

Inguinal Hernias

Rodolfo J. Caños, DO MPH FACS FACOS

Disclosures

- Contracted Case Proctor for Intuitive Surgical

Objectives

- What is an inguinal hernia?
- How to diagnose an inguinal hernia?
- Treatments of inguinal hernias?
- Why I prefer laparoscopic robotic assisted repair of inguinal hernias.

- one of the most commonly performed surgeries in the United States
- more than 750,000 performed annually

- occurs in up to 25% of males and 2% of females will develop an inguinal hernia in their lifetime
- three types of inguinal hernias: indirect, direct, and femoral

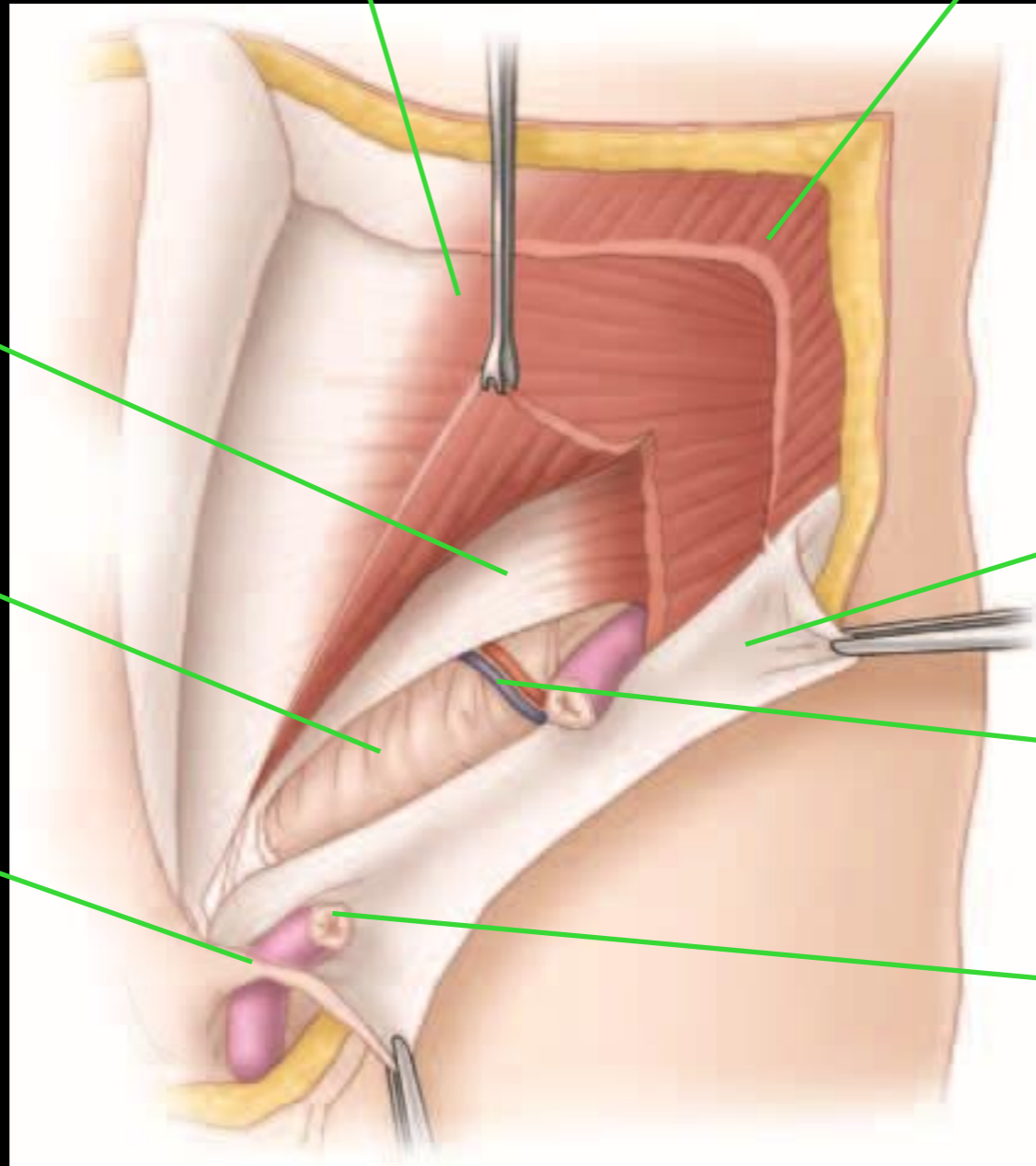
- indirect and direct hernias are determined in relation to Hesselbach's triangle
- indirect inguinal hernias enter the triangle laterally
- direct inguinal hernias enter directly through the triangle

- indirect inguinal hernias involves a peritoneal sac in the inguinal canal with an enlarged internal ring
- as the defect at the internal ring enlarges, the hernia destroys the posterior floor of the direct space or can extend down into the scrotum

- direct inguinal hernias occur through the posterior wall of the inguinal canal (Hesselbach's triangle)
- this is a weak area since it is only composed of transversalis fascia and aponeurotic fibers of transverse abdomens with no true muscle covering

Internal Oblique Muscle

External Oblique Muscle



Transversus Abdominis Muscle and Aponeurosis

Transverse Fascia

Superficial Inguinal Ring

Reflected External Oblique Aponeurosis

Inferior
Epigastric Vessels

Spermatic Cord

Nyhus Classification for groin hernias

Type	Description
1	Indirect hernia with normal internal abdominal ring
2	Indirect hernia in which the internal ring is enlarged but does not extend into scrotum
3A	Direct hernia. Size note taken into account
3B	Indirect sliding or scrotal hernias
3C	Femoral hernia
4	Recurrent hernia

European hernia society classification

- Simplifies the Aachen classification where 1.5 cm is used as reference for the size of the hernia orifice.
- Uses index finger as the reference in open surgery since the tip of the index finger is 1.5-2 cm.
- This reference is similar to the length of branches of a pair of laparoscopic graspers, dissectors, or scissors to allow same classification during laparoscopic surgery.

