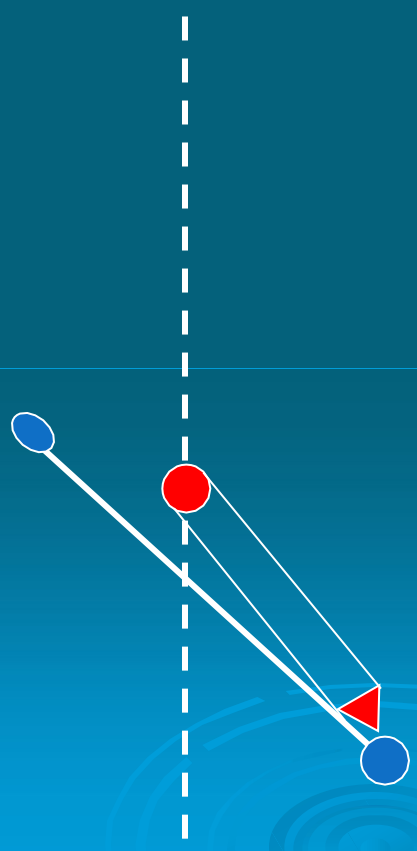
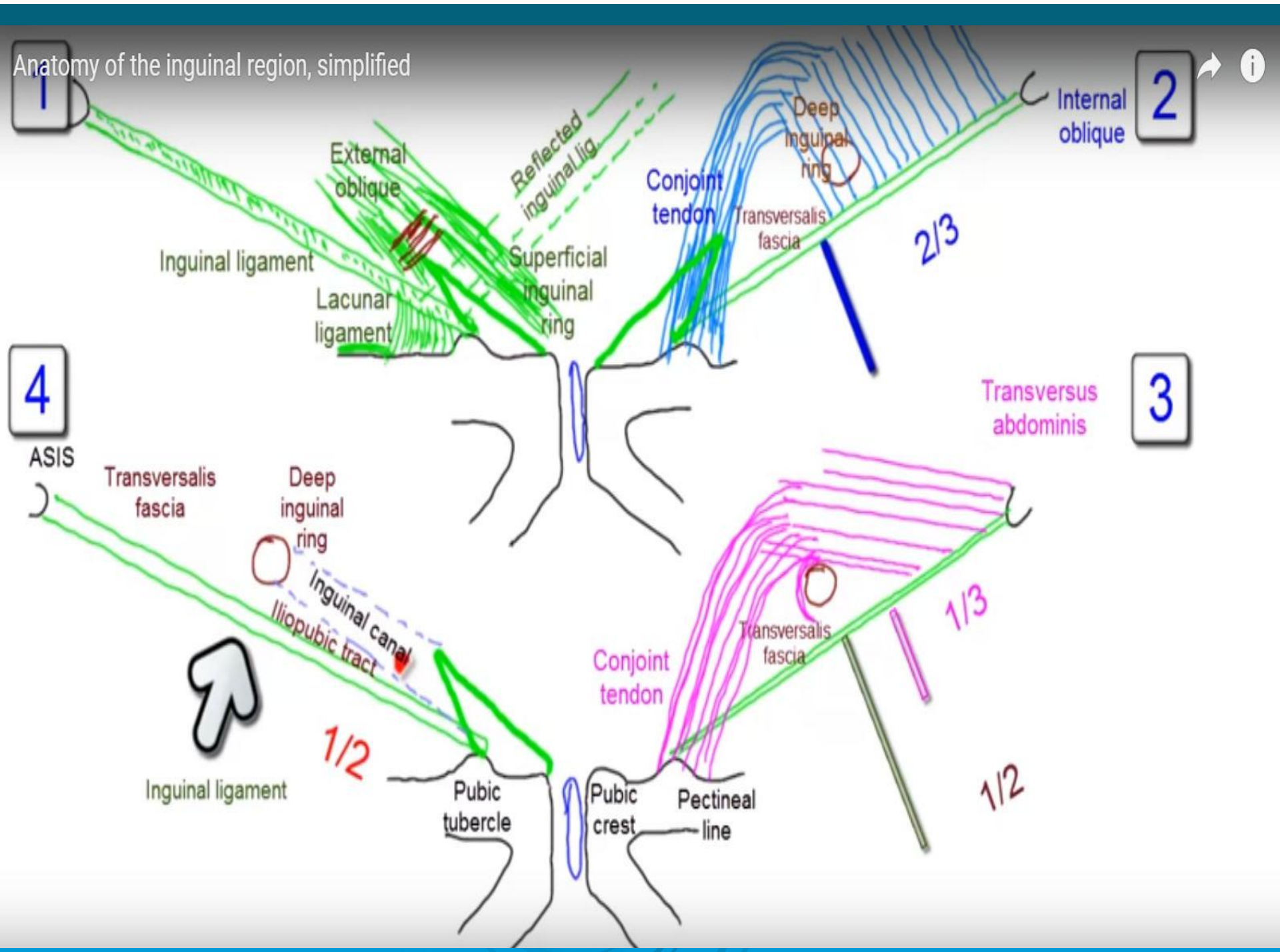
Inguinal canal
Surface anatomy



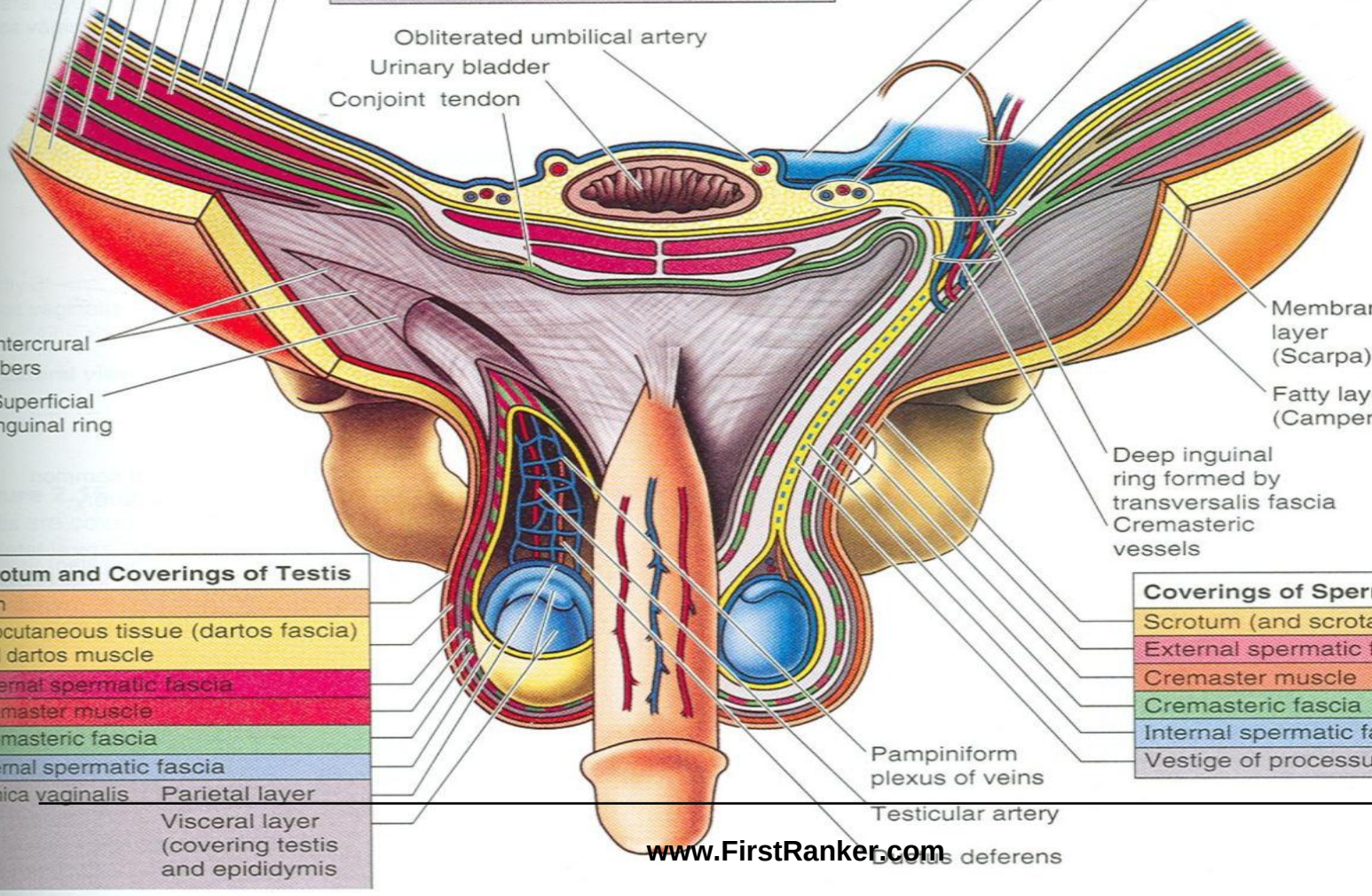
Inguinal Canal

- It is an oblique intermuscular passage through the lower part of the anterior abdominal wall
- Present in both sexes
- It allows 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



