

## Rectus Sheath:

→ an aponeurotic sheath enclosing rectus abdominis muscle (& pyramidalis if present) on either side of linea alba

→ derived from aponeuroses of flat muscles of AAW.

Functions: - checking bowing of rectus abdominis during its contraction

- maintaining strength of AAW.

Features: → has anterior & posterior walls

→ anterior wall is complete

→ posterior wall is deficient above & below

- Above: attached to costal margin (7th, 8th, 9th costal cartilages)

- Below: it presents a free curved margin with concavity facing inferiorly called arcuate line

↳ below this level, muscle lies directly on fascia transversalis.

Formation:

Above level of costal margin:

Anterior Wall: aponeurosis of external oblique (EO) only.

Posterior wall: deficient (muscle lies directly on 5th, 6th, 7th costal cartilages)

Between Costal Margin & Arcuate Line:

Anterior wall: fusion of aponeurosis of EO & anterior lamina of aponeurosis of internal oblique (IO)

Posterior wall: fusion of aponeurosis of transversus abdominis (TA) & posterior lamina of IO aponeurosis.

Below level of Arcuate Line:

Anterior wall: aponeuroses of all 3 flat muscles - EO, IO, TA.

↳ aponeuroses of IO & TA fuse to form conjoint tendon; aponeurosis of EO remains separate.

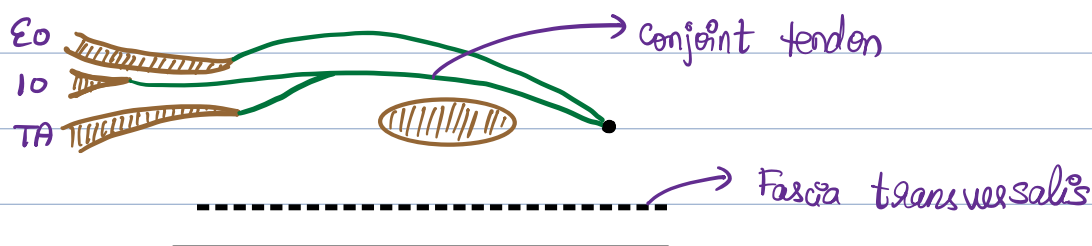
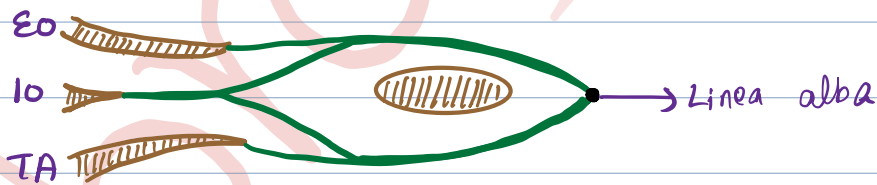
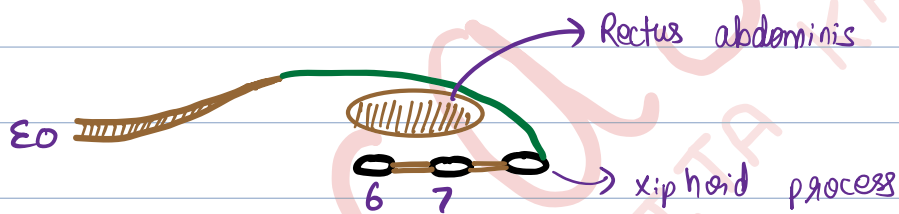
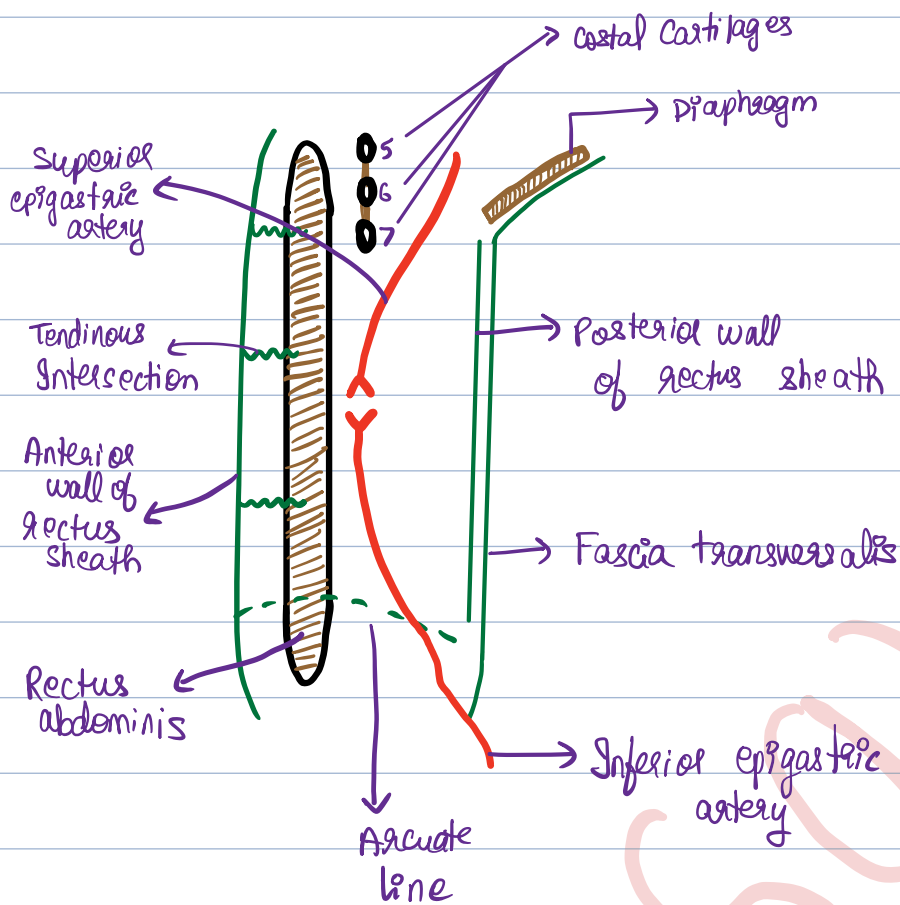
Posterior wall: deficient.