The ehs groin hernia classification

	0	1	2	3
L				
M				
F				

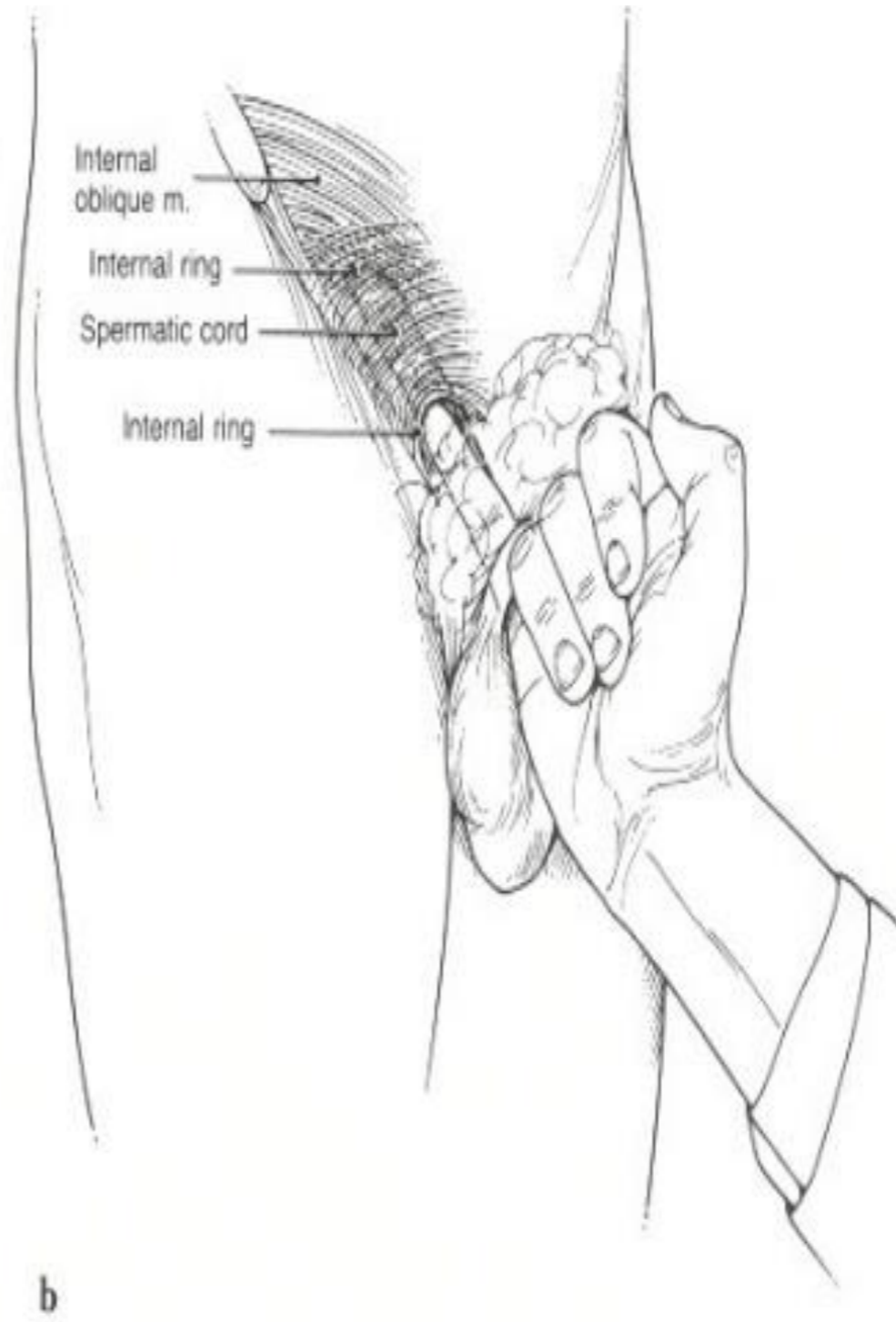
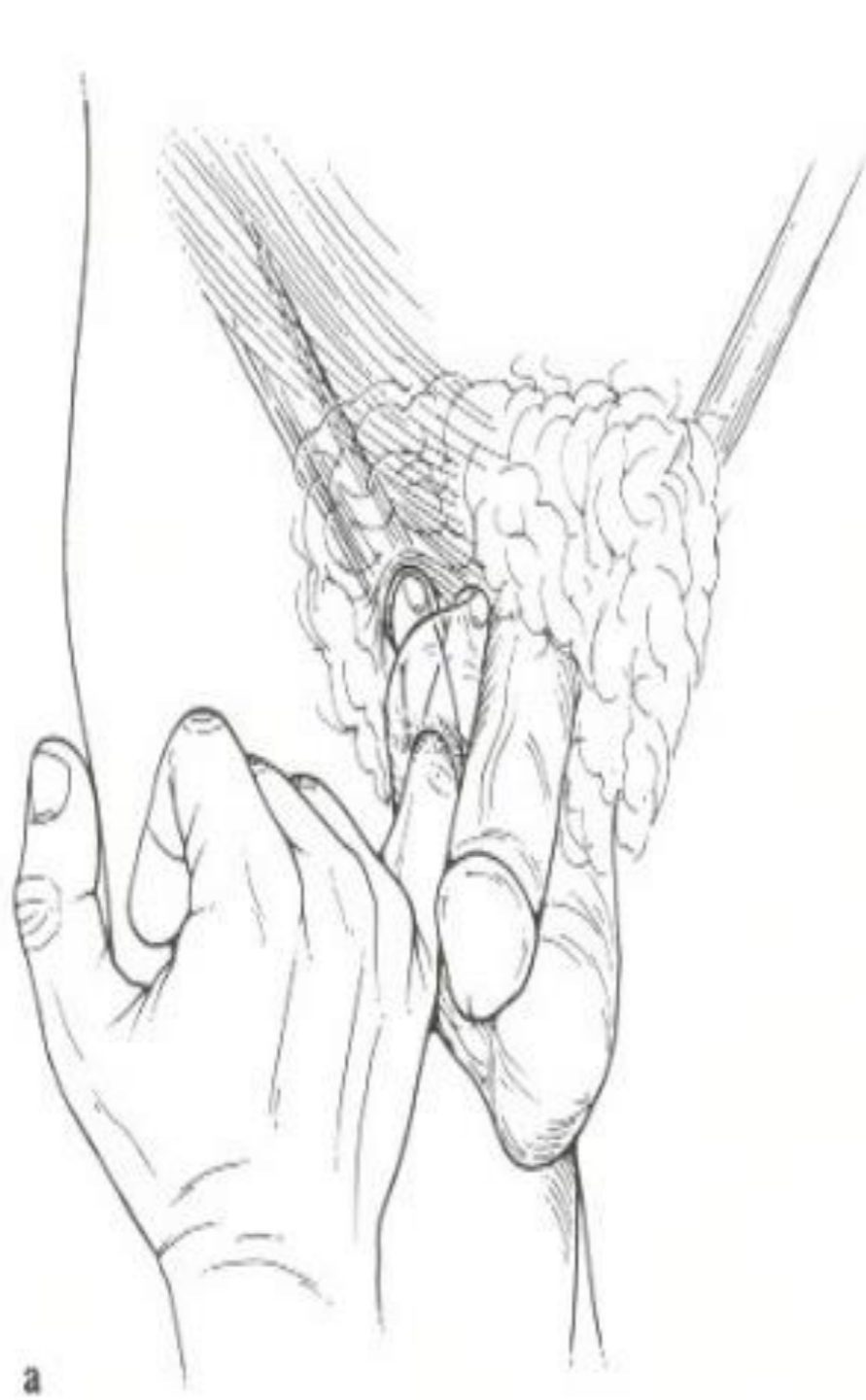
The ehs groin hernia classification

- From the previous table, the size of the hernia orifice is registered as 1 (< finger), 2 (1-2 fingers), and 3 (>3 fingers)
 - A hernia orifice of 2.5 can be described as a size 2.
- For anatomic localization, the hernia can be L=lateral, M=media, or F=femoral.
 - A 2.5 centimeter indirect hernia can be classified as a L2M0F0
- In addition the P or R can be used to depict primary or recurrent.

Aachen Classification

- Makes a distinction between the anatomic localization (indirect or lateral vs. direct or medial) and the size of the hernia orifice defect in cm (<1.5, 1.5-3, or >3 cm).

- **BULGE** is the groin remains the mainstay for diagnosis
- physical exam involves finger invaginating the scrotal skin into the external ring accompanied by Valsalva while patient is standing



- direct inguinal hernias occur due to increased intraabominal pressure from factors such as constipation, chronic cough or difficulty in urination
- a thorough prostate exam for men over 40 and documentation of colon cancer screening in patients over 50 should be done to simultaneous disease of prostate or colon is not present