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



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

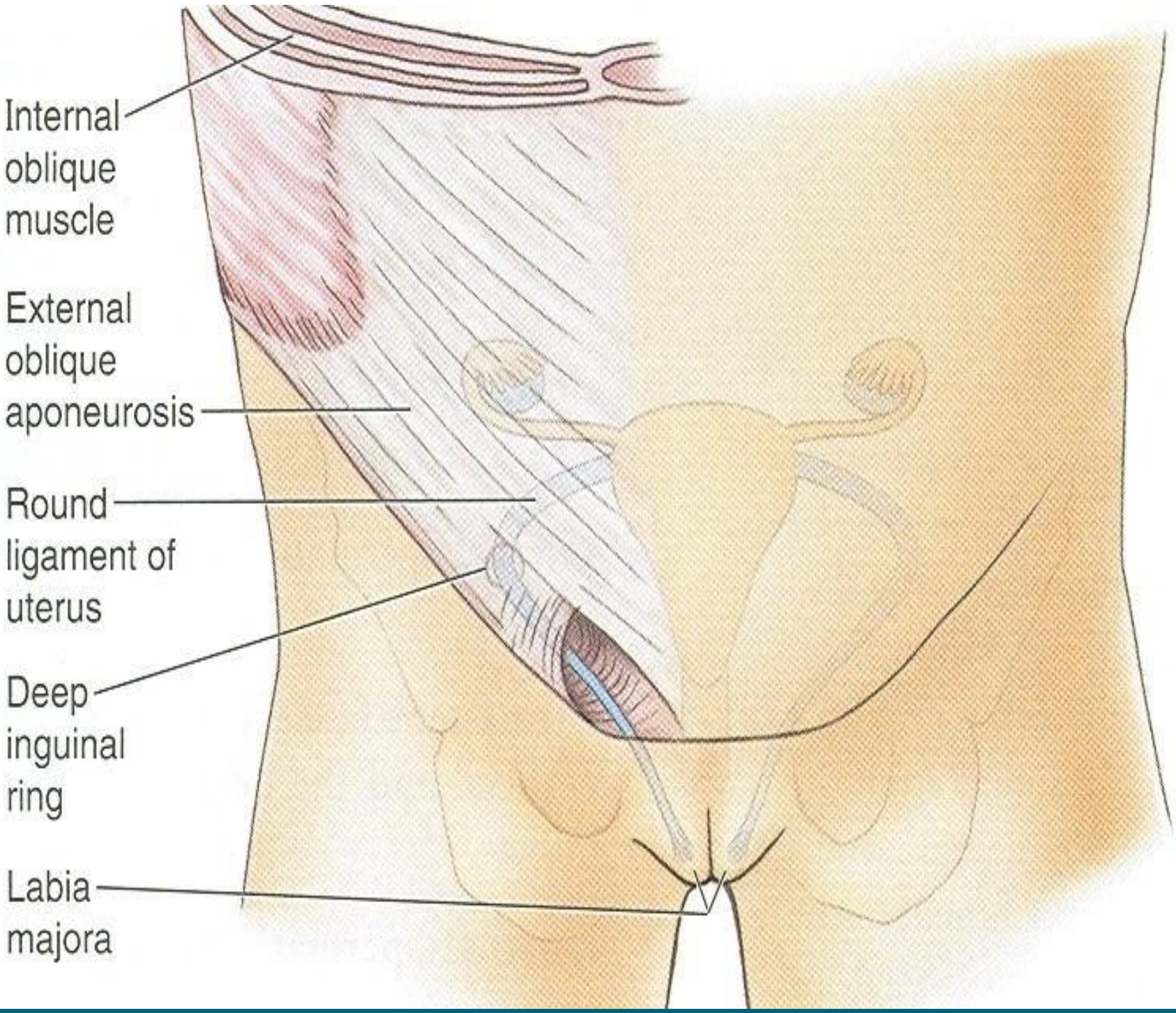
Coverings of Spermatic Cord
Scrotum (and scrotal septum)
External spermatic fascia
Cremaster muscle
Cremasteric fascia
Internal spermatic fascia
Vestige of processus vaginalis