Contents: Two muscles: Rectus abdominis, pyramidalis

Two Arteries: Superior epigastric & inferior epigastric

Two Veins: Superior epigastric & inferior epigastric

Six Nerves: T7 - T12 (5 intercostal nerves + 1 subcostal nerve).



# Fascia Transversalis:

## Extent:

Superiorly: continuous with diaphragmatic fascia

Inferiorly: continuous with fascia iliaca

Anteriorly: linea alba

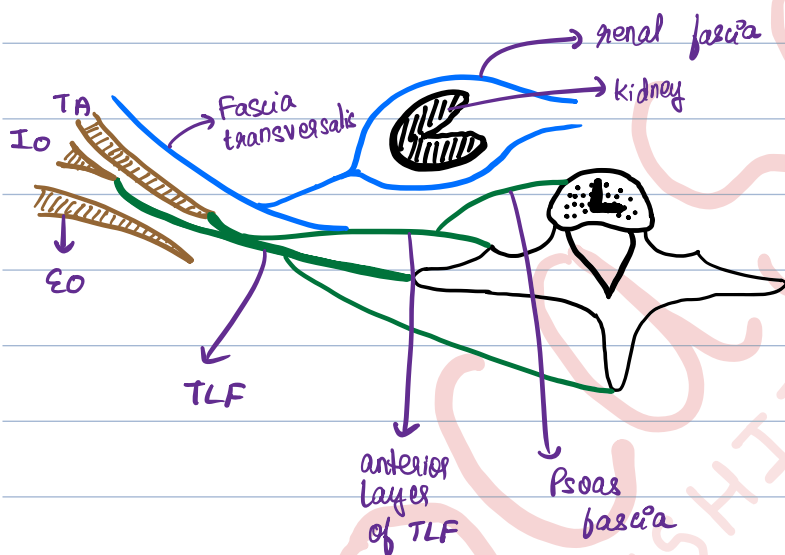
Posteriorly: continuous with thoracolumbar fascia (TLF)

Features: fascia transversalis presents an oval opening 1.2cm above midinguinal point

↳ deep inguinal ring

→ it forms internal spermatic fascia around spermatic cord.

→ forms iliopectic tract in inguinal region.