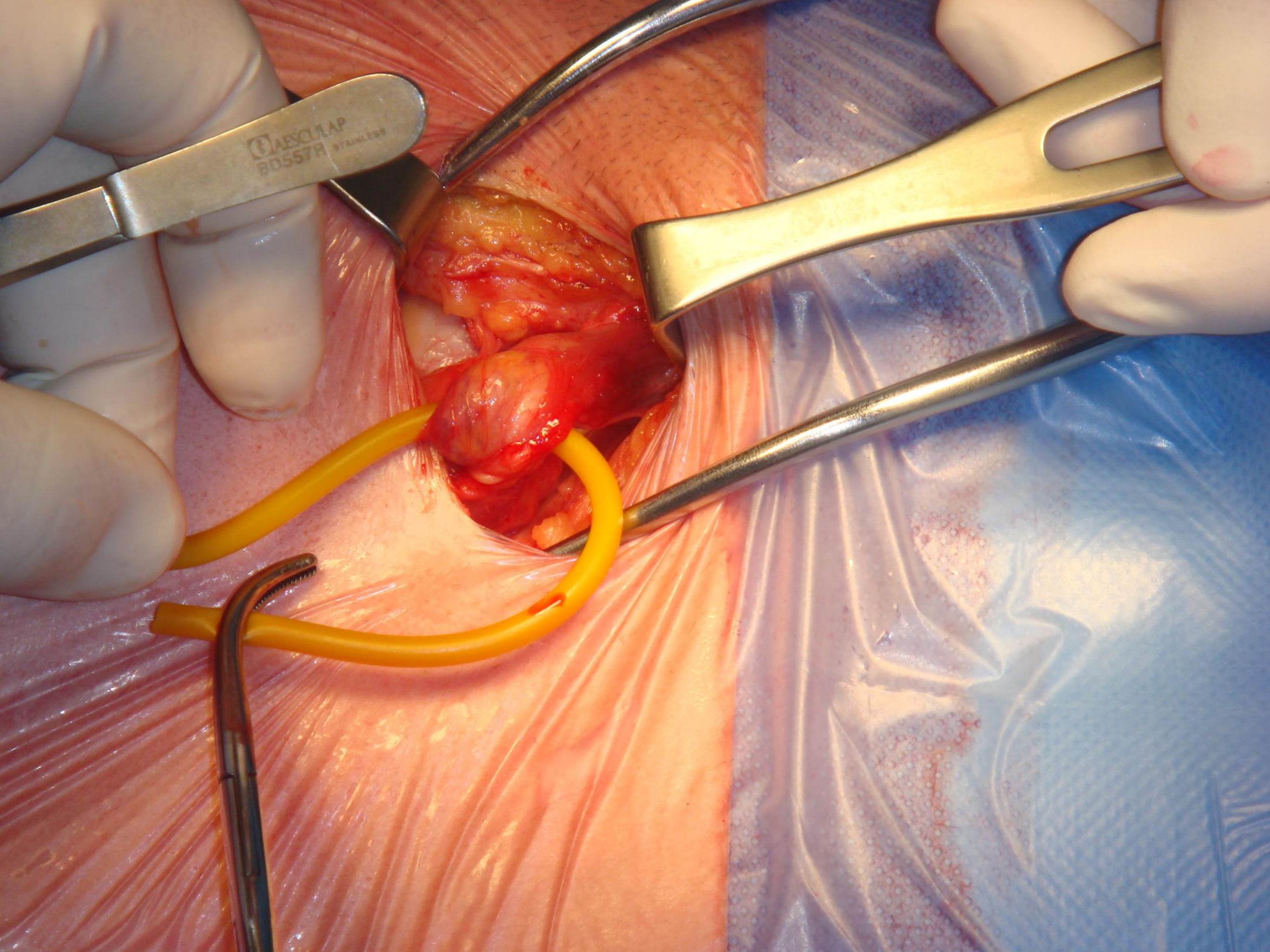
- most bulges are asymptomatic but up to 25% will become symptomatic and require repair in 2 years time
- be suspicious of groin pain with no obvious bulge
- ultrasound, CT, or sometime diagnostic laparoscopy can be used to evaluate patients with groin pain but no palpable bulge

- operating for pain alone usually results in chronic pain
- findings of weak posterior floor, small sac, or cord lipoma can lead to chronic pain if definitive hernia repair is performed

- 10% of inguinal hernias occur bilaterally
- most people will develop a hernia on contralateral side subsequently during their lifetime

- asymptomatic hernias can be done electively when it best fits into patient's work or home schedule
- symptomatic hernias should be repaired earlier to alleviate pain or obstructive symptoms
- non reducible or acutely incarcerated hernias should be considered emergent

Open Hernia Repairs



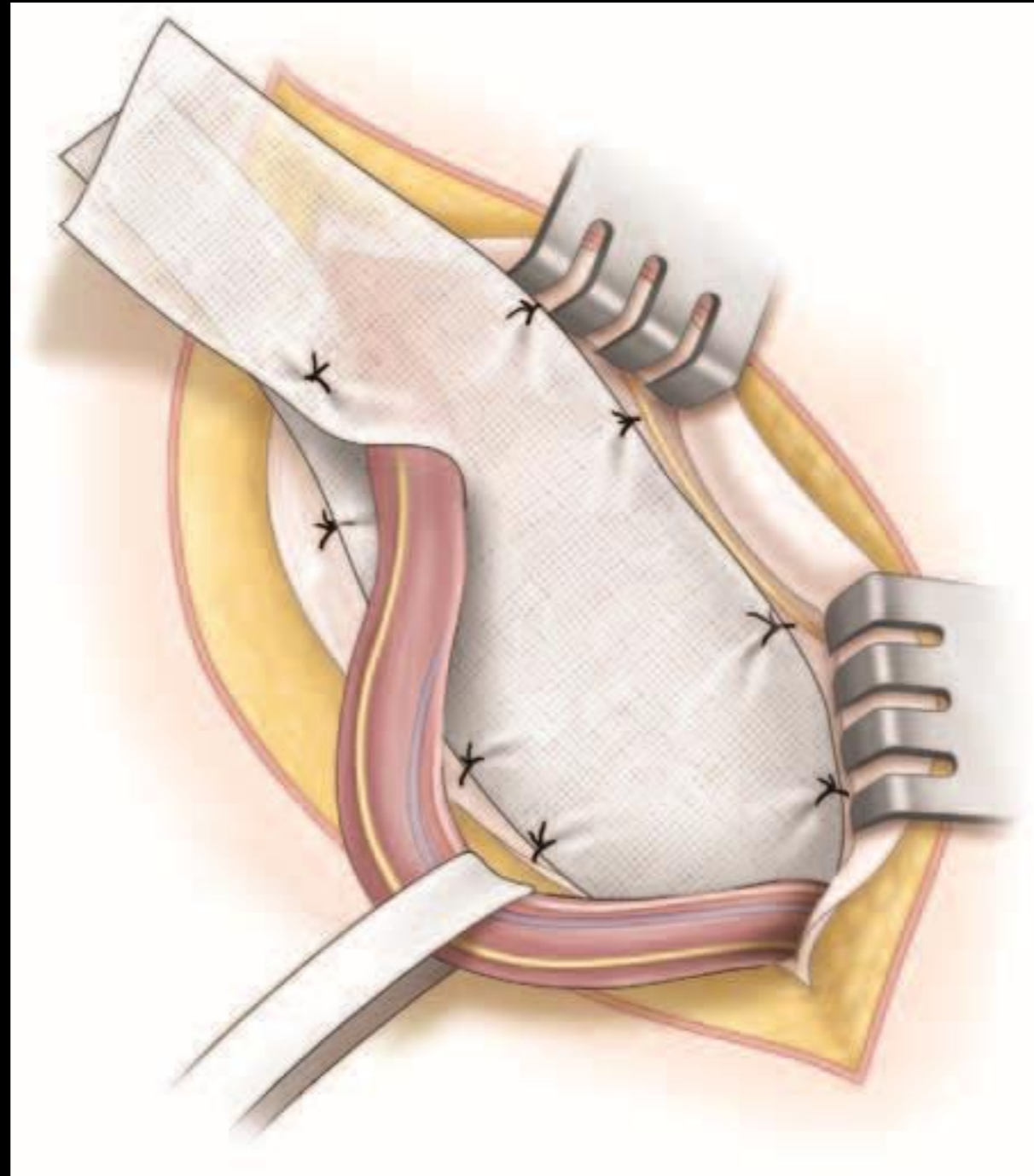
Nonmesh Repairs

- tissue repairs were mainstay of treatment in the 1990s
- Bassini, McVay, and Shouldice repairs are the most common tissue to tissue repairs performed today

Tension Free Repairs

- Lichtenstein Repair
- placement of large prosthesis (at least 15 x 10 cm) from a point 2 cm medial to pubic tubercle to anterior superior iliac spine
- a nonabsorbable suture is placed 2 cm medial to pubic tubercle and then run laterally securing the prosthesis to the shelving edge of the inguinal ligament and the tied at the internal ring

- a slit is made on the lateral side of the prosthesis to create a key hole for the spermatic cord
- the tails of the key hole are placed beneath the external oblique aponeurosis laterally
- two interrupted sutures are placed to attach the superior aspect of the mesh to the internal oblique aponeurosis and rectus fascia

