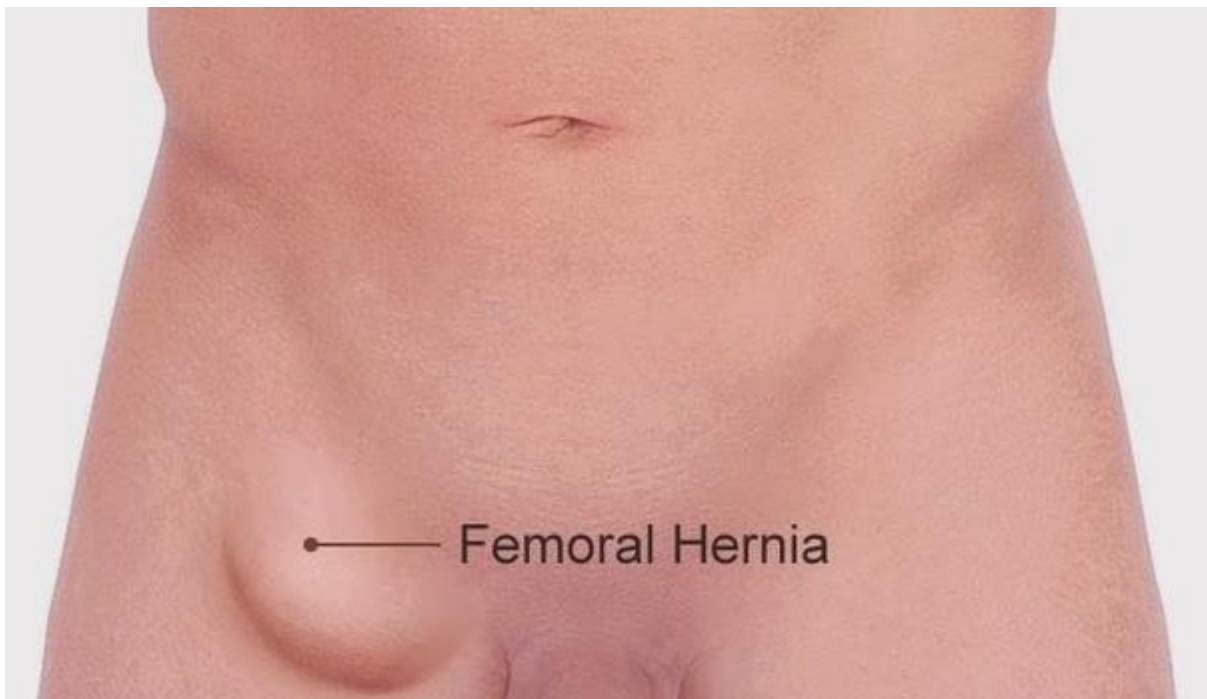




★ **Complications:** It has narrow neck → complications are very common.

★ **Clinical picture:** (As general).

1. **Site:** In the femoral triangle below the inguinal ligament and below & lateral to the pubic tubercle.
2. **Direction of descent:** Downwards, forwards then upwards & laterally.
3. **Direction of reduction:** Downwards then backwards & finally upwards.
4. **Special tests:**
  - Pressure on **saphenus** opening → prevents descent of hernia.
  - **Internal ring test** : the hernia appears below the inguinal ligament .
  - **Zeiman's test** : impulse on cough below inguinal ligament .