## Abdominal Incisions:

(Abdominal incisions may sometimes give rise to abdominal hernias)

Midline incision: healing is poor & may lead to incisional hernia

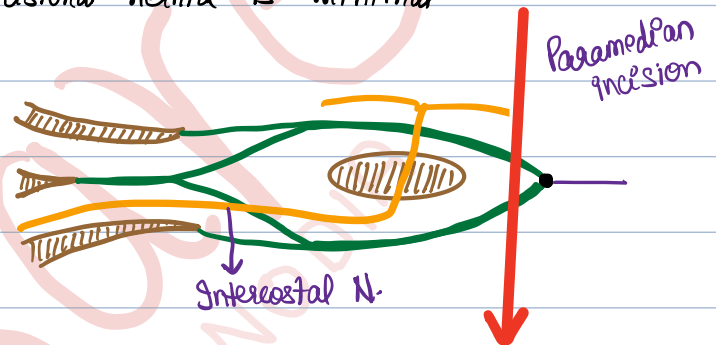
↳ infraumbilical incision is safer because of close approximation of recti which prevents ventral incisional hernia

Paramedian Incision: advantageous than median/midline incision

↳ 2.5 cm lateral & parallel to midline

→ postoperative weakness & occurrence of incisional hernia is minimal

→ given most frequently.



McBurney's incision / Grid-Iron incision:

↳ commonly given for appendectomy.

→ oblique incision in right iliac fossa

→ 2 inches above & medial to -sis

→ EO, IO, TA muscles are incised. ∴ called muscle-splitting incision

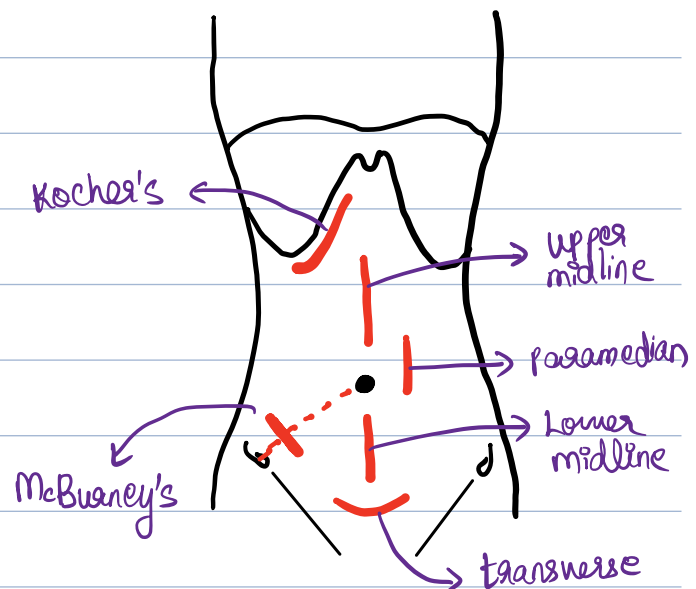
→ no postoperative weakness.

Kocher's incision (Right subcostal incision): 2-5 cm below & parallel to right costal margin

→ for gall bladder & associated ducts

Transverse incision: 2 cm below umbilicus, along the skin crease

→ for pelvic organs





## Inguinal Region:

Inguinal Ligament  $\Rightarrow$  from ASIS to pubic tubercle

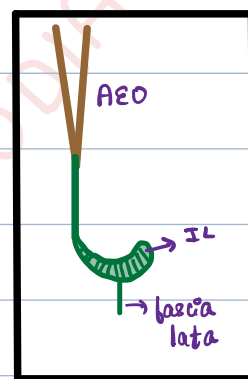
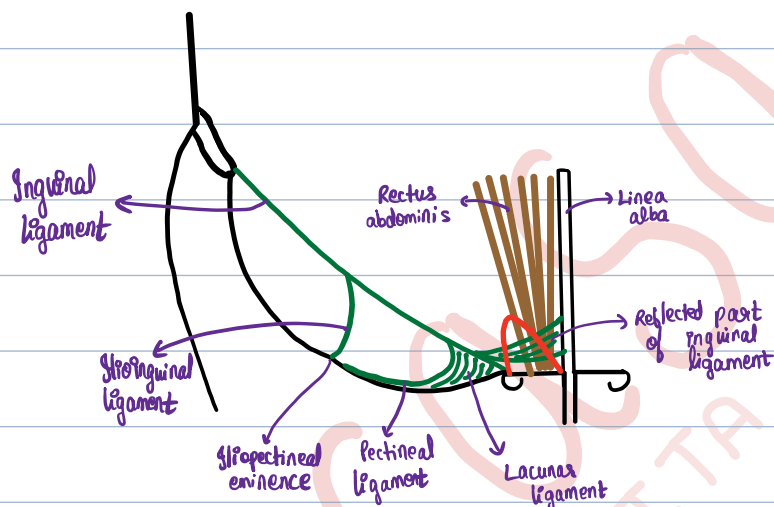
- $\rightarrow$  formed by lower free border of external oblique aponeurosis which is thickened & folded backward on itself
- $\rightarrow$  grooved upper surface of inguinal ligament forms floor of inguinal canal.
- $\rightarrow$  fascia lata of thigh is attached to lower aspect of entire length of ligament which makes it convex inferiorly by its pull.