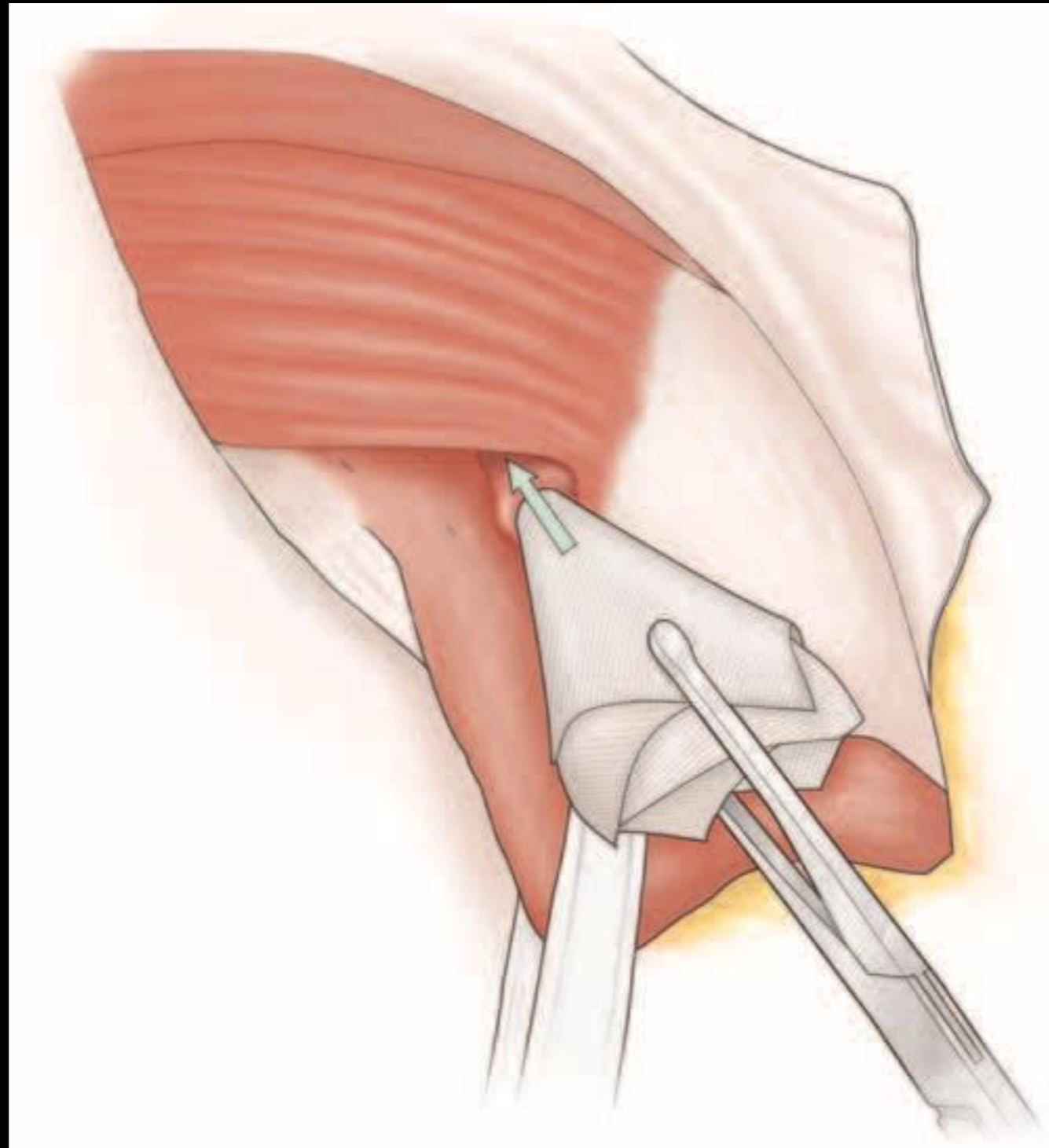


- Plug and Patch
- A sheet of polypropylene mesh is formed into a cone or a prefabricated prosthesis with a flower configuration is inserted into the defect and secured with interrupted sutures

- for indirect hernias the inside pedals are sewn to the internal oblique portion of the internal ring
- this forces the outside pedals of the mesh underneath the inner side of the defect and acts like a preperitoneal underlay

- for direct inguinal hernias, the inside pedals are sewn to Cooper's ligament and the shelving edge of the inguinal ligament
- like indirect placement, it forces the outside pedals to act as an underlay

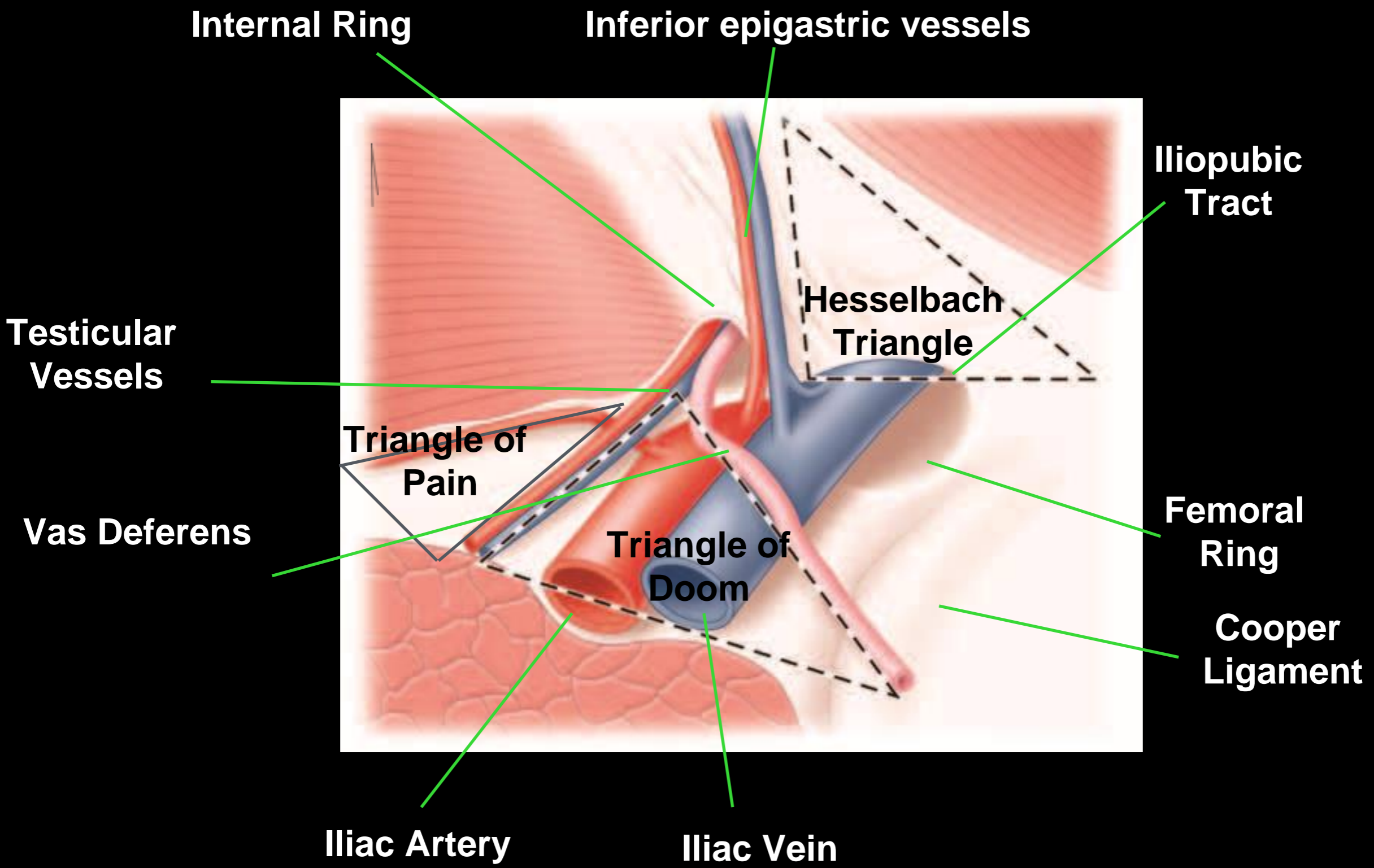
- patch portion is optional
- a flat piece of polypropylene mesh is placed in the inguinal space to overlap the plug
- only 1 or 2 sutures and sometimes no sutures are used to secure the flat prosthesis to the underlying inguinal floor