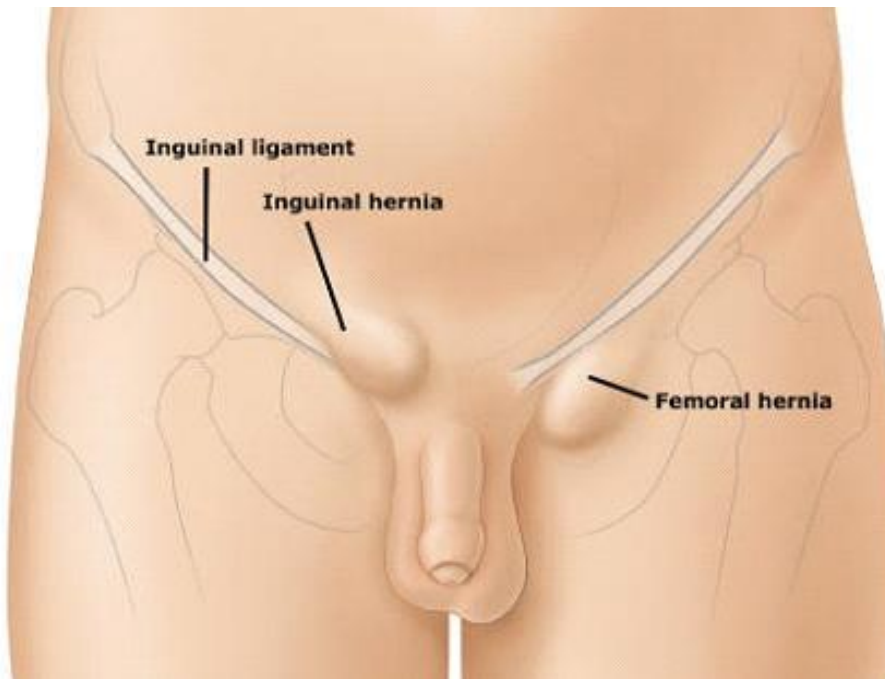


★ **D.D.:** a) *Inguinal hernia*

* <i>Inguinal hernia</i>	* <i>Femoral hernia</i>
<ul style="list-style-type: none"> <li>• Above the <i>inguinal ligament</i>.</li> <li>• Above &amp; medial to pubic tubercle</li> </ul>	<ul style="list-style-type: none"> <li>• Below the <i>inguinal ligament</i></li> <li>• Below &amp; lateral to <i>pubic tubercle</i></li> </ul>
<ul style="list-style-type: none"> <li>• Characteristic direction of <i>reduction &amp; descent</i> and <i>special tests</i>.</li> </ul>	

b) *Other swellings in the femoral triangle :*

- **Reducible femoral hernia** should be differentiated from :
  - Inguinal hernia , obturator hernia , saphena varix, psoas abscess , femoral aneurysm .
- **Irreducible femoral hernia** should be differentiated from :
  - Irreducible inguinal or obturator hernias , enlarged inguinal L.Ns , ectopic femoral testis, , lipoma & sarcoma.



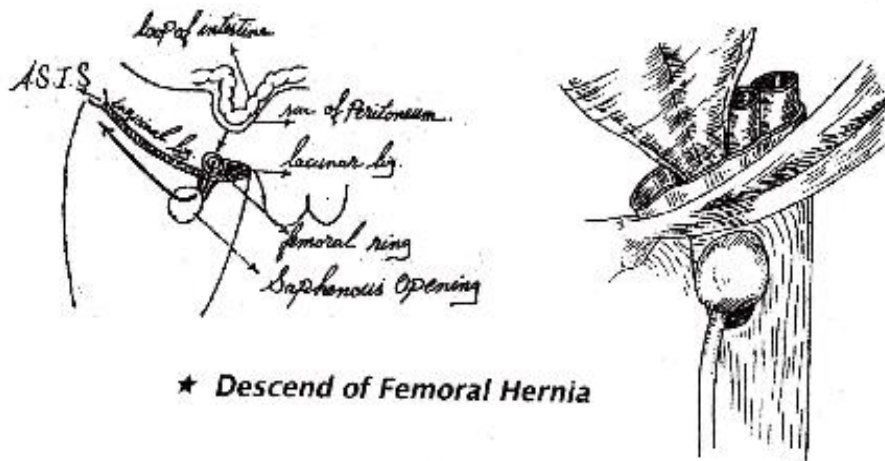
★ **Surgical treatment:** is the only line of treatment. (Truss is not used)

I ) **Laparoscopic hernioplasty** by synthetic mesh is increasingly popular and recommended nowadays .

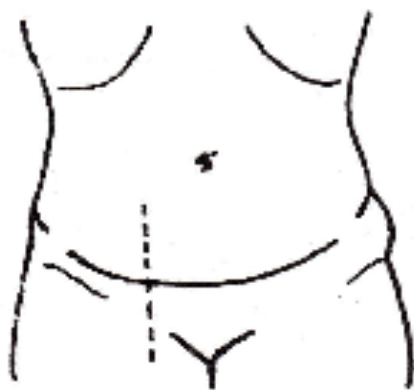
II ) **Open surgery** by one of the following approaches :

1. **High inguinal approach: (Letheissen's Operation)**, commonly used.