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

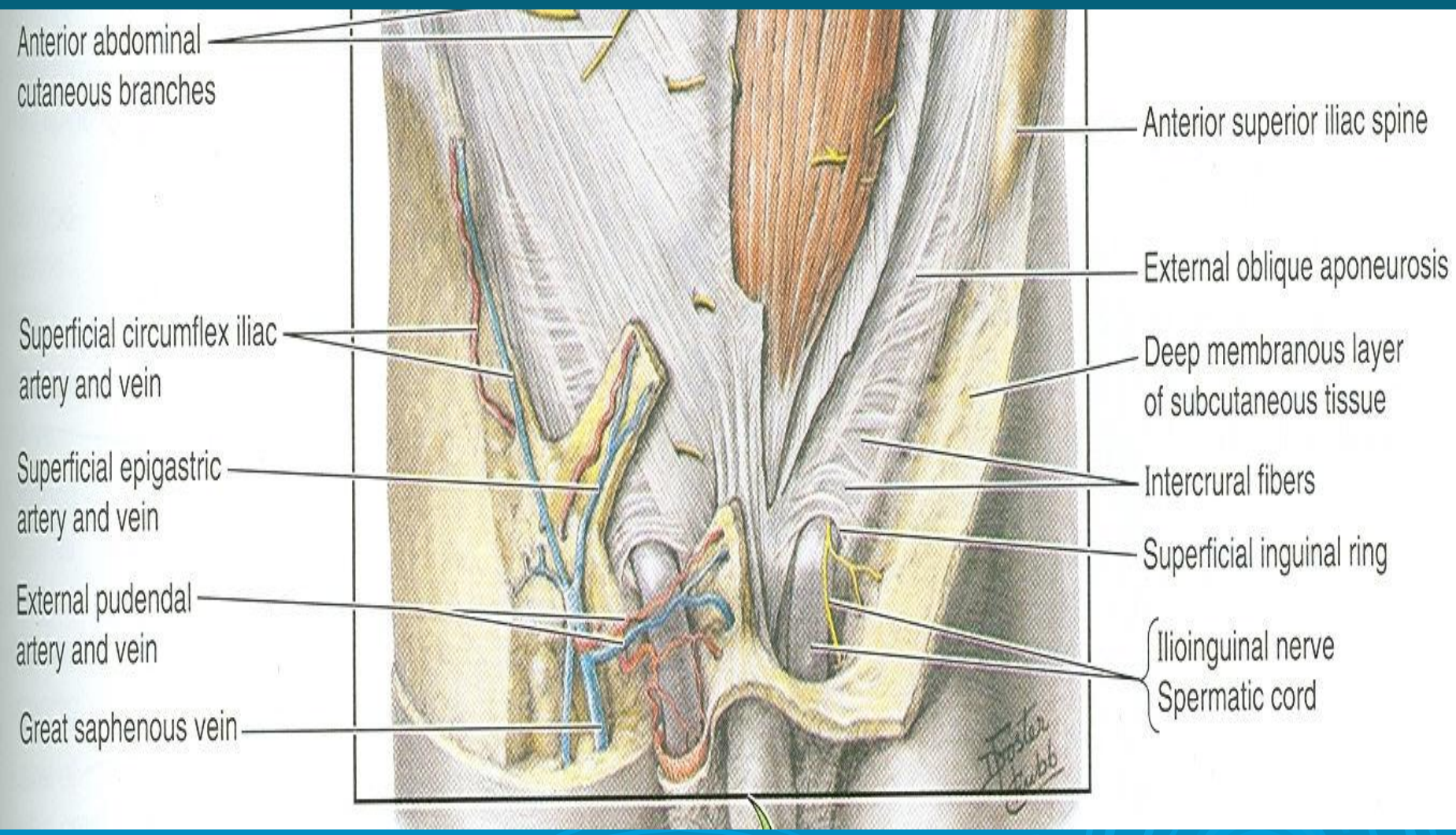
Deep Inguinal Ring

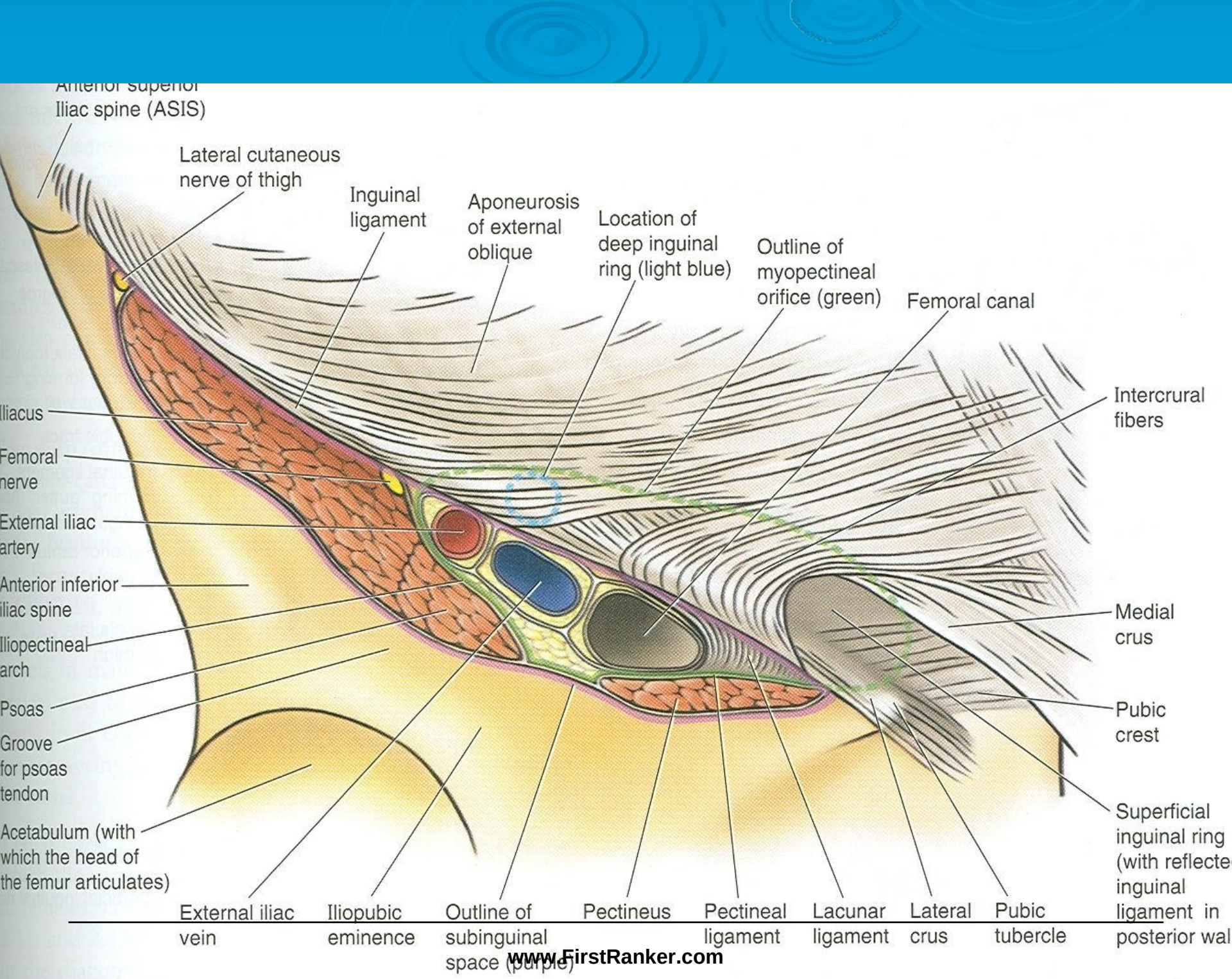
- Is an oval opening in the fascia transversalis
- Lies about ½ inch (1.3cm) above the inguinal ligament midway between the anterosuperior iliac spine and the symphysis pubis
- Margins of the ring give attachment to the internal spermatic fascia



Superficial Inguinal Ring

- Is triangular in shape
- Lies in the aponeurosis of the external oblique muscle
- Lies immediately above and medial to the pubic tubercle
- Its margins give attachment to the external spermatic fascia





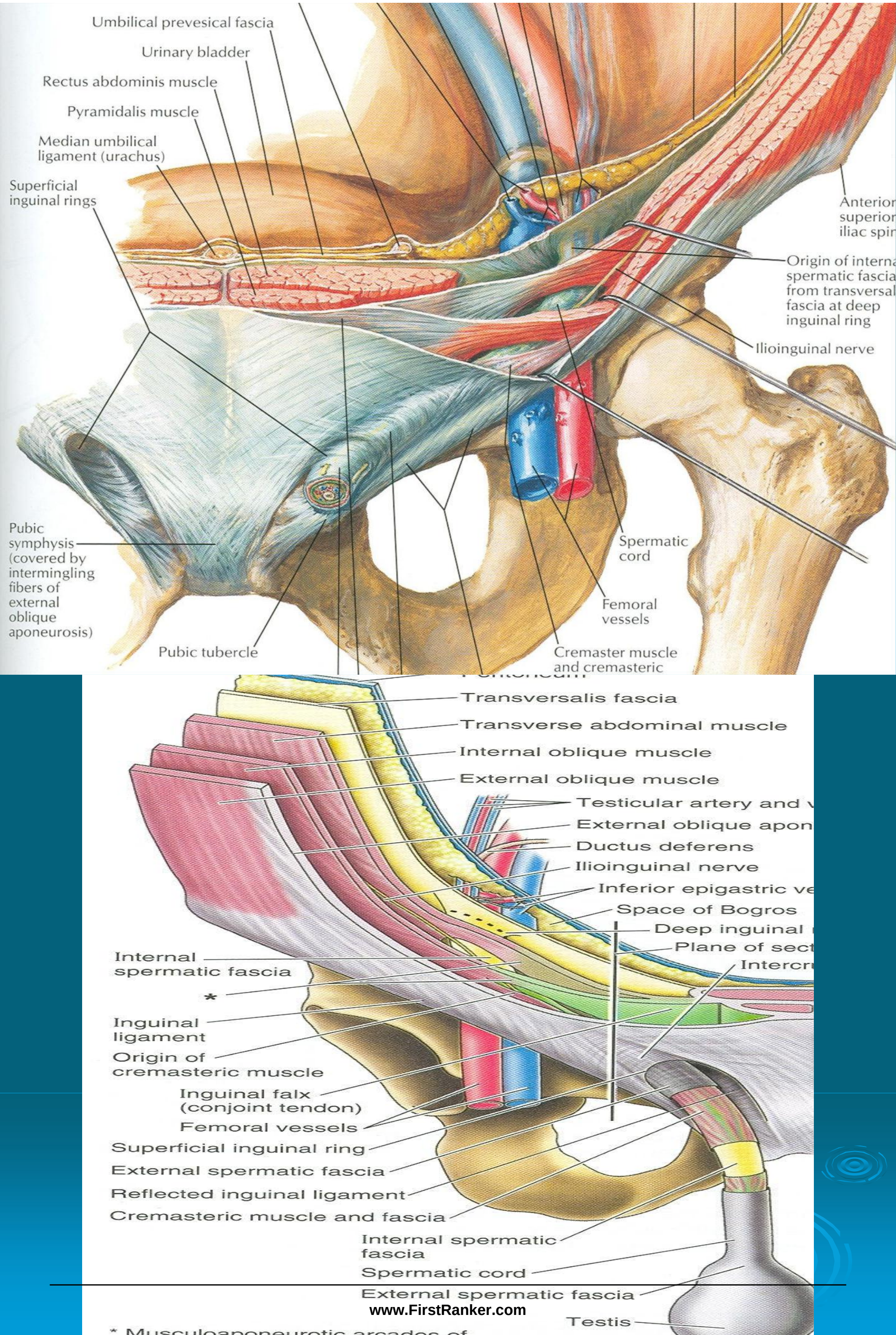
Anteroinferior view

Anterior Wall of Inguinal Canal

- Is formed along its entire length by aponeurosis of the external oblique muscle
- It is reinforced in its lateral third by the origin of the internal oblique from the inguinal ligament
- This wall is strongest where it lies opposite the weakest part of posterior wall, that is deep inguinal ring