Laparoscopic Hernia Repairs

TAPP vs TEP

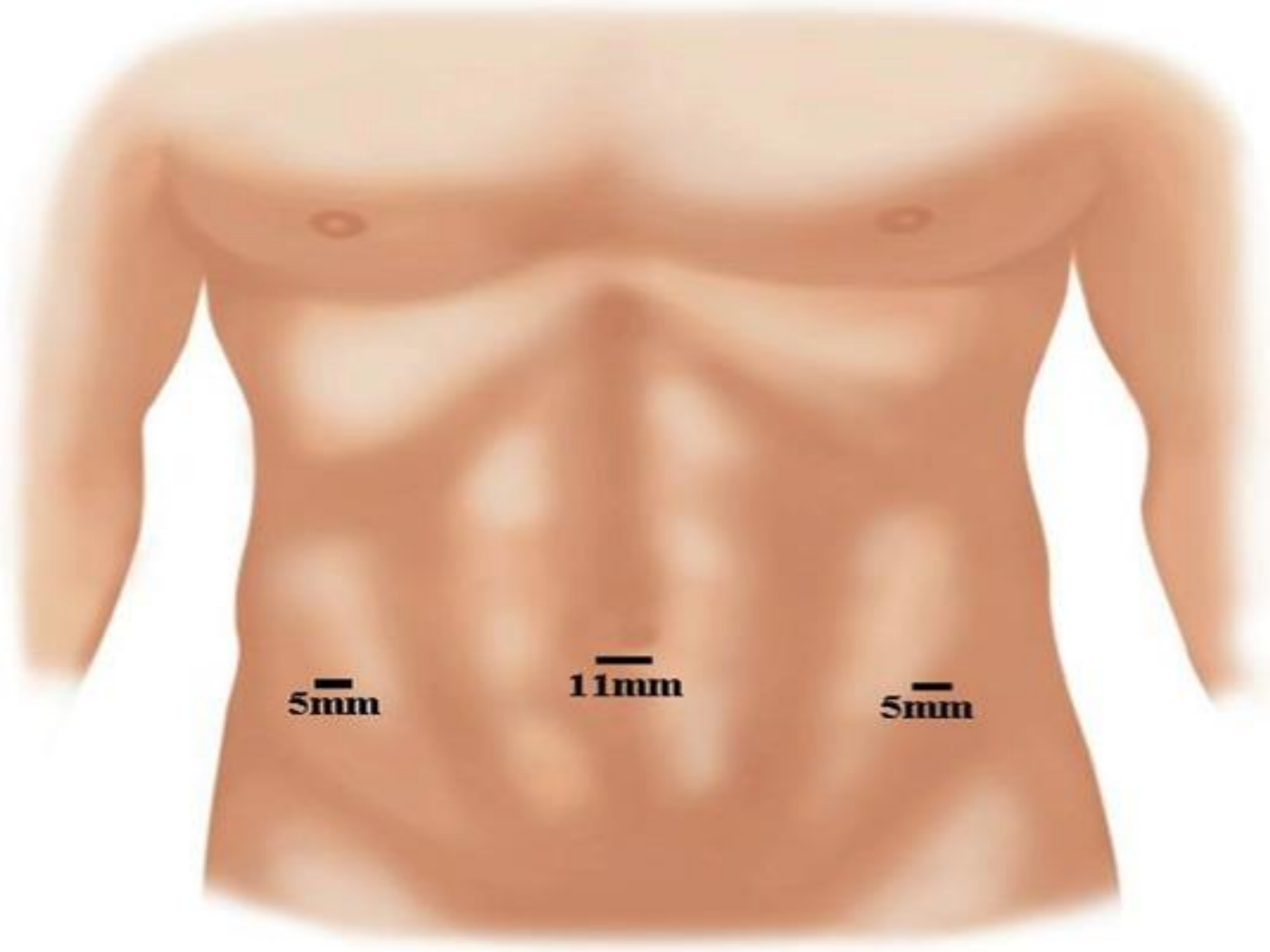
- Transabdominal preperitoneal (TAPP) was the first laparoscopic inguinal hernia repair performed
- Total extra-peritoneal (TEP) is the most common laparoscopic approach to inguinal hernia repairs
- Major difference is the approach to the preperitoneal space.
- TEP does not violate the peritoneal cavity.
- TAPP requires a familiar laparoscopic access technique and better initial view of the inguinal anatomy.



- Triangle of Doom
 - The lateral spermatic vessels and the medial vas deferens merge at the internal ring to form the apex of the triangle of doom
 - the external iliac vessels lie in the triangle so care must be taken not to extend dissection into this area
- Triangle of Pain
 - Inferior to the iliopubic tract and bordered medially by the spermatic vessels
 - Using tacks in this area risks injury to genitofemoral, iliohypogastric, ilioinguinal, and lateral femoral cutaneous nerves

TAPP Repair

- Step 1: tracer placement
 - Pneumoperitoneum is established through open Hassan or Veress needle and Optiview
 - two ports are placed at lateral border of each rectus abdominis at the level of the umbilicus