- ◆ **Through an inguinal incision** one finger above & parallel to the med. 2/3 of inguinal ligament (the same as inguinal hernia).
- ◆ After excision of the sac repair of the femoral ring by one of the followings:
  - a) Plugging the femoral ring with synthetic mesh ( open hernioplasty ) .
  - b) Suturing of conjoint tendon to pectineal ligament to close the femoral ring and strengthening the posterior wall of inguinal canal i.e. **McVay's repair**.
  - c) Suturing of inguinal ligament to pectineal ligament.
  - d) Suturing conjoint tendon to inguinal ligament to pectineal ligament.
- ◆ **Advantages:** (The reverse of disadvantages of low approach).
- ◆ **Disadvantage:** Disturbs shutter mechanism and weakens the posterior wall of inguinal canal.



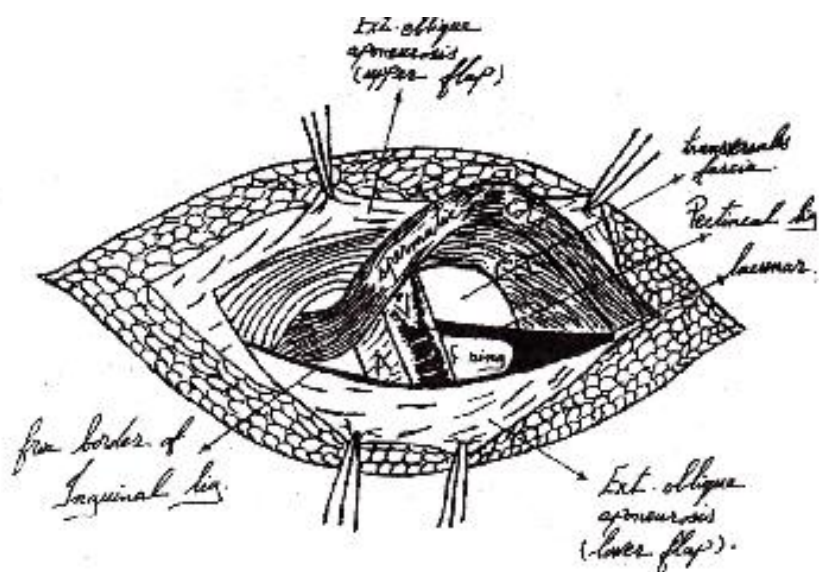
★ Descend of Femoral Hernia



★ McEvedy approach



Ext. oblique



★ Repair of Femoral Ring

## 2. **High McEvedy's approach:**

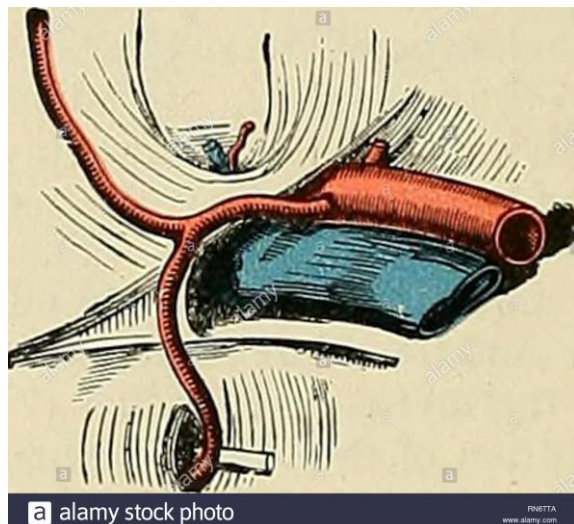
- ◆ Through an incision at the outer border of the lower part of the rectus abdominis muscle. This incision can be extended in the skin down to below the inguinal ligament to empty the sac if it is distended with the contents.
- ◆ The sac & femoral ring are dealt with as described for high inguinal approach.
- ◆ **Advantages:** Reverse of disadvantages of the other 2 operations and it is the best for **strangulated femoral hernia**

**3.Low approach:** Not used nowadays , a transverse incision 1/2 inch below and parallel to the inguinal ligament over the hernia.