Posterior Wall of Inguinal Canal

- 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



* Musculoaponeurotic arcades of

Inferior Wall of Inguinal Canal

- 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

Superior Wall of Inguinal Canal

- Is formed by the arching lowest fibers of the internal oblique and transversus abdominis muscles

Functions of Inguinal Canal

- It allows structures of spermatic cord to pass to and from the testis to the abdomen in male
- Permits the passage of round ligament of uterus from the uterus to the labium majus in female

Mechanics of Inguinal Canal

- Flap valve mechanish- oblique canal, deep & sup. Ing ring do not lie opposite to each other- increased intra abdo pressure – ant & post wall are approximated like a flap.
- Guarding of the inguinal rings- deep ing ring guarded ANTERIORLY by IOM, Sup. Ing ring guarded posteriorly – conjoint tendon & reflected part of ing lig.

Mechanics of Inguinal Canal

- Shutter Mechanism- IOM surrounds the canal in front, above & behind like a flexible mobile arch. When it contracts roof is pulled & approximated on the floor like a shutter
- slit- valve mechanism- contraction of EOM approximates the two crura of sup ing. Ring like a slit valve , the intercrural fibers also help.

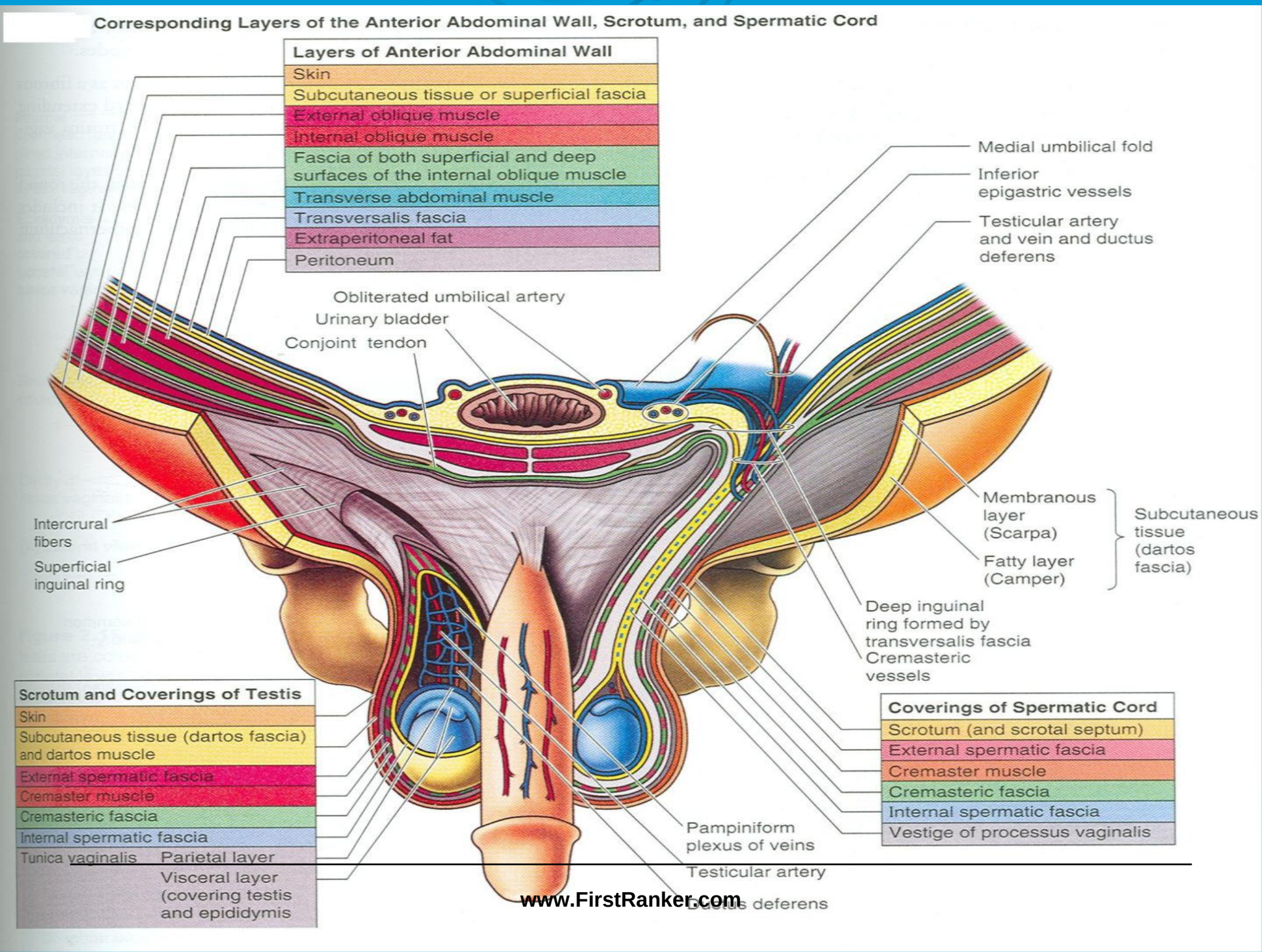
Mechanics of Inguinal Canal

- Ball valve Mechanism-

contraction of cremaster muscle pulls the testis up & sup. Ing. Ring is plugged by spermat. Cord.