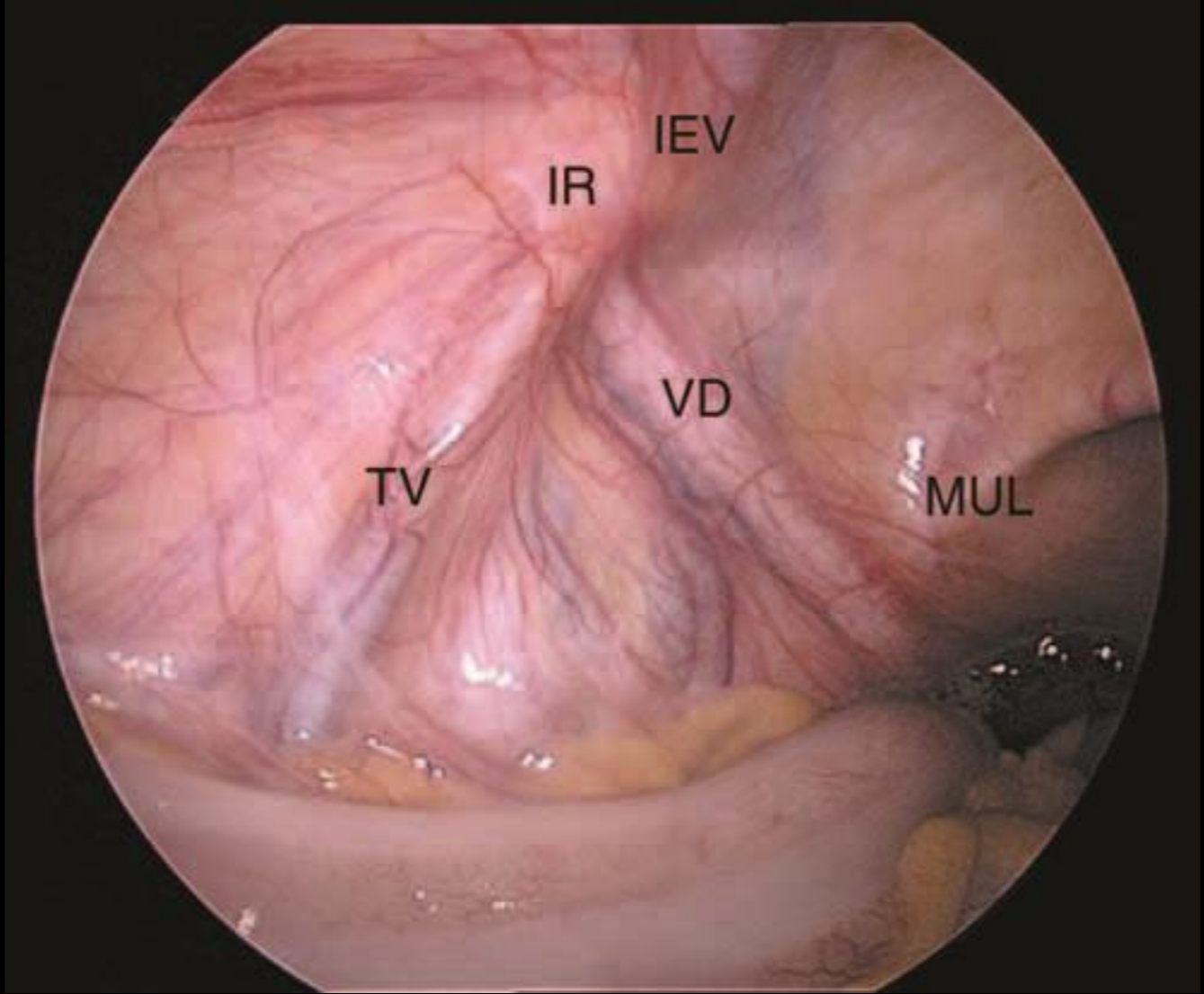


5mm

11mm

5mm

- Step 2: Identification of anatomic landmarks
 - spermatic vessels
 - median umbilical ligament
 - lateral umbilical ligaments (inferior epigastric vessels)
 - external iliac vessels



- indirect inguinal hernias can be easily identified by the presence of discrete hole lateral to the junction of the vas deferens, the testicular vessels, and inferior epigastric vessels

- direct inguinal hernias can be more challenging
- sometimes they appear as a complete circle or hole
- sometimes they appear as a cleft located medial to the vas deferens
- sometimes they are hidden by preperitoneal fat

- Step 3: creation of peritoneal flap
 - transverse incision is made along the peritoneum several centimeters above the upper border of the internal inguinal ring
 - incision extends from pubic tubercle to 5 cm beyond the internal inguinal ring

- the incised peritoneum is grasped and is dissected cephalad to create a lower peritoneal flap
- dissection is done close to the abdominal wall
- when the correct preperitoneal plane is entered, dissection is almost bloodless