Lacunar Ligament / Gimbernat's Ligament

- $\rightarrow$  from medial end, deep fibres of inguinal ligament curve backward to medial part of pecten pubis

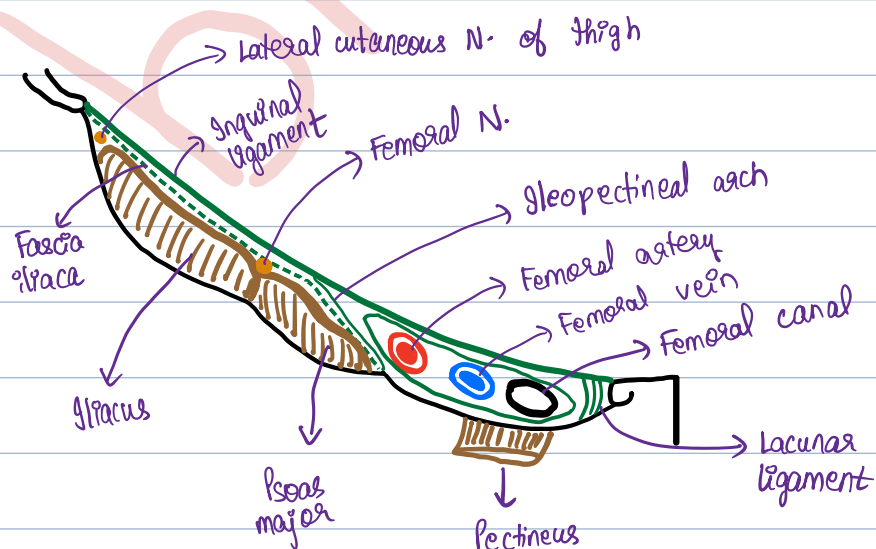
Pectinean Ligament / Ligament of Cooper

- $\rightarrow$  extension of posterior part of lacunar ligament along the pecten pubis upto iliopectineal eminence.



Reflected Part of Inguinal Ligament:

- $\rightarrow$  superficial fibres from medial end of inguinal ligament expand upwards & medially
- $\rightarrow$  they interlace with those of its counterpart of opposite side at linea alba.



Subinguinal /  
Pectofemoral  
Space  
(structures passing through it)

# Inguinal Canal

- 4cm long
- directed downward, forward & medially
- formed due to descent of testis into scrotum & pelvis during fetal development.
- Content: Male  $\Rightarrow$  spermatic cord  
Female  $\Rightarrow$  round ligament

## Extent & Direction

- from deep inguinal ring (oval opening in fascia transversalis) to superficial inguinal ring (triangular gap in external oblique aponeurosis)
- DIR is marked 1.2cm above mid-inguinal point
- SIR is marked just above pubic tubercle.