Spermatic Cord

- 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

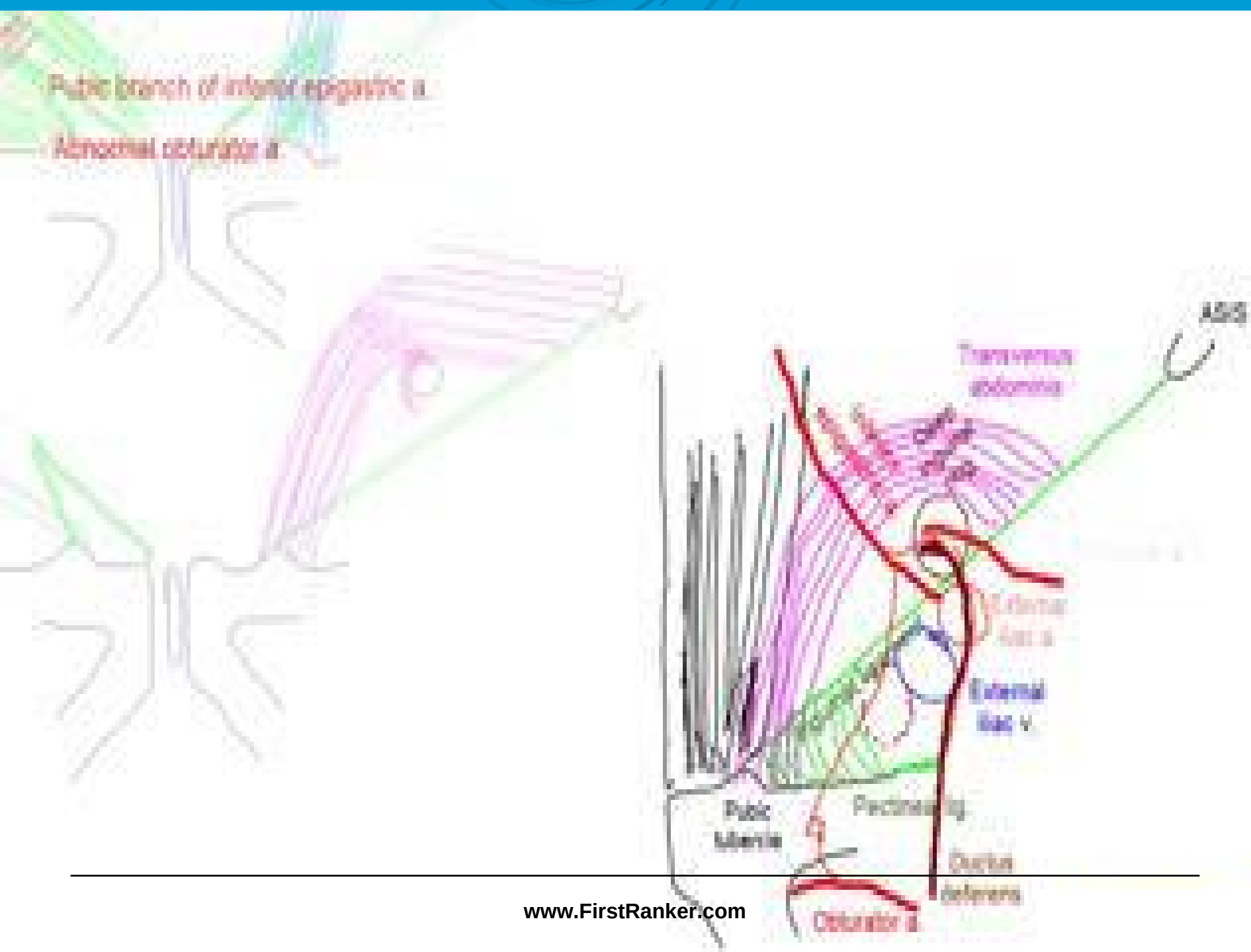


Spermatic cord

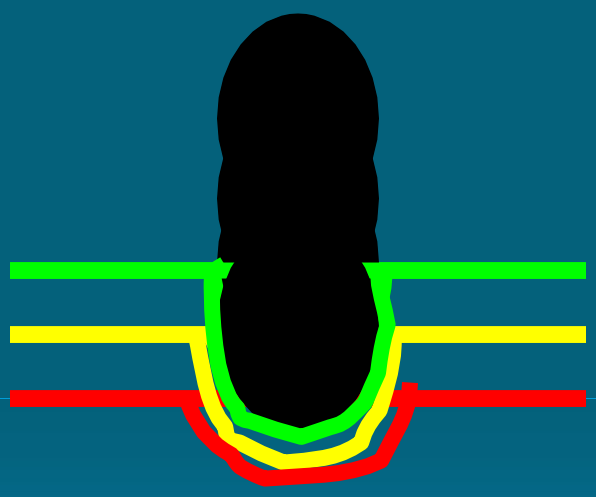
- 3 Fascia layers
  - External spermatic fascia
  - Cremasteric fascia
  - Internal speratic fascia
- 3 Arteries
  - Testicular artery
  - Cremasteric artery
  - Artery to ductus deferens

3 Nerves
- Genito-femoral nerve
- Ilio-inguinal nerve
- Sympathetic autonomic plexus

3 Other structures
- Lymphatic vessels
- Ductus deferens
- Pampiniform venous plexus



Spermatic cord



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 urethra

Testicular Artery

- It is a branch of abdominal aorta
- 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

- 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
- Drains into left renal vein on left side and inferior vena cava on right side

Covering of the Spermatic Cord

- 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

Covering of the Spermatic Cord

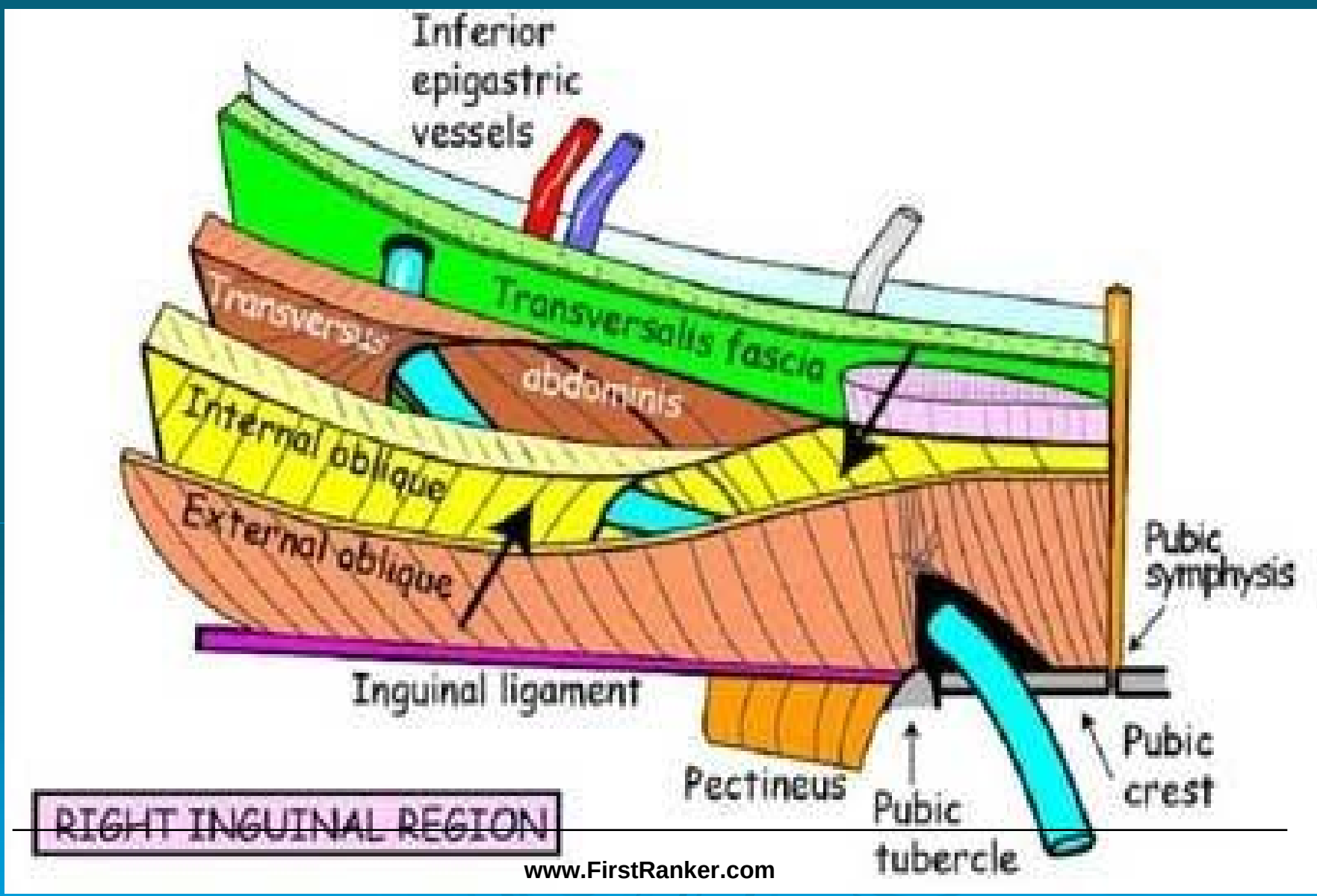
- External Spermatic fascia: Is derived from the external oblique aponeurosis and attached to the margins of the superficial inguinal ring
- Cremasteric Fascia: Is derived from the internal oblique muscle
- Internal Spermatic Fascia: Is derived from the fascia transversalis and attached to the margins of deep inguinal ring

Inguinal Hernia

- A hernia is the protrusion of part of the abdominal contents beyond the normal confines of the abdominal wall