- Step 4: dissection of the hernia sac

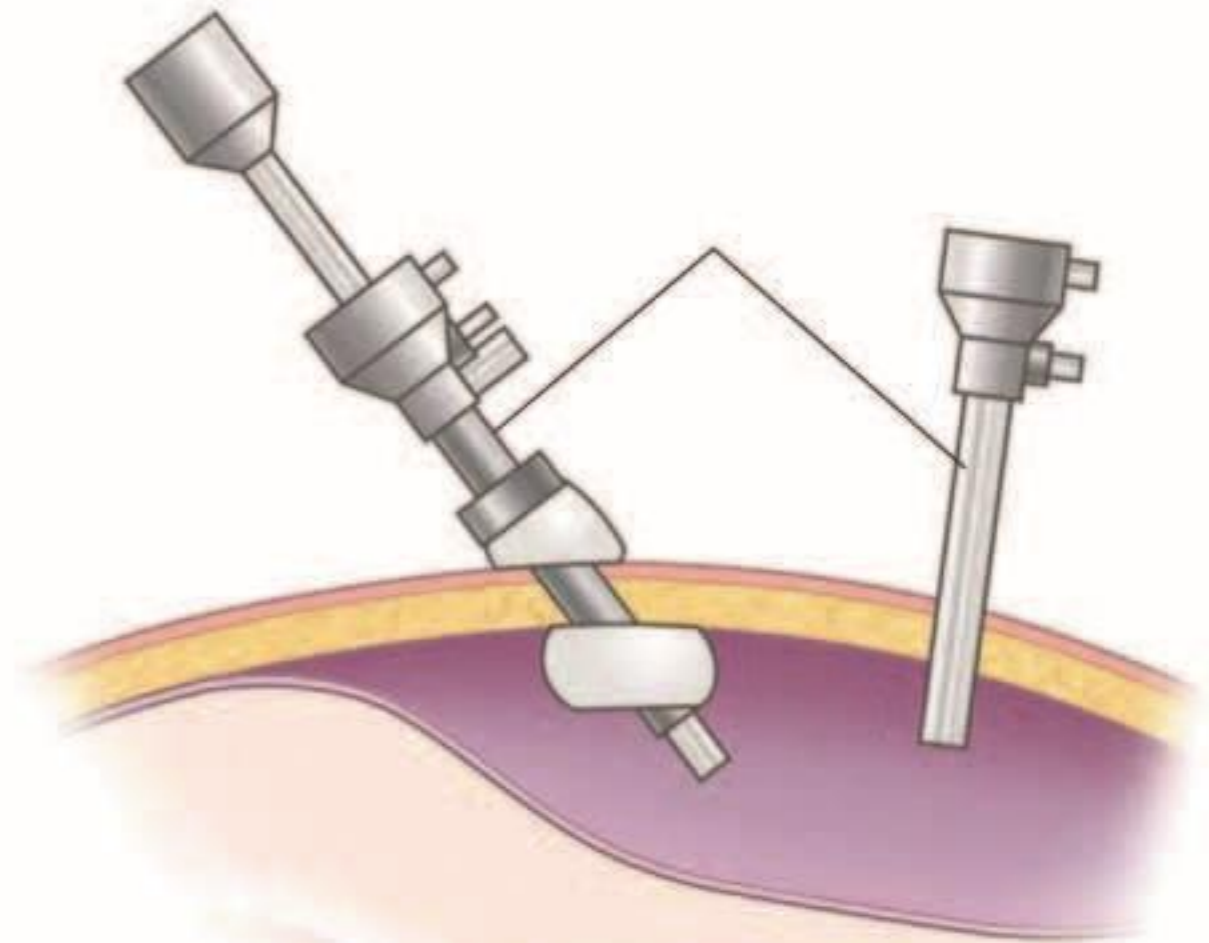
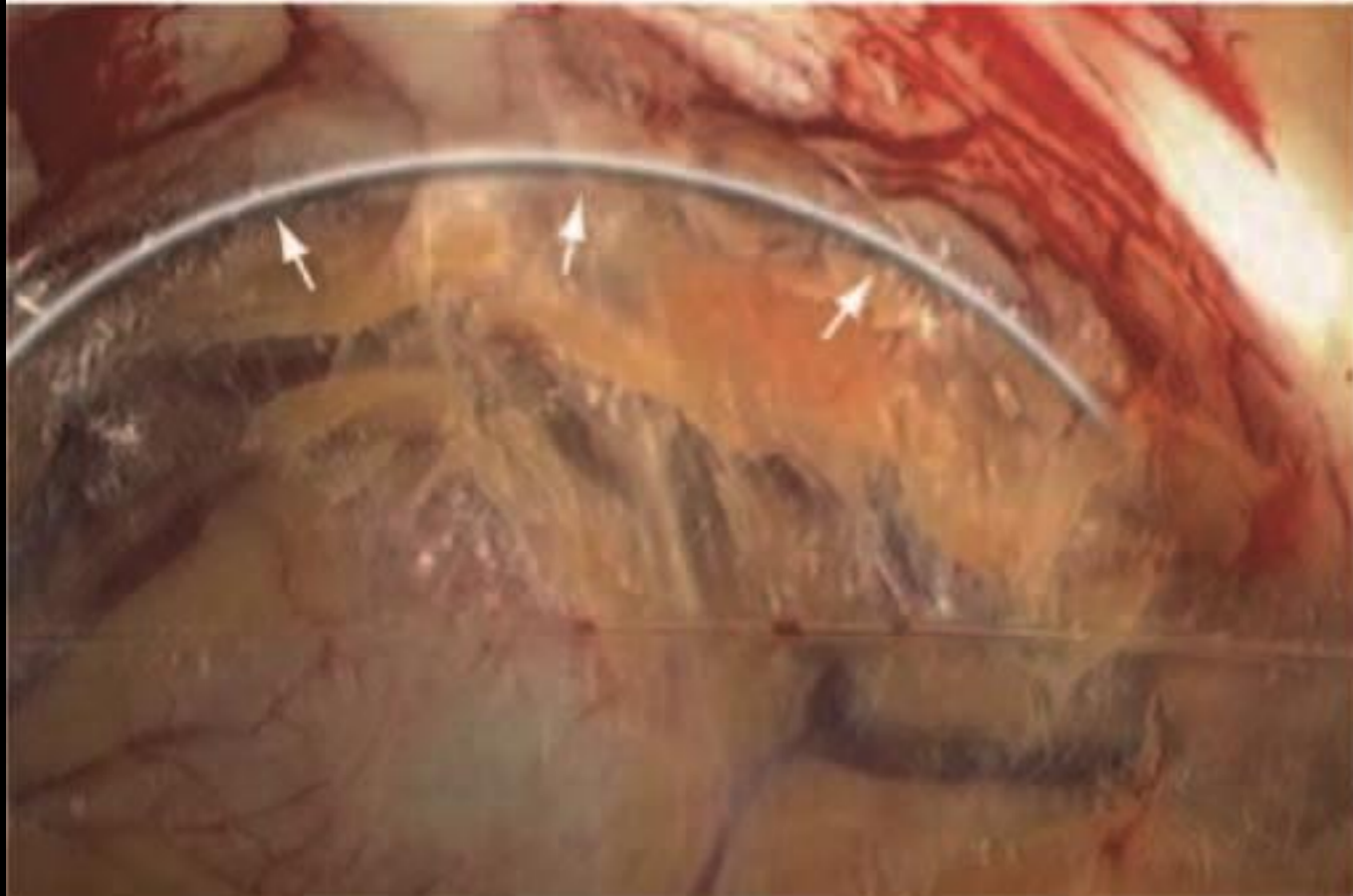
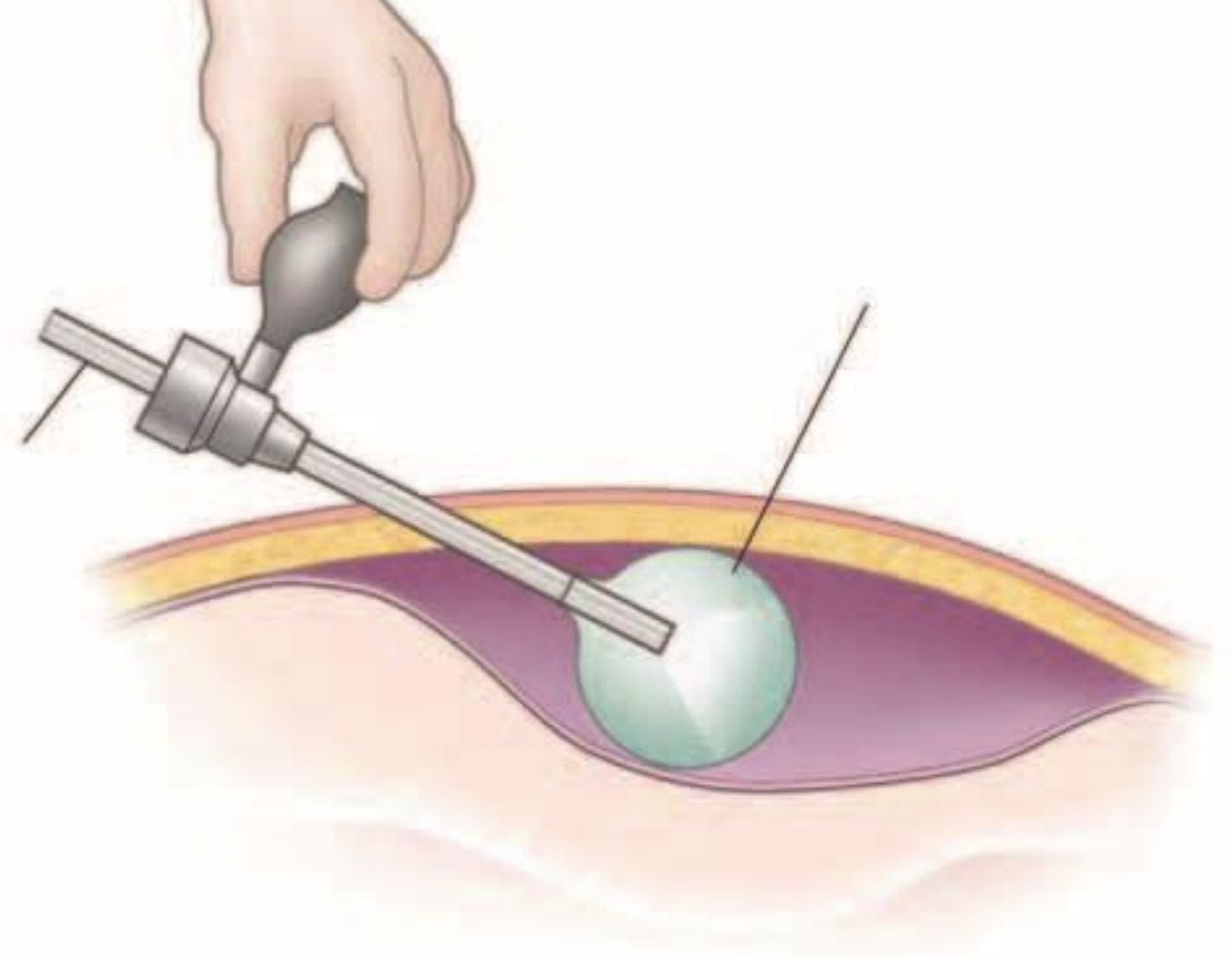
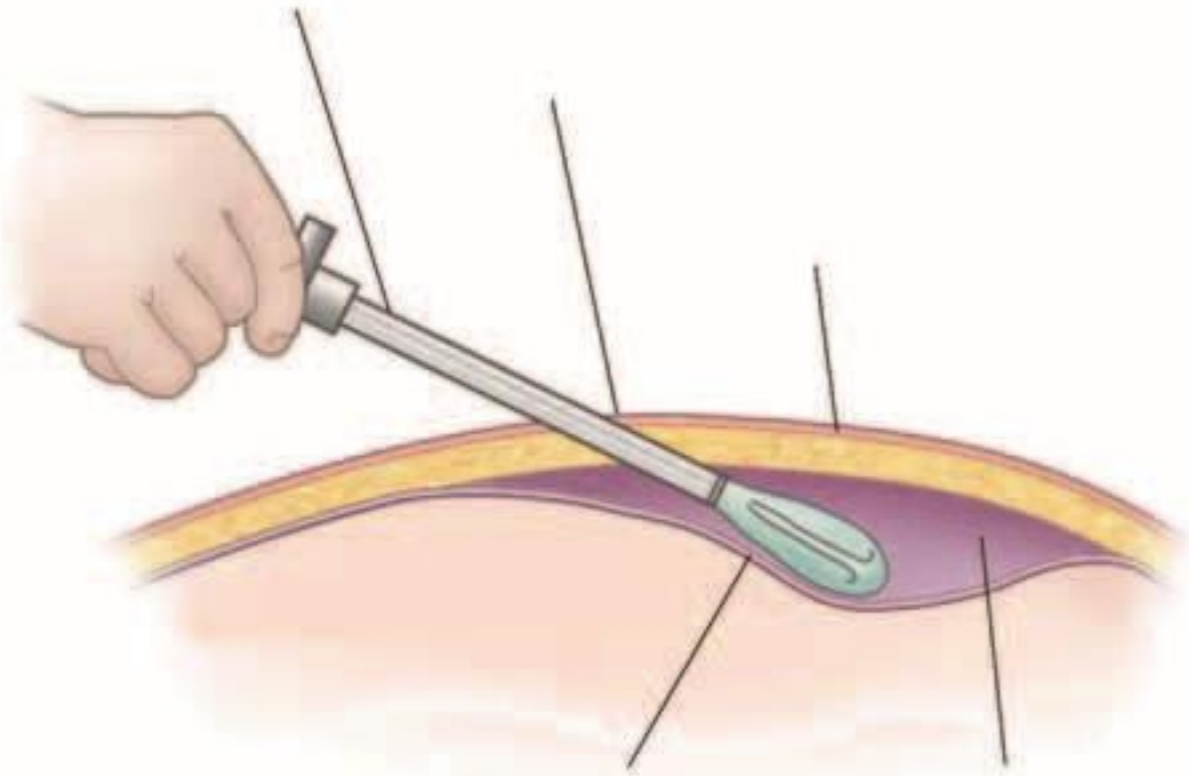
- Step 5: mesh placement
 - 15 x 10 cm sheet of polypropylene or polyester mesh is rolled and introduced into the abdomen
 - mesh is used to cover direct, indirect, and femoral spaces