## Boundaries:

Anterior wall: superficial to deep by

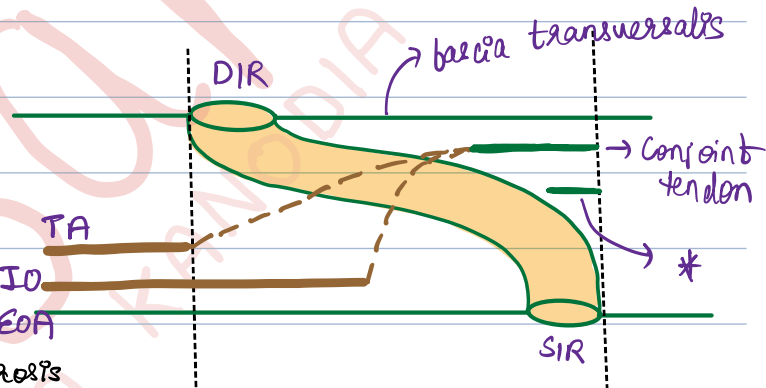
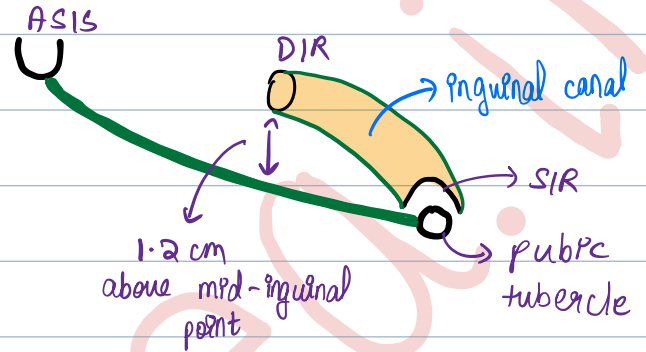
- skin
- superficial fascia
- external oblique aponeurosis
- internal oblique muscle fibre (in lateral  $\frac{1}{3}$ )

Posterior wall: deep to superficial by:

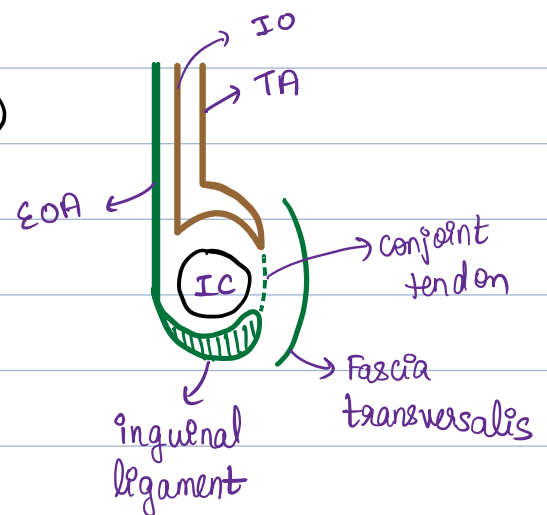
- fascia transversalis
- conjoint tendon in medial  $\frac{2}{3}$
- reflected part of inguinal ligament (in medial-most part)

Roof: - conjoint tendon

Floor: - grooved upper surface of inguinal ligament



\* reflected part of inguinal ligament



## Spermatic Cord

Contents: → ductus deferens

- three arteries - testicular artery (from abdominal aorta)
  - Cremasteric artery (from inferior epigastric artery)
  - artery to ductus deferens (from inferior vesical artery)

→ Veins → pampiniform venous plexus

→ Lymphatics

→ Nerves - genital branch of genitofemoral N.

→ Remains of processus vaginalis

Coverings:

- Internal spermatic fascia (from fascia transversalis)
- Cremasteric fascia & muscle (from internal oblique muscle)
- External spermatic fascia (from external oblique aponeurosis)

Mechanisms to maintain Integrity of Inguinal Canal (BS<sup>2</sup>F)

- flap-valve mechanism
- Ball-valve mechanism
- Split-valve mechanism
- Shutter mechanism

## Inguinal / Hasselbach's Triangle

→ situated deep to posterior wall of inguinal canal

Boundaries:

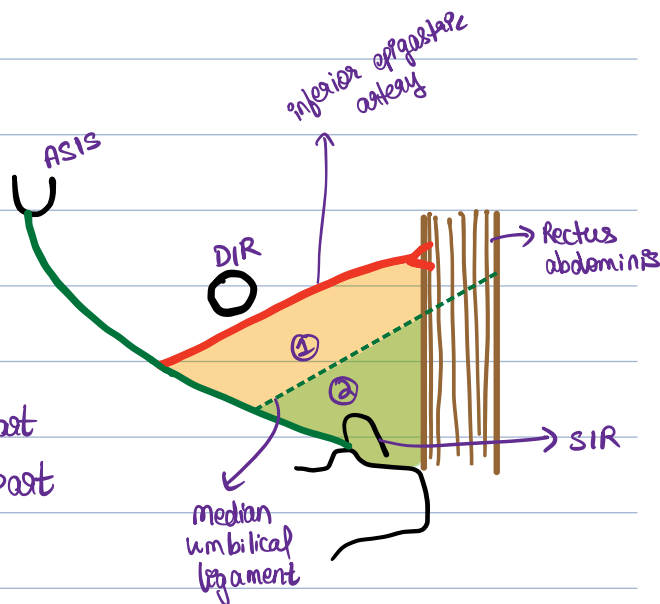
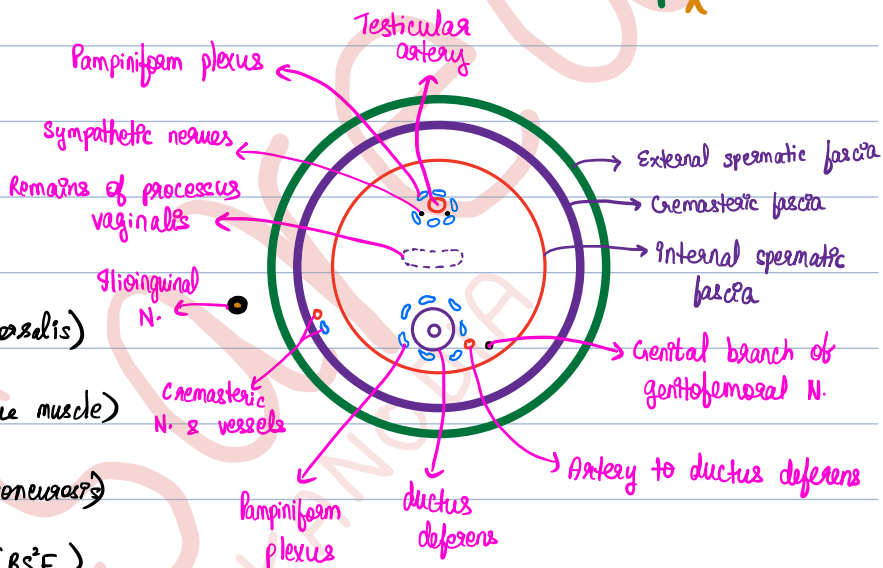
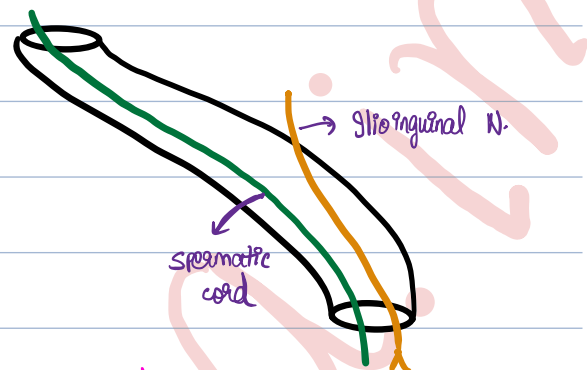
Medial: lateral border of lower part of rectus abdominis

Lateral: inferior epigastric artery

Inferior: medial half of inguinal ligament

Floor: - peritoneum

- extraperitoneal tissue
- fascia transversalis



→ medial umbilical ligament (obliterated umbilical artery) crosses the triangle & divides it into 2 parts

Inguinal Hernias: protrusion of abdominal viscera into inguinal canal

↳ clinically presents as — pear-shaped swelling above & medial to pubic tubercle, above inguinal ligament

Indirect Hernia: if hernial sac enters inguinal canal through DIR

↳ common in children & young adults

→ more often in males than females

Congenital ⇒ occurs due to patent processus vaginalis

Acquired ⇒ due to increased intraabdominal pressure as during weight lifting.

Direct Hernia: hernial sac enters inguinal canal directly by pushing posterior wall of inguinal canal forward, medial to inferior epigastric artery through Hasselbach's triangle

→ common in elderly people due to weak abdominal muscles.