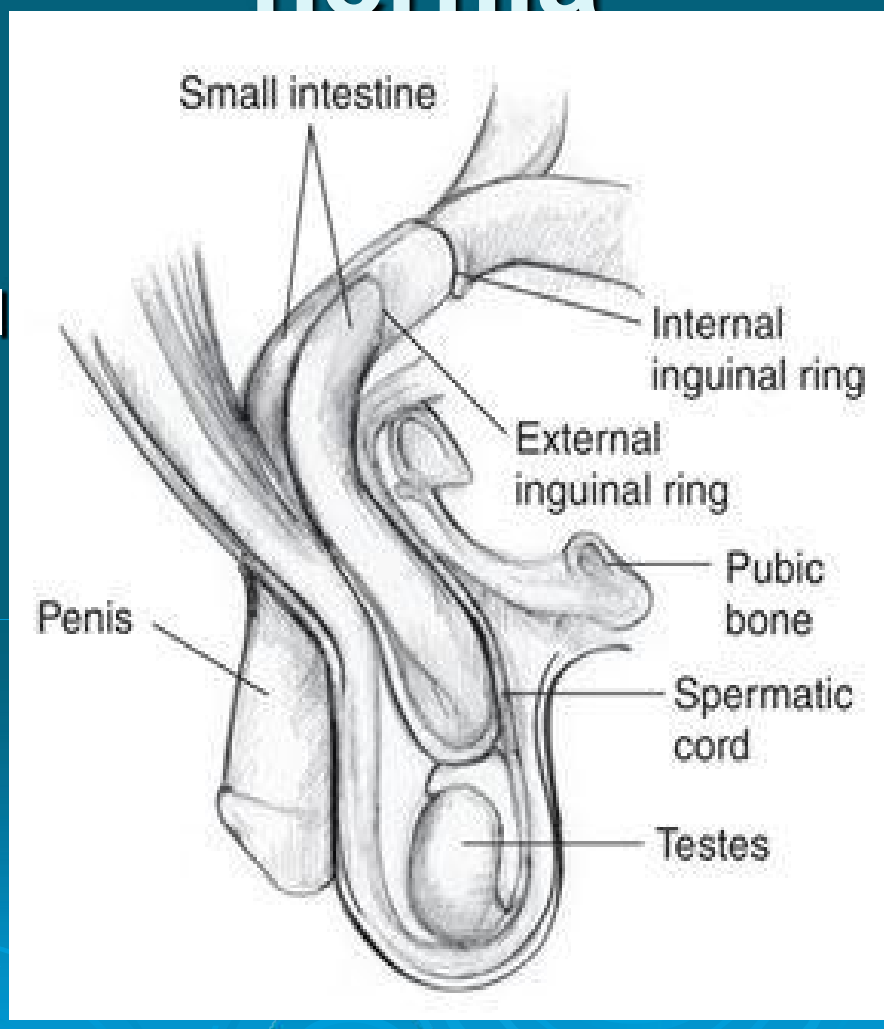
- Hernial coverings are formed from the layers of the abdominal wall through which the hernial sac passes

Inguinal canal



Inguinal hernia

- An **Inguinal hernia** is a protrusion of contents of abdominal-cavity through the Inguinal canal.
- Bulges through a weak area in the lower abdominal muscles.
- An inguinal hernia appears as a bulge on one or both sides of the groin. An inguinal hernia can occur any time from infancy to adulthood.
- Inguinal hernias tend to become larger with time.



- More common in males
- In the case of the female, the opening of the superficial inguinal ring is smaller than that of the male.
- As a result, the possibility for hernias through the inguinal canal in males is much greater because they have a larger opening and therefore a much weaker wall for the intestines to protrude through.

Parts of hernia

- Consists of four parts: the sac, contents of the sac, covering of the sac and neck.
- Hernial coverings are formed from the layers of the abdominal wall through which the hernial sac passes.

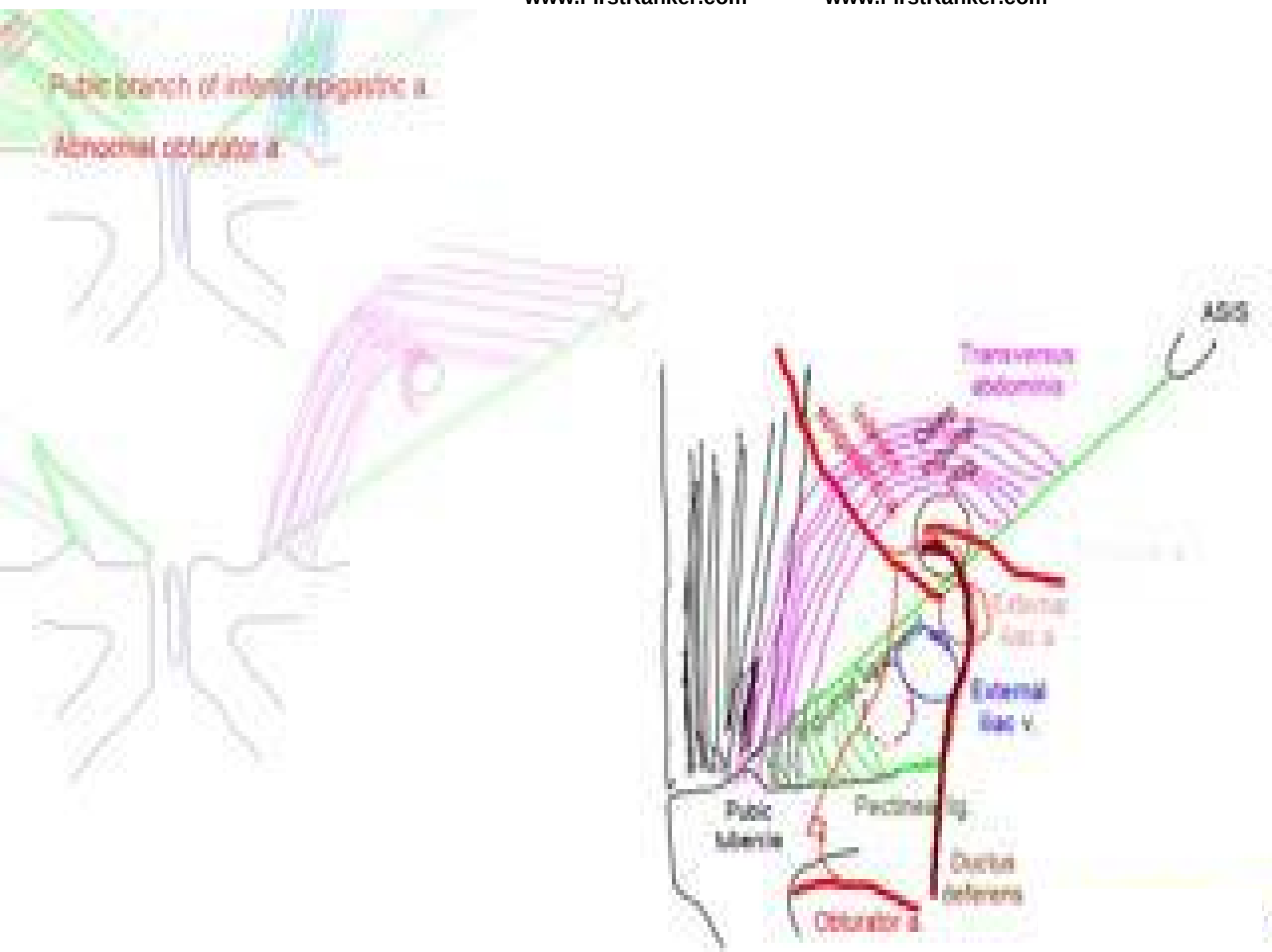
- In Amyand's hernia, the content of the hernial sac is the vermiform appendix.
- In Littre's hernia, the content of the hernial sac contains a Meckel's Diverticulum.

INGUINAL (HESSELBACH'S) TRIANGLE

- INGUINAL (HESSELBACH'S) TRIANGLE is an area of the anterior abdominal wall bounded by