- mesh is secured medially to Cooper's ligament
- lateral to the cord structures tacks are placed superior to the iliopubic tract to prevent entrapment of lateral femoral cutaneous or branches of the genitofemoral nerve

- Step 6: closure
 - the peritoneal flap, including redundant inverted hernia sac, is placed over the mesh, and the peritoneum is reapproximated along its superior edge

TEP Repair

- Step 1: creation of preperitoneal space
 - anterior rectus fascia is opened through 1 cm infraumbilical transverse incision on the side of the hernia
 - rectus is retracted laterally and balloon dissector is inserted to level of pubic tubercle
 - balloon is distended under laparoscopic visualization



- Step 2: tracer placement
 - a midline 5 mm trocar is placed three fingerbreadths below the infraumbilical port
 - a second 5 mm trocar is placed another three finger breadths below the first 5 mm port

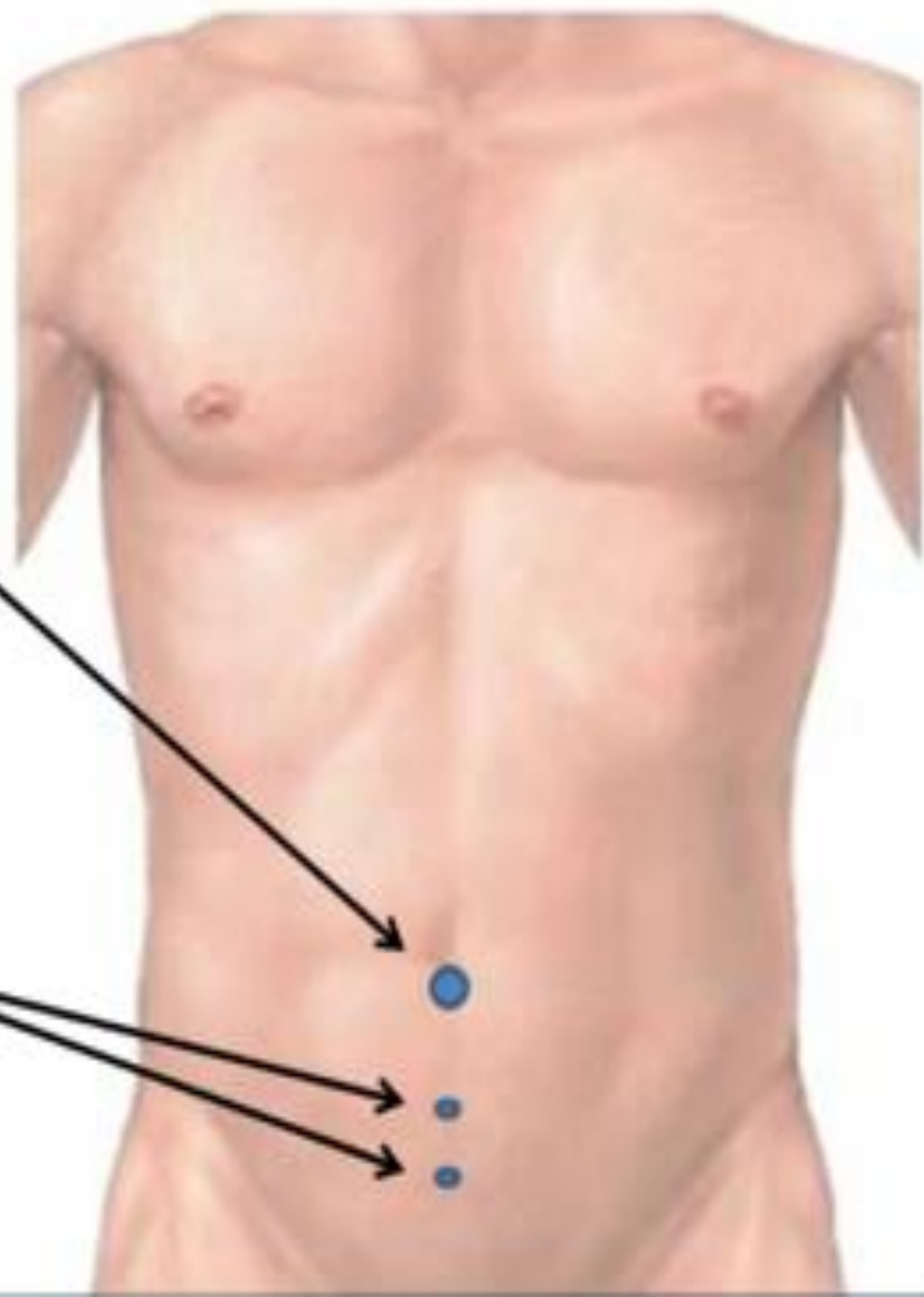
Incisions

8 mm incision

Below navel for the introduction of laparoscope and the mesh

2 incisions 5 mm wide

In the lower abdomen for the insertion of laparoscopic tools.



- if peritoneum is penetrated the resulting pneumoperitoneum can limit work space
- can repair rent with suture, place a Veress needle into the abdominal cavity, or convert to TAPP

- Step 3: dissection of hernia sac

- Step 4: Mesh placement
 - similar to TAPP

- Step 5: closure
 - trocars are removed under direct visualization
 - CO₂ is slowly released so the mesh may be visualized as the preperitoneal space collapses onto the mesh

Complications

- Recurrence
 - mesh repair recurrence between 1-4% for open
 - up to 10% recurrence for laparoscopic repair but likely due to early stage of surgeon's experience with laparoscopic herniorrhaphy

- Pain
 - long term pain seen in 5-15% of patients
 - first rule out recurrence
 - treat conservative with anti inflammatories and local nerve blocks
 - when groin exploration is required, neurectomy, neuroma excision, adhesiolysis, or foreign body removal are options but with less than satisfactory results

- Ischemic orchitis
 - occurs within first 2 postoperative days due to trauma to testicular veins leading to vascular congestion and subsequent thrombosis
 - 1% of patients after laparoscopic repair
 - painful enlarged and hard testicle that last several weeks but is self limited

- Vas Deferens Injuries

- Bladder Injuries
 - likely to occur when space of Retzius is has been dissected in prostatectomy
 - catheter may be useful to identify injury

- Vascular Injuries
 - result of delayed bleeding from cremasteric artery, internal spermatic artery, or branches of inferior epigastric vessels
 - bleeding is usually self limited and can produce impressive scrotal hematoma
 - all vessels with exception of external iliac vessels can be ligated

Negatives of standard laparoscopy

- Uncomfortable is operating for long periods of time
- 2D visualization
- Unstable camera platform
- Steep learning curve for moderate to advanced procedures

Negative perceptions of Robotic surgery

- Too expensive. Surgery can be done better and cheaper with stick laparoscopy.
- Not enough data
- Set up takes too long

positives of robotic surgery

- Ergonomics allow less wear and tear to the body
- 3D visualization
- Stable camera platform
- More precision and control compared to standard laparoscopy