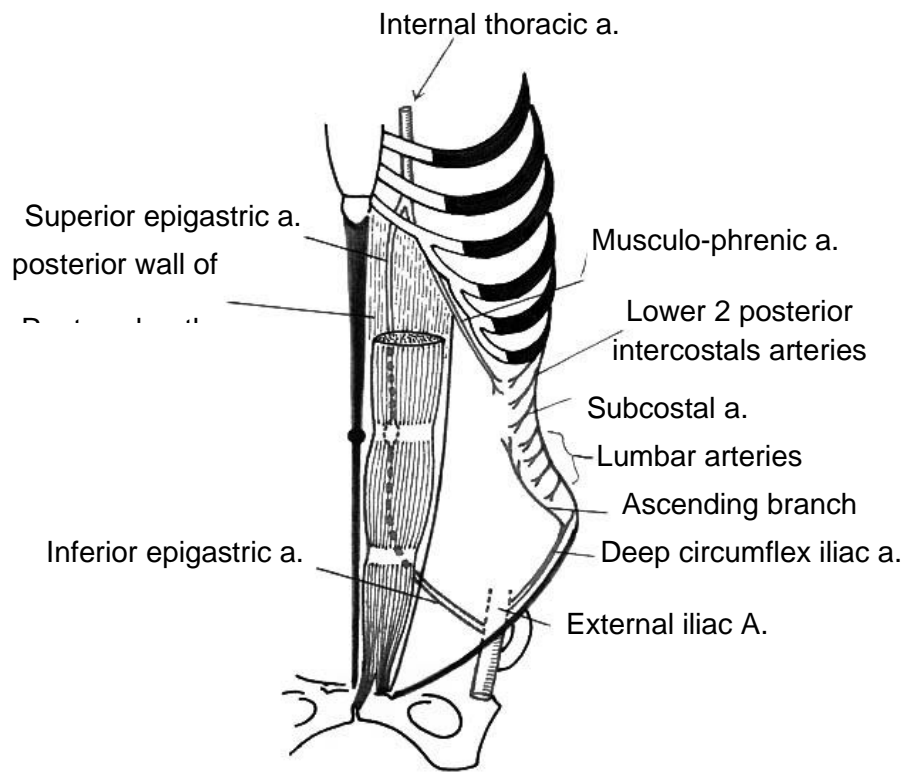
### ◆ **Disadvantages:**

- a) The sac cannot be excised at **the proper neck** → recurrence.
- b) **Strangulated bowel** can not be dealt with.
- c) **Associated inguinal** hernia can not be not dealt with.
- d) Injury to an **abnormal obturator artery** is common in strangulation if the constriction is relieved by cutting the sharp border of lacunar ligament .

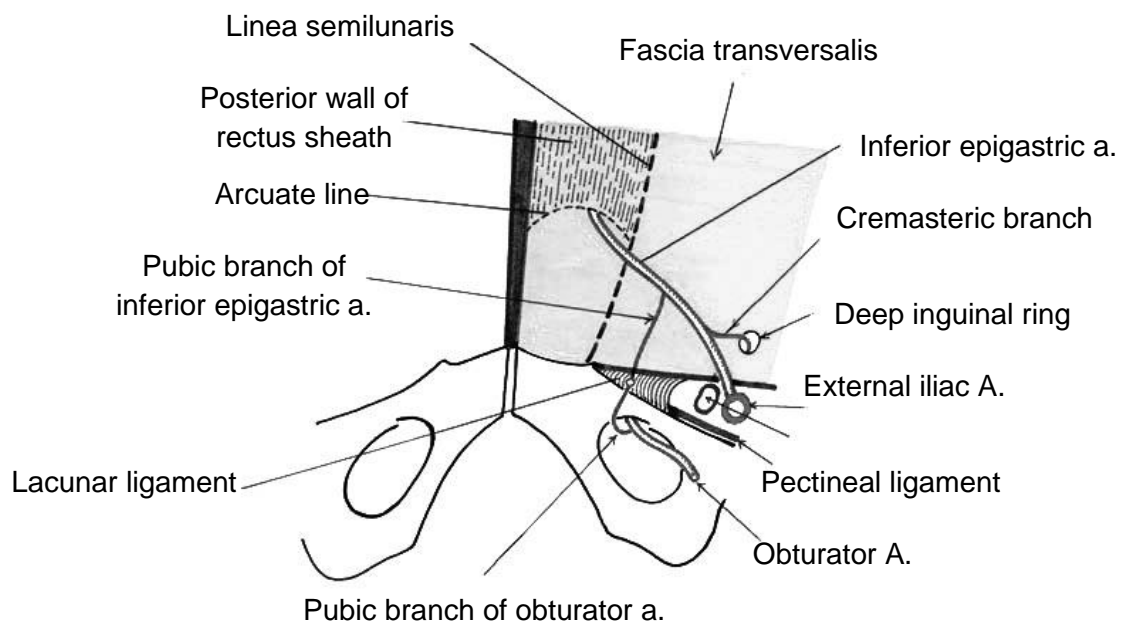
### **Abnormal obturator artery**



**\* Arterial supply of anterior and lateral abdominal walls \***



**Inferior epigastric A.**



**Anterior abdominal wall seen from inside the abdomen (from behind)**