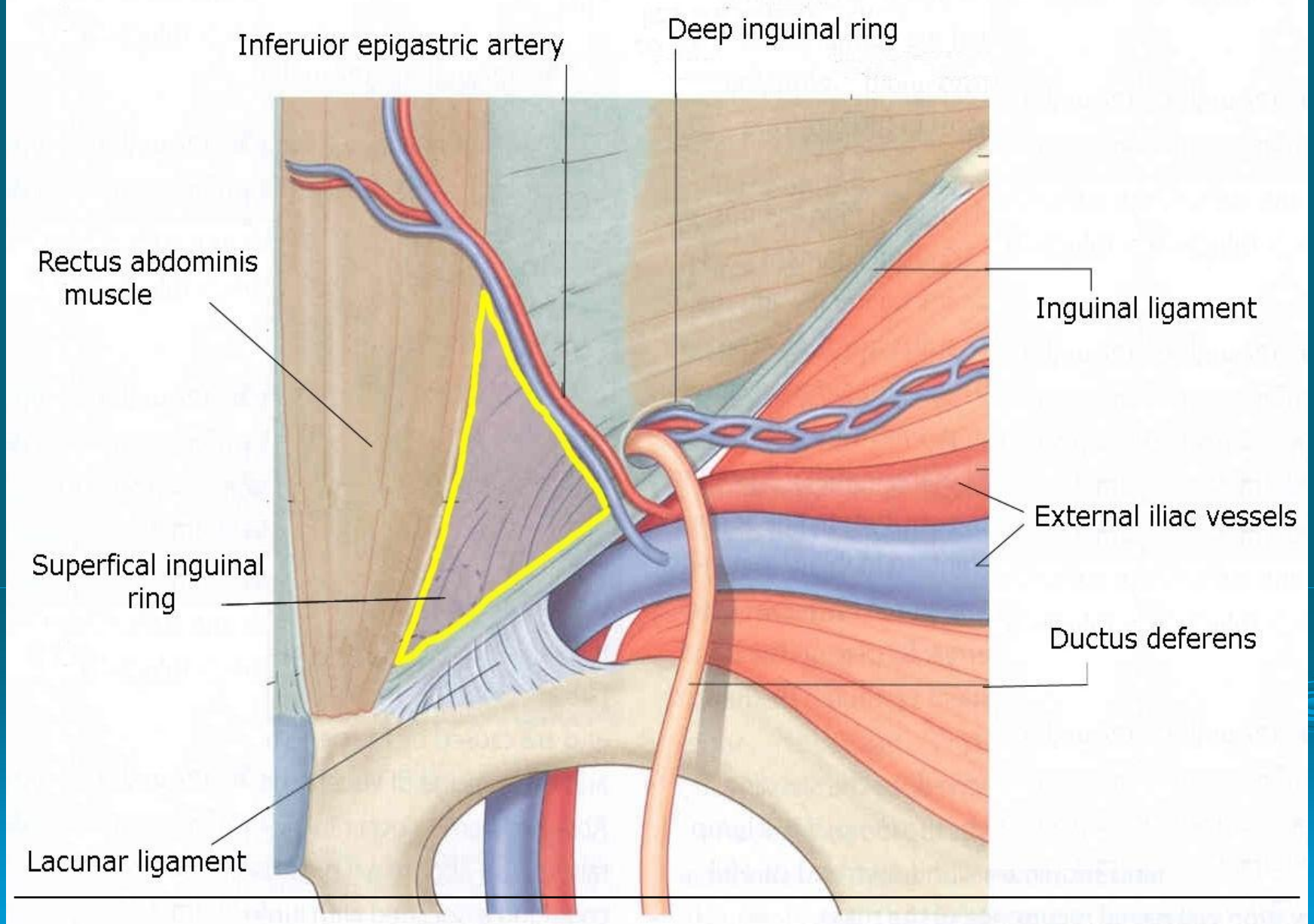
- Inferior epigastric vessels,
- Inguinal ligament and
- Lateral border of the rectus abdominis.

- Direct inguinal hernias leave the abdomen through this triangle.



- **Boundaries**
- Medial border: Lateral margin of the rectus sheath, also called linea semilunaris
- Superolateral border: Inferior epigastric vessels
- Inferior border: Inguinal ligament, sometimes referred to as Poupart's ligament
- This can be remembered by the mnemonic RIP (as direct inguinal hernias rip directly through the abdominal wall).

Hesselbach's triangle



Two types of inguinal hernia

- DIRECT AND
- INDIRECT,
  - which are defined by their relationship to the inferior epigastric vessels.

- Direct inguinal hernias occur medial to the inferior epigastric vessels when abdominal contents herniate through a weak spot in the fascia of the posterior wall of the inguinal canal, which is formed by the transversalis fascia.

- Indirect inguinal hernias occur when abdominal contents protrude through the deep inguinal ring, lateral to the inferior epigastric vessels; this may be caused by failure of embryonic closure of the processus vaginalis.

- **Indirect inguinal hernia.**
  - Indirect inguinal hernias are congenital hernias.
- More common in males than females
- Indirect hernias are the most common type of inguinal hernia.
- More common on right side.
- The neck of the hernial sac lies at the deep inguinal ring
- Premature infants are especially at risk for indirect inguinal hernias because there is less time for processus vaginalis to obliterate.

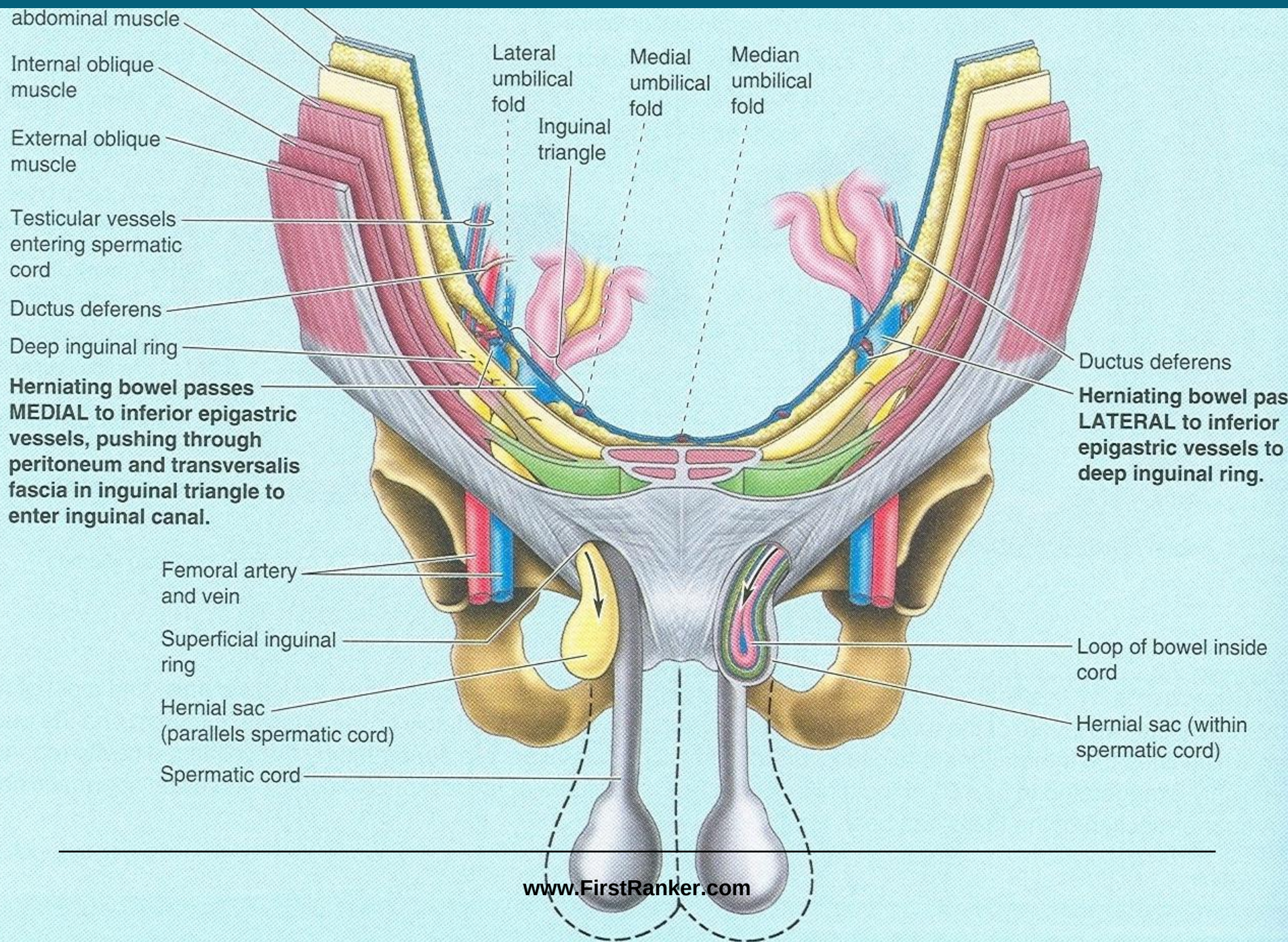
- In a male fetus, the spermatic cord and both testicles—starting from an intra-abdominal location—normally descend through the inguinal canal into the scrotum, the sac that holds the testicles
- Sometimes the entrance of the inguinal canal at the inguinal ring does not close as it should just after birth, leaving a weakness in the abdominal wall.
- Fat or part of the small intestine slides through the weakness into the inguinal canal, causing a hernia.
- In females, an indirect inguinal hernia is caused by the female organs or the small intestine sliding into the groin through a weakness in the abdominal wall.