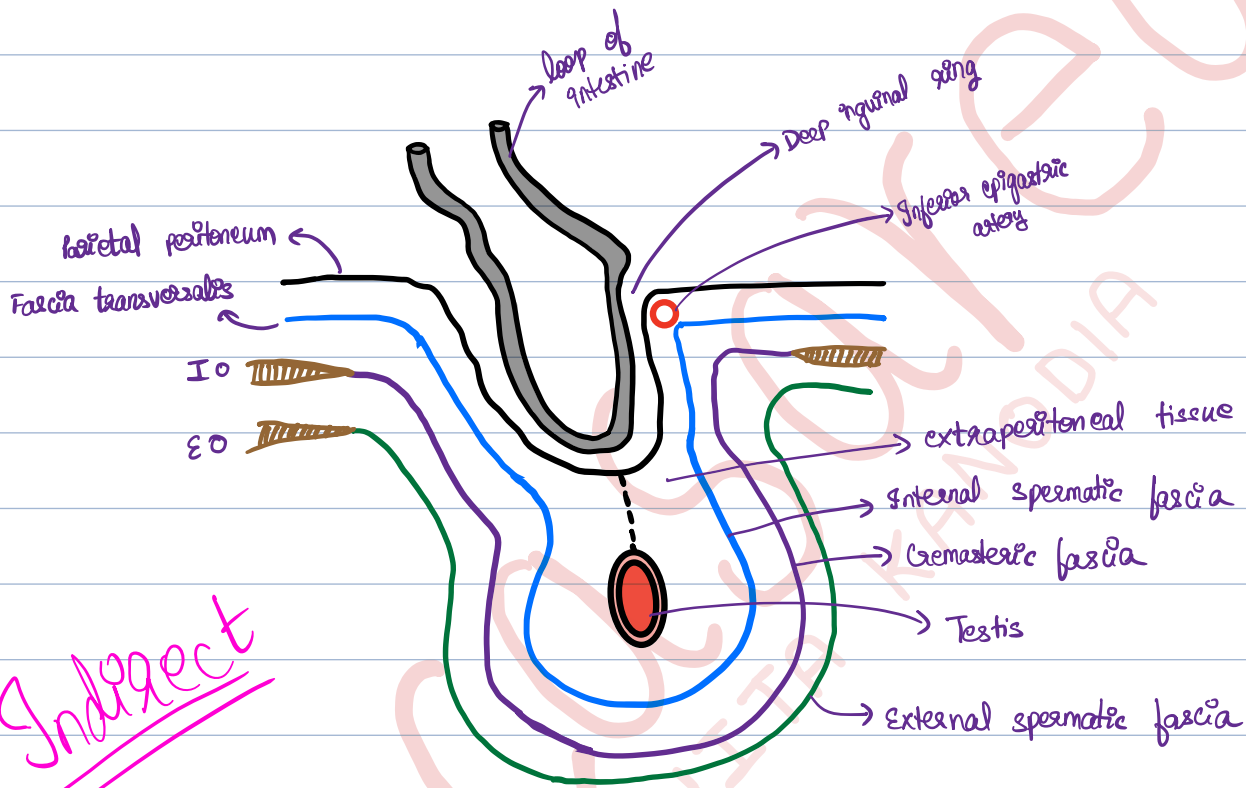
→ of two types  $\begin{cases} \text{lateral direct} \\ \text{medial direct} \end{cases}$

|                                     | <u>Indirect Inguinal Hernia</u>                | <u>Direct Inguinal Hernia</u>               |
|-------------------------------------|------------------------------------------------|---------------------------------------------|
| <u>Site of protrusion</u>           | DIR                                            | posterior wall of inguinal canal            |
| <u>Shape</u>                        | pear-shaped                                    | globular                                    |
| <u>Extent</u>                       | generally scrotal                              | rarely scrotal                              |
| <u>Direction</u>                    | oblique (downward, forward, medially)          | straight (forward)                          |
| <u>Neck of sac</u>                  | Narrow; lateral to inferior epigastric vessels | wide; medial to inferior epigastric vessels |
| <u>Reducibility</u>                 | Sometimes irreducible                          | Always reducible                            |
| <u>Age group</u>                    | Young age                                      | middle & old age                            |
| <u>Internal ring occlusion Test</u> | positive                                       | Negative                                    |

Internal Ring Occlusion Test: after reducing the hernia, pressure is applied over DIR & patient is asked to cough

→ if hernia does not appear  $\Rightarrow$  indirect hernia

if hernia appears  $\Rightarrow$  direct hernia



Indirect