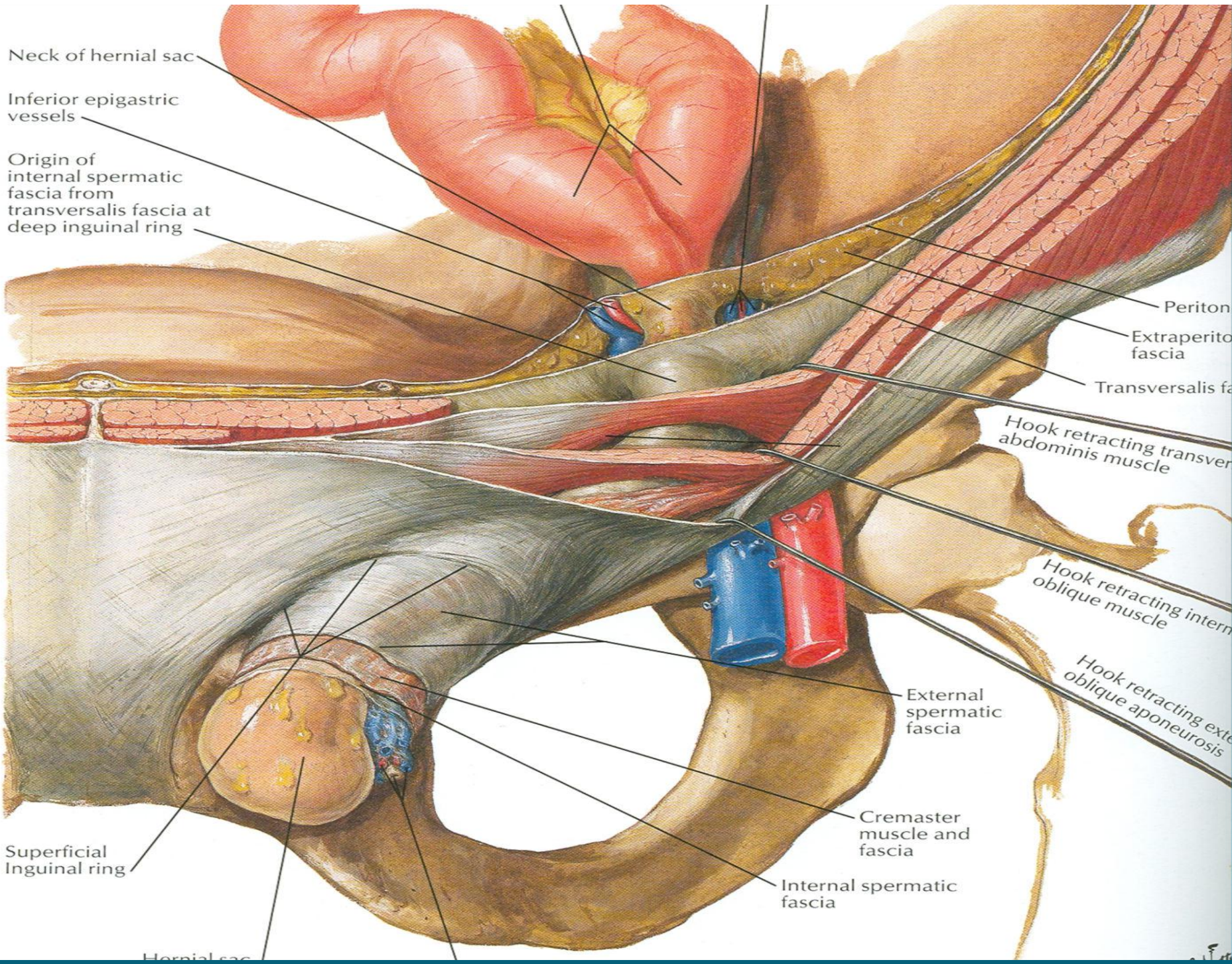
Direct inguinal hernias

- Caused by connective tissue degeneration of the abdominal muscles, which causes weakening of the muscles.
- Common in old men with weak abdominal muscles and rare in women
- The neck of the hernial sac is wide

- The hernia involves fat or the small intestine sliding through the weak muscles into the groin.
- A direct hernia develops gradually because of continuous stress on the muscles.

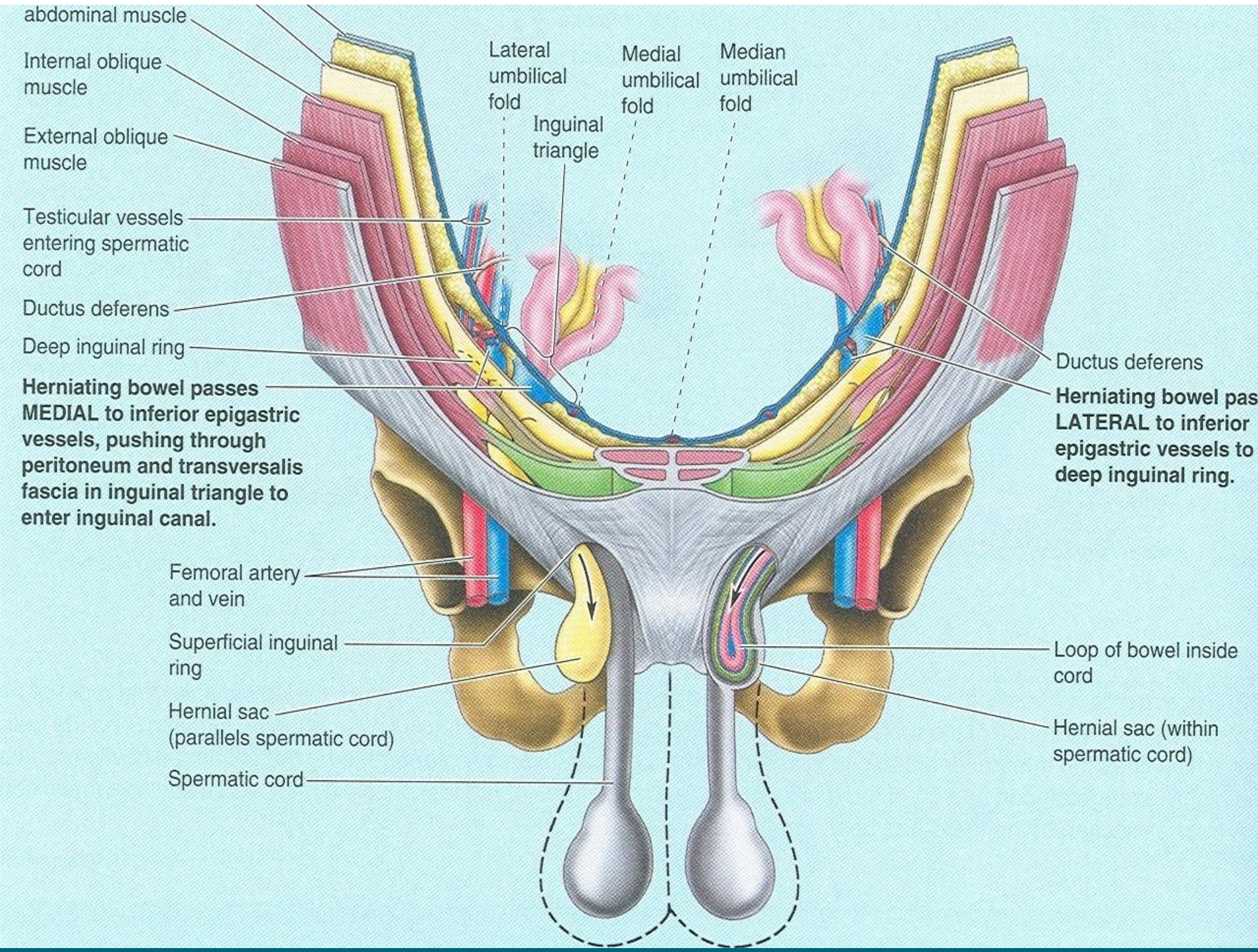
- One or more of the following factors can cause pressure on the abdominal muscles and may worsen the hernia:
  - sudden twists, pulls, or muscle strains
  - lifting heavy objects
  - straining on the toilet because of constipation
  - weight gain
  - chronic coughing





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

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